EPPO Study on Pest Risks Associated with the Import of Tomato Fruit

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CONTENTS

Background and objectives

The EPPO Study on pest risks associated with the import of tomato fruit aimed to produce lists of pests associated with the pathway of fruit of *Solanum lycopersicum* (tomato), with supporting information for pests that could be possible candidates for addition to the EPPO Alert List or for PRA. The original description of the Study envisaged that *Capsicum annuum* (sweet pepper) and *Solanum melongena* (eggplant) also be covered. However, this was not possible due to time constraints. The study was prepared by a consultant in collaboration with the EPPO Secretariat.

One aim of the study was to identify potential threats to tomato from other regions of the world, before they reach the EPPO region. EPPO has in the past used several mechanisms to identify potential pest risks: interceptions in an EPPO country leading to the inclusion of a pest on the EPPO Alert List and possibly a PRA; identification of particular threats from the literature, especially emerging pests, to be included in the Alert List. The present study aimed to achieve a more general search for important tomato pests worldwide. The original idea was to limit the study to pests occurring in areas of the world with Mediterranean climates, due to the predominance of tomato growing in the Mediterranean area of the EPPO region. However, pests cannot be searched for on this basis only, and it was considered more appropriate to first compile a list of tomato pests in other regions, and then screen them on the basis of specified criteria.

Finally, the study aimed to gather information on tomato production worldwide and on the pathway 'tomato fruit into the EPPO region' in support of future pest risk analyses of tomato pests.

The study first addresses the pathway tomato fruit (Part 1) before considering pests of tomato (Part 2). An executive summary is given at the beginning of Part 1 and Part 2.

Acknowledgements

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PART 1

TOMATO FRUIT - PRODUCTION, TRADE, PATHWAY INTO THE EPPO REGION

Executive summary

Tomato is a very variable crop, with thousands of cultivars. The fruit vary in size, shape and colour, and may be produced outdoors or under protected conditions. Tomato fruit is produced throughout the world, in the field or in protected conditions, in a wide range of climatic conditions. Trade in tomato fruit is very important worldwide. Tomato is cultivated in all EPPO countries, and fruit is also imported to meet the high demand. The majority of imports of tomatoes by EPPO countries originate from within the EPPO region. However, EPPO countries do import some tomato fruit from non-EPPO countries. This trade is usually between neighbouring countries, but may also be with distant regions. According to trade statistics in FAOSTAT, EPPO countries have imported tomato fruit from 87 countries in the period 1986-2009, and from 42 countries in 2010 alone. Origins include both large and small producing and exporting countries worldwide.

The tomato pathway into the EPPO region does not consist of one uniform commodity. Tomato fruit may be intended for the fresh market or for processing, be of different types that are handled and stored differently, be accompanied or not by green parts, or have been harvested at different maturity stage (which would influence the pests associated with the fruit).

However, all tomato fruit commodities are similar in that tomato fruit is perishable and has a limited life span if its quality is to be maintained through to final use. Tomato is therefore most likely to be transported under standardized transport conditions for the type of tomato concerned. Packaging seems quite standard. In addition, due to their limited life span and optimal conservation conditions, tomato fruit is expected to be stored and transported under cool conditions (10-13°C or below) for a limited number of days. An important parameter to be considered for individual pests during pest risk analysis would be whether the pest would survive the cool transport conditions for the estimated duration of transport.

Introduction. Some characteristics of the tomato plant and fruit

Tomato (*Solanum lycopersicum*) originates from South America and may have been domesticated in Peru or Mexico (Peralta et al., 2007). It is now grown worldwide outdoors and under protected conditions, commercially and in gardens. The precise number of tomato cultivars was not found, but there are certainly thousands of cultivars worldwide[1]. Tomato is grown in a wide range of climates. Tomato plants are sensitive to cold, especially to low night temperatures, and are a warm season crop; however, they may tolerate some variation. CAL (2007) indicates optimal temperatures of 21-32°C with a tolerance for exposure to temperatures below 12.7°C or above 37.7°C for short periods. Relative humidity is important for pollen transfer, with 40-70% relative humidity being favourable. In desert areas where relative humidity is low, tomato plants are grown with additional irrigation. Tomato is cultivated outdoors as far north as Alaska (Matheke et al., 2006) or similar northern locations, especially in gardens. In warmer areas, tomato may be cultivated outdoors all year round.

The ripe tomato fruit present a wide variation in colour (e.g. red, yellow, green, black, orange), shape (e.g. round, elongated, ribbed) and size. Tomato fruit are generally classified in several types, which are referred to with different names in the literature. In the EU (EC, 2000), there are four recognized commercial types of tomato (round, ribbed, oblong, cherry), for which quality and size requirements are made. Within these types, tomato fruit are separated into marketing categories depending on their colour, weight and size range.
All types may be traded with or without green parts, i.e. with only the calyx and fruit pedoncule, or 'on the vine' (as 'trusses'), as the whole or part of an inflorescence, with several tomatoes attached to the stem. In the latter EC (2000) defines a minimum number of fruit for the different tomato types. Various names are used for tomato types in the literature, and some are given in Table 1.

[1] Over 13 000 thousands tomato cultivars are listed at http://ventmarin.free.fr/passion_tomates/passion_tomate.htm

Table 1. Names of tomato types in the literature.

Round	Spherical shape. Defined as round, smooth, generally red tomatoes intended for fresh consumption (GDV, 2013).	Full-size globe (red or yellow) (Boyette et al., 2013)
Ribbed	Defined as larger than round tomatoes, and called ribbed because of their shape; mostly used in the processing industry, sometimes also eaten fresh (GDV, 2013).	Beef (GDV, 2013)
Oblong	Elongated shape. Defined as a thick-fleshed variety, low in seeds, again used both for fresh consumption and processing (GDV, 2013).	Plum, Roma (a common cultivar of plum tomato) (Boyette et al., 2013)
Cherry	Round or oval, small size, often sold on the vine. Cherry tomatoes are of higher quality than round tomatoes and beef tomatoes (GDV, 2013). It seems that mini-Pear tomato (e.g. Red Pear – Roberts, 2002) and grape tomato (e.g. Santa – Roberts, 2002) are two types of cherry tomatoes. Cherry tomatoes also includes cocktail tomatoes.	Mini-pear, grape, cocktail

Different types of tomato are illustrated here: http://www.elprimertomate.com/en/commercial-strains.

Tomato is a climacteric fruit (with a respiratory peak during ripening) and perishable, and therefore has a short life compared to other fruits (see details under 5.5 'conditions and duration of storage and transport'). Proper harvesting time, handling and storage conditions are essential to ensure proper ripening, avoid decay and ensure quality of the fruit (in terms of flavour, colour, weight, firmness, appearance, which are important parameters of consumer demand for fresh tomato fruit) (Roberts, 2002; Sammi and Masud, 2007; Suslow and Cantwell, 2013).

Tomato fruit are generally picked from the green mature stage to the ripe stage[2]. The best time for harvesting tomatoes depends on the type of tomato, the intended use and expected duration of storage and transport after harvest. For example, grape tomatoes are often picked at 10% red colour or riper stages (Roberts, 2002; Boyette et al., 2013). The harvesting stage also influences the life span. Details on the tomato pathway, including the relationship between the maturity stage at harvest and conditions and duration of storage and transport, are given in section 5.

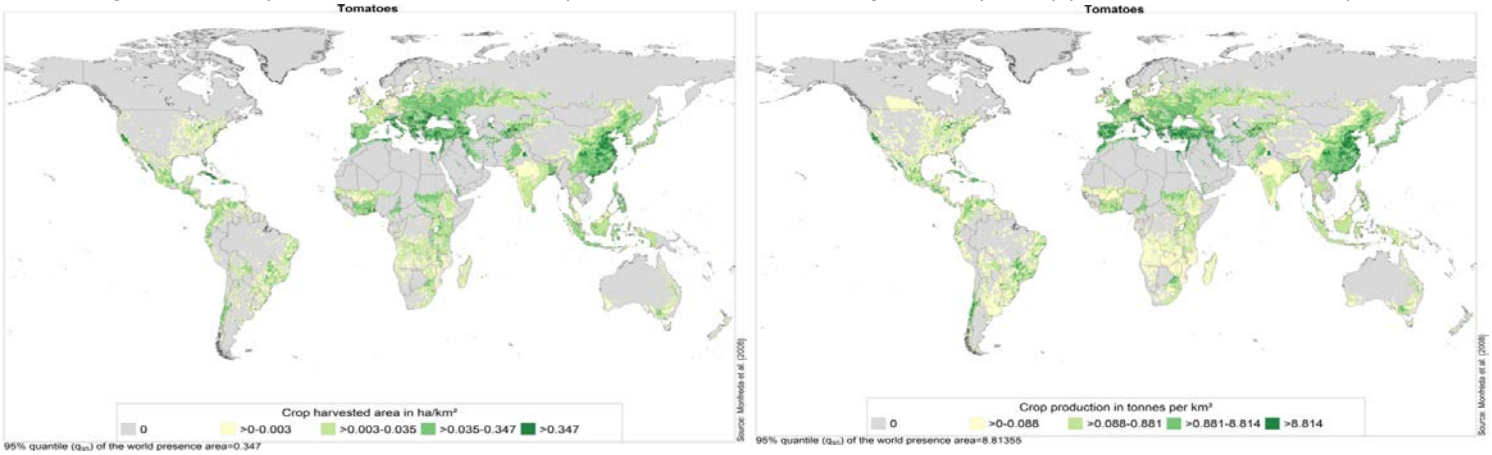
Tomatoes that are picked green ripen subsequently. However those picked at the 'mature green stage' will ripen in a product indiscernible from ripe tomatoes (Boyette et al., 2013). Immature green tomatoes will not ripen properly[3]. Tomatoes are therefore likely to be picked, at the earliest, at the mature green stage.

Tomato are sold for the fresh market or processed into many different products (puree, paste, peeled, canned, chutney, ketchup, juice, dried etc.). This study only focuses on tomato fruit for the fresh market.

1. Tomato production in the world

Tomatoes are produced and consumed worldwide. Figure 1 gives a general overview of tomato production in the world in 2000 (from Monfreda et al., 2008). This section analyses data on areas and volumes of production for different years until 2011 (the latest data available to date in FAOSTAT). This data is detailed in Annex 1 and specific extracts analysed below.

Figure 1. Tomato production in the world in 2000 (left: harvested area in ha/km²; right: tonnes per km²) (Source Monfreda et al., 2008)



[2] The stages of colour in tomato, from "10% red" to "high red" are illustrated in Boyette et al., 2013, as well as described in detail from US standards)

[3] Mature green tomatoes differ from immature green tomatoes in so far as seeds of the latter are cut if opening a tomato with a knife in the field (Suslow and Cantwell, 2013).

1.1 Production area

In 2011, tomato was produced on over 4.7 million hectares. Detailed data is in Table A1-1 of Annex 1. The top 14 countries represented around 75 % of the area cultivated worldwide, and the top 30 countries 88 % of the area cultivated worldwide (see Table 1.1a).

Table 1.1a. Top 30 countries for the area of cultivation of tomato in 2011 in ha (ordered in decreasing order of production area in 2011), with data for 2000 and 2006 (from FAOSTAT). EPPO countries are highlighted in green.

	country	2000 (ha)	2006 (ha)	2011 (ha)
1.	China	869 355	1 404 595	985 903
2.	India	460 000	546 100	865 000
3.	Turkey	225 000	228 714	269 584
4.	Nigeria	210 000	250 000	264 430
5.	Egypt	195 444	220 110	212 446
6.	Iran	118 665	147 462	183 931
7.	Cameroon	21 330	40 507	150 000
8.	USA	168 509	169 808	148 730
9.	Russian Federation	147 400	151 810	117 000
10.	Italy	137 155	122 192	103 858
11.	Ukraine	116 504	92 300	85 900
12.	Mexico	124 575	126 557	85 369
13.	Brazil	56 002	58 893	71 473
14.	Iraq	77 250	65 750	61 042
15.	Ghana	37 000	33 000	58 000
16.	Uzbekistan	45 000	60 470	58 000
17.	Indonesia	45 215	53 492	57 302
18.	Cuba	42 585	53 044	54 955
19.	Pakistan	29 413	46 239	52 247
20.	Romania	47 600	49 967	51 745
21.	Spain	62 285	56 690	49 913
	Sudan*	51 240	34 454	na
22.	Tunisia	24 900	22 600	32 200
23.	Benin	25 790	20 657	31 000
24.	Tanzania	18 000	20 535	30 000
25.	Kazakhstan	22 500	23 200	27 000
26.	Azerbaijan	18 874	26 070	26 613
27.	Bangladesh	14 569	18 769	24 772
28.	Algeria	43 910	31 005	23 500
29.	Serbia	22 400	20 947	20 229
30.	Greece	44 200	33 881	19 900
	Total world 2011			4 734 356

* Sudan was included in this list as it had a substantial cultivated area in 2006, but no data was available for 2011.

Unlike the volume of production, which has increased considerably between 2000 and 2011 (see section 1.2), the total area of tomato cultivation has increased only by 3 % in the same period, and remained quite stable at around 4.7 million hectares. A few countries show more significant increases (over 50% increase) of their area of tomato cultivation in the same period, as shown in Table 1.1b.

Table 1.1b. Increase in production area (ratio) between 2000 and 2011

	country	2011 (ha)	ratio
1.	Maldives*	11	11.00
2.	Cameroon	150 000	7.03
3.	Rwanda	6 705	5.83
4.	Somalia	11 114	5.15
5.	Grenada	39	3.90
6.	Estonia	167	3.55
7.	Guam	16	3.20
8.	Uganda	5 674	2.70
9.	Latvia	1 000	2.50
10.	Mozambique	2 321	2.39
11.	Sierra Leone	2 740	2.27
12.	Bhutan*	116	2.19
13.	Congo	998	1.92
14.	French Polynesia	99	1.90
15.	St Kitts & Nevis	17	1.89
16.	India	865 000	1.88
17.	Montserrat	45	1.88
18.	Gabon	61	1.85
19.	Papua New Guinea	146	1.83
20.	Madagascar	4 600	1.82
21.	Zimbabwe	3 301	1.82
22.	Guyana	1 408	1.81
23.	Senegal	6 300	1.79
24.	Cape Verde	484	1.78
25.	Pakistan	52 247	1.78
26.	Turkmenistan	9 580	1.74
27.	Angola	6 087	1.74
28.	Bangladesh	24 772	1.70
29.	Tanzania	30 000	1.67
30.	Jordan	12 954	1.60
31.	Kuwait	830	1.57
32.	Ghana	58 000	1.57
33.	Iran	183 931	1.55

* for Maldives and Bhutan, the comparison is made for 2004-2011 as data for 2000 or 2002 were not available).

1.2 Production volume

In 2011, the total production of tomatoes worldwide was over 159 million tonnes. Detailed data is given in Table A1-2 in Annex 1. The top-14 producing countries accounted for more than 80% of the production worldwide, and the top 30 for more than 90%. The top 30 tomato producers are given in Table 1.2a. Half of them are EPPO countries.

Table 1.2a. Top 30 tomato producers in 2011 – production for 2000, 2006 and 2011 (volumes in tonnes). EPPO countries are in green.

country	2000	2006	2011
1. China	22 324 771	32 519 322	48 576 853
2. India	7 430 000	9 820 400	16 826 000
3. USA	12 622 300	12 257 200	12 624 700
4. Turkey	8 890 000	9 854 880	11 003 400
5. Egypt	6 785 640	8 576 070	8 105 260
6. Iran	3 191 000	5 064 570	6 824 300
7. Italy	7 538 100	6 351 200	5 950 220
8. Brazil	2 982 840	3 362 660	4 416 650
9. Spain	3 766 330	3 800 550	3 821 490
10. Uzbekistan	970 000	1 583 570	2 585 000
11. Mexico	2 666 280	2 899 150	2 435 790
12. Russian Fed.	1 685 100	2 414 860	2 200 590
13. Ukraine	1 126 500	1 751 000	2 111 600
14. Nigeria	1 260 790	2 079 010	1 504 670
15. Tunisia	950 000	855 000	1 284 000
16. Portugal	1 009 680	983 191	1 245 360

country	2000	2006	2011
17. Morocco	1 008 900	1 245 000	1 236 170
18. Greece	2 085 000	1 568 730	1 169 900
19. Syria	753 218	1 035 790	1 154 990
20. Iraq	989 000	1 042 000	1 059 540
21. Indonesia	593 392	629 744	954 046
22. Romania	628 700	834 968	910 978
23. Cameroon	371 132	522 251	880 000
24. Chile	1 185 000	1 250 000	872 485

country	2000	2006	2011
25. Netherlands	520 000	680 000	815 000
26. Algeria	816 839	796 160	790 000
27. Jordan	354 292	545 566	777 820
28. Poland	311 492	651 567	712 295
29. Japan	806 300	728 300	703 000
30. Argentina	693 393	670 000	698 699
Total world 2011			144 250 806

The total production of tomato worldwide between 2000 and 2011 has increased by 44%, and a large number of countries have increased their production above this factor (see Table 1.2b). Notably, amongst non-EPPO countries that are also amongst the largest tomato producers in the world (in volume), Cameroon, India, China and Iran have more than doubled their production. It is worth noting that a number of EPPO countries have also more than doubled their production during the same this period (such as Estonia, Uzbekistan, Poland, Jordan, Austria).

Some countries that have considerably increased their production are already major exporters of tomato fruit (e.g. China, India, Iran). However, an increase in production, even if significant, may not automatically lead to an increase of exports. Table 1.2b lists the increases in production (as a ratio) and indicates countries that are amongst the top-30 producers (in blue, as per Table 1.2a) or top-30 non-EPPO exporters (in red, as per Table 2.1, with ranking between brackets).

Table 1.2b.Increase in production (ratio) between 2000 and 2011. Ratios are rounded to the nearest decimal place. EPPO countries are in green.

	Country	2011 (t)	ratio
1.	Rwanda	102 501	12.8
2.	Maldives	150	12.5
3.	Malaysia (27)	134 338	7.5
4.	Somalia	17 572	5.3
5.	Senegal	180 000	4.3
6.	Grenada	296	4.0
7.	Honduras (24)	153 098	3.3
8.	Cape Verde	13 000	3.1
9.	Timor-Leste	600	2.9
10.	Estonia	6 414	2.9
11.	Tajikistan (18)	304 209	2.8
12.	Uzbekistan	2 585 000	2.7
13.	Cameroon	880 000	2.4
14.	Bangladesh	232 459	2.3
15.	Poland	712 295	2.3
16.	Gabon	639	2.3
17.	India (17)	16 826 000	2.3
18.	Costa Rica	61 560	2.3
19.	Jordan	777 820	2.2
20.	China (14)	48 576 853	2.2
21.	Iran (8)	6 824 300	2.1
22.	Austria	50 389	2.1

	Country	2011 (t)	ratio
23.	Turkmenistan	354 192	2.1
24.	Kuwait	71 300	2
25.	Latvia	7 908	1.9
26.	Armenia	275 470	1.9
27.	Sierra Leone	22 956	1.9
28.	Ukraine	2 111 600	1.9
29.	Pakistan	529 620	1.9
30.	Guam	162	1.9
31.	St Kitts &Nevis	186	1.9
32.	Tanzania	250 000	1.8
33.	Guatemala (26)	305 427	1.8
34.	Guyana	8 222	1.8
35.	Madagascar	38 562	1.8
36.	Sri Lanka	75 890	1.7
37.	Zimbabwe	18 982	1.7
38.	Iceland	1 605	1.7
39.	Kazakhstan	662 000	1.7
40.	Mozambique	12 148	1.7
41.	Ghana	340 000	1.7
42.	Ireland	13 221	1.7
43.	Uganda	23 537	1.7
44.	Bhutan	301	1.6

	Country	2011 (t)	ratio
45.	Réunion	8 980	1.6
46.	Slovenia	5 512	1.6
47.	Indonesia	954 046	1.6
48.	Belarus	200 314	1.6
49.	Colombia	595 299	1.6
50.	Kenya	407 374	1.6
51.	Puerto Rico	20 156	1.6
52.	Netherlands	815 000	1.6
53.	Antig. & Barb.	423	1.6
54.	Saudi Arabia	483 588	1.6
55.	Liberia	2 100	1.6
56.	Bosnia & Herz.	45 942	1.6
57.	Germany	76 718	1.5
58.	Syria (5)	1 154 990	1.5
59.	Congo	3 617	1.5
60.	Brazil	4 416 650	1.5
61.	Romania	910 978	1.5
62.	Brunei Daruss.	130	1.4

*for Maldives and Bhutan, the comparison is made for 2004-2011 as data for 2000 or 2002 were not available).

1.3 Production of organic tomatoes

Figures on the production (and trade) of organic tomatoes are important when analysing association of pest with tomato fruit at origin and the probability of establishment in the EPPO region. Organic products are not separated in FAOSTAT, and there is no compiled data on organic agriculture worldwide. The FiBl (Research Institute of Organic Agriculture) and IFOAM (International Federation of Organic Agriculture Movements) gather global data every year on organic production and markets in individual countries (160 countries in the 2012 edition) through a questionnaire. Unlike FAOSTAT, which relies on national statistics, this data arises from a wider variety of sources. In many instances, in the data received from countries, 'vegetables' are not broken down into individual crops (Willer and Kilcher, 2012), and there is therefore limited data specifically for tomato. Eurostat also gives some data for EU countries. Table 1.3a compiles the data found for production of organic tomato.

Table 1.3 Area and production of organic tomatoes in some countries. EPPO countries are in green.
For Schaack et al. (2011), figures for area (ha) were taken from the statistical data in annex.

Country	Area (ha)	Production (t)	Year	Source
Albania	6		2009	Schaak et al., 2011
Argentina	-	20	2009	Schaak et al., 2011
Bulgaria	20	616	2011	Eurostat, 2013#
Croatia	1	25	2009	Schaak et al., 2011
Czech Rep.	2	14 (2010)	2011	Eurostat, 2013#
Denmark	6		2010	Eurostat, 2013#
Ecuador	1		2009	Schaak et al., 2011
Finland	1		2009	Schaak et al., 2011
Greece	21		2010	Eurostat, 2013#
Hungary	7	231	2012	Eurostat, 2013#
Iran	30		2012	Willer and Kilcher, 2012
Israel	-	9112	2009	Schaak et al., 2011
Italy	2 183		2011	Eurostat, 2013#
Latvia	2	15	2012	Eurostat, 2013#
Lithuania	-	5	2009	Schaak et al., 2011
Netherlands	39	13 150	2011	Eurostat, 2013#
Norway	1		2009	Schaak et al., 2011
Poland	22	124	2012	Eurostat, 2013#
Romania	24		2011	Eurostat, 2013#
Slovakia	1		2011	Eurostat, 2013#
South Africa	70	-	2009	Schaak et al., 2011
Spain	1 087	48 036	2012	Eurostat, 2013#
Sweden	2		2012	Eurostat, 2013#
Turkey	560	19 077	2009	Schaak et al., 2011
Ukraine	1		2009	Schaak et al., 2011
UK	16		2012	Eurostat, 2013#
USA*	3 738*		2008	ERS, 2010, part 1 and 2

For Eurostat data: area is the total of fully converted area and area under conversion; production is that of fully converted area.
*For the USA, the total area of 3738 ha (9237 acres) included 3355 ha in California (nearly 90% of the total), 89 ha in New York State, 61 ha in Florida, 49 ha in Georgia, 47 ha in New Jersey and minor areas in other States throughout the country.

2. Tomato trade worldwide

The study of export of tomato fruit worldwide and imports into the EPPO region was based on the data of FAOSTAT. 2010 was the most recent year for which data was available for most countries. Data related to tomatoes (and not to peeled tomatoes or tomato juice). In FAOSTAT, tomato exports to EPPO countries are registered as exports by exporting countries, and imports by EPPO countries. This data is not always consistent (see Box 1), and both were used.

Box 1. Inconsistencies between export and import data. As this study is for the whole region, FAOSTAT was used. There are often discrepancies between the data entered by exporting countries and importing countries in FAOSTAT. There are clear cases where data for a specific year has not been entered by the exporting country but imports are registered by EPPO countries (e.g. Egypt for 2010), or where the exporting country for which imports are registered by an importing country does not enter data in FAOSTAT. Other cases are impossible to clarify, for example where an exporting country enters exports to an EPPO country, but this is not mentioned in the EPPO country's imports, or when quantities or years do not match. Eurostat (2009) identifies methodological differences, time lag, different practices and errors, such as misclassifications, as possible causes of discrepancies. As this section aims to identify non-EPPO countries that have exported tomatoes to the EPPO region, all data was taken into account. If considering both importing and exporting countries' data, 42 non-EPPO countries have exported tomato fruit to the EPPO region in 2010, compared to 28 according to exporting countries' data only, and 32 according to importing countries' data.

As for production in section 1, analysis of statistical data in this section was used to give general information about the trade of tomato, and to choose some countries to be analysed further in relation to a developing trade of tomato fruit.

Box 2. EPPO countries not covered by FAOSTAT data. No data was found in FAOSTAT for the following countries: Guernsey, Jersey, Uzbekistan. FAOSTAT contains specific data for a number of territories of EPPO countries, such as Martinique, Réunion, Greenland, Mayotte. These are sometimes mentioned in this study, but not 'counted' as individual countries.

2.1 Exports of tomato fruit worldwide

Annex 2 provides detailed data for exports in some years over 1986-2010 for all countries covered by FAOSTAT. Data for 2010 are included in Table 2.1. In 2010, four countries accounted for over 50% of the exports of tomato fruit worldwide (Mexico, Netherlands, Spain and Turkey). These countries are respectively the 11th, 25th, 9th and 4th producers worldwide. It is worth noting that the area of cultivation of tomato in Mexico has not substantially increased in the period considered. The Netherlands is a special case among these four, as it exports more tomatoes than it produces. The Netherlands are a major platform for trade in Europe, and presumably reexports a part of their tomato imports.

The first 20 exporting countries in 2010 accounted for over 85% of all tomato exports. This includes a majority (13) of EPPO countries (Azerbaijan, Belgium, France, Israel, Italy, Jordan, Morocco, Netherlands, Poland, Portugal, Spain, Turkey, Ukraine) and the following 7 non-EPPO countries: Canada, China, India, Iran, Mexico, Syria, the USA. Among these China, India, Iran and Syria have substantially increased their production between 2000 and 2011 (see Table 1.2b).

Table 2.1. Export volume in tonnes in 2010 by country (FAOSTAT) with the percentage of total worldwide tomato exports
Percentages are rounded to the nearest decimal place. EPPO countries are in green. Countries with quantities below 1 tonnes (indicated as '0' in FAOSTAT) are not listed below but can be found in Annex 2 (they include only one EPPO country, Malta).

	country	tonnes	% total
1.	Mexico	1 509 616	21.2
2.	Netherlands	943 119	13.2
3.	Spain	738 773	10.4
4.	Turkey	574 279	8.1
5.	Syria	407 619	5.7
6.	Morocco	372 112	5.2
7.	Jordan	371 257	5.2
8.	Iran	264 851	3.7
9.	USA	224 279	3.1
10.	Belgium	192 550	2.7
11.	France	190 879	2.7
12.	Canada	166 870	2.3
13.	Italy	128 830	1.8
14.	China	104 110	1.5
15.	Portugal	80 798	1.1
16.	Poland	71 905	1.0
17.	India	67 547	1.0
18.	Tajikistan	60 000	0.8
19.	Ukraine	57 332	0.8
20.	Uzbekistan	50 893	0.7
21.	FYR Macedonia	48 336	0.7
22.	Azerbaijan	40 279	0.6
23.	Israel	36 818	0.5
24.	Honduras	35 765	0.5
25.	Lithuania	32 490	0.5
26.	Guatemala	31 723	0.4
27.	Malaysia	31 399	0.4
28.	Germany	29 528	0.4
29.	Austria	21 541	0.3
30.	South Africa	20 405	0.3
31.	Belarus	17 659	0.3
32.	Tunisia	15 196	0.2
33.	Czech Rep.	13 618	0.2
34.	Burkina Faso	12 929	0.2
35.	Argentina	11 822	0.2
36.	Ethiopia	11 607	0.2
37.	Slovenia	10 729	0.2
38.	Kyrgyzstan	9 047	0.1
39.	Senegal	8 585	0.1
40.	Greece	7 307	0.1
41.	Albania	6 573	0.1
42.	Hungary	6 234	0.1
43.	Afghanistan	5 937	0.1
44.	Serbia	5 847	0.1
45.	Egypt*	5 700	0.1
46.	Saudi Arabia	5 696	0.1
47.	Pakistan	5 692	0.1
48.	Yemen	5 022	0.1
49.	Moldova	4 920	0.1
50.	Bulgaria	4 797	0.1
51.	UK	4 613	0.1
52.	Slovakia	4 297	0.1
53.	New Zealand	4 065	0.1
54.	Nicaragua	4 002	0.1
55.	Brazil	3 561	0.1
56.	Ecuador	3 180	0.0
57.	Dominican Rep.*	3 142	0.0
58.	Australia	2 644	0.0
59.	United Arab Emirates	2 070	0.0
60.	Lebanon	1 939	0.0
61.	Latvia	1 894	0.0
62.	Costa Rica#	1 863	0.0
63.	Denmark	1 854	0.0
64.	Tanzania	1 766	0.0
65.	Kazakhstan	1 464	0.0
66.	Romania	1 367	0.0
67.	Ireland	1 073	0.0
68.	Korea Rep.	1 072	0.0
69.	Chile	790	0.0
70.	Venezuela	720	0.0
71.	Montenegro	674	0.0
72.	Bosnia & Herzeg.	640	0.0
73.	Indonesia	618	0.0
74.	Oman	508	0.0
75.	Trinidad and Tobago	493	0.0
76.	Thailand	427	0.0
77.	Armenia	427	0.0
78.	Sweden	377	0.0
79.	Bahrain	369	0.0
80.	Luxembourg	366	0.0
81.	Guyana	315	0.0
82.	Occ. Palestin. Terr.	279	0.0
83.	Russian Fed.	201	0.0
84.	Norway	201	0.0
85.	Finland	174	0.0
86.	Georgia	161	0.0
87.	Estonia	158	0.0
88.	Colombia	137	0.0
89.	Swaziland	133	0.0
90.	Croatia	116	0.00
91.	Switzerland	115	0.00
92.	Botswana	97	0.00
93.	Singapore	94	0.0
94.	Madagascar	75	0.0
95.	Niger	73	0.0
96.	Libya	49	0.0
97.	Kenya	40	0.0
98.	Seychelles	34	0.0
99.	China, Hong Kong SAR	31	0.0
100	Gambia	27	0.0
101	Cameroon	23	0.0
102	Iraq	22	0.0
103	Mayotte**	20	-
104	Qatar	19	0.0
105	Suriname	18	0.0
106	Panama	16	-
107	Barbados	16	0.0
108	Peru	14	0.0
109	Liberia	14	0.0
110	Turkmenistan	10	0.0
111	Zambia	7	0.0
112	Uganda	5	0.0
113	Japan	5	0.0
114	Cuba	5	0.0
115	Namibia**	4	-
116	Ghana	4	0.0
117	Algeria	4	0.0
118	Dominica	3	0.0
119	Kuwait	2	0.0
120	Angola	2	0.0
121	Zimbabwe	1	0.0
122	Sri Lanka	1	0.0
123	Mozambique	1	0.0
124	Malawi	1	0.0
125	Iceland	1	0.0
126	Cyprus	1	0.0
127	Côte d'Ivoire	1	0.0
128	Bangladesh**	1	-
	TOTAL	7 135 785	100.0

* The figures provided by these countries may be underestimated here. The country did not record any export to EPPO countries in 2010, while significant imports from these countries are recorded by EPPO countries.
** No figure was given in FAOSTAT for tomato exports by these countries, but some imports are reported by EPPO countries, and have been added here as an indication (they do not represent exports worldwide, but only to the EPPO region). Mayotte (although a French territory) is indicated here as exports were to another EPPO country (Denmark).
# Costa Rica is the last of the top-30 non-EPPO exporters

2.2 Major exporters in relation to their production

The percentages of export in relation to the production were calculated in order to identify countries that exported a substantial amount of their production in 2010 (Table 2.2). This was done for countries for which both production and export data are given in FAOSTAT. The percentages of exports in relation to the total of production plus imports are also given. This is because the percentage of export in relation to production is very high for some countries, and it may be that they re-export part of their tomato imports. This should definitely be the case when the percentage of export versus production is above 100%, and may partly be the case for some other countries.

Table 2.2. Non-EPPO countries that exported more than 10% of their production in 2010, with the percentage of export volume (t) versus production volume (t) and the percentage of export volume (t) versus production plus import volume (t) (rounded)

country	% export/production	% export / (production + import)
Nicaragua	68	61
Mexico	50	50
Syria	35	33
Canada	34	24
Trinidad & Tobago	30	19
Ethiopia	29	29
Malaysia	23	23
Honduras	23	23
Tajikistan	21	20
Seychelles	15	12
Guatemala	11	11
Singapore	1567	0.3
*Burkina Faso**	106	105

* The data for Burkina Faso seem to be an anomaly, as the country appears to export more than it produces and imports.

2.3 Imports into EPPO countries

Details on the imports of tomato fruit by 47 EPPO countries in 2004-2010 are given in Table 2.3a from all origins (EPPO and non-EPPO). This data is as declared by the importing countries (see box 1 and 2 under 2.2). Data was not available for the following EPPO member countries: Guernsey, Jersey, Uzbekistan.

Total imports for all the EPPO countries considered were over 3.7 million tonnes. The Russian Federation was the largest individual importing country in the EPPO region, but the EU (see Box 3) imported over 2.8 million tonnes of tomato in 2010, i.e. over 75% of EPPO imports. The first 10 countries in the list below account for approximately 80% of the total EPPO imports.

Box 3. EU countries. Throughout this study, when figures are given for the EU, this takes account of all EU countries at July 2013 (including Croatia), even when data refers to dates prior to their accession to the EU.

Thirty four EPPO countries are recorded to have imported tomato from non-EPPO countries in 2010, and total volumes for each country are given in Table 2.3a (see Box 4). For all these countries, imports from non-EPPO countries represent a minor part of the total imports. Imports from non-EPPO countries are detailed in sections 2.4 and 3.2, and figures further detailed in Table 2.4a and 3.2a-c.

Box 4. Calculation of total quantities. Due to the discrepancies between exporting countries' and importing countries' data, the total quantities are often given as a 'maximum estimated quantity'. These were calculated as the sum of largest volume imported from each origin according to either the EPPO country or the exporting country. The volumes indicated by the EPPO importing country only or by the exporting country only are also given when relevant, if different from the maximum estimated quantity. The figure may reflect better the reality in some cases (e.g. when the discrepancy is due to the fact that exporting countries did not enter data), but may be overestimate quantities in some others.

Thirteen EPPO countries are not recorded to have imported tomato from non-EPPO countries in 2010. However, it is worth noting that all these countries are recorded as having imported tomato from non-EPPO countries in 2001-2009 (according to data provided by importing countries or to data provided by exporting countries, or both, as presented in Annex 3).

Table 2.3a. Imports (in tonnes) into EPPO countries (from FAOSTAT)
Quantities of '0' correspond to <1 tonne in FAOSTAT. Imports from non-EPPO countries (in tonnes) are as per Table 3.2 and relate to 2010. Totals are given as a maximum estimated quantity (see Box 4), with the importing country's data between brackets (if different from the maximum estimated quantity).

country	2004	2006	2008	2009	2010	from non-EPPO
Albania	5 696	7 985	4 184	3 662	3 429	495
Algeria	0	2	22	199	18	
Austria	48 201	54 683	48 734	47 762	62 041	37
Azerbaijan	16	22	22	1 624	13 735	4737 (831)
Belarus	19 353	28 175	28 838	34 791	25 066	239
Belgium	67 664	63 285	85 101	79 295	76 505	2847
Bosnia&Herzeg.	12 365	17 706	14 431	14 893	13 999	543
Bulgaria	7 881	9 923	58 098	80 054	45 755	57
Croatia	9 371	13 754	13 123	9 560	8 987	7
Cyprus	255	228	664	500	942	3
Czech Rep.	62 934	84 073	94 934	94 704	91 450	
Denmark	27 401	32 633	32 087	39 245	48 498	475
Estonia	9 598	9 130	11 848	12 951	11 098	
Finland	21 193	20 157	23 264	24 345	22 479	
France	434 293	468 823	482 546	534 738	500 697	3723 (3308)
FYR Maced	1 358	1 463	1 450	1 210	1 982	158 (-)
Germany	660 792	652 313	654 966	657 023	681 217	2587 (51)
Greece	18 779	20 317	15 674	15 217	17 011	
Hungary	13 433	21 435	17 165	13 578	16 053	69
Ireland	20 388	22 999	35 424	34 890	29 939	
Israel	36	0	1 528	0	495	
Italy	84 870	89 074	85 606	130 208	96 591	194 (68)
Jordan	0	0	0	0	460	566 (460)
Kazakhstan	1 552	165	4 765	7 096	20 244	8655 (-)
Kyrgyzstan	32	157	145	150	160	167 (153)
Latvia	16 956	14 840	19 665	15 745	13 797	
Lithuania	14 538	22 470	52 494	35 091	44 117	
Luxembourg	3 420	4 465	4 086	3 055	5 182	
Malta	292	217	170	1 042	389	
Moldova	6 034	15 459	11 878	9 124	8 744	1035 (1034)
Morocco	30	0	0	0	0	
Netherlands	174 787	247 772	156 280	186 537	183 078	4613

country	2004	2006	2008	2009	2010	from non-EPPO
Norway	18 048	20 401	23 627	22 201	21 502	59
Poland	50 242	64 429	96 235	100 808	101 722	206 (166)
Portugal	27 722	28 630	26 642	31 629	28 781	0
Romania	40 163	51 429	66 017	40 874	60 767	811
Russian Fed.	291 413	413 594	673 894	694 386	699 282	75441 (73920)
Serbia	23 457*	18 291	25 862	22 888	21 546	253 (1)
Slovakia	15 338	25 049	38 816	34 634	29 335	164 (150)
Slovenia	13 373	16 913	21 324	21 068	22 898	41
Spain	100 281	55 908	189 319	192 132	163 475	11 (6)
Sweden	78 644	84 715	84 630	85 563	85 683	52
Switzerland	39 521	41 194	39 901	39 892	39 153	20
Tunisia	2	0	0	127	58	
Turkey	40	0	84	10	492	951 (347)
Ukraine	300	3 678	42 437	60 004	44 260	3169 (3076)
UK	386 443	442 434	419 045	396 675	386 509	2214 (2169)

* relates to 'Serbia and Montenegro'.

2.4 Origin of tomato fruit imports into EPPO countries

For the purpose of analysing the imports of tomato fruit by EPPO countries, data was extracted from FAOSTAT for the period 1986-2010 (compiled data is presented in Annex 3). For 1986-2000, the data is as entered by exporting countries only. For 2001-2010, data was extracted for both exporting and importing countries in the EPPO region, to take into account discrepancies between such data (see Box 1) and try to identify all countries having exported to the EPPO region. Any country mentioned as having exported tomato fruit to the EPPO region, in its own data or data entered by importing countries was taken into account.

Forty two non-EPPO countries[4] are recorded to have exported tomato fruit to the EPPO region in 2010, for a total volume (maximum estimated quantity – see Box 4) of over 114 000 tonnes (Table 2.4a). In the period 1986-2010, 87 non-EPPO countries are recorded to have exported tomato fruit to the EPPO region (Table 2.4b).

The 42 countries recorded to have exported tomato fruit to the EPPO region in 2010 are located in all regions of the world (although the volume coming from Oceania was very low and only from New Zealand). China represents over 65% of the maximum estimated quantity (see Box 4), while the first 5 countries (China, Senegal, Syria, Iran, Egypt) represent over 97 % of the maximum estimated quantity. At the other end of the ranking, the maximum estimated quantity imported in 2010 from Barbados, Ethiopia and Malaysia was below 1 tonne.

Considering the three largest non-EPPO exporting countries to the EPPO region, exports to the EPPO region represent 70% of China's exports, but only a minor part of Syria's and Iran's exports (from export data given in Table 2.1).

Exports from the fourth largest exporting country, Senegal, to the EPPO region seem to account for 100% of the exports as entered by Senegal in FAOSTAT. However, EPPO importing countries' data account for a substantially higher volume from Senegal (12 188 tonnes compared to 8 585 tonnes). It is therefore not certain that all export data is made available in FAOSTAT by Senegal, and it is not known whether there are also exports to non-EPPO countries. Discrepancies between importing and exporting countries' data are also significant in the case of Iran (for example with Azerbaijan). It is not possible to resolve these inconsistencies (see Box 1).

Exports are not only by large producing countries. Of the 45 non-EPPO countries in the world with a production area below 1000 ha, 17 exported small quantities to the EPPO region in 1986-2010 (marked with * in Table 2.4b). It is interesting that some countries or territories that do report low total tomato exports (or none) in 2010 (as per Annex 2) are reported to have exported small quantities to the EPPO region in 2001-2010, such as Botswana, Brunei Darussalam, Comoros, Congo, Guam, Jamaica, Mauritania, Mauritius, Mayotte, Netherlands Antilles, Panama, Paraguay, Philippines, Sierra Leone, Sudan, Turks and Caicos Islands, Uruguay, Vietnam.

Volumes of tomato fruit imports to the EPPO region from other regions in 2001-2010 was low compared to the total imports to the EPPO region (see Table 2.3a). However, there was a large number of exporting countries (87) and importing countries (all EPPO countries for which data is available – see section 2.3). Most countries exporting tomatoes to the EPPO region are geographically close to the countries they export to. For example, most countries importing from China are close to this country (although it is not known

[4] Twenty eight according to exporting countries' data only, and 32 according to importing countries' data.

where tomato exports come from within China). Clear intercontinental trade came mostly from North, Central and South America, from Africa (to Europe) and China (predominantly to the Russia Federation). Only small volumes were imported from other countries in Asia and from Oceania.

Only three of the top-30 non-EPPO exporters worldwide in 2010 (Afghanistan, Honduras, Nicaragua), did not export any tomatoes to the EPPO region in 2010. All others have, even if in small quantities. Among countries with medium total exports (2 000-13 000 tonnes), only Afghanistan, Australia, Burkina Faso, Nicaragua, Pakistan, Yemen and the United Arab Emirates are not recorded to have exported tomatoes to the EPPO region in 2010.

Over the period 1986-2010, among the top-30 non-EPPO exporters worldwide in 2010, only Afghanistan and Nicaragua never exported tomato to the EPPO region. Some countries, such as the USA and Zimbabwe, notably reduced their exports to the EPPO region in the same period. Australia also previously had minor exports to the EPPO region, which stopped completely in 2006. In contrast, many countries have increased their exports of tomato fruit to the EPPO region over the period from 1986-2010, as well as the number of EPPO countries of destination. Finally, some countries seem to have a regular history of tomato export to the EPPO region since 2001, except for 2010, such as Ethiopia, Honduras, Indonesia, Malaysia, Turkmenistan, Venezuela.

For some countries, trade of tomatoes to the EPPO region seems to be relatively new as no data is recorded for previous years. It may be that trade of tomato fruit to the EPPO region has started in recent years, or that data was not recorded prior to 2001.

Table 2.4a. Non-EPPO countries exporting to the EPPO region, with volume and exporter rank in 2010 (from FAOSTAT)

- Between brackets, the quantities as entered by the exporting country/the importing country (ned = not in exporting country's data; nid = not in importing country's data). 0 in FAOSTAT corresponds to quantities <1 tonne.
- The rank is given as per Table 2.1.
- Total 1 uses exporting countries data only; Total 2 is a maximum estimated quantity (see Box 4).
- Countries are ordered by decreasing order of Total 2.

Exporting country	Rank	Importing EPPO countries (quantity in tonnes as entered by exporting country/importing country)	Total 1 (t) (export data)	Total 2 (t) (maximum)
1. China	14	Germany (ned / 14), Kyrgyzstan (167 / 153), Kazakhstan (8431), Russian Federation (66446 / 66579)	75044	75191
2. Senegal	39	Belarus (ned / 6), Belgium (285 / 2841), France (2568 / 2205), Germany (2535 / nid), Italy (226 / nid), Moldova (ned / 0), Netherlands (1299 / 1916), Norway (ned /32), Russian Federation (ned / 287), Serbia (ned / 1), UK (1672 / 1773), Ukraine (ned / 3)	8585	12188
3. Syria	5	Albania (414 / 495), Austria (ned / 37), Azerbaijan (ned / 797), Belarus (ned / 92), Bulgaria (ned / 32), Cyprus (ned / 2), FYR Macedonia (158 / nid), Hungary (ned / 67), Italy (ned / 3), Jordan (537 / 431), Poland (206 / 166), Moldova (742 / 1031), Romania (764 / 776), Russian Federation (3650 / 4161), Serbia (142 / nid), Slovakia (113 / 150), Sweden (ned / 52), Turkey (128 / nid), Ukraine (3046 / 2965)	10004	11912
4. Iran	8	Azerbaijan (3924 / nid), Belarus (ned / 18), France (17 / nid), Kazakhstan (205 / nid), Moldova (1/ 1), Russian Federation (2822/ 1303), Turkey (801/ 325), Ukraine (18/ 53)	7788	7841
5. Egypt	45	Belarus (0), Belgium (ned / 6), Bulgaria (ned / 25), Croatia (ned / 7), Cyprus (ned / 1), Denmark (ned / 455), France (ned / 14), Germany (ned / 37), Hungary (ned / 2), Italy (ned / 65), Netherlands (ned / 2696), Norway (ned / 20), Romania (ned / 15), Russian Federation (ned / 499), Serbia (ned / 0), Slovenia (ned / 41), Switz. (ned / 14), UK (ned / 356), Ukraine (ned / 55)	0	4308
6. Dominican Rep.	57	France (ned / 964)	-	964
7. Armenia	76	Russian Federation (342 / 849)	342	849
8. Montenegro	71	Bosnia & Herzegovina (543 / 543), Romania (20 / 20), Serbia (110 / nid), Switzerland (ned / 4)	673	677
9. Tajikistan	18	Russian Federation (ned / 205)	-	205
10. Georgia	86	Azerbaijan (16 / 16), Belarus (123 / 123), Kazakhstan (19 / nid), Moldova (3 / nid)	161	161
11. Lebanon	60	France (1 / 0), Jordan (28 / 28), Ukraine (12 / nid), UK (3 / nid)	70	70
12. Colombia	88	France (33 / 65), Netherlands (ned / 1)	33	66
13. South Africa	30	France (8 / nid), Germany (1 / nid), UK (ned / 37)	9	46
14. Costa Rica	62	France (ned / 20), UK (14 / nid)	14	34
15. Brazil	55	France (20 / 23), Portugal (ned / 0), Switzerland (ned / 1)	20	24
16. Iraq	102	Turkey (ned / 22)	-	22
17. Mayotte	105	Denmark (ned / 20)	-	20
18. Thailand	76	Denmark (ned / 0), Germany (ned / 0), Russian Federation (ned / 19)	-	19
19. Suriname	104	France (18 / nid)	18	18

Exporting country	Rank	Importing EPPO countries (quantity in tonnes as entered by exporting country/importing country)	Total 1 (t) (export data)	Total 2 (t) (maximum)
20. Panama	106	France (ned / 16)	-	16
21. Kenya	97	France (6 / nid), UK (9 / nid)	15	15
22. Guatemala	26	Slovakia (14 / nid)	14	14
23. Mexico	1	Netherlands (13 / nid)	13	13
24. Chile	69	UK (9), Norway (ned / 1), Russian Federation (ned / 3)	9	13
25. India	17	UK (11 / 3)	11	11
26. Canada	12	France (10 / nid)	10	10
27. Peru	107	Germany (ned / 0) Spain (9 / 4)	9	9
28. Côte d'Ivoire	127	Russian Federation (ned / 8)	-	8
29. Korea	68	Russian Federation (5 / 3), Spain (1 / nid)	6	6
30. Namibia	115	Norway (ned / 4)	-	4
31. Saudi Arabia	46	Netherlands (ned / 1), Norway (ned / 2)	-	3
32. Iceland	120	Greenland (Denmark) (1 / nid), Russian Federation (ned / 2)	1	3
33. New Zealand	53	UK (2 / nid)	2	2
34. Japan	111	Russian Federation (1 / 2)	1	2
35. USA	9	Jordan (ned / 1)	-	1
36. Guyana	81	France (1 / nid)	1	1
37. Ecuador	56	Spain (ned / 1)	-	1
38. Bangladesh	128	France (ned / 1)	-	1
39. Argentina	35	Switzerland (ned / 1)	-	1
40. Malaysia	27	Netherlands (0 / nid)	0	0
41. Ethiopia	36	Bosnia & Herzegovina (0 / nid)	0	0
42. Barbados	107	France (ned / 0)	-	0
		TOTAL	102 853	114 749

Table 2.4b List of non-EPPO countries having exported to the EPPO region in 1986-2010

- Countries are ordered by decreasing quantities of exports to the EPPO region for 2001-2010, based on the maximum estimated quantity (see Annex 3, Table 2.4a and Box 4). The total exports to EPPO countries for 1986-2000 are given for reference. 0 in FAOSTAT corresponds to quantities <1 tonne.
- The last column gives an increase factor between 1986 and 2000.
- Exporting country's data was not extracted for 1986-2000 for countries marked with n/a.
- Countries marked with 'New' did not have exports recorded in 1986-2000 (may indicate new exporting countries, or new entry of data).

Exporter	2001-2010 (max t)	1986-2000 (t)	X
1. China	468 765	95 527.7	4.9
2. Syria	209 731	42 223.5	5.0
3. Senegal	88 642	4 477	19.8
4. Iran	37 968	15 513	2.4
5. Egypt	25 784	4 536.5	5.7
6. USA	14 954	30 531	0.5
7. Tajikistan	5 686	-	n/a
8. Georgia	5 182	280	18.5
9. Montenegro*	4 506	-	n/a
10. Mexico	2 785	152.3	18.3
11. Dominican Rep.	1 967	-	n/a
12. Saudi Arabia	1 725	299	5.8
13. Colombia	1 465	2	732.5
14. South Africa	1 377	674	2.0
15. Armenia	893	0	New
16. Brazil	705	0	New
17. Lebanon	682	57	12.0
18. Turkmenistan	592	-	n/a
19. Costa Rica	374	8	46.8
20. Chile	296	190	1.6
21. Iceland*	278	58	4.8
22. Burkina Faso	225	2	112.5
23. Côte d'Ivoire	214	0.15	1426,7
24. Argentina	199	126	1.6
25. Canada	198	100	2.0
26. Thailand	171	22	7.8
27. India	150	462	0.3
28. Ethiopia	142	0	New
29. Ecuador	126	130.1	1.0
30. Venezuela	104	668	0.2
31. Kenya	73	105	0.7

Exporter	2001-2010 (max t)	1986-2000 (t)	X
32. Suriname*	71	9	7.9
33. Honduras	69	0	New
34. Mauritania	69	-	n/a
35. Tanzania	63	8	7.9
36. Malaysia	56	0.1	560.0
37. Panama*	47	-	n/a
38. Cuba	40	-	n/a
39. Ghana	36	0	New
40. Peru	29	892.3	0.0
41. Cayman Islands*	25	-	n/a
42. Namibia	25	4	6.3
43. Australia	23	110	0.2
44. New Zealand*	23	2	11.5
45. Trinidad and Tob.*	23	-	n/a
46. Iraq	22	-	n/a
47. Korea Rep.	22	56	0.4
48. Mayotte	20	-	n/a
49. Indonesia	17	8	2.1
50. Swaziland*	16	2	8
51. Brunei Daruss.*	15	-	n/a
52. Guatemala	14	0	New
53. Madagascar	11	0	New
54. Guam*	10	-	n/a
55. Sierra Leone	10	-	n/a
56. Nigeria	8	-	n/a
57. Guyana	7	0	New
58. Sri Lanka	7	-	n/a
59. Japan	5	15	0.3
60. Mauritius*	5	-	n/a
61. Netherlands Antilles	5	-	n/a

Exporter	2001-2010 (max t)	1986-2000 (t)	X
62. Pakistan	5	0	New
63. Philippines	5	-	n/a
64. United Arab Em.	5	-	n/a
65. Uruguay*	5	0	New
66. Paraguay	4	-	n/a
67. Antigua and Barb.*	3	0	New
68. Congo*	3	-	n/a
69. Oman	3	0	New
70. Vietnam	3	-	n/a
71. Zambia	3	1	3
72. Botswana	2	-	n/a
73. Comoros*	2	-	n/a
74. Bangladesh	1	-	n/a
75. Niger	1	-	n/a
76. Singapore*	1	0.01	100
77. Sudan (former)	1	-	n/a
78. Turks and Caicos	1	-	n/a
79. Yemen	1	0	New
80. Zimbabwe	1	114	0.0
81. Barbados*	0	1	0
82. Cameroon	0	3	0
83. Guinea	0	35	0
84. Jamaica	0	-	n/a
85. Libya	0	325	0
86. Mongolia	0	16	0
87. Uganda	0	1.1	0

* countries with a production area below 1000 ha (only countries for which area data is available, see Annex 1)

Origins and volumes vary considerably depending on years. 2010 is the latest year with complete data in FAOSTAT. For the EU, a working document on forecasts for tomato (EC, 2013) analyses trade of tomato to the EU in 2003-2012 and reports imports from various EPPO countries and from Senegal, Egypt, Syria, Dominican Rep., Gaza and Jericho (data was not extracted for the analysis above), South Africa, Brazil, Panama. It gives useful indications on the evolution of volumes and non-EU origins. Data for some years and non-EPPO countries are extracted in Table 2.4c, with Morocco (the main non-EU exporter of tomato to the EU) as reference. This seems to indicate

- increased imports from the Dominican Republic in recent years (although quantities remain low);
- stable imports from Egypt, Senegal, Gaza and Jericho since 2009;
- a huge decrease of imports from Syria since 2003/2004 (which used to be the third non-EU exporter to the EU in 2003-2004, after Morocco and Turkey);
- low level of imports, possibly decreasing, from South Africa, Brazil and Panama.

Table 2.4c. EU imports (only external trade) of fresh tomato for periods October/September (in tonnes) in 2003-2012 (extracted from Table 4.1 of EC, 2013).

	2003/2004	2006/2007	2009/2010	2010/2011	2011/2012
Morocco (as reference)	197 950	264 802	294 905	334 967	346 827
Egypt	1 037	2 123	3 655	2 669	2 496
Senegal	3 827	7 143	8 566	9 625	9 547
Syria	19 551	10 711	1 234	368	83
Dominican Rep.	21	87	867	873	1 210
Gaza and Jericho	601	279	232	191	263
South Africa	270	72	37		
Brazil	108	27	15	29	11
Panama	-	-	16	2	
Others	15 871	2 613	1 931	1 946	

Regarding periods of imports, tomato fruit from non-EU countries are mostly imported out of season. Figures for Morocco (as reference), Senegal and 'others' are presented in Table 2.4d (EC, 2013).
For the UK (P. Morley, British Tomato Growers Association, UK, pers. comm., July 2013) note that imports of tomato fruit continue throughout the year. They decline during the tomato season (approximately April-October), but fruit is still imported through this period depending on UK supply, demand and retailer preference. It is assumed that this would also apply to most other countries in the EPPO region.

Table 2.4d. Monthly distribution of EU imports of tomato fruit (in tonnes) in 2012 (extracted from Table 4.3 of EC, 2013).

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Morocco	56 222	52 758	54 737	36 226	21 877	5 704	3 233	2 367	2 222	17 546	50 131	43 804
Senegal	1 935	1 789	1 558	1 473	1 726	552			12			502
Others	911	919	3 943	2 056	111	553	878	489	3 173	4 153	3 236	2 367

2.5 Origin of organic tomatoes imported into the EPPO region

Limited data was found on exports of organic tomato fruit in general and on imports to the EPPO region. It seems that globally in 2012, China was the leading exporter of organic tomatoes, while the USA was second (Internet article; Just Food, 2012). As indicated in section 1.3 organic tomatoes in the USA are mostly produced in California. The company cited in the Internet article above is a major exporter of organic tomatoes. It is cited to export mostly to the Middle East and Latin America, but increasingly targeting Europe, and reports the first sale of organic products to Germany (although it is not specified if these included tomato fruit; Just Food, 2012).

Willer and Kilcher (2012) present the results of questionnaires on organic agriculture and trade addressed to countries (see 1.3). These contain few specific data on tomato. In the USA, the value of organic tomato exports (excluding tomato sauce) in January-October 2011 was over 4.4 million USD. Considering the value of a tonne according to 2010 data in FAOSTAT, this would represent approximately 2700 tonnes[5]. In comparison, the value of organic tomato sauce exports was over 20 million USD. General trends are summarized from questionnaire results:

- 'vegetables' are identified as an important agricultural export in Asia.
- Latin America is a major producer and exporter of organic products,

[5] This is approximative as the value was for another year, but it still gives a broad indication of volume.

- almost all Africa's organic food products are for export;
- USA has become the largest market for organic products (food and drink), ahead of Europe.
- In Europe, Germany is the main importer of organic products.

The situation for organic products for Germany is analyzed by Schaack et al. (2011), who also give details on organic tomato. In 2009-2010, the German market for organic tomatoes was 22 000 tonnes, of which 82% were imported. Most imports originated from Spain, Italy, the Netherlands and Israel, with only 15% of the total tonnage (i.e. 3 300 tonnes) imported from other origins (not specified). Morocco is also mentioned as exporting organic tomato to Germany in the same period. There is no detail on which non-EPPO countries, if any, exported organic tomato to Germany.

3 Details on the flow of tomato exports and imports worldwide

This section aims to analyse the interregional exchanges of tomato worldwide, and identifying some countries to be analysed further for their exports.

3.1 Flow of exports of tomato fruit from different regions

2010 data show that most trade of tomato fruit occurs within the same region or with neighbouring regions (for example North Africa to Europe, or Central America to North America). The trade of tomato fruit to other regions is normally quite limited. An analysis was made of the destinations of tomato fruit when exported to other regions. Detailed data is given in Annex 4 and a summary provided as Table 3.1a. For the EPPO region, non-EPPO origins are detailed in Tables 2.4a and Tables A5.1 and A5.2 in Annex 5.

Table 3.1a – Destinations of extra-regional exports in 2010, without consideration of volume (from data entered by exporting countries into FAOSTAT, with some EPPO countries added from import data if missing in export data (in italics)). Exports by EPPO countries are not covered.

Import region / Export region	Africa	Americas	Asia	EPPO and Europe	Near East and Central Asia (excluding EPPO countries)	Oceania
Africa		Antigua and Barbuda, Bahamas, Canada, Colombia, Jamaica, Mexico, Netherlands Antilles, Panama, USA	China (Hong Kong)	*Belarus*, Belgium, Bosnia & Herzegovina, *Bulgaria*, *Croatia*, Cyprus, Czech Republic, *Denmark*, France, Germany, Greece, Hungary, Iceland, Italy, Malta, *Moldova,* Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, *Serbia*, Slovakia, *Slovenia*, Spain, Switzerland, Turkey, UK, *Ukraine*	Bahrain, Kuwait, Oman, UAE, Qatar, Saudi Arabia	Papua New Guinea
Americas and Caribbean	-		Japan, Korea Rep., China, Singapore	France, *Germany, Jordan,* Netherlands, *Norway, Portugal*, *Russian Federation*, Slovakia, Spain, *Switzerland*, UK	Qatar	Australia
Asia	Egypt, Seychelles	Suriname, USA		*Denmark, France, Germany*, Netherlands, Russian Federation, Spain, Tajikistan, UK	Bahrain, Kazakhstan, Kuwait, Kyrgyzstan, Oman, Pakistan, Qatar, Saudi Arabia, UAE	Guam, NZ
Near East and Central Asia	Central Af. Rep., Congo, Côte d'Ivoire, Egypt	Aruba, Canada, Honduras	China (Hong Kong)	Albania, Austria, *Azerbaijan*, Belarus, Belgium, Bosnia & Herz., Bulgaria, Croatia, Cyprus, Czech Rep., Denmark, Estonia, France, Germany, Greece, Hungary, Italy, Latvia, Netherlands, Norway, Poland, Moldova, Romania, Russian Federation, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, FYR Macedonia, *Turkey*, Ukraine, UK		-
Pacific	-	Canada, USA	Brunei Darussalam, China, Indonesia, Japan, Malaysia, Singapore, Thailand, Timor-Leste	UK	Bahrain, Qatar	

3.2 Flow of tomato imports into the EPPO region from non-EPPO countries

Table 3.2 indicates the total volume imported by each of the 34 EPPO countries recorded to have imported tomato fruit from non-EPPO origins in 2010. Origins of imports, respectively for EU and non-EU countries, are detailed in Tables A5.1 and A5.2 in Annex 5.

85% of imports went to four countries: Russian Federation (from Armenia, China, Syria, Iran, Japan, Republic of Korea), Kazakhstan (from China, Iran, Georgia), Azerbaijan (from Iran, Georgia) and Ukraine (from Iran, Lebanon, Syria). Imports by EU countries from non-EPPO countries were slightly below 10% of the total.

Most EPPO countries imported tomatoes only from a few non-EPPO countries, except for France, UK and the Russian Federation, that imported from 6 to 9 non-EPPO countries. Of these, the UK and France imported from many regions (e.g. Africa, Asia, Near East, Americas, as well as Oceania for the UK alone), while Russian imports originated from Asia and the Near East.

Table 3.2. Total import volumes into EPPO countries from non-EPPO countries (in tonnes in 2010)
The total for each country is given as a maximum estimated quantity (see Box 4, based on data from importing and exporting country). If different, the total volume entered by the importing EPPO country only is given between brackets. 0 in FAOSTAT corresponds to quantities <1 tonne.

country	Volume (t)
1. Russian Fed.	75 441 (73 920)
2. Kazakhstan	8 655 (-)
3. Azerbaijan	4 737 (831)
4. Netherlands	4 613
5. France	3 732 (3 308)
6. Ukraine	3 169 (3 076)
7. Belgium	2 847
8. Germany	2 587 (51)
9. UK	2 214 (2 169)
10. Moldova	1 035 (1 034)
11. Turkey	951 (347)
12. Romania	811

country	Volume (t)
13. Jordan	566 (460)
14. Bosnia & Herz.	543
15. Albania	495
16. Denmark	475
17. Serbia	253 (1)
18. Belarus	239
19. Poland	206 (166)
20. Italy	194 (68)
21. Kyrgyzstan	167 (153)
22. Slovakia	164 (150)
23. FYR Macedonia	158 (-)
24. Hungary	69

country	Volume (t)
25. Norway	59
26. Bulgaria	57
27. Sweden	52
28. Slovenia	41
29. Austria	37
30. Switzerland	20
31. Spain	11 (6)
32. Croatia	7
33. Cyprus	3
34. Portugal	0
Total	114 536

3.3 Export patterns of selected exporting countries to the EPPO region

Export patterns of non-EPPO countries are reflected to a certain extent in Annex 3 with regard to their exports to the EPPO region, and in Annex 4 regarding destination of their tomato fruit exports in 2010. The exports of selected countries were extracted from FAOSTAT for 2001-2010 (Annex 6). This data may be less reliable for countries for which substantial inconsistencies were detected previously between exporting country and importing countries' data (e.g. Senegal, Iran). In addition, FAOSTAT does not contain exporting data for the Dominican Republic, which would otherwise be interesting as its exports to the EPPO region have increased in recent years. Nevertheless, the data in Annex 6 shows different situations:

- Peru, Thailand: countries with small and variable destinations, mostly to their region;
- Mexico, USA: major exporting countries with one nearly exclusive destination (the USA and Canada respectively), and clear decrease of exports to the EPPO region in the case of the USA;
- Senegal: trade nearly all orientated towards another region (Europe);
- Costa Rica: the EPPO region is the only destination outside the Americas;
- Malaysia: increasing exports, but within the region (only one export below 1 tonne to the EPPO region);
- Kenya: small and stable exports;
- Iran: substantially diminishing exports in recent years.

3.4 Conclusion on exports worldwide, imports of tomato by EPPO countries and flows

Although tomatoes are mostly traded within regions and between neighbouring countries, an intercontinental trade of tomato exists, including trade from small producing and exporting countries. Many countries do export tomatoes to the EPPO region, and there are important variations in volume and origins in different years. Only a few non-EPPO countries export large quantities of tomato fruit to the EPPO region; others export small volumes. The total volume of imports of tomato fruit from non-EPPO countries represents a small part of the imports of EPPO countries (only 3% even when considering maximum estimated quantities), and most imports originate from within the EPPO region.

4. Identification of some key non-EPPO countries exporting to the EPPO region

Production, import and export data give useful information on countries involved in producing and exporting tomato fruit, even if patterns of trade and production may change and origins may be replaced from one year to the next. The statistical data also needs to be interpreted with caution given inconsistencies (see Box 1). However, this data was used to identify some countries that seem to present more potential as tomato producers and exporters, i.e. as possible origins for tomato trade coming into the EPPO region.

The identification of key countries took account of countries that:

- have exported to the EPPO region in 2010
- have exported to the EPPO region in previous years (1986-2009)
- have a history of export outside their region
- are major exporting and producing countries
- have shown a significant increase of their tomato production.

The information for 2010 was considered separately to identify recent exporting countries. Countries that have exported to the EPPO region in 1986-2010 were also considered among those that have a history of export to other regions, so this factor had a double weighting (i.e. counted as 2 points in the number of categories in Table 4). The categorization attempts to identify some priority countries to help prioritizing pests. However, it is recognized that tomato may nevertheless be exported from a country with a minor production or that has never exported tomato before.

The non-EPPO countries identified for each category above are indicated in Annex 7 and listed in Table 4. Where possible, the trend of exports for the country concerned is indicated. The countries listed in Table 4 are used in Part 2 of this study to rate pests in order to prioritize them for further study. It is however recognized that trade is volatile and that some countries that are not in a high category below, or not listed at all, may gain importance in the future.

Table 4. List of countries identified in Annex 7 in alphabetical order. The number of categories to which each country belongs is indicated between brackets (if nothing is specified, only 1 category applies).
Trend of exports are indicated as follows:

- new countries with new trade or new data, as per data in FAOSTAT for 2004-2010 (i.e. exports appear to have started in recent years);
- ↑ countries showing increases in exports between 2004 and 2010 (based on exporting countries' data only) (↑≤100%; ↑↑ >100%; ↑↑↑ >1000%).
- ↓ countries with reduced exports between 2004 and 2010 (based on exporting countries' data only) (↓ reduction ≤75%; ↓↓ reduction >75%
- nt no trend (quantities <1 t indicated for 2004 and 2010, or no export data available in FAOSTAT (only production data), or exports mentioned only in importing EPPO countries' data)

Country (nb. categories)	Trend	Country (nb. categories)	Trend	Country (nb. categories)	Trend	Country (nb. categories)	Trend
1. Afghanistan	new	25. Ecuador (4)	↑↑↑	49. Malaysia (5)	↑	73. Sierra Leone (2)	nt
2. Antigua & Barbuda	nt	26. Egypt (5)	↓	50. Mauritania	nt	74. Singapore (2)	↓
3. Argentina (5)	↑↑↑	27. Ethiopia (4)	↑↑	51. Mauritius	nt	75. Somalia	nt
4. Armenia (4)	new	28. Georgia (3)	↓↓	52. Mayotte (2)	nt	76. South Africa (5)	↑↑
5. Australia (4)	↓	29. Guam	nt	53. Mexico (5)	↑	77. Sri Lanka (3)	↓
6. Bangladesh (3)	nt	30. Ghana (4)	↓↓	54. Mongolia	nt	78. Sudan (former) (2)	↓↓
7. Barbados (3)	new	31. Guatemala (6)	↑	55. Montenegro (3)	↓	79. Suriname (3)	New
8. Botswana	nt	32. Guinea	nt	56. Mozambique	↓↓	80. Swaziland	↑↑
9. Brazil (6)	↑↑	33. Guyana (4)	↑	57. Namibia (3)	nt	81. Syria (6)	↑
10. Brunei Darussalam	nt	34. Honduras (3)	↑	58. Netherlands Antilles	nt	82. Tajikistan (6)	↑
11. Burkina Faso (2)	↑↑↑	35. Iceland (4)	↓	59. New Zealand (4)	↑↑	83. Tanzania (3)	↑↑
12. Cameroon (3)	↓↓	36. India (6)	↑↑	60. Nicaragua	↑↑	84. Thailand (3)	↓↓
13. Canada (5)	↑	37. Indonesia (3)	↓	61. Niger	↓	85. Trinidad and Tobago	↑
14. Cape Verde	nt	38. Iran (6)	↑↑↑	62. Nigeria (2)	↓↓	86. Turkmenistan (3)	↓↓
15. Cayman Islands	nt	39. Iraq (3)	↑	63. Oman	↓↓	87. Turks and Caicos	nt
16. Chile (4)	↓	40. Jamaica	nt	64. Pakistan (4)	↑↑	88. Uganda (2)	↓↓
17. China (6)	↑	41. Japan (4)	new	65. Panama (3)	↓↓	89. United Arab Emirates (2)	↓
18. Colombia (5)	↓	42. Kenya (5)	↑	66. Paraguay	↓↓	90. Uruguay	↓↓
19. Comoros	nt	43. Korea Rep. (4)	↓	67. Peru (3)	↑↑↑	91. USA (5)	↑
20. Congo (2)	nt	44. Kuwait	new	68. Philippines	↓↓	92. Venezuela	↓
21. Costa Rica (5)	↑↑	45. Lebanon (5)	↓	69. Puerto Rico	nt	93. Vietnam	nt
22. Côte d'Ivoire (3)	↓↓	46. Liberia	↑	70. Rwanda	nt	94. Yemen (2)	↑↑
23. Cuba	↑	47. Libya	↑↑	71. Saudi Arabia (6)	↑↑	95. Zambia	↓↓
24. Dominican Rep. (4)	↑↑	48. Madagascar (2)	↑↑	72. Senegal (5)	↑	96. Zimbabwe (2)	↓↓

5. The tomato pathway into the EPPO region, and consequences for PRAs on tomato pests

All types of tomatoes described in section 1 may be imported into the EPPO region. This section aims to identify features of the pathway for tomato fruit in the EPPO region. It considers the tomato commodity itself (presence of green parts, maturity stage), the conditions of storage and transport, the means and duration of transport, and the use of imported tomato fruit. Such elements are required in PRA in relation to the survival and multiplication of the pest during storage and transport. This has often been answered in a general manner in previous EPPO PRAs for tomato fruit (e.g. EPPO 2012) or only for specific countries, or using information from personal communication. Information provided during previous PRAs, literature and information from various companies and organizations was used here to try to provide general information that could be used for future PRAs for tomato fruit.

5.1 Presence of green parts associated with the fruit

A tomato fruit may be accompanied by green parts such as the calyx and fruit pedoncule, or even a part of stem (e.g. for tomato on the vine). The presence of green parts influences which pests and which stage of their life cycles may be associated with the fruit. If green parts are absent, the pests most likely to be associated with the consignment are those that are present in or on the fruit. Even among these pests present on the fruit, the likelihood of association would also differ depending on whether the pest is present in or on the fruit. For example pests that are present in a mobile form on fruit (for example Sphingidae sucking fruit sap) may be less likely to be associated with consignments that those present on or in the fruit in a non-mobile form (for example larvae mining in fruit). For some other tomato pests, introduction with tomato fruit would depend entirely on the presence of green parts, as no life stage would be associated with fruit. All types of tomato may be sold with green parts attached, whether a calyx and pedoncule or on the vine, but there was no data on whether this is also the case for imported tomatoes. It was also not known whether some tomato commodities are sometimes exported with leaves (in addition to other green parts). This section aimed to answer the following questions: are imported tomatoes accompanied by green parts, and if so, is it only the calyx, or stems, or calyx, stems and leaves. Is there a difference depending on the origin (e.g. from countries outside the Euromediterranean area)?

No specific information was found in the literature on whether green parts are attached to consignments of tomato imported into the EPPO region. Morley (British Tomato Growers Association, UK, 2013, pers. comm.) remarked that there is almost always a ‘green part’ associated with the final packaged tomato fruit (whether calyx or whole stem associated with the fruit truss where fruit is sold ‘on the truss’), and occasionally there will be small amounts of leaf material. The FPC (2013) indicates that most tomato fruit imported to the UK arrive without green parts, noting in addition that for beef tomatoes, it is preferred that calyxes are removed as they can puncture the fruit. In France, the importer Frulexxo (which imports fruit from Spain and Morocco) proposes several types of tomatoes, including round tomatoes with or without pedoncule, organic tomatoes without pedoncule. It is impossible to verify if this is a general approach among all importers in the EPPO region.

In conclusion, it is likely that all types of tomato may be traded with or without green part attached, i.e. with calyx and fruit pedoncule and a part of stem, ‘on the vine’. This is notably the case for cherry tomatoes, but round tomatoes may also be traded in a similar manner. In PRA, it therefore cannot be assumed that imported tomato fruit is not accompanied with green parts. It may be that the presence of leaf material is limited (as reported by Morley), but this is based on one source from one country (UK) and may need to be confirmed. In the present study, pests that may be associated with green parts are also considered, although several categories are distinguished (see Step 2).

5.2 Stage of maturity at harvest and export

The stage at which tomatoes are picked will influence the pests that may be associated with the fruit. According to data provided in the Introduction, tomato fruit may be harvested (and subsequently exported) at any stage between ‘mature green’ and fully mature. This would depend on the type of tomato and on the destination (considering the duration of transport and the requested shelf-life of the fruit). It is likely that fruit to be exported over a long distance by ship would be harvested at an early maturity stage, whereas it would probably be harvested at a riper stage if it was to be transported by air. Fruits that will be transported over

shorted distances may be harvested ripe, but also at less mature stages if a longer storage or shelf-life is needed. Moneruzzaman et al. (2009), in a study on the effect of maturity at harvest and storage conditions on the post-harvest quality of tomato fruit, suggest that tomato fruit is harvested at the mature green stage for long-distance trade, and full ripe stage for local consumption. Fruits are harvested red if transported by plane (PIP, 2011).

In conclusion, different tomato types may be traded at different maturity stages. In addition, information on the duration and modes of transport below show a range that may allow tomatoes to be traded at any stage between mature green and ripe. It is therefore not possible to know at what maturity stage tomatoes would be harvested and reach the country of destination. However, it is likely that tomato fruit for the fresh market would arrive at a stage before the fully ripe stage, in order to allow for a sufficient shelf-life (although there is no evidence of this). It is also assumed that there may also be some slight variation in maturity within consignments. When analysing this point in an individual PRA, it should be considered whether the pest can be associated with fruit between the mature green and mature stage (i.e. not only with the ripest tomato fruit).

5.3 Packaging

The packaging itself may play a role in the spread of tomato pests. For example pupae of *Tuta absoluta* and *Neoleucinodes occidentalis* that were formed during transport were intercepted on the sides of boxes. In addition, the size of the packaging may influence the detection of pests. This section aimed to answer the following questions: How is tomato fruit packed (e.g. boxes, bulk)? What is the size of individual packages? Is there a difference in packaging for tomatoes coming from EU countries, from Mediterranean countries, and from others outside the region? For tomatoes coming from outside the Euromediterranean region, is there a preferred packaging form?

UNCTAD (2012) mentions that in low technology systems harvested tomatoes are stacked in open baskets. In other situations, immature tomatoes are commonly packaged in cartons, two-layer flats and wire-strapped crates. Tomatoes may be arranged in packaging of limited dimension, sometimes randomly bulk-packed (GDV, 2013). From the good practices in various publications, to avoid damage to fruit tomato for the fresh market are expected to be packed in packages of a few kilos. Boyette et al. (2013) indicates 11 kg for mature green tomato, 6 kg for cherry tomato, 4-13 kg for ripe tomatoes. Frulexxo proposes tomatoes in 6 kg cardboard packages of 40 x 30 cm. CTGA (2013) note that processing tomatoes are transported in bulks in trucks (and are more resistant than other types of tomatoes) (a typical tomato truck would contain 50 000 pounds of tomato, i.e. about 22 700 kg or 300 000 tomatoes). There is no information on transport of tomato fruit in bulk from non-EPPO countries.

In the UK, Morley (British Tomato Growers Association, July 2013, pers. comm.) note that fruit is generally picked into plastic trays, and then prepared in packhouses and repackaged either into final format retail packaging or to another site using cardboard trays (generally non re-usable). For retail in the UK, tomato fruit is generally packed in plastic punnets, with ‘air holes’ to allow the product to breathe and reduce moisture; a relatively small amount is ‘packed’ in loose trays, allowing the consumer to ‘pick their own’. (note that practices may vary between EPPO countries). Imported fruit for fresh consumption may arrive and be delivered to the packhouse in non re-usable cardboard trays, and be packed in the UK (Morley, British Tomato Growers Association, July 2013, pers. comm.). Only small amounts of imported tomato fruit would be prepacked in retailer-specific plastic containers in the country of origin (possibly less than 5%) (Morley, pers. comm.). FPC (2013) note that tomato fruit destined for retailers is usually repacked in the UK or at the country of entry into the EU, especially where transport time was long and the product may need further checking; from close origins (e.g. Spain, two-days transport), tomato fruit may be imported pre-packed. FPC (2013) also indicates different formats from different countries (e.g. cardboard boxes or returnable crates from the Netherlands, cardboard or pre-packed for the Euromediterranean region). There is no preferred packaging format used by countries outside the EU, although most tomato fruit would be imported in cardboard boxes or plastic trays. These may weigh 5 or 10 kg (3-6 kg for cardboard boxes used for cherry tomatoes). The situation for imports into other EPPO countries is not known.

Spread of pests may also be facilitated if packaging is reused. It seems from the information available that this would not be the case for cardboard trays, although other packaging is sometimes reused (EPPO, 2012).

No precise information was found on the size of consignments, but it is assumed to vary. Fruit packed in cardboard outer packaging in a third country will be palletised, and perhaps transported in a truck with other produce as logistics demand (Morley, British Tomato Growers Association, UK, pers. comm., July 2013).

5.4 Intended use and separation of imports and production

The intended use influences the possibilities of transfer of the pest at destination. If tomatoes are destined to be processed in the country of destination, the pest may not be able to transfer to host plants. However, it has been shown in the case of *Tuta absoluta* that one important parameter is whether the fruit is imported in facilities that also produce tomato, in which case transfer to host plants may be facilitated. In fact some PRAs for tomato pests (e.g. EPPO, 2012) conclude that transfer to a host is likely only if packing and handling facilities are located near production areas. This section aimed to answer the following questions: Is there an indication at import of whether the tomatoes are intended for processing or for consumption? If for consumption, are they generally repacked or already packed for consumers? Does the intended use vary with the origin? Are tomatoes imported to facilities that grow tomatoes and is packaging reused.

For the UK, Morley (British Tomato Growers Association, July 2013, pers. comm.) notes that UK imports 80% of its tomatoes for fresh consumption and it is expected that processed tomatoes would generally be imported in pre-prepared 'puree' format. There is no specific intended use attached to specific origins (FPC, 2013). FPC (2013) indicates that importers sometimes import semi-processed fruit into the UK from Continental Europe and Israel in order to reduce handling.

In conclusion, although it is expected that most tomatoes imported from non-EPPO countries will be destined for the fresh market, no data was found on this. It is reasonable to maintain the hypothesis in EPPO (2012) that tomatoes may be imported both for the fresh market and for processing.

When imported tomato fruit is stored or repacked at destination in facilities that also grow tomatoes, consignments would be present for several days at packing stations before being fully processed (EPPO, 2012 mentioned the presence of tomatoes sometimes for weeks at packing stations, although this duration seems unlikely considering the life span of tomatoes). *T. absoluta* was found several times at packing stations in the UK and the Netherlands, and outbreaks were recorded in greenhouses close to these packing stations (EPPO, 2012, citing others). Pests may escape from packing facilities or discarded material, and transfer to a suitable host (tomato is common in the PRA area). It may be that the practice of using the same facilities for imported fruit and for production is changing due to introduction of several serious pests of tomato (e.g. *Pepino mosaic virus, Tuta absoluta*), but there is no evidence of this for the whole EPPO region.

It therefore cannot be excluded that tomatoes are imported to facilities that also produce tomato fruit, even if this practice may have decreased due to recent pest introductions. However, no data was found on this for the whole EPPO region and it is likely that this practice continues. It is reasonable that EPPO PRAs consider that the risk is different in such cases.

5.5 Conditions and duration of storage and transport

The conditions of storage and transport may influence the survival of some pests and their ability to continue development. Temperature and relative humidity are especially important. The means of transport (air, sea, road, rail), which define its duration depending on origins, will also have an influence. It is known that some pests survive transport and storage of tomato fruit exported from distant origins, for example *Tuta absoluta* from South America. This question aims to answer the following questions: What are the factors linked to the commodity itself that influence the temperature and duration of storage and transport? What is the transport chain for exported tomato fruit? What are the temperatures of storage and transport for tomato fruit? Are they refrigerated? Which means of transport are used to export tomato to the EPPO region, and what would be the duration of transport?

Conditions of transport

UK P&I (2013) summarizes the storage, transit and shelf life for many fruit and vegetables, indicating optimum transit temperature and relative humidity. Tomato fruit has a short life span. The maximum storage, transit and shelf life for tomato fruit (in optimal storage temperature and relative humidity) is approximately 14 days (similar to that of other sensitive fruit and vegetables such as blueberry, apricot, cucumber or sweet pepper) (although some other sources indicate longer life spans – see Table 5.5a). At the other end of the scale, this figure reaches for example 240 days for apple, and 180 days for pears and seed potatoes. The optimal transit temperature varies according to the fruit species. Roberts (2002) mentions that tomato fruit were often shipped in mixed lots with other fruit, below 5°C, which is not suitable for proper storage.

The tomato fruit should reach the intended market with a satisfactory quality and level of ripening. The combination of maturity stage at harvest and storage and transport conditions determine the post-harvest quality of tomato fruit. The conditions of storage after harvest are optimized to control the rate of ripening in order to extend the marketing period, while maintaining the quality of the fruit (in terms of the parameters in section 1) and avoiding damage (chilling, decay etc.) (NHBI, ND; UNCTAD, 2012; GDV, 2013; UK P&I, 2013). It is expected that markets in the EPPO region would normally require high quality tomato fruit (e.g. in terms of colour, firmness and taste), and that proper storage and transport conditions are likely to be used.

One important factor of storage is temperature, and precise temperature control is critical to quality (Boyette et al., 2013). Cooling before and during storage is important to prolong the life of the tomato fruit and is normal practice when fruit is not immediately delivered to the fresh market. It is suggested by several publications that fresh tomatoes not destined to be sold in the immediate vicinity of the harvest sites would be cooled immediately after harvest (e.g. Boyette et al., 2013). It is therefore expected that tomato fruit imported from most, if not all, origins outside the EPPO region would be cooled. The cargo and holds/containers would be precooled prior to loading (GDV, 2013).

Regarding temperature, tomato fruit should be stored above a certain temperature to avoid decay and chilling, which results in poor ripening and lower fruit quality (Cantwell et al., 2009, citing others; UNCTAD, 2012). Tomato fruit is very sensitive to chilling, with a cumulative effect throughout growth and storage (UNCTAD, 2012), and extended refrigeration below the recommended threshold would increase chilling injury. Very ripe tomatoes, if stored for 3 weeks at 0.5-1.7°C will not decay, but will have almost no shelf life and very poor flavour and colour (Boyette et al., 2013).

Most post-harvest recommendations for tomato indicate that they should be stored above 10°C to avoid chilling injury (Cantwell et al., 2009, citing others). This is the same threshold indicated for decay, as mature green tomatoes stored below 10°C are susceptible to decay caused by *Alternaria* spp. (Boyette et al., 2013). UNCTAD (2012) notes that tomato fruit will not ripen above 26°C.

The optimal temperature for storage and transport depend on the level of maturity of the fruit, the type of tomato and the requested life span for the fruit. Roberts et al. (2002) note that most recommendations were originally for round tomatoes, and that requirements may vary for other types. The optimal temperatures indicated in the literature vary to a certain extent. Some examples are given in Table 5.5a.

Table 5.5a. Optimal temperatures depending on the maturity stage and intended life span

'turning' (colour): 9°C (90-95% RH) – life span 10-14 days Green: 13.3 C (90-95% RH) - life span 21-28 days	UK P&I (2013)
Mature green: 14.4-15.5°C (85-95% relative humidity) - storage life: 21-28 days 'Pink' tomatoes: 8.9-10°C (85-95% relative humidity) - storage life: 7-14 days Mature red tomatoes: no temperature indicated - storage life: 2-4 days 'Light red' tomatoes: 10°C - storage life 2 weeks or longer	Boyette et al. (2013)
Mature green: 12.5-15°C – can be stored for 14 days prior to ripening at 12.5°C without reduction of quality Light red: 10-12,5°C Firm ripe: 7-10°C - will last 3-5 days. 8-10 days of shelf life if tomatoes are kept within the optimum temperature range after reaching the firm ripe stage.	Suslow and Cantwell (2013)
Storage life at different temperatures: - 10-12°C (85 % relative humidity) approx. 14 days - 10°C (80 - 85%) : 8-10 days;	GDV 2013 (citing various sources)

- 8-10°C (80 - 85%) : 7-14 days Travel temperature: 10-13°C Three-quarters ripe, fully coloured, firm fruit: 8-11°C Semi-ripe fruit with incipient red-colouring: 12-15°C Green fruit: 10-12.5°C (with some sources recommending 18-20°C)	
Grape and pear tomato (types of cherry tomato), picked at red-ripe stage, washed, rinsed, quickly cooled and held at 13°C with 90-90% relative humidity in handling and shipping, maintain their quality for at least 14 days. At inferior temperatures, longer ripening (17-19 days compared to 12-13 days), but quality lower.	Roberts et al. (2002)
13°C with 90-95% - storage for 2-3 weeks. Unripe tomatoes: 8-10°C with 85-90 % relative humidity – storage life 4 weeks Fully ripe fruits: 7°C with 90% relative humidity - storage life 1 week.	NHBI (ND)
8-10 days at 18-21°C and 90-95 % RH. Red fruit – a few days at 7-10°C Green fruit – several weeks at 13-16°C	PIP (2011)

Recent studies investigated storage of tomato fruit at temperatures below the recommended 10°C threshold, presumably in order to increase the life span of tomato fruit. Znidarcic et al. (2010) concluded that tomatoes (cv. Belle) may be stored at temperatures below 10°C, although noting some changes in the quality of the tomatoes. Cantwell et al. (2009) studied cherry and grape tomatoes held at 5°C with different controlled atmospheres (including high carbon dioxide – see below), and showed that cherry and grape tomatoes can tolerate 2-3 weeks at 5°C, if not exposed to higher temperatures, which triggers chilling injury. It was not expected that such low temperatures would be used for exported tomatoes, as fruit transported at 5°C, may then be stored in the country of destination at the recommended temperature above 10°C, and may suffer unacceptable chilling damage. In the UK (Morley, British Tomato Growers Association, UK, July 2013, pers. comm.), fruit arrive in temperature-controlled trucks with a continuous cool chain at approximately 10°C.

According to information gathered from Turkish exporters for the PRA on *Keiferia lycopersicella*, transport temperature is between 5-8°C for tomato in Turkey, and in Spain the normal temperature for tomato trade and storage is about 8.2ºC (pers. comm. in EPPO, 2012). This would correspond to temperatures recommended by others in case of a short storage period for ripe tomatoes. It is likely that tomato travelling for longer distance and longer time would be transported at the green mature stage at slightly higher temperatures, as per the recommendations above. FPC (2013) note that tomatoes are transported at 5-18°C, with an ideal temperature of 8-12°C.

Controlled atmosphere has been used (increased CO_2 concentration) to depress metabolic rate (e.g. for apple, strawberries, nuts and dried fruit; UK P&I, 2013). Suslow and Cantwell (2013) mention that controlled atmosphere offers a moderate benefit for tomato. Typically 3% O_2 and 0-3% CO_2 are used and delay ripening while maintaining quality. However, CO_2 concentration above 3 % is not tolerated by most cultivars and will cause injury, as will O_2 levels of 1%. Where controlled atmosphere is used, the transport and storage duration of tomatoes may be extended. GDV (2013) also provide recommendations on controlled atmosphere. No information was found on how widely controlled atmosphere is used for the transport of tomato in international trade.

The conditions of storage and transport are optimized for the tomato fruit. In tomatoes transported with green parts, it is not known if the conditions that are optimal for the fruit are also optimal for the leaves, calyx and stems. These would presumably have to reach the consumer in a not too dry stage, but some degradation processes may have started, which would influence the survival of pests present on them. This is a hypothesis, as no information was found on this.

In considering the survival of the pests in relation to the temperature of transport in PRA, it would be reasonable to assume that tomato fruit may be transported in refrigerated conditions, at temperatures ranging between 5ºC and 18ºC depending on the type of tomato, the origin (defining the duration of transport) and the intended use. Some considerations in PRA would be whether some life stages would survive such temperatures for the duration of transport and storage corresponding to the origin.

Means and duration of transport

The short life of the tomato fruit, combined with the conditions under which it is stored and transported determines the maximum length of transport of tomato fruit. The duration of storage and transport needs to

be shorter than the life span of the fruit, and allow some time for delivery at destination and shelf life. 2-3 weeks is indicated by most sources as a common life span for tomato fruit, in extreme cases 28 days. Transport should in any case be shorter. No detailed data was found in previous EPPO PRAs for tomato regarding the duration of transport from the different parts of the world, but this would be important to determine how long the pests are likely to be in storage and transit before they reach destination.

It is expected that transport by plane from any origin in the world not take more than a few days from harvest to delivery at destination. Kellou (2012) notes that the time of transport from Morocco to France is about the same by sea and truck between Agadir (South Morocco) and Port Vendres (France, border with Spain on the Mediterranean Coast) (respectively 2.5 days and 3.5 days by sea).

To estimate the duration of sea transport from different parts of the world to the EPPO region, the site SeaRates[6] was used, for a container ship at an average speed (14 knots). This corresponds broadly to the record of 9 days in Van Stiljn (2001) for shipping of tomatoes from Rotterdam (Netherlands) to the USA (Newark, New Jersey). This website was therefore used to try to estimate the sea transit times for a few other harbours worldwide to the Netherlands (Rotterdam or Amsterdam), as indicated in Table 5.5b. Harbours in countries reported to export tomato fruit by sea to the EU (Table 5.5c) were also added (with the Netherlands as destination for the purpose of comparison, and not the countries indicated in Table 5.5c). Morocco is given as a comparison and as it is the main exporter of tomato fruit to the EPPO region. In addition to the net sailing time, further days would be needed for transportation of the products to the origin harbour and departure of the ship, transfer of containers between ship as needed ('transhipment' on SeaRates), and unloading and delivery at destination. In the example of van Stiljn (2001) it seems that the transport time was optimized. This may be the case in case of regular exports, therefore limiting the number of additional days.

Table 5.5b. Estimated sea transit time by container ship, 14 knots for exports to the Netherlands (source: SeaRates).

Sea transit	Origin:Country (harbour)	Sea transit	Origin:Country (harbour)
4 days	Morocco (Casablanca)	15 days	Panama (Colon, Atlantic), Costa Rica (Puerto Limon, Atlantic)
8 days	Senegal (Dakar)	18 days	South Africa (Cape Town, Atlantic) (21 d. from Durban, Indian Ocean), India (Mumbai)
9 days	Canada (Chicoutimi, St Laurent Estuary, Atlantic)	19 days	Argentina (Buenos Aires, Atlantic); Kenya (Mombasa)
10 days	Egypt (Alexandria), Syria (Tartous)	22 days	Chile (Valparaiso)
11 days	Cote d'Ivoire (Abidjan)	29 days	China (Guangzhou, South); Vietnam (Haiphong) (26.5 d. from Vung Tau, South);
12 days	Dominican Republic (Santo Domingo)	31 days	China (Shangai, Centre-East)
13 days	Brazil (Recife); Colombia (Baranquilla, Atlantic)	34 days	New Zealand (Auckland)

Real transport times vary depending on transport conditions. For example a speed of 22 knots results in 12 days instead of 19 days from Mombasa in Kenya. However, given the shelf life of tomato and the normal refrigeration conditions, the number of days needed for sea transport seems to reduce the possible origins from which tomato could be transported by sea (e.g. for import to the Netherlands, sea transport does not appear to be compatible with the life span of tomato for countries such as Chile, China and New-Zealand).

Mode of transport

In the EPPO region, Kellou (2012) gives details on the transport of tomato from Morocco to Europe. Tomato used to be transported by refrigerated truck, but there was a shift in the previous 3 years, and by 2012 sea transport represented 40 % of tomato transport from Morocco to Europe (mostly due to lower cost, better maintenance of the cooling chain over the whole transport duration, and general environmental considerations). It is possible that for similar reasons sea transport of fruit from other regions has increased, where this is possible.

Eurostat gives some data regarding the mode of transport to EU countries, which concern transport by sea, air, road and train. Data was extracted for imports of tomato by all EU countries from those countries registered to have exported tomato to the EU in 2008-2010 (according to Annex 3 – however data was not available for all of these). Detailed data (indicating EU countries) is given as Annex 8, and summarized in

[6] http://www.searates.com. This site was used to obtain estimates of sea transit time by container ship from different parts of the world. Each query brings back a total duration (including transhipment), with net sailing time, used here.

Table 5.5c. Although transport by road or train is recorded for some origins, there are doubts in some cases as to whether this relates to the whole journey (from origin to destination), for reasons detailed below. The following elements are interesting in relation to the different regions of origin of tomato fruit imports.

From the Americas

- Sea transport of tomato fruit occurs from countries with an Atlantic coast and the Caribbean. Transport by air is also recorded from such countries (Colombia, Costa Rica, the Dominican Republic, Brazil). Transport by sea from the Dominican Republic exceeded 1200 tonnes in 2012. By air, the quantities transported tend to be small, although 6-90 tonnes per year are recorded from the Dominican Republic (to France) and smaller quantities from Colombia and Costa Rica. From these countries, sea transport would take 10-15 days according to Table 5.5b, which is still compatible with the life span of tomatoes, depending on harvest time and transport conditions.
- Only air transport is used from countries without an Atlantic Coast (Peru, Chile). From the USA, the main State producing tomato is California, on the Pacific Coast, which may be the reason of air transport. In a similar manner, exports from Mexico were by air.
- The record for transport from Suriname to France by road may relate to tomato transported to the adjacent French Guiana, although this is not specified.

From Asia

- Sea transport is recorded from Vietnam and China, from which transport by sea is estimated to take more than 25 days (see 5.5b). This is surprising as this is a long transport time, which is close to the maximum life span of a tomato fruit in certain conditions. Such transport may use ways of prolonging the life span of the fruit, such as controlled atmosphere. It would be interesting to know in which conditions this fruit is transported.
- Imports from India and Thailand are only by air (although these countries are closer than China and Vietnam for sea transport).
- It would be expected that transport of tomato from China to the Russian Federation or Central Asian countries would be by road, although there is no data on this. Transport by road from Bangladesh to the EU is recorded but may refer to only part of the journey.

From the Near East

- Tomato fruits are transported by road from Syria or Lebanon to the Eastern part of the EU[7] (and probably also to Eastern non-EU EPPO countries such as the Russian Federation). Small quantities were also transported by air. Sea transport would take approximately 10 days according to Table 5.5b.

From Africa

- From South Africa, only transport by sea is recorded, which is estimated to take approximately 18 days. Most tomatoes exported from Senegal also travel by sea, although non negligible quantities are recorded to travel by road (see below), and smaller volumes by air.
- Transport by air occurs from Egypt, Ethiopia, Senegal and Kenya, and is the sole transport for tomatoes from Kenya and Ethiopia (although sea transit times would probably still be compatible with the life span of tomato fruit).
- There is a transport by road to all parts of the EU from Egypt. Quantities are lesser than by sea, but are not negligible. There is no information on whether this relates to the whole journey. Transport by rail from Egypt to Denmark is recorded, but it is not certain if this relates to the whole journey or only the last part.
- Transport by road of non-negligible quantities is also recorded from Senegal. However, there is even more uncertainty in this case as to whether this data reflects a whole journey by road. The main road itinerary from Senegal to reach Morocco and forward to Europe would presumably go across the Sahara, through Mauritania and Algeria.

[7] Although, as for other cases of road transport, it is not certain that the data refers to a whole journey by road, this mode of transport seems more practical from Syria and Lebanon than for some other origins.

Table 5.5c. Means of transport of tomato fruit to the EU (from Eurostat): tonnes of tomatoes transported by different means

Americas and Caribbean (from North to South)

Canada	USA	Mexico	Costa Rica		Panama	Dominican Republic		Colombia	
Sea	Air	Air	Sea	Air	Sea	Sea	Air	Sea	Air
6 (2008)		0 (2008)				49 (2008)	82 (2008)	120 (2008)	1 (2008)
17 (2009)	0 (2009)				10 (2009)	247 (2009)	63+ (2009)	28+ (2009)	2+ (2009)
			20 (2010)		16 (2010)	872 (2010)	91 (2010)	66 (2010)	
			9 (2011)		2 (2011)	860 (2011)	14+ (2011)	9+ (2011)	
	48 (2012)	85+ (2012)	127 (2012)	5 (2012)		1202 (2012)	6 (2012)		

Suriname	Peru	Brazil	Chile
Road	Air	Air	Air
	0 (2008)		36 (2008)
	0 (2009)		57 (2009)
2 (2010)	4+ (2010)	0 (2010)	
7 (2011)	0 (2011)		
10 (2012)			

Asia (from East to West)

China	Vietnam	Thailand	Bangladesh		India
Sea	Sea	Air	Air	Road	Air
	3 (2008)	4+ (2008)	1 (2008)	5 (2008)	
		0+ (2009)		17 (2009)	0 (2009)
14+ (2010)		0+ (2010)		23 (2010)	3 (2010)
		1+ (2011)		29 (2011)	0 (2011)
		0+ (2012)		11 (2012)	1 (2012)

Near East (from South to North)

Saudi Arabia	Lebanon		Syria		
Air	Road	Air	Sea	Road	Air
	206 (2008)	2 (2008)	21 (2008)	2488 (2008)	
			44 (2009)	4424 (2009)	
1 (2010)		0 (2010)	5 (2010)	1279 (2010)	0+ (2010)
		0 (2011)	50 (2011)	314 (2011)	3 (2011)
		0 (2012)		82 (2012)	0 (2012)

Africa

Egypt					Ethiopia	Kenya	South Africa	Senegal			
Unknown	Sea	Rail	Road	Air	Air	Air	Sea	Unknown	Sea	Road	Air
1398 (2008)	962 (2008)	21 (2008)	209 (2008)	76+ (2008)			0 (2008)	2689 (2008)	5978 (2008)	142 (2008)	19 (2008)
1258 (2009)	1503+ (2009)	11 (2009)	115+ (2009)	51+ (2009)		1 (2009)		2308 (2009)	4567 (2009)	4 (2009)	14+ (2009)
	2515 (2010)		1163 (2010)	50+ (2010)	0 (2010)	0 (2010)	37 (2010)		8646 (2010)	109 (2010)	6 (2010)
	1637 (2011)		951 (2011)	96+ (2011)	6 (2011)	0 (2012)		1300 (2011)	6690 (2011)	1632 (2011)	5 (2011)
	1841 (2012)		177 (2012)	0+ (2012)	0 (2012)			866 (2012)	5218 (2012)	3462 (2012)	

Interaction between the maturity at harvest, conditions of transport and mode and duration of transport

From the information above regarding maturity at harvest, storage conditions and duration of transport, it is likely that the further away the origin, the more likely the tomatoes will be harvested at the mature green stage, and will be in transit for some days at slightly higher temperatures than ripe tomatoes. The conditions of transport vary according to the type of tomato and its ripeness, and it is not possible to generalize for all tomatoes transported to the EPPO region. It is reasonable to make the hypothesis that tomato fruit may be transported at temperatures of 5-18°C, at any stage between green mature and ripe, for any duration between 2 and 25 days, and that if tomato fruit is transported at low temperature, the duration of transport is likely to be short, so that quality of the fruit is maintained. Fruit to be transported over long distances by sea are expected to be closer to the mature green stage. Some sea transport of tomato is recorded from China and Vietnam to the EU, which would entail long transport times, and the conditions under which this fruit is transported are not known.

The EPPO PRAs generally consider that tomato fruit is harvested, sorted, packed, delivered and put on sale within a few days. EPPO (2012) notes that the whole process, from harvest to reaching final destination, could range between 2 to 5 days. This is probably the case in most cases where air transport is used (or transport by sea from close origins) and is in line with the short life span of tomato fruit and the need to deliver good quality products to the user with a sufficient shelf-life. However, there are cases where storage and transport will be longer as indicated by the figures above, with storage and transport under refrigerated conditions. In addition, it is not known how much controlled atmosphere is used to prolong the life span of tomato fruit. Consequently, the whole process, from harvest to reaching final destination, could take more time than previously hypothesised, under refrigerated conditions, and this would influence survival of the pests. However, the hypothesis that the whole process could last only a few days still applies to all origins, as air transport may occur from all regions of the world.

For every pest in PRA, it may be possible to find data on whether some life stages would survive at these temperatures, with the levels of ripeness and durations implied by each origin. Transport may take longer than originally expected, and this may affect the survival of pests.

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PART 2

TOMATO PESTS - IDENTIFICATION AND PRIORITIES FOR FURTHER STUDY

Executive summary

A three-step screening procedure was followed to identify some pests that could be possible candidates for addition to the EPPO Alert List, or possible candidates for PRA:

In Step 1, various sources were consulted to identify pests of tomato worldwide, focusing on other regions of the world. 1102 species, genera or groups of organisms were listed and basic preliminary information gathered on their distribution, host plants and other elements. These pests were screened to determine those that could be excluded from further consideration (i.e. which were not pests of tomato, or could not be transported on tomato fruit, or were already widespread in the EPPO region, or were present in 3 or more countries of the EPPO region, or are already recommended for regulation by EPPO or under consideration). The remaining 379 species or genera were considered further in Step 2.

In Step 2, further information was sought for the 379 species or genera retained after Step 1, and several criteria were rated for each pest, including its transport on tomato fruit, its distribution in the EPPO region, level of polyphagy, and the level of climatic similarity between its current distribution and the EPPO region. Criteria to facilitate the prioritization of pests for further consideration were developed and applied. Finally an overall rating, defining the priority for further consideration, was allocated to each pest and accompanied by a brief conclusion where relevant. A number of additional tomato pests were identified only in Step 2, and added to the listing, bringing the total number of pests to 417. At the end of Step 2, some pests were excluded from further consideration and the remaining pests were considered further in Step 3.

In Step 3, a selection was made among the remaining pests, and records were prepared for selected pests. It is intended that these are screened further in order to identify pests which are a priority for PRA.

6. Process

Three steps were applied to identify pests of tomato that potentially present a risk for the EPPO region and should be further studied:

- **Step 1**. Establishing a list of tomato pests worldwide, including basic preliminary information especially on distribution and whether these pests may be associated with tomato fruit in trade.
  →*Outcome*: 'Step 1 list', a general list of pests, and identification of those needing to be considered further and those which do not.
- **Step 2**. Screening the pests to be considered further according to Step 1 against a number of criteria. Additional pests were also identified at this stage.
  →*Outcome*: This step looks into more detail concerning the pests, taking into account a number of criteria (details given below). It leads to the 'Step 2 List' of pests, with information, ratings against individual criteria and an overall rating, as well as identification of those pests not needing further consideration.
- **Step 3**. Screening the pests to be considered further according to Step 2 in order to select pests to be proposed to the Panel on Phytosanitary Measures for further consideration.
  →*Outcome*: Step 3 records (in the format of EPPO Alert List records) for selected insects, and pre-selection of some other pests.

7. Step 1: Listing tomato pests worldwide

In Step 1, organisms associated with tomato worldwide were identified, and basic information gathered to determine whether they should be considered or could already be excluded from consideration. Some vectors are also included. The main objective during this step was to prepare a list of pests of tomato, and already exclude a number of them prior to gathering more information in Step 2. In particular, although searches focused on regions of the world other than the European and Mediterranean region, this first step identified a number of pests that are already widespread in the EPPO region, and were thus excluded from further consideration. This step did not aim to gather complete information on each pest, and such in-depth data was gathered in Step 2 and Step 3 only for the pests retained for further study.

7.1 Inclusion of organisms in the list, sources used

In order to identify tomato pests worldwide, this step relied mostly on a number of general sources relating to tomato pests, or sources relating to tomato cropping and pests in specific countries or regions:

- PQR (pests with tomato as a host)
- CABI CPC (pests with tomato as a host)
- Articles identified in Ovid SP (general search for tomato pests for 2002-2013)
- Existing compilations of tomato pests for certain countries, regions or groups of pests, including:
  - Netherlands screening of tomato insects from the Americas to identify priorities for Quickscan
  - PRAs from other regions, such as the USA PRA on tomato fruit from ECOWAS (USDA, 2009)
  - Books on tomato pests for specific regions (e.g. Near East, Asia)
  - Books on specific groups of pests (e.g. viruses, pathogens)
  - Other types of publications relating to tomato pests in a country
  - Leaflets (flyers), cropping advice, lists of pests present in a country, both in written form or as Internet databases. A few official lists of pests are available from the International Phytosanitary Portal (IPP, www.ippc.int), others are available in cropping advice brochures.
  - Publications on groups of pests (e.g. nematodes, viruses)
  - Targeted searches for certain countries, for example those that were not covered in the general publications above, or important producers as identified in section 1.
  - Databases regarding pests in a country (for example NZPPIN in New Zealand).
- Lists of quarantine pests of non-EPPO countries (as available on the IPP, www.ippc.int). At this stage, these were only used to identify pests, and only those giving an indication of the host were used at this stage. Screening others would require a specific search on whether tomato is a host for each of the pest listed, and this was not possible due to the time it would take (and it is assumed that most pests would have been identified through other sources). A screening of the quarantine lists for those regulated in countries was performed in Step 2 to further classify the pests.
- Regulations from countries regarding tomato imports from third countries (for example New Zealand regulation regarding tomato from Tonga and from Australia)
- EPPO Reporting Service articles and notifications of non-compliance
- Interceptions from other countries. USDA interceptions on tomato were provided for 1986-2006 in USDA (2009) (PRA on tomato from ECOWAS), and interceptions for the period 2007/2012 were kindly provided by the USDA.

The sources for Step 1 are indicated in the Step 1 List, with information on the pest[8].

As a result of the first screening 1102 species, genera or groups of organisms were listed.

7.2 Information gathered

All or part of the information below was collected for each organism. Each source may give information on only one or few of the items below, as reflected in the resulting list. The items below correspond to the structure of the Step 1 List (see 7.3).

Identity

- Scientific name of the organisms, i.e. species or genus as identified during the search. Synonyms were included only where the organism is called by a synonym in some of the references used. Some uncertainties on synonymy could not be resolved easily and were stated.
- Type of pest (as a code and taxonomic details). These are as indicated in the table below. The aim of this was to be informative for the reader, and the taxonomic levels are not consistent across all groups of organisms. For birds and plants, no detail was given (none of these are retained to Step 2).

[8] References are cited for those pests that were later retained (Annex 11)

Table 7.2. Codes and taxonomic details for the pests

Code	Type of pest	Taxonomic details given	Upper taxonomic levels (for reference)
Animals			
I	Insecta (Class)	Order: Family	Animalia (Kingdom), Arthropoda (Phyllum), Hexapoda (Sub-Phyllum)
E	Entognatha (Class)	Order: Family	Animalia (Kingdom), Arthropoda (Phyllum), Hexapoda (Sub-Phyllum)
A	Arachnida (Class)	Order: Family	Animalia (Kingdom), Arthropoda (Phyllum), Chelicerata (Sub-Phyllum)
N	Nematoda (Phyllum)	Order: Family	Animalia (Kingdom)
M	Myriapoda (Sub-Phyllum)	Class: Order: Family	Animalia (Kingdom), Arthropoda (Phyllum)
G	Gastropoda (Class)	Order: Family	Animalia (Kingdom), Mollusca (Phyllum)
Bird	Aves (Class)	'Bird'	Animalia (Kingdom), Chordata (Phyllum), Vertebrata (Sub-phyllum)
Pathogens			
V	Viruses and viroids (Kingdom)	Family: genus	-
B	Bacteria (Kingdom)	Order: Family	-
F	Fungi (Kingdom)	Phyllum	-
C	Chromista (Kingdom)	Phyllum: Class	-
Plants			
P	Plantae (Kingdom)	Family or 'Plant'	-

References and additional citation/links as relevant. For Internet references, a link is given in most cases. Where possible, the Internet page was also saved as a PDF for the purpose of future access to the information when links change or disappear from the Internet. Publications found in GoogleBooks are only available via the Internet.

Distribution data, with three elements

- *Origin of the record considered, where relevant* (e.g. if the publication relates to a specific country)
- *Preliminary worldwide distribution*. This was based on CABI Crop Protection Compendium (CPC) or PQR, when available. Either of those was used at this stage, and it may be that they do not contain the most up-to-date information available. Additional records found in the literature were added in some cases. When CABI CPC or PQR did not indicate a distribution for an organism, a general search was made of other sources.
- *Preliminary EPPO distribution*. This was based on the preliminary worldwide distribution above, and aimed to identify pests that are already present in at least 3 EPPO countries.
- Assessment of whether the pest is widespread in the EPPO region, based on the information above. This indicates, from the data available, if the pest occurs in all broad geographical areas of the EPPO region (Near East, Central Asia, North Africa, Europe). If not, details are given on where it does not seem to occur.

There are organisms that are very well documented in CABI CPC and PQR, and the distribution is accurately reflected. For others, these sources give only a partial image of the distribution, or contain records that may need to be checked further. However, distribution data was used at this stage only to determine whether the organism is widespread in the EPPO region (in which case it will not be studied further at the next stage), and data in CABI CPC and PQR is suitable for this purpose. It is recognized that some common pests or non-prominent pests may be much more widely distributed than indicated in the CABI CPC or PQR.

Preliminary assessment of whether the pest may be transported on fruit. This was done according to one or a few sources consulted. A number of pests that could not be transported on the fruit pathway for obvious reasons (see 7.4.1 below) were identified. Notes were made for pests that are not found on fruit but may be associated with green parts (i.e. leaves, stems, calyx). It should be noted that assessing whether a pest may be transported on the fruit pathway is not straightforward and requires detailed consideration of the biology of the pest (and is a detailed process within PRA). There is also often conflicting information about this in various publications. It is therefore not always possible at this stage to provide a definitive answer for each pest.

Preliminary host range

This is based on the few sources consulted, and on CABI CPC or PQR where available. This is an item for which some of the data available in CABI CPC is obtained through data mining, and the host lists given will need to be studied further.

Some organisms were listed in Step 1 because they were mentioned in a database that records plant species on which it was found, whether they are hosts or not (i.e. whether they complete their life cycle on these plant species or not), or because they have been intercepted in a tomato consignment. For these, the host status of tomato was sometimes difficult to determine.

Where tomato was not included as a host in the CABI CPC and PQR, a general search was made to determine if any association of that organism as a pest of tomato was mentioned in other sources, in which case the pest was kept. In other cases, it was already possible to exclude the pest or the pest was retained to the next step where determining whether tomato is a host may require extensive searches. The interceptions records from the USA are a special case. The recorded organisms may have been hitchhikers on tomatoes, or contaminating consignments, but may not be a pest at all, or not a pest of tomato. Most of these were not considered further. However, a few pests of other crops for which the number of interceptions on tomato was high have been kept to the next stage.
For the purpose of the possible continuation of the study in relation to sweet peppers and eggplant, these 2 plant species are indicated where relevant.

Whether the pest is already on EPPO A1/A2 lists (and also, in the case of plants, on the list of invasive alien plants), or has been on EPPO Alert List. This records whether the pest is already on EPPO A1/A2 lists or under consideration, and whether it has been on the EPPO Alert List. The former were classified in a separate category (see 7.4), the latter were not necessarily excluded from further consideration.

Other information. Interesting information from the sources consulted was extracted. This may relate for example to the importance of the pest, its biology, records of interceptions, or any element already excluding the organism from further study. Such information was noted when available in the publications reviewed, but not systematically searched for.

7.3 Step 1 List as xls file

The information from the one or few sources for each pest are presented in a general xls file, referred to as 'Step 1 List' in this study. The Step 1 List is available separately as an xls file. It can be obtained by EPPO member countries on request from hq@eppo.int. A number of pests were identified only in Step 2, but were not added retrospectively to the Step 1 List.

I Important words of caution regarding the use of the table:

- The Step 1 List is NOT a complete list of tomato pests worldwide. It attempts to identify, as well as possible, all pests of tomato in other regions of the world, but there are probably some that were not identified. As the focus of searches was not the EPPO region, some tomato pests present in the EPPO region may not be listed. In addition, a large number of pests mentioned as being associated with tomato in one source proved to not be tomato pests (especially for data relating to interceptions or general databases, see 7.2).
- Having said that, it is probably quite a complete list of pests for some types of organisms (e.g. viruses), for which there are good anthologies of pests covering the whole world, at the time the study was carried out (it should be noted that the situation of viruses evolves rapidly).
- The Step 1 List presents information from one or a few sources for each organism, and may therefore present biased information in some cases. Further analysis of individual pests will require more complete information, gathered in Step 2 and Step 3.
- For pests that are retained for Step 2, the information is NOT complete, and it may still be shown, for example, that they are not tomato pests, or not likely to be transported on fruit, or are already present in 3 EPPO or more countries.
- For organisms that are not retained for further study, the Step 1 List often only documents the specific element that allowed it to be excluded (especially for organisms that are widespread in the EPPO region). Other elements may not have been checked, in particular whether the organism is really a pest of tomato, or if tomato fruit can be a pathway.
- The rows' height in Excel could not always be adjusted to display the whole text, and certain cells contain more text than displayed on screen.

7.4 Conclusion of Step 1: determination of pests to be considered in Step 2

Based on the information available in the original sources considered, and without further research at this stage, a preliminary evaluation was made of whether the pest should be considered at the next step, classifying the pests in various categories, expressed as 1 to 4, and NO1 to NO5 in the Step 1 List.

7.4.1 No further assessment needed – Categories NO1 to NO5

The basic information available indicates that the pest does not need to be considered further, for one or more of the five reasons in the table below. Those pests are listed in Annex 9 (Only the overall rating is given in Annex 9, and the key reasons to not retain an organism are highlighted in red in the Step 1 List). Annex 9 was completed in Step 2 with those pests excluded from further consideration in Step 2 due to one of the reasons below.

Table 7.4.1 Reasons for not assessing an organism further

	Main reason	Were not covered in this category
NO1	No possibility of transport on the fruit pathway. A conservative approach was taken. Whether a pest can be carried by a pathway generally requires a deeper analysis, except for very specific cases, where this can already be excluded (such as soil pests, plant seeds contaminating seed lots etc.)	-Pests recorded specifically in or on the fruits (even if this related to adults of the species that may fly, as association with fruit would require further consideration). -Pests that could be transported on leaves, stems, calyx etc., were retained as tomato fruit in trade may be accompanied by green parts. Whether tomato fruit may be a pathway for those pests will require a deeper analysis. Note regarding pests listed in USDA (2009) (PRA on fruit from ECOWAS countries): details of the USDA assessment of the possibility that a pest may be associated with the pathway fruit is included in the table. However, this PRA excluded many pests that may be transported on green parts only, and this assessment was not retained for the present study. The approach followed here differs, and the rating of this parameter may also differ.
NO2	Pest occurring in all geographical areas of the EPPO region. This covers pests that are present in countries over the whole EPPO region (i.e. also in its different geographical areas, Central Asia, Near East, North Africa, Europe).	Any pest that is present in more than 3 EPPO countries but, from the data consulted, does not occur in a specific geographical area of the EPPO region (for example absent in North Africa). These pests were retained, in a separate category.
NO3	Tomato is not a host. This covers in particular a number of organisms identified through interception records, but for which other sources provide convincing information that tomato is not part of the host range. This was used very conservatively.	Any pest for which there is a doubt on whether tomato is a host, or for which there are conflicting records. In particular, any pest for which a specific publication relating to tomato was found was not classified in this category, even if a number of other more sources (e.g. CPC or PQR) do not mention tomato as host (see notes under Preliminary host range).
NO4	Other reasons. For example if the organism is a natural enemy. This also covers organisms that are mentioned at the genus level in interceptions, but for which it was impossible to find information on individual species associated to tomato.	
NO5	Not possible to analyse. This covers a few cases where an organism is listed in a publication on tomato pests in a country, but it was impossible to find any reference to the scientific name in the literature.	

7.4.2 Remaining pests – Categories 1 to 4

All other pests were retained, and fall into categories 1 to 4 in the Step 1 List.

- Pests to be considered in Step 2

These are the pests in categories 1 or 2 in the Step 1 List. Allocation to these categories was not done with precise criteria, but according to a general impression, based on the sources consulted, of which pests seemed more important for further analysis. All pests in category 1 and 2 were retained in Step 2.

There were 379 pests in categories 1 and 2 in Step 1. Pests identified when performing the screening in Step 2 (see point 8) were not added to the Step 1 List.

- Pests that occur in at least three EPPO countries but that seem to be absent from one or more specific geographical area

This corresponds to the category 3 in the Step 1 List. The distribution data consulted presents evidence that the organism is present in at least three EPPO countries, but absent from one or more specific geographical area (e.g. present in Europe but absent from North Africa). Because 379 pests had been identified in categories 1 and 2, it was felt that the study should focus on those in order to identify new threats. It is not proposed that the pests in category 3 are studied further, but this category may contain pests of interest for some EPPO countries.

The pests in category 3 are listed in Annex 10 and details given in the Step 1 List. Annex 10 was completed with the pests identified in Step 2 as being present in at least three EPPO countries, but not all geographical areas of the EPPO region.

Caution should be exercised in using this data, as explained in 7.3. In particular, it may be that the pests concerned are more widespread than reflected in the sources consulted or have reached the limit of their possible distribution in the EPPO region, or are not pests of tomato, or may not be transported on tomato fruit. Limited information was found regarding tomato pests in Central Asia for most countries, and many pests listed as absent from that area may be more widespread.

- Pests that are on the EPPO A1/A2 list of pests recommended for regulations or currently under consideration for inclusion in these lists

These pests are classified in Category 4 in the Step 1 List, and are listed in Annex 11. They include all pests on the EPPO A1 or A2 Lists of pests recommended for regulation (including invasive plants), as well as pests for which PRAs are under consideration in EPPO.

EPPO A1/A2 pests are recommended for regulation, but the risk posed by tomato fruit may not have been considered when they were listed. For these pests, a first screening could be carried out to confirm that they are tomato pests, and are likely to be transported on the pathway tomato fruit (it has already been determined for a few of the pests in Annex 11 that they did not meet these conditions, and this is indicated in the Annex). Pests that meet this condition may then be analysed further in relation to tomato fruit, to decide whether pest risk management measures should be recommended for tomato fruit. This has not been done in the present study.

7.5 General conclusion concerning Step 1

Step 1 identified 1102 species or genera:

- 379 were considered further in Step 2.
- 237 were either present in at least 3 countries of the EPPO region (but not in all geographical areas of the EPPO region) or already listed by EPPO (Annex 10 and 11).
- 486 were excluded as they are already present in all geographical areas of the EPPO region, or are not likely to be transported by tomato fruit, or are not pests of tomato (Annex 9).

Many pests identified as being of major importance throughout the world in the sources considered are either already present in the EPPO region (in some cases originating from it) or already listed as pests recommended for regulation. For example for insects, this is the case for *Helicoverpa armigera*, *Spodoptera litura*, *Liriomyza huidobrensis*, *Bemisia tabaci*, *Tetranychus urticae*. Other have recently caused serious damage following their introduction into the EPPO region, such as *Tuta absoluta*.

Finally a few remarks may be made on Step 1 as it was performed:

- It was very valuable to be able to analyse USA interception data, and similar data from other countries would also be useful. One approach to identify priorities in EPPO has always been to consider interceptions in EPPO countries. Such data from other regions is also valuable to detect some pests before they start being intercepted in the EPPO region.
- The commodity PRAs considered in this study mainly base their first screening on the CABI CPC and a few other sources, sometimes quite old, from the scientific literature. The CABI CPC is extremely useful and a good starting point as it provides a worldwide compilation of pests, and uses information from

sources that are not readily available. However, in some cases, distribution and host plants records in the CABI CPC are based only on data extracted from the literature, and need to be confirmed. Likewise, old publications are valuable as pests that were once present in a country are still likely to be there, even if currently under control in the current production systems. However, this does not allow those pests of current concern to be identified, and especially those mentioned as important in the 'grey' literature (e.g. cropping information for growers, regional publications on important pests, recommendations of plant protection products manufacturers, general books on tomato pests, etc.).

- Commodity PRAs normally aim to establish pest lists. They rate some parameters, for example the distribution or the association with the pathway, but only cite the reference that allowed that conclusion to be reached, and provide no detailed information. Because information in the present study will necessitate additional screening and the information used should be available to EPPO countries, all elements were written down and documented. This was very time consuming and the information written down, although informative, is only partial.
- Commodity PRAs normally focus on one country as origin or on a specific group of countries (for example USDA (2009) for tomato fruit from the ECOWAS region (West Africa)). The present study attempts to identify tomato pests in all regions of the world (outside the EPPO region). Proceeding per region, i.e. first finding the pests of Caribbean, then North America etc., would have the advantage of better focusing searches, but the disadvantage of bringing back many 'doubles' between regions, all needing to be recorded, checked and documented. This approach was not thought feasible in the limited time available.

7.6 Possible gaps in data in Step 1 and pests missing from the list

A large number of organisms were identified in this study. Additional organisms were also found when performing Step 2 on some pests, and even when writing Step 3 records (at which stage they could not be added to the study). It is therefore certain that the study is not a complete list of pests of tomato that do not occur in the EPPO region. In particular, the searches relied extensively on the Internet to find information, and some earlier publications, or publications from an area may be less accessible (see also Table 7.5).

Among the groups of organisms considered, suitable information was found for most categories, but it was difficult to find even preliminary information for some insects and fungi. Plants, molluscs and birds were identified only through the CABI CPC.

An indication of the overall geographical coverage of the sources used is rated below (apart from the CABI CPC and PQR, which cover most regions). From the sources available and consulted, the world coverage of the study, in terms of identifying pests of tomato, may be more complete for some regions and countries than for others. Even where the coverage is good and pest names are available, it is sometimes difficult to find detailed information on individual pests. The type of sources only refer to those specific to countries; in all cases individual pests or pest groups may be covered across regions in global databases (e.g. fruit flies).

Table 7.6. Broad geographic coverage of the study (apart from the CABI CPC and PQR)

Region	Coverage	Types of sources
Africa	Good for some countries (e.g. Ghana, Kenya, probably West Africa in general, Angola, probably for viruses for South Africa), medium to poor for others	Where coverage is best, guidance to farmers, lists of pests present in countries, some scientific publications. West African countries are covered by USDA (2009, mostly through CABI CPC or old publications) and by the more recent James et al. (2010). For all, general pest databases on the Internet, general regional publications, articles on individual pests. No specific publications for some countries.
Asia	Good for Thailand, India, possibly China. Medium for others, including Japan (but which is probably well covered under the CABI CPC)	Scientific articles and specific country publications for Thailand, guidance to farmers. In all cases regional publications. For China, one summary on tomato pests (Xu et al., ND).
Near East and Central Asia	Good for Iran and Afghanistan, medium to poor for others	Specific country publications or scientific articles for Iran and Afghanistan. General publications (e.g. from FAO or USDA) for others, occasional articles (e.g. viruses in Saudi Arabia). Coverage for Central Asia and Russian Federation was poor when trying to determine presence of pests in the EPPO region.
Central America	Good for some countries (e.g. El Salvador), medium (e.g. Cuba, Costa Rica, Panama) to poor for others (e.g. Nicaragua)	Where coverage is best, guidance to farmers, books on crop pests. In all cases, references in publications from other regions, guidance to export to the USA. Very few sources apart from the CABI CPC for some countries. For some countries, the main sources available are lists of species for certain taxonomic groups, without references or details.

Region	Coverage	Types of sources
North America	Good	Scientific publications, books on crop pests, cropping and control manuals, leaflets, pest listings, Internet databases and listings, databases on groups of pests (e.g. fruit flies). Even if the coverage may be reasonably good, some organisms associated to tomato are missing from this study. USDA (2013b) lists large numbers of organisms associated to tomato (although possibly not to fruit) but became available after data had been gathered, and could not be used.
South America	Probably good for Brazil, Chile, Venezuela, Argentina. Medium for others, but some information was available for all.	Scientific publications, books on crop pests, manuals, pest listings, Internet databases and listings, guidance by plant protection products' manufacturers.
Caribbean	Medium to poor	Books on crop pests, indirect references in North, Central or South American sources, pest listings. One main source in CABI CPC is pest distribution data from Schotman et al. (1989)
Oceania	Good for Australia; Probably good for New Zealand, Tonga; Medium for other Pacific Islands	Australian databases, scientific articles, New Zealand regulations covering Tonga and Australia. Advice to gardeners and farmers in Australia and New Zealand. Fruit flies are well covered for all countries by regional publications.

8. Step 2: Identifying pests that may require further consideration

The aim of Step 2 was to establish priorities for further consideration amongst the 379 pests retained in Step 1. This original list was modified because additional pests were identified while searching for information, and because a few pests among the initial 379 appeared to be synonyms. The Step 2 List consequently contains 417 pests[9]. For each of them, further information was sought (see 8.1) in order to evaluate the pest against a number of criteria (defined in 8.2). This criteria system was used in order to be able to evaluate the large number of pests in a consistent manner and against the same elements, in order to determine those that require further consideration in Step 3. Each pest was rated against the criteria, and pests were allocated to different categories (8.3). A number of pests were excluded from further consideration; others were considered in Step 3. All information is presented in the form of a 'Step 2 List' that, for each pest, gives information, ratings against the criteria, and the overall category rating with a conclusion where relevant.

8.1 Further information gathered

Step 2 first required confirmation that the pest may be transported on the fruit pathway, completion of the distribution to ascertain that the pest was not present in at least three EPPO countries, and verification that tomato is a host. The aim of data gathering in Step 2 was mostly to find information on these three elements and in relation to the criteria in 8.2. The aim was not to carry out an extensive bibliographic study for each pest (which will still be necessary in Step 3 and beyond). Interesting additional information was nevertheless recorded where available. The information gathered in Step 2 is still preliminary, and in many cases it was not always possible to gather all the necessary information to evaluate the pests against the criteria.

- Parts of plants attacked according to the biology of the pest

Where needed, an additional search was made on the parts of plant that are likely to carry the pest. This was done in order to confirm that the pest may be transported on tomato fruit (including those with green parts attached). This information was used for the criterion A 'whether the pest may be carried with tomato fruit'. Where tomato fruit was eventually determined to not be a possible pathway (i.e. if pest may not be carried on tomato fruit or if tomato was not a host), the assessment of the pest stopped, and no other information was sought.

For example, *N. elegantalis* larvae are present on fruit, and on other plant parts (e.g. calyx) only during the short period needed to find a suitable site on a fruit (EPPO, under development). This kind of distinction requires detailed analysis and would be normally found only at the stage of PRA. Assuming in a first screening that *N. elegantalis* could be associated with the fruit and with green parts would be a reasonable approach, which could be confirmed, or not, at later stages. In many cases, the assessment that the pest may be carried on consignments of tomato fruit is still preliminary.

- Worldwide and EPPO distribution

This second collection of distribution data did not aim to carry out a complete study of the distribution (which may be further completed Step 3 based on new sources of information) but to refine the distribution defined

[9] Reminder: the additional pests identified in Step 2 were not added retrospectively to the Step 1 List.

in Step 1, which generally relied only on one source of information. There was no additional search for pests for which distribution data in Step 1 was considered to be adequate (e.g. recent information in PQR, recent Alert List entry, recent and full data sheet in CABI CPC, etc.). Where an additional search was made, it sometimes appeared that a pest already occurred in at least three EPPO countries. In that case, the pest was added to either Annex 10 (present in at least 3 EPPO countries but not all geographical areas in the EPPO region) or Annex 9 (category NO2 - present in all geographical areas in the EPPO region). The search for information stopped as soon as 3 EPPO countries were identified (i.e. the pest may be more widely distributed in the EPPO region, but further distribution data was not searched for). This information was used for the criterion B 'present in less than 3 EPPO countries'.

- Host range
In Step 1, the information generally relied on one source of information, or a few contradictory sources. Complementary information was needed in some cases to verify that tomato is a host. This was not done for pests for which information in Step 1 seemed adequate, consistently confirming the host status of tomato, and sufficient to evaluate the level of polyphagy of the pest. This information was used for the criterion C 'level of polyphagy'.

- Additional information
This contains any other information considered useful at this stage (e.g. importance of the pest in order to rate the corresponding criteria, spread of the pest, quarantine status, interceptions etc.).

- References
All references used are mentioned in the table and listed in Annex 12.

8.2 Criteria used to prioritize pests

The criteria below were used and documented for each pest. It is important to remember that the rating of the criteria are not used to assess the pest risk, but are only used for the purpose of prioritizing the pests for further consideration. The answers are not always precise and there are a lot of unknown elements at this stage, but the ratings give an indication to assess the priority for further consideration.

Main criteria

A. Whether the pest may be carried with tomato fruit
This is not an easy criterion to determine based on basic information (see 7.2). Multiple rating was used here as a simple yes/no was not considered sufficient. The list in Step 1 contains a number of pests with mobile life stages feeding on fruit, or pests which are only on foliage. The likelihood of association of the pest with the pathway fruit depends on whether some life stages are associated directly with the fruit, and this was therefore taken into account in the rating. Five ratings where used, with A1 the most likely:

A. Whether the pest may be carried with tomato fruit

A1	Yes, in or on the fruit itself, in a non-highly mobile life stage (non-running/flying), whether or not some stages may also be associated to green parts attached. *Subcategories* A1a. on large/mature fruits ; A1b. young fruit or unknown; A1c. in fruit, but pest needs a transmission means for transfer (i.e. for viruses and viroids, vector or other mechanism)
A2	Yes, on the fruit itself (whether or not some stages may also be associated to green parts attached), but in a highly mobile form, i.e. it is difficult to judge if the life stages remain associated with the fruit at and after harvest. This includes pests whose larvae feed on green parts (or eggs are laid on leaves) and adults on fruit as very mobile form (e.g. some Lepidoptera), pests for which some life stages are associated to green parts but may wander on the fruit.
A3	Yes, in a non-mobile life stage if green parts are attached (non-running/flying, e.g. egg, larvae, pupae), with no life stage associated to fruit. This includes all pests that are exclusively living and feeding on leaves or stems.
A4	No evidence of possible association. The clearer cases are pests that live in or on the soil. Other cases covered in this category are: pest that can be associated if green parts are attached to the fruit, but only in a mobile life stage (and no life stage associated to fruit). Pests that clearly attack plants at a phenological stage where there would be no fruit (e.g. seedlings only) also belong to this category.
AU	Unknown (insufficient information found to assess this)

B. Present in fewer than 3 EPPO countries.

The following ratings were used:

	Distribution in the EPPO region
B1	B1a: absent from the EPPO region; B1b: Present only on the Canary Islands or Azores (Spain) or Madeira (Portugal)
B2	Present in 1-2 EPPO countries, or present in 1-2 EPPO countries and Canary Island or Azores (Spain) or Madeira (Portugal)
B3	Present in at least 3 EPPO countries
BU	Unknown. There is no good information on the distribution of the pest, and whether or how widely it occurs in the EPPO region. This covers in particular pests that seem to be more widespread than indicated in the few references found, without evidence that this is the case.

C. Polyphagous or not

The following ratings were used:

	Polyphagy level
C1	Hosts in several families (without consideration of the number of hosts, which is reflected in the host list)
C2	Several hosts, but only in the family Solanaceae
C3	Only tomato
CU	Unknown. Information on hosts does not seem sufficient to answer this question (in particular, there is a presumption (but no evidence) that the pest may have more hosts than found).

This criterion proved to be poorly discriminative as most pests were in the category C1.

D. Other possible pathways

A list of other possible pathways is given in the table below, based on the information collected on the parts of plants attacked and on the life stages of the pest. At this stage of the evaluation, the pathways are often indicated with question marks, as it is not an easy question to answer without an in-depth analysis (such question marks are in fact also used in the current Alert List). A rating is also given of whether the pest could be transported on other commodities, as follows:

	Commodities that may transport the pest
D1	Fruit and plant commodities other than fruit (including possibly of several hosts)
D2	Only fruit (including possibly of several hosts) (or other commodities such as soil)
DU	Not known (fruit is thought to be a pathway, but there is uncertainty regarding other pathways (presumption but no evidence that the pest may be transported on other commodities than fruit)

This criterion proved to be poorly discriminative as most pests were in the category D1.

E. Climatic similarity

This rating aims to screen the level of climatic similarity outdoors between the EPPO region and the known distribution of the pest. This can only be a rough estimate as a detailed study of climatic similarity would also take account the precise distribution of the pest in a specific country. The classification of Koppen-Geiger was used (as in Kottek et al., 2006). The 14 climate types in Table 8.2a were used, counting the number of climate types that are present in the EPPO region and in countries at origin, i.e. maximum 14. Several climates of the classification of Koppen Geiger were not taken into account, for reasons detailed in in Table 8.2b. The rating generally takes account of countries in their entirety, except if data on the distribution within a country is available (for example, there would be only 1 common climate with the EPPO region for a pest present only in Florida, while if it is reported generally for the USA, there would be 13 common climates).

An overview map summarizes all climate types present in the EPPO region with their occurrence worldwide (Map 1 in Annex 13). In addition, individual maps were used for the purpose of rating (see Maps 2-9 in Annex 13). The rating was done visually, looking in parallel at the pest distribution and Maps 2-9.

Table 8.2a. The 14 climates of the classification of Koppen Geiger that were taken into account in the screening for climatic similarity

Code	Description and comments
B	Arid climates Pann < 10 Pth
BWk	Desert climate, cold arid
BWh	Desert climate, hot arid
BSk	Steppe climate, cold arid
BSh	Steppe climate, hot arid
	These were kept as tomatoes might be grown outdoors under irrigation under these climatic conditions.

Code	Description and comments
C	**Warm temperate climates −3◦C < Tmin < +18 ◦C**
Cfa	Warm temperate climate, fully humid (neither Cs nor Cw), hot summer
Cfb	Warm temperate climate, fully humid (neither Cs nor Cw), warm summer
Cfc	Warm temperate climate, fully humid (neither Cs nor Cw), cool summer
Csa	Warm temperate climate with dry and hot summer
Csb	Warm temperate climate with dry and warm summer
D	**Snow climates Tmin ≤ −3◦C**
Dsa	Snow climate with dry and hot summer
Dsb	Snow climate with dry and warm summer
Dwb	Snow climate with dry winter and warm summer
Dfa	Snow climate, fully humid (neither Ds nor Dw) with hot summer
Dfb	Snow climate, fully humid (neither Ds nor Dw) with warm summer

Table 8.2b. Climates of the classification of Koppen Geiger that were not taken into account to screen the climatic similarity and reasons

Code	Description and comments
Climates that do not occur in the EPPO region	
A	Equatori**al climates Tmin ≥ +18 ◦C** (See map 2 in Annex 13)
Af	Equatorial rainforest, fully humid
Am	Equatorial monsoon
As	Equatorial savannah with dry summer
Aw	Equatorial savannah with dry winter
C	**Warm temperate climates −3◦C < Tmin < +18 ◦C** (See maps 4 and 5 in Annex 13)
Cwb	Warm temperate climate with dry winter, warm summer
Cwa	Warm temperate climate with dry winter, hot summer
Climates that do not reflect appropriately the climatic similarity with the EPPO region	
D	**Snow climates Tmin ≤ −3**◦C (See maps 7 and 9 in Annex 13)
Dwa	Snow climate with dry winter and hot summer. *This climate does occur in the EPPO region, in a very limited part of Far East Russia, it is more prominent in North-East China, the Republic of Korea and the Democratic People's Republic of Koreas. It was not taken into account, as including it would add a climate similarity with any pest present in these countries, while tomato pests are more likely to occur in other climatic areas*.
Dsc	Snow climate with dry and cool summer. *This climate occurs in limited areas of Far East Russia and Northern part of Alaska and Canada, with additional spots in the Rocky mountains (USA) and Mongolia. It was not taken into account, as including it would add a climate similarity with any pest present in Mongolia, USA and Canada, while tomato pests are more likely to occur in other climatic areas these countries.*
Dfc	Snow climate, fully humid (neither Ds nor Dw)
Dwc	Snow climate with dry winter and cool summer *It is questionable whether Dfc and Dwc should be used. However, it was considered that tomatoes are not likely to be grown outdoors in these areas of the countries concerned (Canada, USA, China, Mongolia, Iceland), and also that such countries already have a number of climates in common with the EPPO region. Not taking account of these climates therefore diminishes the climatic similarity by 1 for China, Mongolia, Iceland and the USA, and by 2 for Canada. The climates Dwb (snow climate with dry winter and warm summer) was retained.*
E	Polar climates Tm**ax < +10 ◦C**
EF	Frost climate Tmax < 0◦C. *Occurs only in Greenland, Northern Canada and Antarctica.* '
ET	Tundra climate 0 ◦C ≤ Tmax < +10 ◦C. *Occurs in the northern part of Canada and Alaska (USA), the Far-East, the very southern part of South America, as well as in mountains at higher altitude (e.g. Himalayas, Andes, Alps, Tien Shan).* *Although these climates do occur in the EPPO region, they were not taken into account, as including them would add a climate similarity with pests present in, for example, India, Nepal, Canada, USA, Chile, Argentina, while tomato pests are more likely to occur in other climatic areas of these countries.*
Climates that seem to be only present in the EPPO region (northern part of Far-East Russia or Siberia) based on the maps available (see map 9 in Annex 13)	
D	**Snow climates Tmin ≤ −3◦C**
Dsd	Snow climate with dry summer, extremely continental
Dwd	Snow climate with dry winter, extremely continental
Dfd	Snow climate, fully humid neither Ds nor Dw, extremely continental

According to this system, some countries do not present common climates with the EPPO region, such as Guyana, Cameroon or Indonesia, while others include many of the climates considered, such as the USA (13), Australia (8), Argentina (8), South Africa (7) or China (5). Some large countries situated at the same latitude as that of the EPPO region have a low number of climates, but these may also occur in large parts of the EPPO region. For example, Canada has only 4 similar climates, but the climate Dfb corresponds to a large part of Central and Eastern Europe. Using this criterion probably overestimates the climatic similarity in many cases, as climatic conditions may be considered as more similar than they are in reality. For example:

- if a pest occurs in a country with many climatic zones, the rating is high but the pest may not be present in all these climates.
- a pest may be present only under glasshouse at origin, in which case the climates of that country should not be taken into account, but this information is not always available.

This criterion gives a general idea of the climatic similarity, and is not intended to be used on its own. It allows pests to be identified whose distribution has a low to very low level of similarity with the EPPO region (although pests that occur in a certain climatic conditions may adapt to other climatic conditions). Applying the rating to pests that have been introduced in the EPPO region, *Tuta absoluta* would have had 8 common climates and *Rhynchophorus ferrugineus* 9.

The following ratings were initially proposed:

	Common climates between the countries where the pest is present and the EPPO region
E1	High: 8 to 14 common climates
E2	Medium: 4 to 7
E3	Low: 0 to 3

Although a high and a medium category were defined in order to separate the pests better, it is not considered that there is a major difference between these categories, for the reasons mentioned above. When the pest is present in areas with more than 4 common climates, it is understood that the pest is likely to be able to establish in the field in several parts of the EPPO region considering climates in its current distribution. With less than 4 common climates, there does not seem to be climatic similarity (e.g. the pest is present in regions where tropical climates of the type A are predominant, although a few of the climates of the EPPO region also occur in limited areas, such as the North of South America, West and Central Africa, and the South of South East Asia). The number of common climates (and not the rating) was indicated in the Step 2 List.

The rating was done visually and only gives an indication of the climatic similarity. It may not be precise in some cases, for example where a climate occurs in a limited area of a country (e.g. Bwk in Australia), or at borders.

If this approach is to be used in future, it could be improved by:

- producing individual maps from the same data used to produce Map 1 (based on Rubel and Kottek (2010), instead of Kottek et al. (2006) for Maps 2-9), or checking that Map 1 and Maps 2-9 provide similar ratings. There was no time to do this.
- verifying that there are no inconsistencies between the data underlying Map 1 and the climates that were retained or not for the screening (e.g. Dwa was not retained for reasons indicated in Table 8.2b below, but seems to represent 43 % of the Republic of Korea and 23% of the Democratic People's Republic of Korea). Was it still the right approach to exclude these climates based on the arguments above?

F. Impact at origin

This was answered based on the information given in the publications considered, which is often quantitative. The following ratings were used:

	Impact at origin
F1	High (Some references refer to a major or serious pest, even if only at local level)
F2	Medium (Only occasional damage mentioned; no mention of serious damage)
F3	Low (mentioned as a minor pest of tomato, and no reference corresponding to the above categories)
FU	Unknown

Records such as 'one of the most serious tomato pest in country/province Z' were rated as F1, as well as records of serious damage on other hosts. In many cases, the information available does not allow this to be rated. Even when it was rated, this may be inaccurate (for example if the only reference to damage is in an old publication). In any case, the rating is not very precise, but gives an indication especially for major or minor pests.

G. Intercepted

This rating is based mostly on the information provided by USDA. In a few other cases, interceptions were mentioned in individual articles, PRAs, etc. Notifications of non-compliance as reported in the EPPO Reporting Service were consulted, but the only notifications on tomato fruits related to pests that are listed on the EPPO A1/A2 lists (none of those is subject to screening in Step 2). The following ratings were used:

	Known to have been intercepted
G1	Yes, several interception records
G2	Yes, 1 interception record
GU	Not known to have been intercepted (no interception record for this pest in the sources considered)

H. Pest has spread/emerging pests

This is based only on the sources consulted to find other data. The following ratings were used:

	Is there evidence that the pest has spread or is emerging?
H1	Yes (this takes account of spread/emergence of the pest between or inside a country)
H2	No
HU	Not known from the information available

H1 was used when this was specifically indicated in the literature, or when the current distribution data points to this (e.g. a new record in Africa for a pest otherwise distributed only in the Americas). H2 was used in particular where a pest is recorded in only 1 country, without specific indication of spread.

Other criteria

I. Tomato fruit trade from countries where the pest occurs towards the EPPO region

This criterion considers the percentage of the countries where the pest occurs that are known to have exported tomato fruit to the EPPO region in 1986-2010 (see Table 2.4a and Table 2.4b). The following ratings were used:

	% of the countries where the pest occurs that have exported tomato fruit to the EPPO region in 1986-2010
I1	High - >50%
I2	Medium – 20-50%
I3	Low – <20%
I4	No exports
IU	Not known. The distribution is not consolidated enough to answer this question

EPPO countries or territories associated to EPPO countries (e.g. Martinique) were not taken into account in this criteria, as the study generally does not take account of the exports of EPPO countries'/territories.

Using volumes of export to the EPPO region by the countries where the pest occurs was originally envisaged as a criterion. However, this would require detailed calculations of total volumes, and this was not considered feasible for this screening due to the time it would take. In addition, there are inconsistencies between the quantities entered by exporting countries and importing countries in FAOSTAT. In conclusion, using volumes would be complicated and would not make the criteria more precise.

The thresholds chosen were initially thought to allow discrimination between pests. However, many pests were in the category I1. A better distinction would be obtained by adding a new category for 100% (or more than 75%). It was not possible to re-evaluate all pests with this new category in the course of this study.

J. General trade and production of tomato fruit where the pest occurs

This is based on the information in Section 1, and considers whether the pest is present in some countries in Table 4. Several categories were introduced in order to better discriminate between pests. The following ratings were used:

	General trade and production of tomato fruit where the pest occurs
J1	High (more than 3 countries in categories 5-6 of Table 4, or more than 10 countries in Table 4)
J2	Medium (1-2 countries in categories 5-6 of Table 4, or 5-10 countries in Table 4)
J3	Low (1-4 countries in Table 4)
J4	Very low (no country in Table 4)
JU	Unknown. The distribution is not consolidated enough to answer this question

This criterion was not very discriminative as many countries are listed in Table 4. In particular J4 was used only 7 times.

K. Non-EPPO countries that regulate the pest

Countries known to have regulated the pest are indicated. This uses the 'categorization' information in PQR (with corresponding year). However, this component of PQR has not been updated recently, and lists of regulated pests published by IPPC contracting parties on the IPP (www.ippc.int) or available on the Internet were also used. Non-EPPO countries for which lists of regulated pests are available on the IPP or were found in other places on the Internet are listed in Annex 14. The files available were screened by a combination of automatic search for pest names (or genus) and reading. Pests that are mentioned under a synonym or misspelled in the quarantine lists may have been missed.

L. Number of references

This criterion was especially useful to identify pests that are mentioned in one publication, but are not mentioned further on the Internet or in other publications. This does not rate only the publications used at this step (reflected in Annex 12), but rather a general impression of the availability of articles and other references on the Internet. This takes account of material (articles, publications, books, brochures) giving information on the pest, and not of the many web-based databases that only list organisms' names and taxonomy. Because the Internet was the basis of searches, the number of references reflects the amount of information available and searchable on the Internet. Searches were made in English, and where relevant in French, Spanish, Portuguese and a few other European languages. The following ratings were used:

	Number of references found
L1	≥ 10 references
L2	<10 references

8.3 Overall category rating after Step 2

The ratings of the different criteria were used to allocate each pest to one of five categories. Two ratings totally excluded a pest from further consideration: A4 (no evidence of association with the pathway tomato fruit or tomato is not a host) and B3 (Present in at least 3 EPPO countries). For others, a preliminary assessment of the category was made by considering the ratings to the different criteria. The following ratings were considered as being equal when attributing the preliminary overall priority:

- A1 to A2, i.e. a pest was given the same priority whether it is present on or in the fruit, irrespective of whether the associated life stage is mobile or not. Pest present only on green parts (A3) were considered separately.
- B1a, B1b and B2, i.e. no difference was made between a pest absent and a pest present in less than 3 EPPO countries. As pests rated B3 were excluded from further consideration, this criterion was therefore not discriminatory at this stage.
- C1, C2, C3, i.e. a pest was not given a lower priority because it attacks only Solanaceae or only tomato. In most cases where C3 was used (only for certain viruses), this rating is also uncertain as information is lacking on the host range. This criterion was therefore not used in the preliminary category rating.
- D1 and D2, i.e. a pest was not given a lower priority because it may be transported only on fruit (in general, pests classified as D2 may also be transported on some non-plant pathways, especially soil). This criterion was therefore not used in the preliminary category rating.
- E1 and E2. Considering that the study addresses the whole EPPO region, high and medium climatic similarities were not treated separately. However, when further screening the pests, a higher importance was given to those that are present in countries with climates represented in the Mediterranean area. Criterion E was not taken into account for viruses and viroids.

In addition, criteria F to H (main criteria) and I to L (other criteria) were used as indications when attributing a first category rating.

Category 1 – A1 or A2 and many high ratings for some criteria (in particular F, G, H), with E1 or E2 (except for viruses). This category therefore includes only pests that, with the preliminary evaluation made, may have one or more life stages directly associated with the fruit itself; very often, some life stages may be associated with green parts. It does not include those pests that may only be associated to green parts (A3).

Category 2 – A3, or A1 or A2 with lower ratings for some criteria (including E1/E2 but without climates of the Mediterranean area, or low climatic similarity 1-3 similar climates – except for viruses)
Category 3 – Very low climatic similarity (0) (except for viruses), or specific reasons explained in the table
Category 4 – Excluded from further consideration. This includes pests that are present in more than 3 EPPO countries (B3), pests of categories NO1 to NO4 (as described in 7.4.1), and pests on EPPO A1/A2 lists.
Category 5 – Excluded from further consideration, because cannot be allocated to one of the categories above due to lack of data. Very limited information was found (sometimes only the pest name) (corresponding to NO5 in 7.4.1).

The pests of categories 1-3 were then reviewed again and the category adjusted based on the information available. Some pests were downgraded to a lower category for reasons specified in the conclusion. In particular pests whose distribution mostly include tropical climates, and did not seem to include climates from the Mediterranean area (Csa, Csb, Cfa or Bsk) were downgraded. This additional consideration was added to distinguish between pests, as considering E1 and E2 as a whole led to many pests being listed in the category 1.

8.4 Step 2 List as xls file

Information and category ratings for Step 2 are presented in an xls file, referred to as 'Step 2 List' in this study. The Step 2 List is available separately as an xls file. It can be obtained by EPPO member countries on request from hq@eppo.int. The pests added in Step 2 are not retrospectively added to the Step 1 List.

i Important words of caution regarding the use of the xls table:

- The Step 2 List presents information from few sources for each organism, and may therefore still present biased information in some cases, and is NOT complete. Further analysis of individual pests will require more complete information, gathered in Step 3.
- For organisms that are not retained for further study, the Step 2 List often only documents the specific element that allowed its exclusion. Other elements may not have been verified, in particular whether the pest attacks tomato or if tomato fruit can be a pathway.
- The rows' height in Excel could not always be adjusted to display the whole text, and certain cells contain more text than displayed on screen.

8.5 General Conclusion concerning Step 2

For the 417 pests in Step 2:
- 230 were classified in the Category 1
- 96 in the Category 2
- 24 in the Category 3
- 60 in the Category 4
- 7 in the Category 5

More than half of the pests are classified in the Category 1, which was not very helpful for the selection of priority pests for Step 3. Such low discrimination was however predictable as one of the main driver to retain pests for Step 2 was that they may be transported on tomato fruit.

New columns were added to the Step 2 List in order to be able to select pests by continent in Step 3 (see 9.1). The Americas were subdivided as this was relevant to the selection. Asia and the Near East were considered separately.

Pests of categories 1 to 3 were considered further in Step 3.
Pests of categories 4 and 5 were excluded from further consideration and are listed in:
- Annex 9 for pests not retained for further consideration for the reasons listed in Step 1 in 7.4.1;
- Annex 10 for pests present in at least three EPPO countries (pests in the category B3, but possibly not all geographical areas in the EPPO region);
- Annex 11 for pests considered to be covered by EPPO A1/A2 lists.

9. Step 3. Identifying pests for further study

The aim of Step 3 was to select some pests for further consideration amongst those retained in Step 2, and to prepare records, in the format of EPPO Alert List records, for the further consideration of the Panel on Phytosanitary Measures.

9.1 Selection of pests for Step 3

350 pests in categories 1, 2 and 3 remained after Step 2. The EPPO Panel on Phytosanitary Measures was consulted at its meeting in October 2013 on the further selection of pests for Step 3. The Panel agreed that a set of pests should be selected for each continent (South-Central America and Caribbean; North America; Oceania; Africa; Asia). The Panel suggested focusing on pests that are not present in the EPPO region, and that have a higher likelihood of transfer to host plants. It was considered that transfer is more likely for pests that can fly, or can be transmitted by vectors or by contact).

This was applied to the 230 pests of Category 1 as follows:
- *Transfer is more likely (they fly or are transmitted by vectors or by contact)*. This criterion would exclude Acari, Bacteria, Chromista, Fungi, Gastropoda; in practice it excluded only 5 Fungi, as the other groups were not represented in Category 1. For viruses the idea was to retain those that may be transmitted by vectors or by contact, although this is not always known (in particular for emerging viruses). Viroids were also retained as they may be transmitted in similar way than viruses. Phytoplasmas were also retained as they are transmitted by vectors.
It can be noted that EFSA evaluations for tospoviruses, viroids and begomoviruses (transmitted by *Bemisia tabaci*) (EFSA, 2011, 2012 and 2013) identified a low risk of introduction of these on the pathway fruit. However, this was still taken into account in this study because of previous introductions or spread of viruses in the tomato industry (e.g. *Pepino mosaic virus*). It is acknowledged that the possibility of transfer is limited to places of production where fruits are both imported and produced. However, there are still places of production with this feature in the EPPO region. The assessor tried to select viruses that presented interesting characteristics and for which information was available.
- *pests that are absent from the EPPO region*. Only pests in the category B1a or with an uncertainty (but presumed absent from the EPPO region) were retained.

The remaining pests of Category 1 (72 viruses, 3 phytoplasmas, 3 viroids, 121 insects) were screened by continent. The target was to select 5-10 pests by continent.

Pests of Category 2 were screened only in order to detect some that may be of interest for future action (see 9.2). Pests of Category 3 were not considered.

9.2 Outcome of Step 3

The pre-selections for insects, viruses, viroids and phytoplasmas by continent were made available to the Panel on Phytosanitary Measures. Due to time constraints, Step 3 records were prepared only for the selected insects and are in Annex 15 (38 records covering 43 species and, in several cases, some related species). Additional information was sought in order to prepare these records, and all references are indicated in the "'Source(s)"' section of each record. Step 3 records were not prepared for the pre-selected viruses, viroids and phytoplasmas.

A few insects that were not selected but may be of interest for future action for other pathways/crops are summarized in Annex 16 (including a few insects from Category 2). Finally, pests of Category 1 that were not considered because they are present in 1-2 EPPO countries (or Canary Islands, Azores or Madeira) are summarized in Annex 17 as they may be of interest for some EPPO countries.

Pests of Category 2 and 3 that are not covered above are not mentioned in annexes, and all information can be found in the Step 2 List.

The EPPO Panel on Phytosanitary Measures reviewed the Step 3 records for insects and the proposed selection of viruses, viroids and phytoplasmas. It decided to identify, from the 38 records, the insects for which further action is required, in particular addition to the EPPO Alert List or performance of a PRA) (e.g.

pests posing the higher risk present in areas not covered by pests already recommended for regulation) in order to decide on further action, as necessary. The selection by the Panel on Phytosanitary Measures is not an outcome of this study and will be pursued separately in the EPPO system.

10. Reflections on the process followed in Part 2

While the EPPO Study will be considered further in various EPPO groups, the Secretariat would like to present a few preliminary conclusions as follows.

The EPPO Study attempted to perform a pathway analysis for tomato fruit for the whole world. From a list of over 1100 organisms identified worldwide as having some kind of association with tomato, the processes and methods developed during this study aims to identify some pests that may be associated with tomato fruit and may present a pest risk for the EPPO region. 38 detailed records were eventually prepared for selected insects, and some viruses, viroids and phytoplasma were also pre-selected. While recognizing the large number of pests associated with tomato, it is important to recognize that relatively few may ultimately be relevant for the fruit pathway. Further analysis of selected pests is necessary to more precisely define those that represent a real pest risk.

Identifying tomato pests worldwide was not a simple operation. Some organisms identified in the first step as being associated with tomato finally appear not to be tomato pests. This highlights the importance of critical review of pest lists that may be automatically generated by data mining programmes. Pests may still be missing from the lists, in particular because information is not readily available for some parts of the world or for some pests. However, it is hoped that major tomato pests were identified. It should be noted that for most pests identified, plant for planting is also a pathway. This supports the results of the previous EPPO Study on the Risk of Imports of Plants for Planting.

Screening so many organisms in a meaningful and consistent manner was complicated. It necessitated choosing criteria and developing methods, which was done during the study. They are considered to have provided a useful tool for screening, which may be adapted and reused for similar studies. However, it is clear that some key aspects, such as whether the pest is a tomato pest, or whether some life stages are likely to be associated with tomato fruit, or even in some cases whether the pest occurs in the EPPO region, are difficult to ascertain in a ‘quick’ screening and are uncertain in some cases even in Step 3.

At all stages, the study required the consultation of huge amounts of information. Because EPPO countries should be able to use this study for their own purposes, all information was archived in order to be retrievable. At the same time, gaps in information limited the analysis at all stages.

In conclusion, this is the first time that such a ‘worldwide pathway analysis’ was done for the EPPO region. Work started in March 2013 and, although it was not conducted full time until its completion, the study required a large number of working days. This element should be taken into account when establishing priorities for PRA activities in particular the performance of any possible commodity PRA.

However, although it was time-consuming, the study served its objectives of documenting the pathway tomato fruit into the EPPO region, and selecting some pests that may be associated with tomato fruit. During the study, a process was developed for the purpose of screening, which may be improved for further use. Finally some pests were identified that are not a concern in relation to tomato fruit but that may be a threat for other crops, and will be considered for further action.

11. Conclusion concerning Part 2

The successive screenings and criteria applied in this Study reduced an initial list of over 1100 organisms identified in Step 1 as having an association with tomato (but not necessarily tomato pests), to 350 pests by the end of Step 2 (all considered as having a possible association to tomato fruit, even if only to green parts associated with fruit). Among these, only 230 pests were further reviewed in Step 3, i.e. those classified in the highest category of association with tomato fruit and pest risk for the EPPO region. These pests were further screened against various criteria in order to further reduce the selection. A number of insects, viruses,

viroids and phytoplasmas were pre-selected, and 38 records were prepared for insects (covering 43 species and, in several cases, some related species).

In conclusion, the EPPO Study identified a number of pests that may be associated with tomato fruit and may present a risk for the EPPO region. Considered together, their distribution covers most or all origins from which tomato fruit may be imported into the EPPO region. Origins that have a very low climatic similarity with the EPPO region have not been retained at Step 2as presenting a high priority for further scrutiny (because of the weight given in the prioritization system to establishment outdoors, i.e. pests coming from areas with a low climatic similarity have a much lower probability to establish outdoors). However some pests with wider climatic requirements may also be present in these areas.

Only pests classified in the highest category for association with tomato fruit and presenting a pest risk for the EPPO region were reviewed in Step 3, and a limited number were selected to try and focus on the higher risks. The records of Step 3 and pre-selection of viruses, viroids and phytoplasmas do not allow specific pest risk management options to be recommended for tomato fruit, as these would need to be based on the further study of specific species.

The EPPO Panel on Phytosanitary Measures conducted a review of Step 3 records for insects to identify species that could be studied further in the EPPO system, and this could be used for this purpose. This review was not part of the Study.

However, the Panel on Phytosanitary Measures considered that the selection of pests in Step 3, together with the fact that some pests associated with tomato fruit are already recommended or proposed for regulation by EPPO (such as *Keiferia lycopersicella*, *Neoleucinodes elegantalis*, *Bactericera cockerelli* and '*Candidatus* Liberibacter solanacearum') is sufficient to justify a general phytosanitary import requirement for a phytosanitary certificate for tomato fruit, thereby ensuring that tomato fruit are inspected at export.

The study also supports the case that import operations and production of tomato fruit should be separated in the importing country.

Finally, the Study identified a number of other pests that were eventually not selected, but that may still present an interest for future action for other pathways/crops. These are especially the few insects in Annex 16, and pests with a very limited distribution in the EPPO region in Annex 17 (although there may also be pests of interest for other pathways in the Step 2 List).

Annex 1. Tomato production in some years of 2000-2011: area of cultivation and volume

Table A1. Area of cultivation of tomato (ha) for countries available in FAOSTAT for years in the period 2000-2011
The last column indicates the increase (>1) or decrease (<1) in production area between 2000 and 2011

country	2000	2002	2004	2006	2008	2010	2011	2011/2000 (or earliest available)
Albania	5400	6100	5700	7385	5050	6161	6300	1.17
Algeria	43910	42510	46739	31005	19655	21350	23500	0.54
American Samoa	19	18	25	23	19	24	26	1.37
Angola	3500	3696	4509	3945	3965	6262	6087	1.74
Antigua and Barbuda	30	35	40	37	48	37	42	1.40
Argentina	18500	17000	17333	17000	17195	16903	15871	0.86
Armenia	5588	5618	6374	7205	6257	6517	6837	1.22
Australia	8322	8000	8460	7750	6796	7734	8244	0.99
Austria	159	169	171	189	185	175	185	1.16
Azerbaijan	18874	23761	24998	26070	26609	25552	26613	1.41
Bahamas	372	370	410	450	506	391	439	1.18
Bahrain	180	108	80	82	78	74	76	0.42
Bangladesh	14569	15384	17925	18769	19642	23817	24772	1.70
Barbados	55	54	43	60	45	28	50	0.91
Belarus	7500	5000	7984	7733	7602	7365	5777	0.77
Belgium	900	900	630	519	470	481	474	0.53
Belize	100	62	34	47	33	36	37	0.37
Benin	25790	28354	20947	20657	31622	31260	31000	1.20
Bermuda	10	10	10	10	10	10	9	0.90
Bhutan			53	337	200	86	116	2.19
Bolivia	7385	8249	8856	9117	9417	5062	4880	0.66
Bosnia & Herzeg.	4515	3996	3980	3922	3840	3573	3589	0.79
Brazil	56002	62520	60152	58893	60912	67892	71473	1.28
Brunei Darussalam	7	8	9	10	10	11	10	1.43
Bulgaria	28828	14562	12266	7022	3474	2924	3860	0.13
Burkina Faso	1000	949	800	1000	1320	1193	1155	1.16
Cameroon	21330	35000	42849	40507	43820	139976	150000	7.03
Canada	7841	9254	8313	7361	7959	6623	6643	0.85
Cape Verde	272	230	194	240	370	500	484	1.78
Cayman Islands	1	1	1	1	1	1	1	1.00
Chile	20249	19500	17900	19000	15000	13800	13864	0.68
China	869355	1005199	1255046	1404595	850933	951735	985903	1.13
Colombia	17264	16762	15456	16953	16736	16227	15185	0.88
Comoros	67	57	48	70	72	63	65	0.97
Congo	520	666	660	521	650	1027	998	1.92
Cook Islands	9	9	8	10	10	10	11	1.22
Costa Rica	1044	1482	1000	1423	996	966	1026	0.98
Côte d'Ivoire	2539	4110	2163	2700	2850	3300	3195	1.26
Croatia	6634	6867	1200	1550	1226	945	1054	0.16
Cuba	42585	40382	58100	53044	62124	49057	54955	1.29
Cyprus	450	460	380	355	328	123	132	0.29
Czech Republic	1978	872	830	1456	1202	389	409	0.21
DPRep of Korea	8563	8797	9214	8500	8172	9109	9433	1.10
Dem Rep Congo	5900	6000	7564	7151	6300	6700	6513	1.10
Denmark	54	54	48	46	53	40	40	0.74
Dominica	24	30	27	24	27	28	31	1.29
Dominican Rep.	10279	5644	7424	7691	6580	3664	3586	0.35
Ecuador	6582	2908	3235	3092	2568	2682	1603	0.24
Egypt	195444	191171	195164	220110	240174	216385	212446	1.09
El Salvador	840	850	1013	1113	1393	802	767	0.91
Estonia	47	153	211	175	175	168	167	3.55
Ethiopia	4344	5107	2919	4800	4800	4593	4258	0.98
Fiji	270	242	259	240	270	285	304	1.13
Finland	127	121	117	117	116	114	114	0.90
France	7290	6355	5907	4291	5188	6338	6111	0.84
French Guiana	132	127	132	112	115	112	105	0.80
French Polynesia	52	49	68	64	70	93	99	1.90
FYR Macedonia	6778	6400	5973	5642	5319	5665	5632	0.83
Gabon	33	47	42	37	36	63	61	1.85

country	2000	2002	2004	2006	2008	2010	2011	2011/2000 (or earliest available)
Georgia	8100	12000	12000	8400	7800	6700	6933	0.86
Germany	327	282	292	279	308	322	321	0.98
Ghana	37000	35093	29561	33000	47000	60000	58000	1.57
Greece	44200	38900	39514	33881	25000	24200	19800	0.45
Grenada	10	9	10	27	23	35	39	3.90
Guadeloupe	208	182	200	190	350	270	303	1.46
Guam	5	10	10	12	13	15	16	3.20
Guatemala	6510	7000	7500	7068	10201	8666	8822	1.36
Guyana	780	500	290	740	350	1500	1408	1.81
Haiti	390	100	150	139	182	141	158	0.41
Honduras	4169	1958	3844	3800	5931	5263	4942	1.19
Hungary	6049	7150	5938	2873	2275	1874	1975	0.33
Iceland	4	4	4	4	4	4	4	1.00
India	460000	458100	502800	546100	566000	634400	865000	1.88
Indonesia	45215	49457	52719	53492	53128	61154	57302	1.27
Iran	118665	129000	122083	147462	132070	146985	183931	1.55
Iraq	77250	84500	66500	65750	59614	53195	61042	0.79
Ireland	25	27	27	27	32	35	32	1.28
Israel	4934	4360	5820	5270	5530	5500	5002	1.01
Italy	137155	122045	144973	122192	115477	118822	103858	0.76
Jamaica	1193	1122	1088	1350	1155	1281	1595	1.34
Japan	13600	13300	13100	12900	12500	12300	12000	0.88
Jordan	8115	7656	9023	11265	11752	14189	12954	1.60
Kazakhstan	22500	24810	25167	23200	25200	25700	27000	1.20
Kenya	15048	17430	22784	19542	16400	17529	18178	1.21
Kuwait	529	550	800	660	730	831	830	1.57
Kyrgyzstan	9494	5443	9131	9451	9957	9514	9181	0.97
Latvia	400	606	992	1500	500	580	1000	2.50
Lebanon	4700	5163	3100	3880	4060	4383	4400	0.94
Liberia	160	151	127	125	180	150	160	1.00
Libya	16500	10000	9585	10000	10120	11000	10987	0.67
Lithuania	900	600	286	311	262	421	346	0.38
Luxembourg	2	2	2	1	1		1	0.50
Madagascar	2531	3157	3634	4965	5288	4459	4600	1.82
Malawi	4000	4200	4300	4400	4930	4271	4406	1.10
Malaysia	951	789	1250	1901	1039	1347	1354	1.42
Maldives			1	0	0	8	11	11.00
Mali	2399	2646	2459	3300	3280	2482	2500	1.04
Malta	500	451	360	400	371	380	350	0.70
Martinique	307	279	100	300	340	234	263	0.86
Mauritius	788	947	953	956	744	830	761	0.97
Mexico	124575	114782	124909	126557	101505	98189	85369	0.69
Montenegro				963	970	972	987	1.02
Montserrat	24	30	39	35	35	40	45	1.88
Morocco	26000	19070	21690	20833	18600	18182	18160	0.70
Mozambique	972	1161	1337	1827	1946	2250	2321	2.39
Namibia	850	1000	1150	1300	1300	1300	1264	1.49
Netherlands	1200	1200	1352	1500	1600	1676	1702	1.42
New Zealand	720	609	730	745	690	850	691	0.96
Nicaragua	427	460	480	513	470	400	376	0.88
Niger	7988	4500	6000	5063	9515	7000	6777	0.85
Nigeria	210000	210000	240000	250000	265000	272950	264430	1.26
Norway	31	31	33	34	37	34	31	1.00
Occupied Palestinian Territory	2539	2530	2617	2476	2492	1558	1556	0.61
Oman	886	1005	990	894	930	1431	1048	1.18
Pakistan	29413	29381	38959	46239	53150	49992	52247	1.78
Panama	495	680	815	529	541	600	563	1.14
Papua New Guinea	80	90	95	110	120	137	146	1.83
Paraguay	1803	1699	2268	2620	1206	1730	1282	0.71
Peru	7957	5201	5379	5403	5971	6040	5145	0.65
Philippines	16692	16699	17687	17128	17646	17663	17548	1.05
Poland	21001	8749	14515	15973	14640	10493	13441	0.64
Portugal	18000	11898	14015	13014	14297	16600	16744	0.93

country	2000	2002	2004	2006	2008	2010	2011	2011/2000 (or earliest available)
Puerto Rico	980	890	387	352	439	339	381	0.39
Qatar	299	197	250	250	370	378	302	1.01
Rep. Moldova	12350	10670	7324	8044	7008	5834	5847	0.47
Republic of Korea	4916	3531	5883	6613	6144	5270	5850	1.19
Réunion	250	213	310	205	250	246	254	1.02
Romania	47600	47828	58461	49967	51460	49755	51745	1.09
Russian Federation	147400	157030	150910	151810	112210	115200	117000	0.79
Rwanda	1150	2100	3500	5000	5586	6500	6705	5.83
Saint Kitts and Nevis	9	8	7	8	10	11	17	1.89
Saint Lucia			9	12	14	8	9	1.00
Saudi Arabia	12458	17832	17061	13998	14699	14192	14175	1.14
Senegal	3522	2097	4474	3475	2225	6680	6300	1.79
Serbia	22400	22256	21848	20947	20309	20181	20229	0.90
Seychelles	29	36	42	58	33	33	35	1.21
Sierra Leone	1209	1500	1800	1850	2600	2830	2740	2.27
Singapore			2	2	2	1	0	0.00
Slovakia	3577	2811	3535	3302	2939	2703	3835	1.07
Slovenia	162	189	165	175	187	117	201	1.24
Somalia	2160	11900	13000	12000	12436	10774	11114	5.15
South Africa	11000	5861	6405	6400	7800	7508	7298	0.66
Spain	62285	59266	69902	56690	54868	59300	49913	0.80
Sri Lanka	5790	5420	5980	6640	7740	7260	7620	1.32
Sudan (former)	51240	51240	38949	34454	32046	35280	na	0.69
Suriname	77	71	70	54	48	70	59	0.77
Swaziland	270	270	280	270	333	380	369	1.37
Sweden	49	64	51	51	49	45	48	0.98
Switzerland	214	233	209	211	216	225	206	0.96
Syria	19922	19000	17700	17680	19600	18499	16675	0.84
Tajikistan	9800	9068	9700	10600	11300	11778	11799	1.20
Tanzania	18000	19000	16492	20535	21888	28000	30000	1.67
Thailand	9870	7689	7901	6057	5917	6013	5827	0.59
Timor-Leste	99	102	112	110	95	100	95	0.96
Togo	1435	1361	1147	1350	1400	1400	1355	0.94
Tonga	25	23	25	23	19	24	26	1.04
Trinidad and Tobago	220	105	140	140	160	124	139	0.63
Tunisia	24900	22100	26000	22600	27000	33000	32200	1.29
Turkey	225000	255000	255000	228714	300000	304000	269584	1.20
Turkmenistan	5500	6800	6817	8100	9100	9360	9580	1.74
Uganda	2100	2609	3004	4104	4372	5500	5674	2.70
Ukraine	116504	113359	95700	92300	80800	83600	85900	0.74
United Arab Emirates	10113	2234	2300	1073	1754	2200	2197	0.22
United Kingdom	300	480	190	200	216	217	216	0.72
Uruguay	2000	884	1303	956	423	414	389	0.19
USA	168509	178557	173620	169808	162580	158590	148730	0.88
Uzbekistan	45000	49660	56380	60470	54000	57000	58000	1.29
Venezuela	10974	9570	9075	9448	9226	9434	8858	0.81
Yemen	16601	18493	14909	15610	17273	18542	18519	1.12
Zambia	2500	3018	2730	2600	2200	2700	2785	1.11
Zimbabwe	1818	2267	1773	2447	2536	3200	3301	1.82
Total	4100264	4227985	4602362	4754860	4237231	4532373	4734356	1.03

Data was not available in FAO Stat for the following countries or territories: Afghanistan, Andorra, Anguilla, Aruba, Botswana, British Virgin Islands, Burundi, Cambodia, Central African Republic, Chad, Channel Islands, Djibouti, Equatorial Guinea, Eritrea, Ethiopia PDR, Falkland Islands (Malvinas), Faroe Islands, Gambia, Gibraltar, Greenland, Guinea, Guinea-Bissau, Holy See, Isle of Man, Kiribati, Lao People's Democratic Republic, Lesotho, Liechtenstein, Marshall Islands, Mauritania, Mayotte, Micronesia (Federated States of), Monaco, Mongolia, Myanmar, Nauru, Nepal, Netherlands Antilles, New Caledonia, Niue, Norfolk Island, Northern Mariana Islands, Pacific Islands Trust Territory, Palau, Pitcairn Islands, Saint Helena, Saint Pierre and Miquelon, Saint Vincent and the Grenadines, Samoa, San Marino, Sao Tome and Principe, , Solomon Island Svalbard and Jan Mayen Islands, Tokelau, Turks and Caicos Islands, Tuvalu, United States Virgin Islands, Vanuatu, Viet Nam, Wallis and Futuna Islands, Western Sahara

Table A2. Production of tomato fruit (in tonnes) for countries available in FAOSTAT (countries ordered by decreasing order of 2011 production volume). The last column indicates the increase (>1) or decrease (<1) in production area between 2000 and 2011

country	2000	2002	2004	2006	2008	2010	2011	2011/2000 (or earliest year available)
China	22324771	27153124	30143936	32519322	39938708	46876088	48576853	2.18
India	7430000	7462300	8125600	9820400	10303000	12433200	16826000	2.26
USA	12622300	13466500	13987700	12257200	12735100	12858700	12624700	1.00
Turkey	8890000	9450000	9440000	9854880	10985400	10052000	11003400	1.24
Egypt	6785640	6777880	7640820	8576070	9204100	8544990	8105260	1.19
Iran	3191000	4109000	4022880	5064570	4826400	5256110	6824300	2.14
Italy	7538100	5750040	7683070	6351200	5976910	6024800	5950220	0.79
Brazil	2982840	3652920	3515570	3362660	3867660	4106850	4416650	1.48
Spain	3766330	3979720	4383200	3800550	4049750	4312700	3821490	1.01
Uzbekistan	970000	1079770	1245470	1583570	1930000	2347000	2585000	2.66
Mexico	2666280	2573370	3037270	2899150	2872670	2997640	2435790	0.91
Russian Fed.	1685100	1979530	2017860	2414860	1938710	2049640	2200590	1.31
Ukraine	1126500	1311700	1145700	1751000	1492100	1824700	2111600	1.87
Nigeria	1260790	1284060	1805090	2079010	1823840	1799960	1504670	1.19
Tunisia	950000	907000	1118000	855000	1200000	1296000	1284000	1.35
Portugal	1009680	867416	1200930	983191	1147600	1406100	1245360	1.23
Morocco	1008900	991020	1213530	1245000	1312310	1277750	1236170	1.23
Greece	2085000	1752000	1962580	1568730	1338600	1406200	1169900	0.56
Syria	753218	900600	965400	1035790	1163300	1156350	1154990	1.53
Iraq	989000	1309000	988000	1042000	802386	1013180	1059540	1.07
Indonesia	593392	573517	626872	629744	725973	891616	954046	1.61
Romania	628700	658800	1330090	834968	814376	768532	910978	1.45
Cameroon	371132	389160	408064	522251	572219	795327	880000	2.37
Chile	1185000	1287000	1200000	1250000	977000	900000	872485	0.74
Netherlands	520000	555000	655000	680000	730000	815000	815000	1.57
Algeria	816839	814941	1092270	796160	559249	718240	790000	0.97
Jordan	354292	359832	449487	545566	600336	737261	777820	2.20
Poland	311492	221414	582232	651567	702546	558064	712295	2.29
Japan	806300	784900	754900	728300	732800	690900	703000	0.87
Argentina	693393	667753	675000	670000	701311	720733	698699	1.01
Kazakhstan	387030	448855	490911	510800	549310	593420	662000	1.71
France	848170	802545	848467	640582	617629	650303	635854	0.75
Cuba	554300	496000	788700	636000	575900	517040	601000	1.08
Colombia	375082	411151	402864	443587	490929	546322	595299	1.59
Pakistan	283216	294112	412786	468146	536217	476826	529620	1.87
South Africa	403003	450396	436528	441770	540470	554108	507261	1.26
Sudan (former)	653520	707000	556000	484000	453000	504000	na	0.77
Saudi Arabia	310401	409286	479963	480188	522152	499852	483588	1.56
Canada	701330	791951	816940	816905	770059	492650	470840	0.67
Azerbaijan	337409	411665	425037	441951	468016	434036	463244	1.37
Israel	415200	388280	513770	438752	418990	446592	410965	0.99
Kenya	256770	284859	328510	503730	402070	539151	407374	1.59
Korea Rep.	276663	226599	394621	433155	408170	324806	368224	1.33
Turkmenistan	173000	225000	250000	282000	310000	325000	354192	2.05
Ghana	200000	205178	223516	176264	284000	350000	340000	1.70
Lebanon	235000	270504	225300	291000	305300	310000	315000	1.34
Guatemala	172365	187229	200034	304566	355556	300193	305427	1.77
Tajikistan	110000	155278	198500	221000	267000	289057	304209	2.77
Australia	413617	424950	474220	450459	381824	471883	301719	0.73
Dominican Rep.	285630	251042	285806	254314	243012	240254	290187	1.02
Armenia	143667	170008	229478	319285	293784	251916	275470	1.92
Yemen	251138	267267	200438	211734	239897	261930	253407	1.01
Tanzania Rep.	136914	132023	129577	161344	171970	235000	250000	1.83
Bangladesh	100000	103000	119935	131280	143058	190213	232459	2.32
Libya	225000	190000	207006	160000	212810	230000	222516	0.99
Belgium	216280	234400	245900	238200	226200	227680	218435	1.01
Albania	162000	162000	152000	164853	162500	199283	205000	1.27
Philippines	148101	149259	172344	175596	195810	204272	203582	1.37
Belarus	125000	120000	229709	241496	274557	310159	200314	1.60
Serbia*	180000	223558	207506	189222	176501	189412	198677	1.10
Occupied	196096	192781	205809	207188	207559	204849	198184	1.01

country	2000	2002	2004	2006	2008	2010	2011	2011/2000 (or earliest year available)
Palestini.errit.								
Venezuela	213064	196964	196941	195944	199319	202030	195854	0.92
Peru	250500	130631	183516	169715	210685	224897	185985	0.74
Benin	139231	141301	144234	113648	184527	182300	180000	1.29
Senegal	42254	48069	81500	104780	43820	165000	180000	4.26
Kyrgyzstan	155602	101637	168118	172914	187221	182222	176706	1.14
FYR Macedonia	134654	109480	116837	142387	121637	168010	165642	1.23
Hungary	203448	247191	269239	204557	205597	134274	163349	0.80
UAE	946447	231137	240000	73533	127405	165000	159631	0.17
Honduras	46380	36772	120500	155000	160647	157926	153098	3.30
Malaysia	18000	21955	34188	63282	26752	133670	134338	7.46
Thailand	236434	129199	207430	122849	140437	124930	118370	0.50
Niger	139907	100000	122000	117818	89823	53508	109371	0.78
Bulgaria	409556	245299	237597	212969	134131	114605	103145	0.25
Rwanda	8000	15000	25000	35000	41035	135000	102501	12.81
Ukraine	113100	100900	78290	84100	88690	89320	89800	0.79
Moldova	104046	99910	74225	104355	83802	57231	83399	0.80
Germany	49969	46100	58082	53239	65096	73285	76718	1.54
Sri Lanka	43940	41240	53770	61040	84700	75330	75890	1.73
Korea Dem. Rep.	64107	72817	78320	68000	61309	71476	74087	1.16
Kuwait	36713	42660	64000	55750	61960	73698	71300	1.94
New Zealand	87000	87000	95000	92000	90000	98646	63074	0.72
Georgia	120000	126700	116000	69900	62600	56000	61600	0.51
Costa Rica	27319	55578	45000	43500	59450	51615	61560	2.25
Oman	39586	43065	44477	40444	41780	82207	53742	1.36
Congo Dem. Rep.	43000	44000	46000	45000	47000	50000	51667	1.20
Ethiopia	53702	59623	36155	35000	41815	40636	50783	0.95
Austria	24463	29888	35839	39105	42109	44241	50389	2.06
Bolivia	97728	112825	122121	126215	122687	53062	49476	0.51
Bosnia & Herzeg.	29618	37669	39655	40700	40722	36632	45942	1.55
Paraguay	61304	57934	69451	88070	40254	58335	45255	0.74
Switzerland	29237	26655	29583	26917	33459	40149	41929	1.43
Mali	36495	49718	47896	75316	57895	41293	41500	1.14
Finland	35349	36402	34599	38743	40467	39198	40163	1.14
Malawi	35000	37000	38000	39000	30373	41683	39230	1.12
Madagascar	22000	25314	28198	35111	37424	40974	38562	1.75
Ecuador	65819	58645	84886	61929	50552	53518	36221	0.55
Croatia	69555	71400	25938	28400	32358	33648	35798	0.51
Côte d'Ivoire	23026	35401	25393	27101	28798	31241	32364	1.41
Uruguay	36000	41242	44400	46101	28504	31609	30643	0.85
Jamaica	20941	19395	18654	23090	19387	19006	26950	1.29
Uganda	14000	16259	18112	22553	24500	31000	23537	1.68
Montenegro				22507	22165	22430	23074	1.03
Sierra Leone	12000	14000	17800	18000	24000	25763	22956	1.91
El Salvador	21352	21500	25417	35886	44436	17663	21592	1.01
Puerto Rico	12792	11605	17881	15343	18413	17042	20156	1.58
Zambia	25000	25000	25783	25000	20966	26000	19741	0.79
Zimbabwe	11000	13009	13883	18788	20025	25000	18982	1.73
Somalia	3310	16100	18000	16000	13418	18671	17572	5.31
Panama	21138	20506	22242	18968	19210	16634	16125	0.76
Angola	13000	13598	14249	17801	14608	15500	16017	1.23
Czech Republic	30573	27400	22036	35604	27899	7238	15518	0.51
Cyprus	35600	38200	33431	30302	23443	18315	14835	0.42
Denmark	21200	21238	20680	17639	20009	15000	14200	0.67
Malta	20738	10952	15438	16462	15746	14572	13953	0.67
Sweden	17300	22771	19400	17400	16200	13800	13543	0.78
Ireland	7800	10000	9000	10000	12005	13000	13221	1.70
Norway	10169	11082	11835	12018	14075	12917	13137	1.29
Cape Verde	4250	4500	4902	4800	9000	12144	13000	3.06
Mozambique	7117	9215	10265	12782	13624	16000	12148	1.71
Mauritius	9719	11738	14400	15118	11518	12338	11354	1.17
Burkina Faso	10000	10259	11176	10000	14600	12151	10827	1.08
Qatar	9401	5904	7379	7972	11870	12802	10661	1.13

country	2000	2002	2004	2006	2008	2010	2011	2011/2000 (or earliest year available)
Réunion	5502	3917	8943	7797	11958	11827	8980	1.63
Guyana	4683	2700	1583	4032	1943	8481	8222	1.76
Latvia	4113	7530	7532	11400	4700	5307	7908	1.92
Namibia	5500	6500	5062	7249	8669	8500	7781	1.41
Slovakia	72991	38727	61469	62952	56585	36457	6580	0.09
Estonia	2248	4194	4135	6730	5392	5184	6414	2.85
Martinique	7376	6700	2280	4536	5720	5405	6393	0.87
Nicaragua	6234	6700	7000	7411	8043	5904	5724	0.92
Slovenia	3421	4375	5431	4610	4704	3766	5512	1.61
Togo	7095	6446	7022	6000	6300	6000	5346	0.75
Swaziland	3400	3400	3500	3400	4143	4750	4800	1.41
Guadeloupe	3713	3070	2970	3000	5250	3861	4566	1.23
Bahamas	3352	3500	4000	4400	4050	3749	4434	1.32
French Guiana	3536	3770	4009	3571	4000	4141	4014	1.14
Bahrain	4213	2048	2085	4370	4274	3886	3760	0.89
Congo	2392	3185	3181	3913	3200	3500	3617	1.51
Haiti	6000	1500	2250	2450	2200	2037	2409	0.40
Fiji	2400	2228	3306	2800	3600	3538	2262	0.94
Liberia	1349	1384	1507	1591	1991	2000	2100	1.56
Trinidad and Tobago	2737	1235	1748	1680	1760	1660	1963	0.72
Iceland	931	948	1318	1724	1621	1653	1605	1.72
Lithuania	5100	4400	2361	1430	1357	2435	1192	0.23
Djibouti	1123	1650	1512	1816	911	1250	1176	1.05
French Polynesia	1100	1125	1156	1342	1418	1749	1118	1.02
Belize	2233	1434	591	932	649	850	824	0.37
Barbados	880	917	837	1041	815	718	813	0.92
Suriname	931	921	900	670	627	1048	741	0.80
Comoros	610	502	563	650	545	759	714	1.17
Gabon	280	313	328	410	449	618	639	2.28
Timor-Leste	205	275	350	415	483	565	600	2.93
Tonga	450	460	511	487	500	795	508	1.13
Papua New Guinea	380	400	440	500	540	666	426	1.12
Antigua and Barbuda	270	310	350	294	387	358	423	1.57
Dominica	383	402	250	210	245	300	355	0.93
Bhutan			184	1108	514	223	301	1.64
Grenada	74	66	72	199	169	250	296	4.00
Saint Lucia			218	307	346	247	292	1.34
Seychelles	189	218	243	303	230	220	230	1.22
Montserrat	190	199	218	210	224	178	211	1.11
Saint Kitts and Nevis	100	90	80	131	117	119	186	1.86
Cook Islands	560	318	250	250	250	261	167	0.30
Guam	87	120	133	140	206	254	162	1.86
Maldives			12	7	5	151	150	12.50
Bermuda	137	147	152	134	149	137	134	0.98
Brunei Darussalam	90	96	113	107	100	125	130	1.44
American Samoa	156	159	130	124	104	129	82	0.53
Luxembourg	135	90	150	69	83	71	64	0.47
Singapore			35	33	29	6	10	0.29
Cayman Islands	8	10	8	8	8	8	9	1.13
St Pierre & Miquelon	8	5	7	7	6	6	6	0.75
Total	110.390.709	116.532.679	128.355.522	131.194.491	141.068.130	152.055.325	159.023.383	1.44

*Data under Serbia for 2000-2004 relate to Serbia and Montenegro

Data was not available in FAO Stat for the following countries or territories: Afghanistan, Andorra, Anguilla, Aruba, Belgium-Luxembourg, Botswana, British Virgin Islands, Burundi, Cambodia, Central African Republic, Chad, Channel Islands, Czechoslovakia, Equatorial Guinea, Eritrea, Falkland Islands (Malvinas), Faroe Islands, Gambia, Gibraltar, Greenland, Guinea, Guinea-Bissau, Holy See, Isle of Man, Kiribati, Lao People's Democratic Republic, Lesotho, Liechtenstein, Marshall Islands, Mauritania, Mayotte, Micronesia (Federated States of), Monaco, Mongolia, Myanmar, Nauru, Nepal, Netherlands Antilles, New Caledonia, Niue, Norfolk Island, Northern Mariana Islands, Pacific Islands Trust Territory, Palau, Pitcairn Islands, Saint Helena, Saint Vincent and the Grenadines, Samoa, San Marino, Sao Tome and Principe, Solomon Island, Svalbard and Jan Mayen Islands, Tokelau, Turks and Caicos Islands, Tuvalu, United States Virgin Islands, Vanuatu, Viet Nam, Wallis and Futuna Islands, Western Sahara.

Annex 2. Volumes of export of tomato fruit in some years of 1986-2010 for all countries available in FAO STAT
(data as entered by exporting countries only; volumes in tonnes)
The last column gives the increase between 2004 and 2010 (as a ratio)
In green, EPPO countries
There is no data in FAOSTAT on exports from, among others, Puerto Rico, Bangladesh, Somalia, Congo, Viet Nam.

Belgium 1986 refers to Belgium-Luxembourg in FAO Stat
^ Ethiopia 1986 refers to Ethiopia PDR in FAO Stat
* Serbia 1994, 2000 and 2004 refers to Serbia and Montenegro

country	1986	1994	2000	2004	2006	2008	2009	2010	Increase 2004-2010
Afghanistan	0	0	0	0	0	0	0	5937	N/A
Albania	30000	0	24	317	216	1355	2123	6573	20.74
Algeria	0	1	0	0	21	7	0	4	N/A
Angola	0	0	0	2	2	2	2	2	1.00
Antigua and Barbuda	0	0	0	0	0	0	0	0	N/A
Argentina	0	1350	1709	167	1792	579	11382	11822	70.79
Armenia		0	0	0	0	7	8	427	N/A
Aruba	0	0	1	0	1	1	0	0	N/A
Australia	1294	5502	3808	4342	4314	4071	3707	2644	0.61
Austria	46	846	4519	9689	8964	12668	13733	21541	2.22
Azerbaijan		17260	474	20600	30741	48951	44627	40279	1.96
Bahamas	0	0	0	0	0	0	0	0	N/A
Bahrain	0	0	13	0	14	19	117	369	N/A
Barbados	2	22	0	0	7	5	8	16	N/A
Belarus		0	7057	6071	4853	11372	13284	17659	2.91
Belgium	85853#	273623	173640	204503	200002	188986	200483	192550	0.94
Belize	0	0	12	0	0	0	0	0	N/A
Benin	0	0	0	0	0	0	0	0	N/A
Bhutan	0	0	1	1	1	1	1	0	0.00
Bolivia	0	0	0	0	0	0	0	0	N/A
Bosnia and Herzegovina	0	0		121	416	390	1050	640	5.29
Botswana	0	1	10	1	0	96	106	97	97.00
Brazil	2916	1353	21600	890	0	2018	1892	3561	4.00
Brunei Darussalam	15	0	0	0	0	0	0	0	N/A
Bulgaria	90349	12836	420	187	440	5927	10744	4797	25.65
Burkina Faso	950	52	1	354	371	7140	6924	12929	36.52
Cambodia	0	0	0	0	0	0	0	0	N/A
Cameroon	119	13	28	118	0	0	12	23	0.19
Canada	4943	7712	102213	137163	141957	138627	152784	166870	1.22
Cape Verde	0	0	0	0	0	0	0	0	N/A
Chile	763	2760	6417	977	62	238	211	790	0.81
China	12675	12368	22583	82878	76667	116675	108079	104110	1.26
China, Hong Kong SAR	46	12	473	2	18	10	18	31	15.50
China, Macao SAR	0	0	0	0	0	0	0	0	N/A
Colombia	10	2697	4770	386	304	199	187	137	0.35
Comoros	0	0	0	0	0	0	0	0	N/A
Cook Islands	7	0	0	0	0	0	0	0	N/A
Costa Rica	13	158	254	525	540	365	1994	1863	3.55
Côte d'Ivoire	0	65	0	5	2	1	1	1	0.20
Croatia		541	130	250	201	523	166	116	0.46
Cuba	0	0	0	4	14	15	11	5	1.25
Cyprus	285	200	40	1	33	25	7	1	1.00
Czech Republic		105	827	3752	9468	13412	20030	13618	3.63
DPR of Korea	2000	0	0	0	0	0	0	0	N/A
Denmark	1297	2905	1525	1203	709	748	693	1854	1.54
Djibouti	0	0	0	0	0	0	0	0	N/A
Dominica	4	3	2	0	0	1	3	3	N/A
Dominican Rep.	10561	871	91	1175	2581	2069	2981	3142	2.67
Ecuador	8	0	1557	136	351	3358	2479	3180	23.38
Egypt	17279	25081	1745	7188	6732	3172	23867	5700	0.79
El Salvador	0	0	78	2383	101	0	63	0	0.00
Estonia		46	9	10	80	71	67	158	15.80
Ethiopia	561^	1045	1457	3421	165	5283	5998	11607	3.39
Fiji	2	4	0	0	0	2	2	0	N/A
Finland	317	6099	586	17	42	450	161	174	10.24
France	14006	80046	81050	96706	120647	179924	196149	190879	1.97
French Polynesia	0	0	0	0	0	0	0	0	N/A
Gambia	0	0	0	0	0	0	75	27	N/A

country	1986	1994	2000	2004	2006	2008	2009	2010	Increase 2004-2010
Georgia		0	280	985	46	26	53	161	0.16
Germany	5091	6326	13395	24518	36702	37960	30221	29528	1.20
Ghana	0	0	1019	36	15	0	43	4	0.11
Greece	531	5987	2720	2923	3550	3337	2639	7307	2.50
Guam	0	0	0	0	0	0	0	0	N/A
Guatemala	18757	95	37827	20193	17595	26890	24150	31723	1.57
Guinea	0	0	0	0	0	0	0	0	N/A
Guyana	0	0	9	206	182	184	184	315	1.53
Haiti	0	0	4	0	0	0	0	0	N/A
Honduras	40	699	3212	26747	44239	27153	13940	35765	1.34
Hungary	1948	1331	2511	420	1100	1821	2765	6234	14.84
Iceland	0	1	1	2	0	3	2	1	0.50
India	0	1072	1134	7427	33593	124617	105557	67547	9.09
Indonesia	695	3745	2373	752	179	874	565	618	0.82
Iran	27	6872	12848	18744	136898	86821	3058	264851	14.13
Iraq	4	0	0	11	11	11	11	22	2.00
Ireland	1398	371	748	772	1552	2636	1825	1073	1.39
Israel	3723	9037	13397	26913	36436	37171	35680	36818	1.37
Italy	20535	90333	119909	107115	103195	110801	93185	128830	1.20
Jamaica	40	0	0	0	0	0	0	0	N/A
Japan	0	1	2	0	0	1	4	5	N/A
Jordan	94973	100924	194620	237859	304529	393983	431713	371257	1.56
Kazakhstan		0	2603	39452	46722	25930	10490	1464	0.04
Kenya	130	334	18	21	19	61	48	40	1.90
Kuwait	46	55	19	0	2	2	2	2	N/A
Kyrgyzstan		1000	7631	2497	3852	15231	15200	9047	3.62
Latvia		41	20	71	841	2534	1240	1894	26.68
Lebanon	1000	15130	6685	7707	2174	6202	1551	1939	0.25
Liberia	0	0	0	7	14	14	14	14	2.00
Libya	0	0	0	7	182	182	112	49	7.00
Lithuania		342	2502	3007	15516	49409	21407	32490	10.80
Luxembourg			294	149	377	286	305	366	2.46
Madagascar	1	16	0	24	58	90	93	75	3.13
Malawi	0	0	0	10	0	0	0	1	0.10
Malaysia	7761	4799	12295	19424	22451	26714	28285	31399	1.62
Mali	85	0	0	16	0	0	0	0	0.00
Malta	11	0	0	0	2	4	0	0	N/A
Mauritius	0	0	1	0	0	0	0	0	N/A
Mexico	538317	459622	689997	895126	1031503	1042727	1136299	1509616	1.69
Mongolia	0	0	0	0	0	0	0	0	N/A
Montenegro					1045	694	51	674	N/A
Morocco	99955	150876	166699	107365	192353	346222	410118	372112	3.47
Mozambique	0	0	0	17	17	17	17	1	0.06
Myanmar	0	0	0	0	0	0	0	0	N/A
Namibia	0	0	4790	0	0	0	0	0	N/A
Nepal	12	0	0	66	66	66	1	0	0.00
Netherlands	525378	727240	534687	771848	776496	920950	976435	943119	1.22
New Caledonia	0	0	1	6	0	0	0	0	0.00
New Zealand	169	528	219	1980	4177	1447	2957	4065	2.05
Nicaragua	0	1168	2598	804	2011	613	3587	4002	4.98
Niger	0	0	84	273	77	28	28	73	0.27
Nigeria	0	0	0	8	48	33	4	0	0.00
Norway	0	4	11	45	37	12	32	201	4.47
Occupied Palestinian Territory	22000	0	23786	11997	11000	105	259	279	0.02
Oman	1982	3406	734	2821	480	5804	3297	508	0.18
Pakistan	0	0	13	1566	4965	998	40907	5692	3.63
Panama	0	0	0	1	0	0	0	0	0.00
Paraguay	8353	2915	533	167	0	0	0	0	0.00
Peru	0	79	0	1	8	26	8	14	14.00
Philippines	21	21	0	0	5	0	0	0	N/A
Poland	1497	1814	9098	36355	57908	87501	72385	71905	1.98
Portugal	1181	2307	2405	5774	42477	117059	106559	80798	13.99

country	1986	1994	2000	2004	2006	2008	2009	2010	Increase 2004-2010
Qatar	0	166	67	0	33	8	2	19	N/A
Rep. of Korea	174	140	11724	3010	1812	644	928	1072	0.36
Rep. of Moldova	12848	2597		3926	5596	4572	6310	4920	1.25
Romania	90300	4659	402	472	129	694	1334	1367	2.90
Russian Fed.	372	503		1	18	107	230	201	201.00
Rwanda	0	0	0	0	0	0	2	0	N/A
Saint Kitts and Nevis	0	0	0	2	1	0	0	0	0.00
Saint Vincent & Grenadines	0	0	0	0	0	0	0	0	N/A
Saudi Arabia	571	7196	2540	1187	2803	4209	4209	5696	4.80
Senegal	213	190	19	5068	6976	9901	7535	8585	1.69
Serbia		0*	796*	739*	2591	5365	2568	5847	7.91
Seychelles	0	1	0	10	9	9	34	34	3.40
Singapore	318	241	191	130	218	127	535	94	0.72
Slovakia		11123	7898	3055	6501	14069	9991	4297	1.41
Slovenia		154	26	392	3086	10476	8706	10729	27.37
South Africa	590	771	7097	6160	6824	7742	8579	20405	3.31
Spain	398358	686249	859040	1023028	987260	938596	829540	738773	0.72
Sri Lanka	1	9	0	3	551	17	10	1	0.33
Sudan (former)	0	0	0	1	0	0	0	0	0.00
Suriname	0	0	0	0	0	0	0	18	N/A
Swaziland	0	0	122	38	191	133	133	133	3.50
Sweden	11	161	253	1114	1145	558	517	377	0.34
Switzerland	156	187	41	9	48	61	162	115	12.78
Syrian Arab Republic	2522	93176	189648	259945	559482	367502	627274	407619	1.57
Tajikistan		0	427	45800	601	65500	60000	60000	1.31
Thailand	5731	1347	1350	6038	2243	433	510	427	0.07
The former Yugoslav Republic of Macedonia	12961	8878		30879	42166	62256	42919	48336	1.57
Togo	0	0	0	0	3	0	0	0	N/A
Tonga	2	0	0	3	5	0	0	0	0.00
Trinidad and Tobago	3	30	75	332	237	179	322	493	1.48
Tunisia	405	739	1560	1960	2165	11145	9395	15196	7.75
Turkey	165749	115968	119899	235364	304372	439729	542259	574279	2.44
Turkmenistan		0	20	217	80	10	10	10	0.05
Uganda	0	0	1	43	1	2	14	5	0.12
Ukraine		6283	3364	3005	12314	32393	69416	57332	19.08
United Arab Emirates	1213	3707	3040	2444	1209	5269	2070	2070	0.85
United Kingdom	8422	14650	5532	4775	4395	5011	6714	4613	0.97
United Rep of Tanzania	0	0	21	204	124	1681	411	1766	8.66
USA	59188	169891	208564	212279	144184	251876	241065	224279	1.06
Uruguay	0	15	0	222	3	0	0	0	0.00
Uzbekistan		17000	43651	42700	48661	14311	34780	50893	1.19
Venezuela	3739	4289	2142	2226	1789	1076	88	720	0.32
Yemen	0	0	2197	764	2236	2286	4944	5022	6.57
Zambia	68	7	7	62	1	7	1	7	0.11
Zimbabwe	72	156	30	33	1	4	7	1	0.03

Annex 3. Volumes of tomato fruit imported into the EPPO region in 1986-2010

All data from FAOSTAT. Volumes in tonnes.
- 1986-1990: as entered in FAOSTAT by the exporting country
- 1991-2000: as entered in FAOSTAT by the exporting country
- 2001-2010: as entered in FAOSTAT by the exporting country [in black] and by the importing country [*in red italics*])

Totals are given for 1986-2001 (as entered by exporting countries) and for 2001-2010 (as entered by exporting countries and as a maximum estimated quantity (see Box 4 in the main text)

	Period 1986-1990		Period 1991-2000		1986-2000	Period 2001-2010			2001-2010	2001-2010
Exporter	Year	Importer Tonnes	Year	Partner Tonnes	Total (t)	Year	Partner	Tonnes	Total (t)	Max
1. Antigua and Barbuda	Total: 0		Total: 0		0	Total: 1			1	3
						2005	UK	1		
						2007	*UK*	*3*		
2. Argentina	Total: 16		Total: 110		126	Total: 69			69	199
	1990	Italy 16	1991	Germany 63		*2002*	*Norway*	*0*		
			1991	Italy 39		2003	UK	2 *1*		
			1991	Netherlands 3		2004	Italy	65		
			1992	Italy 1		2005	Italy	1		
			2000	Germany 4		*2007*	*Norway*	*2*		
						2007	*Moldova*	*0*		
						2008	Spain	1		
						2010	*Switzerland*	*1*		
3. Armenia	Total: 0		Total: 0		0	Total: 357			357	893
						2005	*Russia*	*9*		
						2006	*Russia*	*20*		
						2008	Russia	7 *7*		
						2009	Russia	8 *8*		
						2010	Russia	342 *849*		
4. Australia	Total: 104		Total: 6		110	Total: 0			0	23
	1986	Norway 56	1996	Switzerland 1		*2004*	*UK*	*22*		
	1986	Sweden 47	1997	Netherlands 4		*2005*	*Netherlands*	*1*		
	1990	Switzerland 1	1999	Netherlands 1		*2006*	*Russia*	*0*		
5. Bangladesh	No export data. Importing countries' data not searched		No export data. Importing countries' data not searched		-	*2010*	*France*	*1*	-	*1*
6. Barbados	Total: 1		Total: 0		1	Total: 0			0	0
	1989	Netherlands 1				*2010*	*France*	*0*		
7. Botswana	No export data. Importing countries' data not searched		No export data. Importing countries' data not searched		-	*2008*	*Bosnia*	*2*	-	*2*
8. Brazil	Total: 0		Total: 0		0	Total: 135			135	705
						2001	*France*	*76*		
						2001	*Norway*	*19*		
						2002	*France*	*75*		
						2002	*Portugal*	*0*		
						2002	*Russia*	*2*		
						2003	*France*	*83*		
						2004	France	2 *90*		
						2004	*Switzerland*	*9*		
						2005	Italy	58		
						2005	*France*	*106*		
						2005	*Norway*	*10*		
						2006	*France*	*72*		
						2006	*Norway*	*6*		
						2006	*Portugal*	*6*		
						2007	France	12 *8*		
						2007	Netherlands	6 *2*		
						2007	*Moldova*	*1*		
						2007	*Russia*	*2*		
						2008	France	15 *1*		
						2008	*Russia*	*5*		
						2009	*Denmark*	*3*		
						2009	France	22 *14*		
						2009	*Norway*	*3*		
						2010	France	20 *23*		
						2010	*Portugal*	*0*		
						2010	*Switzerland*	*1*		
9. Brunei Darussalam	No export data. Importing countries' data not searched		No export data. Importing countries' data not searched		-	*2002*	*Serbia & Mont.*	*15*	-	*15*
10. Burkina Faso	Total: 0		Total: 2		2	Total: 225			225	225
			1997	UK 2		2001	UK	1		
						2002	Finland	29		

	Period 1986-1990	Period 1991-2000	1986-2000	Period 2001-2010	2001-2010	2001-2010
Exporter	Year Importer Tonnes	Year Partner Tonnes	Total (t)	Year Partner Tonnes	Total (t)	Max
				2002 UK 195		
11. Cameroon	Total: 2 1988 France 2	Total: 1 1997 France 1	3	Total: 0	0	0
12. Canada	Total: 59 1986 France 3 1986 Greenland 1 1988 Greenland 1 1989 Italy 20 1989 Sweden 11 1990 Italy 23	Total: 41 1994 Italy 36 1995 Netherlands 5	100	Total: 71 *2001 Croatia 1* *2001 Czech Rep. 4* *2001 Malta 5* *2001 Norway 23* *2001 Slovakia 1* 2001 Italy 20 2001 UK 33 *2002 Malta 3* *2002 Norway 12* *2002 Slovakia 4* *2003 Estonia 8* *2003 Malta 2* *2003 Norway 19* *2003 Slovakia 3* 2004 France 1 *2004 Norway 3* *2004 Poland 3* *2004 Slovakia 1* 2005 France 1 *2005 Norway 9* *2006 Norway 5* *2006 Russia 6* *2007 Norway 2* *2007 Russia 2* *2008 Norway 1* *2008 Russia 8* *2009 Croatia 2* 2009 France 6 2010 France 10	71	198
13. Cayman Islands	No export data. Importing countries' data not searched	No export data. Importing countries' data not searched	-	*2001 Slovakia 13* *2008 Croatia 11* *2009 Croatia 1*	-	25
14. Chile	Total: 82 1986 Switzerland 4 1987 Belgium-Luxemb. 2 1987 Switzerland 5 1987 UK 2 1988 Belgium-Luxembourg 2 1988 France 2 1988 Switzerland 10 1988 UK 8 1989 Belgium-Luxemb. 5 1989 EU(15) (exc.below) 9 1989 France 3 1989 Switzerland 8 1989 UK 6 1990 EU(15)(exc.below) 7 1990 France 1 1990 Switzerland 5 1990 UK 3	Total: 108 1991 Austria 2 1991 Belgium-Luxemb. 1 1991 France 2 1991 Germany 14 1991 Italy 1 1991 Switzerland 2 1991 UK 2 1992 France 2 1992 Germany 10 1992 UK 2 1993 Germany 15 1993 UK 3 1994 Germany 2 1997 Germany 7 1997 UK 4 1998 UK 9 1999 UK 4 2000 Spain 17 2000 UK 9	190	Total: 222 2001 UK 10 *2002 Russia 1* *2003 Russia 1* 2003 UK 10 2004 UK 10 2005 Spain 23 *23* *2005 Norway 1* 2005 UK 8 2006 Spain 29 *29* *2006 Norway 23* 2006 UK 8 2007 Netherlands 1 *2007 Norway 6* *2007 Russia 3* 2007 UK 4 *2008 France 6* *2008 Norway 6* *2008 Russia 6* 2008 Spain 36 *36* 2008 UK 11 *2009 Croatia 5* *2009 Russia 1* 2009 Spain 57 *57* 2009 UK 6 *17* *2010 Norway 1* *2010 Russia 3* 2010 UK 9	222	296
15. China	Total: 230 1988 USSR 108 1989 USSR 56	Total: 95297.7 1992 Russia 28 1993 EU(15)ex.int 2.20	95527.7	Total: 461734 2001 Russia 12692 *13661* 2002 Kazakhstan 20	461734	468765

	Period 1986-1990		Period 1991-2000		1986-2000	Period 2001-2010			2001-2010	2001-2010
Exporter	Year	Importer Tonnes	Year	Partner Tonnes	Total (t)	Year	Partner Tonnes		Total (t)	Max
	1990	USSR 66	1993	Russia 644		2002	Kyrgyzstan 5	*5*		
			1994	Netherlands 62		*2002*	*Latvia*	*3*		
			1994	Russia 5784		*2002*	*Norway*	*3*		
			1994	UK 15		2002	Russian 22955	*25669*		
			1995	EU(15)ex.int10.50		*2003*	*Khirghizistan*	*4*		
			1995	Kazakhstan 5		*2003*	*Norway*	*1*		
			1995	Russia 11282		2003	Russia 25802	*24772*		
			1996	Russia 10976		2004	Germany 23			
			1997	Russia 26341		2004	Kazakhstan 59			
			1998	Kazakhstan 9		2004	Romania 25			
			1998	Kyrgyzstan 12		2004	Russia 31857	*31719*		
			1998	Russia 26535		*2004*	*Khirghizistan*	*32*		
			1999	Kazakhstan 6		*2004*	*Norway*	*2*		
			1999	Russia 6789		2005	Germany 12			
			2000	Netherlands 6		2005	Kazakhstan 209			
			2000	Russia 6789		2005	Kyrgyzstan 9	*7*		
						2005	Russia 40020	*40657*		
						2006	Kazakhstan 81			
						2006	Kyrgyzstan 157	*154*		
						2006	Russia 46021	*48504*		
						2006	*Norway*	*1*		
						2007	Kazakhstan1375			
						2007	Kyrgyzstan 521	*262*		
						2007	Russia 56923	*55924*		
						2007	*Norway*	*1*		
						2008	Kazakhstan2979			
						2008	Kyrgyzstan 111	*145*		
						2008	Netherlands 6			
						2008	Russia 72964	*72342*		
						2009	Kazakhstan9612			
						2009	Kyrgyzstan 392			
						2009	Russia 61860	*61595*		
						2010	*Germany*	*14*		
						2010	Kazakhstan8431			
						2010	Kyrgyzstan 167	*153*		
						2010	Russia 66446	*66579*		
16. Colombia	Total: 1		Total: 1		2	Total: 1136			1136	1465
	1990	UK 1	1991	Germany 1		*2002*	*Czech Rep.*	*0*		
						2003	*Czech Rep.*	*0*		
						2003	*France*	*90*		
						2003	France 41			
						2003	*Netherlands*	*0*		
						2004	France 242	*330*		
						2004	*Netherlands*	*0*		
						2004	*Slovakia*	*7*		
						2004	*Switzerland*	*2*		
						2005	France 377	*454*		
						2006	France 168	*145*		
						2006	*Russia*	*2*		
						2007	France 127	*124*		
						2008	France 93	*121*		
						2008	*Norway*	*1*		
						2009	France 55	*29*		
						2009	*Netherlands*	*0*		
						2009	*Switzerland*	*1*		
						2010	France 33	*65*		
						2010	*Netherlands*	*1*		
17. Comoros	No export data. Importing countries' data not searched		No export data. Importing countries' data not searched		-	*2001*	*Croatia*	*2*	-	2
18. Congo	No export data. Importing countries' data not searched		No export data. Importing countries' data not searched		-	*2004*	*Portugal*	*3*	-	3
19. Costa Rica	Total: 0		Total: 8		8	Total: 311			311	374
			1994	UK 8		*2001*	*Norway*	*1*		
			2000	EU(15)ex.int 0.03		2002	Germany 1			
						2003	France 79	*70*		
						2004	France 53	*58*		
						2004	*Norway*	*1*		
						2005	France 24	*22*		

	Period 1986-1990	Period 1991-2000	1986-2000	Period 2001-2010	2001-2010	2001-2010
Exporter	Year Importer Tonnes	Year Partner Tonnes	Total (t)	Year Partner Tonnes	Total (t)	Max
				2005 Norway 2 2006 France 5 *5* *2006 Switzerland 4* 2007 France 34 *31* *2007 Norway 8* *2007 Russia 8* *2009 Croatia 14* *2009 Norway 0* 2009 UK 101 *2010 France 20'* 2010 UK 14		
20. Côte d'Ivoire	Total: 0	Total: 0.15 1997 EU(15)ex.int 0.15	0.15	Total: 1 *2001 Norway 3* *2002 Netherlands 16* *2002 Norway 1* *2002 Slovenia 13* 2003 France 1 *2003 Norway 13* *2003 Russia 3* *2003 UK 74* *2004 Czech Rep. 0* *2004 Russia 1* *2004 Slovakia 2* *2005 France 38* *2005 Norway 4* *2005 Russia 1* *2006 Belgium 24* *2006 Norway 4* *2007 Norway 4* *2007 Russia 4* *2008 Norway 0* *2010 Russia 8*	1	214
21. Cuba	No export data. Importing countries' data not searched	No export data. Importing countries' data not searched	-	*2005 France 11* *2005 Italy 0* *2005 Spain 29*	-	40
22. Dominican Rep.	No export data. Importing countries' data not searched	No export data. Importing countries' data not searched	-	*2001 France 13* *2002 France 78* *2003 France 53* *2004 France 36* *2005 France 146* *2006 France 121* *2007 France 109* *2007 Netherlands 11* *2008 France 127* *2009 France 309* *2010 France 964*	-	1967
23. Ecuador	Total: 66 1988 Belgium-Luxembourg 12 1989 EU(15)ex.int 33 1990 EU(15) (exc. below) 14 1990 Belgium-Luxembourg 4 1990 France 3	Total: 64.1 1991 EU(15) (exc. below) 9 1991 Germany 51 1991 Italy 2 1991 Netherlands 2 1999 EU(15)ex.int 0.10	130.1	Total: 3 *2003 Bosnia 20* *2005 Spain 2* 2006 Netherlands 1 2006 Spain 1 2007 Germany 1 *2007 Norway 0* *2007 Russia 2* *2008 Norway 5* *2008 Russia 1* *2009 Norway 2* *2009 Russia 93* *2010 Spain 1*	3	126
24. Egypt	Total: 838 1986 Algeria 2 1986 Austria 1 1986 Denmark 4 1986 France 3 1986 Greece 13 1986 Jordan 16 1986 Morocco 4	Total: 3698.5 1991 EU(15) (exc. below) 42 1991 Austria 6 1991 Belgium-Luxembourg 1 1991 Denmark 3 1991 France 18	4536.5	Total: 16907 2001 Belgium 7 *3* 2001 Finland 1 *0* 2001 France 145 *101* 2001 Germany 1 *4* *2001 Greece 1* 2001 Italy 115 *59* 2001 Netherlands 71 *180*	16907	25784

	Period 1986-1990			Period 1991-2000			1986-2000	Period 2001-2010				2001-2010	2001-2010
Exporter	Year	Importer	Tonnes	Year	Partner	Tonnes	Total (t)	Year	Partner	Tonnes		Total (t)	Max
	1986	Netherlands	7	1991	Italy	2		2001	UK	270	107		
	1986	Switzerland	1	1991	Jordan	20		2002	Austria	2	3		
	1986	Tunisia	2	1991	Netherlands	5		2002	Belgium	14	25		
	1986	UK	15	1991	Sweden	2		2002	Croatia	34			
	1987	Austria	7	1991	UK	9		2002	Czech Rep.		1		
	1987	Denmark	2	1991	Yugoslav SFR	41		2002	Denmark	17			
	1987	France	1	1992	EU(15)(exc.below)	4.50		2002	France	37	78		
	1987	Hungary	20					2002	Germany	10	29		
	1987	Italy	3	1992	Denmark	2		2002	Greece	13	40		
	1987	Jordan	7	1992	France	3		2002	Hungary		19		
	1987	Netherlands	5	1992	Greece	32		2002	Italy	250	183		
	1987	UK	14	1992	Jordan	35		2002	Jordan	49			
	1988	Austria	4	1992	Netherlands	2		2002	Lithuania		0		
	1988	Denmark	10	1992	Sweden	2		2002	Netherlands	106	207		
	1988	France	2	1992	Switzerland	11		2002	Norway		1		
	1988	Greece	1	1992	UK	1651		2002	Romania	1			
	1988	Italy	1	1993	Austria	8		2002	Serbia & Mont.	12	6		
	1988	Jordan	34	1993	France	30		2002	Slovenia	18			
	1988	Netherlands	15	1993	Germany	251		2002	Sweden	1	10		
	1988	Switzerland	1	1993	Greece	5		2002	Switz.		1		
	1988	UK	18	1993	Israel	2		2002	UK	159	235		
	1989	EU(15)(exc.below)	42	1993	Netherlands	8		2003	Albania		23		
	1989	Austria	1	1993	Romania	1		2003	Armenia	7			
	1989	Denmark	4	1993	Slovenia	13		2003	Austria		1		
	1989	France	52	1993	Switzerland	13		2003	Belgium	21	51		
	1989	Greece	22	1993	UK	325		2003	Croatia	19			
	1989	Netherlands	35	1994	Austria	3		2003	Czech Rep.		0		
	1989	Norway	15	1994	Bulgaria	21		2003	Estonia		1		
	1989	Portugal	2	1994	Cyprus	16		2003	France	63	62		
	1989	Spain	23	1994	Germany	70		2003	Germany	75	35		
	1989	Sweden	2	1994	Italy	13		2003	Greece	24	10		
	1989	Switzerland	19	1994	Jordan	42		2003	Hungary	20	6		
	1989	UK	22	1994	Romania	11		2003	Italy	423	177		
	1990	EU(15)(exc.below)	65	1994	Russia	86		2003	Malta	36	49		
	1990	Algeria	9	1994	Switzerland	4		2003	Netherlands	222	322		
	1990	Austria	2	1995	EU(15)(exc.below)	26		2003	Norway		1		
	1990	Belgium-Luxembourg	19					2003	Romania		1		
	1990	Denmark	5	1995	Austria	5		2003	Russia		3		
	1990	France	67	1995	Belgium-Luxembourg	1		2003	Slovenia		29		
	1990	Italy	15	1995	Croatia	31		2003	Switz.		1		
	1990	Jordan	7	1995	Jordan	19		2003	UK	160	202		
	1990	Netherlands	49	1995	Netherlands	24		2003	Ukraine	43			
	1990	Norway	2	1995	Russia	4		2004	Belarus	1			
	1990	Sweden	4	1995	Sweden	4		2004	Belgium	5	23		
	1990	Switzerland	5	1995	Switzerland	2		2004	Cyprus		5		
	1990	UK	137	1995	FYR Macedonia	5		2004	Czech Rep.		8		
				1995	UK	26		2004	Estonia		0		
				1996	Austria	1		2004	France	24	57		
				1996	Croatia	8		2004	Germany	48	31		
				1996	France	6		2004	Greece	10			
				1996	Greece	6		2004	Hungary		16		
				1996	Italy	1		2004	Italy	73	36		
				1996	Netherlands	12		2004	Jordan	2			
				1996	UK	6		2004	Malta	29	21		
				1998	Belgium-Luxembourg	7		2004	Netherlands	550	401		
				1998	France	41		2004	Norway		4		
				1998	Germany	2		2004	Portugal		23		
				1998	Italy	1		2004	Romania	135	100		
				1998	Morocco	17		2004	Russia		14		
				1998	Netherlands	45		2004	Slovenia		16		
				1998	Ukraine	50		2004	Switzerland	1	5		
				1998	UK	10		2004	UK	556	277		
				1999	Belgium-			2005	Algeria	43			
								2005	Austria	43	4		
								2005	Azerbaijan	62			
								2005	Bosnia		15		
								2005	Bulgaria	23	22		

	Period 1986-1990		Period 1991-2000			1986-2000	Period 2001-2010			2001-2010	2001-2010
Exporter	Year	Importer Tonnes	Year	Partner	Tonnes	Total (t)	Year	Partner	Tonnes	Total (t)	Max
			Luxembourg		9		2005	France	62 3		
			1999	Germany	1		2005	Germany	8 57		
			1999	Netherlands	109		*2005*	*Hungary*	*1*		
			1999	Slovenia	2		2005	Ireland	115		
			1999	Switzerland	3		2005	Italy	230 221		
			1999	Ukraine	35		2005	Jordan	56		
			1999	UK	28		2005	Luxembourg	5		
			2000	Belgium	46		2005	Netherlands	692 480		
			2000	France	41		2005	Norway	2 2		
			2000	Germany	3		2005	Romania	185 109		
			2000	Italy	107		2005	Russia	74 48		
			2000	Netherlands	85		2005	Serbia & Mont.	22		
			2000	Switzerland	3		2005	Slovakia	20 20		
			2000	UK	53		2005	Slovenia	109 83		
							2005	*Switz.*	*3*		
							2005	Turkey	46		
							2005	UK	355 334		
							2005	Ukraine	270		
							2006	Belgium	9 18		
							2006	Bulgaria	1 3		
							2006	Croatia	13		
							2006	*Cyprus*	*1*		
							2006	France	14 3		
							2006	Germany	29 19		
							2006	Hungary	107 58		
							2006	Italy	268 160		
							2006	Netherlands	756 883		
							2006	*Norway*	*12*		
							2006	*Romania*	*1*		
							2006	*Russia*	*119*		
							2006	*Slovenia*	*175*		
							2006	Spain	5 25		
							2006	*Sweden*	*1*		
							2006	Turkey	25		
							2006	UK	851 473		
							2006	Ukraine	25 86		
							2007	*Albania*	*4*		
							2007	Belgium	59 61		
							2007	*Cyprus*	*7*		
							2007	Denmark	14 69		
							2007	France	5		
							2007	Germany	62 29		
							2007	Greece	4 2		
							2007	Hungary	95 75		
							2007	Italy	307 25		
							2007	Jordan	303		
							2007	*Moldova*	*53*		
							2007	Netherlands	1666 1541		
							2007	*Norway*	*9*		
							2007	*Romania*	*29*		
							2007	Russia	183 210		
							2007	Slovenia	112 73		
							2007	Spain	155 50		
							2007	*Switz.*	*0*		
							2007	UK	542 383		
							2007	Ukraine	29 14		
							2008	*Belarus*	*0*		
							2008	*Belgium*	*97*		
							2008	*Croatia*	*0*		
							2008	*Cyprus*	*13*		
							2008	*Denmark*	*67*		
							2008	*France*	*20*		
							2008	*Germany*	*22*		
							2008	*Hungary*	*34*		
							2008	*Italy*	*3*		
							2008	*Netherlands*	*1830*		
							2008	*Norway*	*15*		

	Period 1986-1990		Period 1991-2000		1986-2000	Period 2001-2010			2001-2010	2001-2010
Exporter	Year	Importer Tonnes	Year	Partner Tonnes	Total (t)	Year	Partner Tonnes		Total (t)	Max
						2008	*Romania*	*11*		
						2008	*Russia*	*145*		
						2008	*Slovenia*	*21*		
						2008	*UK*	*499*		
						2008	*Ukraine*	*40*		
						2009	*Belarus*	*1*		
						2009	Belgium 207	*5*		
						2009	*Bosnia*	*5*		
						2009	*Croatia*	*1*		
						2009	Cyprus 2			
						2009	*Denmark*	*98*		
						2009	France 24	*19*		
						2009	*FYR Macedonia*	*57*		
						2009	Germany 129	*26*		
						2009	Greece 109			
						2009	Italy 92	*48*		
						2009	Jordan 9			
						2009	*Malta*	*1*		
						2009	Netherlands 2715	*2057*		
						2009	*Norway*	*17*		
						2009	Romania 64	*31*		
						2009	Russia 266	*366*		
						2009	Slovenia 74			
						2009	*Sweden*	*0*		
						2009	Tunisia 264			
						2009	UK 854	*673*		
						2009	Ukraine 104	*50*		
						2010	*Belarus*	*0*		
						2010	*Belgium*	*6*		
						2010	*Bulgaria*	*25*		
						2010	*Croatia*	*7*		
						2010	*Cyprus*	*1*		
						2010	*Denmark*	*455*		
						2010	*France*	*14*		
						2010	*Germany*	*37*		
						2010	*Hungary*	*2*		
						2010	*Italy*	*65*		
						2010	*Netherlands*	*2696*		
						2010	*Norway*	*20*		
						2010	*Romania*	*15*		
						2010	*Russia*	*499*		
						2010	*Serbia*	*0*		
						2010	*Slovenia*	*41*		
						2010	*Switz.*	*14*		
						2010	*UK*	*356*		
						2010	*Ukraine*	*55*		
25. Ethiopia	Total: 0		Total: 0		0	Total: 139			139	142
						2003	Denmark 1			
						2005	Germany 9			
						2005	Netherlands 4	*6*		
						2006	Germany 2			
						2006	Netherlands 24	*25*		
						2007	Belgium 5			
						2007	Germany 2			
						2007	Netherlands 74	*28*		
						2008	Netherlands 14			
						2009	UK 4			
						Note: other FAO Stat data include 0 t (i.e. <1 t) to Bosnia-Herzegovina in 2010				
26. Georgia	Total: 0 (Note: Georgia is independant since 1991. It probably"exported" tomato to other parts of former-USSR prior to that date)		Total: 280 2000 Russia 280		280	Total: 2462			2742	5182
						2001	*Russia*	*26*		
						2002	*Russia*	*82*		
						2002	Ukraine 12			
						2003	*Russia*	*216*		
						2004	Russia 983	*1436*		
						2005	Russia 1172	*2108*		

	Period 1986-1990	Period 1991-2000	1986-2000	Period 2001-2010	2001-2010	2001-2010
Exporter	Year Importer Tonnes	Year Partner Tonnes	Total (t)	Year Partner Tonnes	Total (t)	Max
				2006 Azerbaijan 35 *2006 Russia 22* 2006 Ukraine 10 *10* 2007 Azerbaijan 10 *2007 Russia 42* *2008 Russia 663* 2008 Ukraine 26 *26* 2009 Belarus 53 *53* 2010 Azerbaijan 16 *16* 2010 Belarus 123 *123* 2010 Kazakhstan 19 2010 Moldova Rep. 3 *2*		
27. Ghana	Total: 0	Total: 0	0	Total: 14 *2001 Norway 22* 2003 Tunisia 14	14	36
28. Guam	No export data. Importing countries' data not searched	No export data. Importing countries' data not searched	-	*2008 Switzerland 10*	-	*10*
29. Guatemala	Total: 0	Total: 0	0	Total: 14 2010 Slovakia 14	14	14
30. Guinea	Total: 0	Total: 35 1995 Netherlands 35	35	Total: 0	0	0
31. Guyana	Total: 0	Total: 0	0	Total: 5 *2004 Slovenia 2* 2004 Bosnia & Herz.1 2006 France 3 2010 France 1	5	7
32. Honduras	Total: 0	Total: 0	0	Total: 63 2001 France 7 2001 Italy 6 2003 France 8 2004 France 21 2004 Italy 11 2005 Italy 10 *2009 Serbia 3*	63	69
33. Iceland	Total: 0	Total: 58 1994 Greenland 3 1995 Faroe Islands 2 1995 Greenland 2 1995 Netherlands 32 1996 Faroe Islands 5 1996 Greenland 1 1997 Greenland 1 1998 Faroe Islands 7 1998 Greenland 3 1999 Greenland 1 2000 Greenland 1	58	Total: 12 *2001 Belarus 40* *2001 Cyprus 0* *2001 Russia 20* *2001 Slovakia 22* *2002 Czech Rep. 10* 2002 Greenland 1 *2002 Slovakia 8* *2003 Belarus 3* 2003 Greenland 1 *2003 Latvia 0* *2003 Romania 10* *2003 Russia 31* *2003 Slovakia 23* *2003 UK 27* *2004 Bosnia 14* *2004 Cyprus 2* 2004 Greenland 1 *2004 Poland 4* *2004 UK 8* 2005 Greenland 1 *2005 Russia 18* *2006 Ukraine 5* *2007 Bosnia 1* 2007 Greenland 2 *2007 Russia 18* 2008 Greenland 3 2009 Greenland 2 2010 Greenland 1 *2010 Russia 2*	12	278
34. India	Total: 2 1989 UK 2	Total: 460 1992 UK 2 1994 Germany 72	462	Total: 146 2002 Finland 35 2003 Israel 10	146	150

	Period 1986-1990		Period 1991-2000			1986-2000	Period 2001-2010			2001-2010	2001-2010
Exporter	Year	Importer	Year	Partner	Tonnes	Total (t)	Year	Partner	Tonnes	Total (t)	Max
			1995	Turkey	350		2003	Italy	50		
			1995	UK	20		2003	Latvia	6		
			1999	Italy	16		2003	Russia	22		
							2004	UK	5		
							2006	*Norway*	*1*		
							2006	*Switzerland*	*3*		
							2008	UK	3		
							2009	UK	4		
							2010	UK	11 *3*		
35. Indonesia	Total: 0		Total: 8			8	Total: 13			13	17
			1992	Belgium-Luxembourg	1		*2001*	*Bulgaria*	*4*		
			1992	Netherlands	1		2002	Italy	1		
			2000	Netherlands	5		2003	France	1		
			2000	Spain	1		2003	Ireland	1		
							2003	Netherlands	1		
							2004	Finland	8		
							2005	Slovenia	1		
							2008	*Norway*	*0*		
36. Iran	Total: 0		Total: 15513			15513	Total: 28567			28567	37968
			1997	Azerbaijan	2800		2001	Azerbaijan	4111 *257*		
			1997	Kazakhstan	97		2001	Kazakhstan	58		
			1997	Russia	38		*2001*	*Romania*	*18*		
			1997	Ukraine	6		2001	Russia	42 *35*		
			1998	Azerbaijan	2819		2001	Turkey	3		
			1998	Bosnia & Herzeg.	3		*2001*	*UK*	*9*		
			1998	Kazakhstan	75		2001	Uzbekistan	17		
			1998	Romania	33		2002	Azerbaijan	3571 *54*		
			1998	Russia	60		2002	Bosnia & Herzeg.	9		
			1998	Turkey	154		2002	Germany	1 *1*		
			1998	Uzbekistan	7		2002	Kazakhstan	71		
			1999	Azerbaijan	3483		2002	Russia	393 *473*		
			1999	Kazakhstan	37		2003	Azerbaijan	5357 *316*		
			1999	Romania	66		*2003*	*Belarus*	*12*		
			1999	Russia	253		2003	Germany	7 *3*		
			1999	Turkey	558		2003	Kazakhstan	49		
			2000	Azerbaijan	4412		2003	Russia	646 *564*		
			2000	Kazakhstan	81		2003	Uzbekistan	1		
			2000	Moldova Rep.	17		2004	Azerbaijan	1876 *6*		
			2000	Romania	30		2004	Kazakhstan	21		
			2000	Russia	144		2004	Russia	2051 *2024*		
			2000	Turkey	338		2004	Turkey	9		
			2000	Uzbekistan	2		2005	Azerbaijan	1013		
							2005	Kazakhstan	10		
							2005	Russia	1462 *1383*		
							2005	Turkey	1		
							2006	*Azerb.*	*1*		
							2006	*Belarus*	*17*		
							2006	*Russia*	*3640*		
							2006	*Switz.*	*1*		
							2006	*Ukraine*	*6*		
							2007	*Russia*	*2800*		
							2008	*Azerb.*	*18*		
							2008	*Russia*	*995*		
							2008	*Ukraine*	*21*		
							2009	*Russia*	*1711*		
							2009	*Ukraine*	*18*		
							2010	Azerbaijan	3924		
							2010	*Belarus*	*18*		
							2010	France	17		
							2010	Kazakhstan	205		
							2010	Moldova Rep.	1 *1*		
							2010	Russia	2822 *1303*		
							2010	Turkey	801 *325*		
							2010	Ukraine	18 *53*		
37. Iraq	No export data. Importing countries' data not searched		No export data. Importing countries' data not searched			-	*2010*	*Turkey*	*22*	-	*22*
38. Jamaica	No export data. Importing countries' data not searched		No export data. Importing countries' data not searched			-	*2009*	*Norway*	*0*	-	*0*

	Period 1986-1990			Period 1991-2000			1986-2000	Period 2001-2010				2001-2010	2001-2010
Exporter	Year	Importer	Tonnes	Year	Partner	Tonnes	Total (t)	Year	Partner	Tonnes		Total (t)	Max
39. Japan	Total: 0			Total: 15			15	Total: 4				4	5
				1996	Russia	15		2007	Russia	1	*1*		
								2008	*Russia*		*1*		
								2009	Russia	2	*1*		
								2010	Russia	1	*2*		
40. Kenya	Total: 64			Total: 41			105	Total: 63				63	73
	1986	Netherlands	1	1991	France	22		2001	UK	2			
	1986	UK	1	1992	France	4		*2003*	*Albania*		*4*		
	1987	Belgium-Luxembourg	1	1993	France	9		*2003*	*Czech Rep.*		*0*		
	1987	Denmark	4	1993	UK	3		2003	France	9			
	1987	France	2	1998	UK	1		*2003*	*Netherlands*		*1*		
	1987	Greece	1	1999	Netherlands	1		2003	UK	1			
	1987	UK	1	1999	UK	1		2004	Malta	1			
	1988	Netherlands	3					2004	UK	8			
	1990	France	21					2005	France	1			
	1990	Switzerland	1					2005	Germany	1			
	1990	UK	28					2005	UK	19			
								2006	Netherlands	1			
								2008	UK	1			
								2009	UK	4	*9*		
								2010	France	6			
								2010	UK	9			
41. Korea Rep.	Total: 0			Total: 56			56	Total: 22				22	22
				1994	Russia	40		2006	Russia	2			
				1996	Russia	4		2007	Russia	4	*2*		
				1998	Russia	12		2008	Russia	8	*3*		
								2009	Russia	2	*2*		
								2010	Russia	5	*3*		
								2010	Spain	1			
42. Lebanon	Total: 0			Total: 57			57	Total: 663				663	682
				1997	Jordan	36		2001	Moldova Rep.	40	*40*		
				1997	Russia	3		2001	Netherlands	1	*1*		
				1998	Romania	18		2002	France	6	*16*		
								2002	Italy	2			
								2002	Jordan	2			
								2003	*Belarus*		*8*		
								2003	France	1			
								2003	Italy	7	*7*		
								2003	Jordan	4			
								2003	Russia	8			
								2004	France	3			
								2004	UK	2			
								2005	Cyprus	23	*23*		
								2005	France	1			
								2005	Germany	2			
								2005	Jordan	4			
								2005	UK	3			
								2006	*Bulgaria*		*1*		
								2006	France	1			
								2006	Turkey	1			
								2006	UK	1			
								2007	Cyprus	16	*16*		
								2007	France	1			
								2007	Italy	1			
								2007	Jordan	5			
								2007	UK	1			
								2008	Cyprus	2	*2*		
								2008	France	1			
								2008	Moldova Rep.	49	*33*		
								2008	Romania	206	*206*		
								2008	Russia	216	*216*		
								2008	UK	2			
								2009	Azerbaijan	1			
								2009	France	1			
								2009	UK	5			
								2010	France	1	*0*		
								2010	Jordan	28	*28*		

	Period 1986-1990	Period 1991-2000	1986-2000	Period 2001-2010	2001-2010	2001-2010
Exporter	Year Importer Tonnes	Year Partner Tonnes	Total (t)	Year Partner Tonnes	Total (t)	Max
				2010 UK 3 2010 Ukraine 12		
43. Libya	Total: 248 1990 Austria 5 1990 Czechoslovakia 91 1990 Denmark 4 1990 France 3 1990 Italy 8 1990 Switzerland 3 1990 Tunisia 28 1990 UK 106	Total: 77 1991 Austria 7 1991 Italy 4 1991 Tunisia 66	325	Total: 0 *2003 UK 0*	0	0
44. Madagascar	Total: 0	Total: 0	0	Total: 11 2003 France 9 2007 France 1 2009 France 1	11	11
45. Malaysia	Total: 0	Total: 0.1 1998 EU(15)ex.int 0.10	0.1	Total: 0 Note: other FAO Stat data include 0 t (i.e. <1 t) to the Netherlands in 2010 *2001 Czech Rep. 21* *2004 Poland 20* *2008 Russia 5* *2008 Serbia 3* *2009 Croatia 7*	0	56
46. Mauritania	No export data. Importing countries' data not searched	No export data. Importing countries' data not searched	-	*2002 France 3* *2002 Netherlands 0* *2003 France 7* *2006 UK 59*	-	*69*
47. Mauritius	No export data. Importing countries' data not searched	No export data. Importing countries' data not searched	-	*2006 Croatia 5*	-	*5*
48. Mayotte	No export data. Importing countries' data not searched	No export data. Importing countries' data not searched	-	*2010 Denmark 20*	-	*20*
49. Mexico	Total: 79 1986 Cyprus 74 1988 UK 1 1990 Cyprus 4	Total: 73.3 1991 Cyprus 17 1993 Hungary 3 1995 Russia 1 1995 Spain 4 1997 EU(15)ex.int 0.30 1998 Spain 42 1998 UK 2 1999 Italy 1 1999 Netherlands 1 2000 Italy 1 2000 Netherlands 1	152.3	Total: 2775 2001 Austria 94 2001 Netherlands 1 2002 Austria 2663 2002 Germany 2 2002 Netherlands 1 *2002 Norway 2* *2002 UK 2* *2004 UK 6* 2005 Netherlands 1 *2008 Italy 0* *2009 Moldova 0* 2010 Netherlands 13	2775	2785
50. Mongolia	Total: 0	Total: 16 1997 Russia 9 1998 Russia 2 1999 Russia 5	16	Total: 0	0	0
51. Montenegro	Total: n/a (Montenegro became independant in 2006. Exports prior to that date where under "Serbia and Montenegro" (which are not given here as Serbia is an EPPO member)	Total: n/a	-	Total: 4404 2006 Bosnia & Herz. 915 2006 Serbia 130 2007 Bosnia & Herz. 588 *664* 2007 Bulgaria 300 *301* 2007 FYR Maced. 36 2007 Greece 21 2007 Romania 26 *8* 2007 Serbia 970 2008 Bosnia & Herz. 291 *291* 2008 Bulgaria 164 *185* 2008 Serbia 222 2008 Slovakia 16 *16* 2009 Bosnia & Herz. 31 *31* 2009 Germany 2 2009 Serbia 19 2010 Bosnia & Herz. 543 *543* 2010 Romania 20 *20* 2010 Serbia 110	4404	4506

	Period 1986-1990	Period 1991-2000	1986-2000	Period 2001-2010	2001-2010	2001-2010
Exporter	Year Importer Tonnes	Year Partner Tonnes	Total (t)	Year Partner Tonnes	Total (t)	Max
				2010 Switz. 4		
52. Namibia	Total: 0	Total: 4 1997 Russia 2 1998 Russia 2	4	Total: 1 2001 Russia 1 *2005 UK 20* *2010 Norway 4*	1	25
53. Netherlands Antilles	No export data. Importing countries' data not searched	No export data. Importing countries' data not searched	-	*2003 Ukraine 5*	-	*5*
54. New Zealand	Total: 2 1988 UK 1 1989 UK 1	Total: 0	2	Total: 3 *2007 Russia 19* *2008 Bosnia 1* *2008 Norway 0* 2009 UK 1 2010 UK 2	3	23
55. Niger	No export data. Importing countries' data not searched	No export data. Importing countries' data not searched	-	*2003 Latvia 1*	-	1
56. Nigeria	No export data. Importing countries' data not searched	No export data. Importing countries' data not searched	-	*2004 Russia 8*	-	8
57. Oman	Total: 0	Total: 0	0	Total: 3 2005 Spain 3	3	3
58. Pakistan	Total: 0	Total: 0	0	Total: 5 2005 UK 2 2007 UK 3	5	5
59. Panama	No export data. Importing countries' data not searched	No export data. Importing countries' data not searched	-	*2007 Ukraine 21* *2009 France 10* *2010 France 16*	-	47
60. Paraguay	No export data. Importing countries' data not searched	No export data. Importing countries' data not searched	-	*2008 Russia 4*	-	4
61. Peru	Total: 1.3 1986 EU(15)ex.int 1.30	Total: 891 1992 Belgium-Luxembourg 32 1992 Germany 276 1992 Italy 125 1992 Netherlands 150 1992 Spain 35 1992 UK 35 1993 Germany 33 1993 Netherlands 18 1993 Spain 113 1994 Belgium-Luxembourg 20 1994 Netherlands 54	892.3	Total: 22 *2002 Russia 5* 2007 France 1 *2007 Italy 0* 2007 Spain 12 *2008 France 10* *2009 Croatia 0* *2009 Russia 1* *2010 Germany 1* 2010 Spain 9 *4 0*	22	29
62. Philippines	No export data. Importing countries' data not searched	No export data. Importing countries' data not searched	-	*2002 Russia 5*	-	5
63. Saudi Arabia	Total: 0	Total: 299 1998 Netherlands 299	299	Total: 810 2001 Germany 85 2001 Italy 28 2001 Netherlands 652 *660* *2001 Turkey 47* 2001 UK 45 *2002 Netherlands 530* *2003 Netherlands 325* *2008 Norway 1* *2009 Norway 1* *2010 Netherlands 1* *2010 Norway 2*	810	1725
64. Senegal	Total: 406 1988 EU(15)(exc.below) 67 1988 Belgium-Luxembourg 65 1988 France 176 1988 Netherlands 4 1988 Spain 2 1988 Switzerland 5 1988 UK 17 1989 Belgium-Luxembourg 24	Total: 4071 1992 Belgium-Luxembourg 27 1992 France 93 1992 Germany 2 1992 Switzerland 2 1993 Belgium-Luxembourg 18 1993 France 278 1993 Netherlands 2 1993 Switzerland 14 1993 UK 1 1994 Belgium-	4477	Total: 61515 2001 Belgium 224 *476* *2001 Czech Rep. 1* 2001 France 1831 *1046* *2001 Hungary 2* *2001 Italy 1* *2001 Lithuania 0* 2001 Netherlands 58 *781* *2001 Norway 1* *2001 Russia 38* 2002 Belgium 259 *455* *2002 Czech Rep. 2* *2002 Estonia 0*	61515	88642

	Period 1986-1990			Period 1991-2000			1986-2000	Period 2001-2010				2001-2010	2001-2010
Exporter	Year	Importer	Tonnes	Year	Partner	Tonnes	Total (t)	Year	Partner	Tonnes		Total (t)	Max
	1989	France	45	Luxembourg		12		2002	France	1988	*1045*		
	1989	Switzerland	1	1994	France	167		2002	Germany	341	*26*		
				1994	Germany	2		*2002*	*Hungary*		*2*		
				1994	Netherlands	2		*2002*	*Lithuania*		*1*		
				1994	Switzerland	5		2002	Netherlands	84	*1176*		
				1994	USSR	1		*2002*	*Norway*		*3*		
				1995	Belgium-Luxembourg	22		*2002*	*Russia*		*8*		
				1995	France	91		*2002*	*Slovakia*		*0*		
				1995	Germany	17		*2002*	*UK*		*17*		
				1995	Netherlands	141		2003	Belgium	103	*738*		
				1995	Switzerland	2		*2003*	*Czech Rep.*		*3*		
				1997	France	4		*2003*	*Estonia*		*1*		
				1997	Netherlands	569		2003	France	2862	*806*		
				1998	France	343		2003	Germany	303	*20*		
				1998	Netherlands	180		*2003*	*Hungary*		*5*		
				1999	Belgium-Luxembourg	19		2003	Italy	47			
				1999	France	147		2003	Netherlands	91	*1697*		
				2000	France	19		*2003*	*Norway*		*5*		
				2000	Italy	1891		*2003*	*Russia*		*30*		
								2003	*Slovakia*		*1*		
								2003	UK	3	*287*		
								2004	Belgium	45	*955*		
								2004	*Czech Rep.*		*7*		
								2004	*Estonia*		*0*		
								2004	France	4312	*1052*		
								2004	*Hungary*		*2*		
								2004	Italy	118			
								2004	Netherlands	374	*1666*		
								2004	*Norway*		*12*		
								2004	*Poland*		*2*		
								2004	*Romania*		*3*		
								2004	*Russia*		*34*		
								2004	*Spain*		*8*		
								2004	UK	209	*608*		
								2005	Belgium	9	*520*		
								2005	France	5678	*1987*		
								2005	Italy	89			
								2005	Netherlands	12	*1571*		
								2005	*Norway*		*27*		
								2005	*Romania*		*4*		
								2005	*Russia*		*20*		
								2005	UK	621	*643*		
								2006	Belgium	71	*872*		
								2006	France	6063	*2169*		
								2006	Germany	38			
								2006	Italy	36			
								2006	Netherlands	122	*1748*		
								2006	*Norway*		*238*		
								2006	*Poland*		*8*		
								2006	*Romania*		*3*		
								2006	*Russia*		*30*		
								2006	*Switz.*		*1*		
								2006	UK	645	*1120*		
								2007	*Belarus*		*0*		
								2007	Belgium	716	*1844*		
								2007	France	5568	*2485*		
								2007	Germany	1227			
								2007	Italy	192			
								2007	Netherlands	35	*1927*		
								2007	*Norway*		*447*		
								2007	*Russia*		*53*		
								2007	Spain	4	*1*		
								2007	*Switz.*		*1*		
								2007	UK	1116	*1046*		
								2008	*Belarus*		*0*		
								2008	Belgium	1147	*2414*		
								2008	France	4522	*2276*		

	Period 1986-1990		Period 1991-2000		1986-2000	Period 2001-2010			2001-2010	2001-2010
Exporter	Year	Importer Tonnes	Year	Partner Tonnes	Total (t)	Year	Partner	Tonnes	Total (t)	Max
						2008	Germany	2012		
						2008	Italy	250		
						2008	*Moldova*	*1*		
						2008	Netherlands	665 *2695*		
						2008	*Norway*	*230*		
						2008	*Russia*	*413*		
						2008	*Spain*	*1*		
						2008	UK	1300 *1348*		
						2008	*Ukraine*	*6*		
						2009	*Belarus*	*0*		
						2009	Belgium	329 *1371*		
						2009	France	3152 *2006*		
						2009	Germany	1884 *0*		
						2009	Italy	152		
						2009	*Moldova*	*1*		
						2009	Netherlands	1065 *2675*		
						2009	*Norway*	*269*		
						2009	*Russia*	*181*		
						2009	*Switz.*	*0*		
						2009	UK	953 *842*		
						2009	*Ukraine*	*2*		
						2010	*Belarus*	*6*		
						2010	Belgium	285 *2841*		
						2010	France	2568 *2205*		
						2010	Germany	2535		
						2010	Italy	226		
						2010	*Moldova*	*0*		
						2010	Netherlands	1299 *1916*		
						2010	*Norway*	*32*		
						2010	*Russia*	*287*		
						2010	*Serbia*	*1*		
						2010	UK	1672 *1773*		
						2010	*Ukraine*	*3*		
65. Sierra Leone	No export data. Importing countries' data not searched		No export data. Importing countries' data not searched		-	*2004*	*Belgium*	*10*	-	10
66. Singapore	Total: 0		Total: 0.01		0.01	Total: 1			1	1
			2000	EU(15)ex.int 0.01		*2001*	*Norway*	*0*		
						2002	France	1		
67. South Africa	Total: 0		Total: 674		674	Total: 836			836	1377
			1994	EU(15)(exc.below) 7		2001	France	40 *31*		
						2001	*Germany*	*10*		
						2001	*Netherlands*	*5*		
						2001	*Norway*	*3*		
						2001	*Serbia*	*3*		
						2001	*Slovenia*	*5*		
						2001	UK	144 *62*		
						2002	France	130 *138*		
						2002	*Switz.*	*0*		
						2002	UK	230 *241*		
						2003	France	33 *37*		
						2003	*Netherlands*	*0*		
						2003	*Norway*	*0*		
						2003	*Russia*	*1*		
						2003	*Slovakia*	*1*		
						2003	UK	130 *342*		
						2004	UK	38 *176*		
						2005	*Belarus*	*1*		
						2005	*Bosnia*	*2*		
						2005	France	2		
						2005	*Norway*	*2*		
						2005	UK	1 *176*		
						2006	*Belarus*	*13*		
						2006	Morocco	6		
						2006	*Norway*	*19*		
						2007	France	71 *72*		
						2007	Italy	1		
						2007	*Russia*	*1*		
						2007	*Switz.*	*2*		
			1994	Belgium-Luxembourg 2						
			1994	France 4						
			1994	Greece 1						
			1994	Netherlands 1						
			1994	Sweden 1						
			1997	France 1						
			1997	UK 56						
			1998	France 11						
			1998	Netherlands 1						
			1998	UK 162						
			1999	France 1						
			1999	Greece 1						
			1999	UK 178						
			2000	France 56						
			2000	Netherlands 30						
			2000	UK 161						

	Period 1986-1990	Period 1991-2000	1986-2000	Period 2001-2010	2001-2010	2001-2010
Exporter	Year Importer Tonnes	Year Partner Tonnes	Total (t)	Year Partner Tonnes	Total (t)	Max
				2008 France 1 *2008 Moldova 0* *2008 Norway 6* *2008 Russia 10* *2009 Russia 9* 2010 France 8 2010 Germany 1 *2010 UK 37*		
68. Sri Lanka	No export data. Importing countries' data not searched	No export data. Importing countries' data not searched	-	*2005 Norway 7*	-	7
69. Sudan (former)	No export data. Importing countries' data not searched	No export data. Importing countries' data not searched	-	*2004 Netherlands 1*	-	1
70. Suriname	Total: 3 1990 Netherlands 3	Total: 6 1991 Netherlands 6	9	Total: 18 *2002 Albania 21* *2003 Albania 32* 2010 France 18	18	71
71. Swaziland	Total: 0	Total: 2 1997 France 1 1997 Netherlands 1	2	Total: 0 *2002 Serbia 16*	0	16
72. Syria	Total: 219.5 1986 Jordan 164 1987 Jordan 35 1988 EU(15)ex.int 2.50 1988 Jordan 16 1989 UK 2	Total: 42004 1992 Bulgaria 19 1992 Jordan 10 1992 Poland 40 1992 Romania 164 1998 Romania 4187 1998 Russia 16740 1998 Turkey 810 1998 Ukraine 505 1999 Romania 435 1999 Russia 19070 1999 Ukraine 24	42223.5	Total: 68751 2001 Bulgaria 352 *2001 Germany 26* *2001 Hungary 11* *2001 Italy 2* *2001 Moldova 154* *2001 Netherlands 52* 2001 Romania 336 2001 Russia 4827 *2001 Serbia 9* 2001 Turkey 5 *2002 Albania 37* 2002 Bulgaria 112 *2002 FYR Maced. 34* 2002 Germany 654 *2002 Greece 97* *2002 Hungary 35* *2002 Moldova 501* *2002 Netherlands 66* 2002 Romania 415 2002 Russia 3046 2002 Serbia & Mont. 454 *2002 Slovakia 6* *2002 Slovenia 21* *2002 Sweden 33* 2002 Turkey 9 2002 Ukraine 50 *2003 Albania 133* *2003 Austria 5* *2003 Bulgaria 370* *2003 Denmark 4* *2003 FYR Maced. 20* *2003 Germany 58* *2003 Moldova 88* *2003 Netherlands 10* *2003 Romania 6946* *2003 Russia 3663* *2003 Slovakia 74* *2003 Sweden 20* *2004 Albania 664* *2004 Bulgaria 267* *2004 Cyprus 6* *2004 Denmark 2* *2004 Germany 3* *2004 Greece 77* *2004 Hungary 35* 2004 Jordan 471 *2004 Moldova 1*	68751	209731

	Period 1986-1990		Period 1991-2000		1986-2000	Period 2001-2010			2001-2010	2001-2010
Exporter	Year	Importer Tonnes	Year	Partner Tonnes	Total (t)	Year	Partner Tonnes		Total (t)	Max
						2004	*Poland*	*3*		
						2004	Romania 2054	*19182*		
						2004	Russia 561	*6745*		
						2004	*Serbia*	*13*		
						2004	*Slovakia*	*45*		
						2004	Turkey 3280			
						2004	Ukraine 10697			
						2005	*Albania*	*1160*		
						2005	*Bosnia*	*20*		
						2005	*Bulgaria*	*127*		
						2005	*Hungary*	*538*		
						2005	*Moldova*	*284*		
						2005	*Netherlands*	*20*		
						2005	*Poland*	*41*		
						2005	*Romania*	*17663*		
						2005	*Russia*	*10259*		
						2005	*Ukraine*	*20*		
						2006	*Albania*	*469*		
						2006	*Belarus*	*113*		
						2006	*Bulgaria*	*87*		
						2006	France 228			
						2006	*FYR Maced.*	*19*		
						2006	*Greece*	*7*		
						2006	*Hungary*	*153*		
						2006	Jordan 4880			
						2006	*Moldova*	*1185*		
						2006	*Poland*	*59*		
						2006	Romania 2832	*19821*		
						2006	Russia 2607	*9987*		
						2006	*Ukraine*	*59*		
						2007	*Albania*	*495*		
						2007	*Belarus*	*8*		
						2007	*Bosnia*	*37*		
						2007	*Bulgaria*	*183*		
						2007	*Germany*	*8*		
						2007	*Greece*	*19*		
						2007	*Hungary*	*1*		
						2007	Jordan 7620			
						2007	*Moldova*	*1839*		
						2007	*Poland*	*23*		
						2007	Romania 10676	*10696*		
						2007	Russia 1490	*10676*		
						2007	*Sweden*	*25*		
						2007	*Ukraine*	*117*		
						2008	*Albania*	*146*		
						2008	*Bulgaria*	*74*		
						2008	Jordan 238			
						2008	*Moldova*	*1172*		
						2008	*Netherlands*	*15*		
						2008	*Romania*	*2414*		
						2008	*Russia*	*3725*		
						2008	Turkey 294			
						2008	*UK*	*6*		
						2008	*Ukraine*	*165*		
						2009	*Albania*	*411*		
						2009	*Bulgaria*	*2368*		
						2009	Jordan 894			
						2009	*Moldova*	*2389*		
						2009	*Poland*	*67*		
						2009	*Romania*	*2027*		
						2009	*Russia*	*4241*		
						2009	*UK*	*6*		
						2009	Ukraine 183	*4877*		
						2010	Albania 414	*495*		
						2010	*Austria*	*37*		
						2010	*Azerb.*	*797*		
						2010	*Belarus*	*92*		

	Period 1986-1990		Period 1991-2000		1986-2000	Period 2001-2010			2001-2010	2001-2010
Exporter	Year	Importer Tonnes	Year	Partner Tonnes	Total (t)	Year	Partner Tonnes		Total (t)	Max
						2010	*Bulgaria*	*32*		
						2010	*Cyprus*	*2*		
						2010	FYR Macedonia	158		
						2010	*Hungary*	*67*		
						2010	*Italy*	*3*		
						2010	Jordan 537	*431*		
						2010	Moldova Rep. 742	*1031*		
						2010	Poland 206	*166*		
						2010	Romania 764	*776*		
						2010	Russia 3650	*4161*		
						2010	Serbia 142			
						2010	Slovakia 113	*150*		
						2010	*Sweden*	*52*		
						2010	Turkey 128			
						2010	Ukraine 3046	*2965*		
73. Tadjikistan	No export data. Importing countries' data not searched		No export data. Importing countries' data not searched		-	*2001*	*Russia*	*897*	-	5686
						2002	*Russia*	*1294*		
						2003	*Russia*	*515*		
						2004	*Russia*	*249*		
						2005	*Russia*	*199*		
						2006	*Russia*	*571*		
						2007	*Russia*	*1279*		
						2008	*Russia*	*378*		
						2009	*Russia*	*99*		
						2010	*Russia*	*205*		
74. Thailand	Total: 4		Total: 18		22	Total: 27			27	171
	1987	UK 2	1999	Netherlands 18		*2001*	*Denmark*	*21*		
	1988	UK 2				*2001*	*Germany*	*6*		
						2002	*Germany*	*6*		
						2003	*Germany*	*6*		
						2004	*Germany*	*7*		
						2005	Belgium 4			
						2005	Faroe Islands 2			
						2005	France 12			
						2005	*Germany*	*7*		
						2005	Malta 2			
						2005	*Russia*	*1*		
						2006	Czech Rep. 1			
						2006	*Germany*	*6*		
						2006	Netherlands 3			
						2006	*Russia*	*6*		
						2007	*Germany*	*10*		
						2007	*Russia*	*12*		
						2007	Spain 3			
						2008	*Germany*	*4*		
						2008	*Russia*	*19*		
						2008	*Switz.*	*0*		
						2009	*Denmark*	*0*		
						2009	*Germany*	*0*		
						2009	*Russia*	*14*		
						2009	*Switz.*	*0*		
						2010	*Denmark*	*0*		
						2010	*Germany*	*0*		
						2010	*Russia*	*19*		
75. Trinidad and Tobago	No export data. Importing countries' data not searched		No export data. Importing countries' data not searched		-	*2004*	*France*	*5*	-	23
						2006	*Serbia*	*18*		
76. Turkmenistan	No export data. Importing countries' data not searched		No export data. Importing countries' data not searched		-	*2001*	*Russia*	*179*	-	592
						2002	*Azerb.*	*5*		
						2002	*Bulgaria*	*1*		
						2003	*Russia*	*34*		
						2004	*Azerb.*	*10*		
						2004	*Russia*	*207*		
						2005	*Russia*	*53*		
						2006	*Russia*	*62*		
						2007	*Azerb.*	*4*		
						2007	*Russia*	*37*		
						2009	*Russia*	*0*		

	Period 1986-1990		Period 1991-2000		1986-2000	Period 2001-2010			2001-2010	2001-2010
Exporter	Year	Importer Tonnes	Year	Partner Tonnes	Total (t)	Year	Partner Tonnes		Total (t)	Max
77. Turks and Caicos	No export data. Importing countries' data not searched		No export data. Importing countries' data not searched		-	*2001*	*Bulgaria*	*1*	-	1
78. Uganda	Total: 0		Total: 1.1		1.1	Total: 0			0	0
			1996	Belgium-Luxembourg 1		*2008*	*Belgium*	*0*		
			1999	EU(15)ex.int 0.10						
79. United Arab Emirates	No export data. Importing countries' data not searched		No export data. Importing countries' data not searched		-	*2004*	*Russia*	*1*	-	5
						2005	*Azerb.*	*4*		
80. Tanzania	Total: 0		Total: 8		8	Total: 43			43	63
			1998	EU(15)ex.int 0.07		2002	Israel	36		
			2000	EU(15)(exc.below) 7		2002	UK	4		
						2003	EU(15)ex.int	2		
						2004	Netherlands	1		
			2000	UK 1		*2006*	*Serbia*	*20*		
81. USA	Total: 2141		Total: 28390		30531	Total: 2640			14556	14954
	1986	EU(15)(exc.below) 3	1991	EU(15)(exc.below) 53		2001	Belgium	2640		
	1986	Italy 2				2001	France	418		
	1986	UK 32	1991	Belgium-Luxembourg 17		2001	Germany	55		
	1987	France 8	1991	Denmark 7		2001	Italy	34		
	1987	Italy 28	1991	France 31		*2001*	*Netherlands*	*0*		
	1987	Netherlands 9	1991	Netherlands 1141		*2001*	*Norway*	*2*		
	1987	Switzerland 12	1991	Norway 39		2001	Portugal	52		
	1987	UK 26	1991	Sweden 121		2001	Spain	74		
	1988	EU(15)(exc.bel.15	1991	Switzerland 150		*2001*	*Sweden*	*0*		
	1988	France 15	1991	UK 326		2001	Switzerland	2		
	1988	Netherlands 78	1992	Belgium-Luxembourg 2		2001	UK	207		
	1988	Spain 19	1992	Germany 88		*2002*	*Belarus*	*7*		
	1988	Sweden 34	1992	Netherlands 461		2002	Belgium	2747		
	1988	Switzerland 57	1992	UK 416		*2002*	*France*	*2*		
	1988	UK 21	1993	France 5		2002	Netherlands	586		
	1989	Netherlands 715	1993	Netherlands 50		*2002*	*Russia*	*1*		
	1989	Norway 63	1993	Sweden 34		*2002*	*Sweden*	*40*		
	1989	Sweden 132	1993	Switzerland 2		2002	UK	476		
	1989	Switzerland 139	1994	France 4		2003	Belgium	1493		
	1989	UK 20	1994	Russia 6		2003	France	97		
	1990	Denmark 4	1994	Switzerland 4		2003	Netherlands	1842		
	1990	Netherlands 339	1994	UK 77		*2003*	*Slovakia*	*1*		
	1990	Norway 48	1995	Belgium-Luxembourg 37		2003	Sweden	29		
	1990	Spain 9	1995	France 37		2003	Switzerland	12		
	1990	Sweden 114	1995	Germany 223		2003	UK	320		
	1990	Switzerland 31	1995	Italy 12		2004	Belgium	1284		
	1990	UK 168	1995	Netherlands 256		2004	France	3		
			1995	Russia 331		2004	Germany	1		
			1995	UK 305		2004	Netherlands	1105		
			1996	Belgium-Luxembourg 1700		2004	Turkey	22		
			1996	Russia 281		2004	UK	393		
			1996	Spain 19		2005	Belgium	172		
			1996	Switzerland 2		2005	France	74		
			1996	Ukraine 23		2005	Germany	1		
			1996	UK 222		2005	Netherlands	304		
			1997	Belgium-Luxembourg 1893		*2005*	*Norway*	*18*		
			1997	Germany 150		2006	France	34		
			1997	Netherlands 678		2006	Netherlands	4		
			1997	Russia 87		*2006*	*Russia*	*3*		
			1997	Spain 56		*2006*	*Spain*	*3*		
			1997	UK 985		2006	Turkey	9		
			1998	Belgium-Luxembourg 1455		*2007*	*France*	*7*		
			1998	France 38		2007	Netherlands	3		
			1998	Germany 96		2007	Russia	2		
			1998	Netherlands 347		2007	Switzerland	20		
						2007	*Ukraine*	*248*		
						2008	France	21		
						2008	Italy	6		
						2008	Netherlands	4		
						2008	*Russia*			
						2008	Russia	2		
						2008	Ukraine	8		

	Period 1986-1990	Period 1991-2000	1986-2000	Period 2001-2010	2001-2010	2001-2010
Exporter	Year Importer Tonnes	Year Partner Tonnes	Total (t)	Year Partner Tonnes	Total (t)	Max
		1998 Portugal 70 1998 Russia 24 1998 Spain 77 1998 UK 1095 1999 Belgium-Luxembourg 2248 1999 France 19 1999 Germany 384 1999 Ireland 38 1999 Netherlands 978 1999 Portugal 489 1999 Spain 167 1999 Turkey 77 1999 UK 1667 2000 Belgium 3614 2000 France 844 2000 Netherlands 733 2000 Portugal 226 2000 Spain 441 2000 UK 2932		*2010 Jordan 1*		
82. Uruguay	Total: 0	Total: 0	0	Total: 5 2007 UK 5	5	5
83. Venezuela	Total: 270 1988 EU(15)(exc.below) 14 1988 France 5 1988 Switzerland 18 1988 UK 9 1989 EU(15) (exc.below) 29 1989 Belgium-Luxembourg 3 1989 France 20 1989 Switzerland 9 1989 UK 9 1990 EU(15)ex.int 79 1990 Belgium-Luxembourg 18 1990 France 3 1990 Switzerland 5 1990 UK 44	Total: 398 1991 Austria 2 1991 Belgium-Luxembourg 5 1991 France 4 1991 Germany 116 1991 Netherlands 20 1991 Portugal 1 1991 UK 101 1992 Germany 55 1992 Netherlands 19 1992 Switzerland 6 1992 UK 45 1993 Switzerland 2 1993 UK 20 1995 UK 2	668	Total: 86 2001 EU(15)ex.int 1 2002 France 7 *10* 2003 France 28 *30* 2004 France 16 *29* 2004 Germany 2 2005 France 10 *10* 2006 France 12 *12* 2006 Netherlands 2 2007 France 2 *2* 2008 Malta 3 2009 Czech Rep. 3	86	104
84. Viet Nam	No export data. Importing countries' data not searched	No export data. Importing countries' data not searched	-	*2008 Norway 0* *2008 UK 3*	-	3
85. Yemen	Total: 0	Total: 0	0	Total: 1 2006 Jordan 1	1	1
86. Zambia	Total: 0	Total: 1 1997 UK 1	1	Total: 0 *2008 Norway 3*	0	3
87. Zimbabwe	Total: 114 1987 Netherlands 3 1987 UK 16 1990 Austria 4 1990 Belgium-Luxembourg 5 1990 Denmark 2 1990 France 2 1990 Netherlands 24 1990 Sweden 2 1990 UK 56	Total: 0	114	Total: 0 *2006 Netherlands 0* *2007 Netherlands 1*	0	1

Annex 4. Exports of tomato fruit in 2010 from countries in Africa, Americas and the Caribbean, Asia, Near East and Central Asia, Oceania (quantities in tonnes)
In yellow, interregional trade; In green, EPPO countries; in blue: trade within EPPO

Table A4.1 – Exports from countries in Africa. Note, within this region, there were no intraregional exports recorded to: Cameroon, Cape Verde, Central African Republic, Chad, Egypt, Eritrea, Gambia, Madagascar, Morocco, Namibia, Rwanda, Sao Tome e Principe, Sierra Leone, Togo, Tunisia.

reporter	Algeria	Angola	Antigua&Barb.	Bahamas	Bahrain	Belgium	Benin	Bosnia&Herz.	Botswana	Burkina Faso	Canada	China Hong K.	Colombia	Comoros	Congo	Côte d'Ivoire	Cyprus	Czech Rep.	DR Congo	Djibouti	Equat. Guinea	Ethiopia	France	Gabon
Botswana																								
Burkina Faso							539																	
Cameroon																					23			
Côte d'Ivoire																								
Ethiopia					18			0												7916				
Gambia																								
Ghana										2														
Kenya														2									6	
Madagascar														21										
Malawi									1															
Morocco			7	2		39					277	0				521	2	138					281837	
Niger							20																	
Rwanda																								
Senegal						285																	2568	
South Africa		214											3		13	1			46				8	6
Tunisia	18				2	25					4											1	12615	
Uganda																								
Tanzania																								
Zambia																			7					
Zimbabwe																								

reporter	Germany	Ghana	Greece	Guinea	Guinea-Bissau	Hungary	Iceland	Italy	Jamaica	Kenya	Kuwait	Liberia	Libya	Malawi	Mali	Malta	Mauritania	Mauritius	Mayotte	Mexico	Mozambique	Netherlands	NLAntilles	Niger	Nigeria	Norway	Oman
Botswana																											
Burkina Faso		12390																									
Cameroon																											
Côte d'Ivo.																											
Ethiopia																									8		0
Gambia				17	1										6												
Ghana																											
Kenya																											
Madagascar																			54								
Malawi																											
Morocco	2194		1			49	1	2970	1			25			19	3	5907					12470	0	28		292	
Niger																									16		
Rwanda																											
Senegal	2535			0				226														1299					
South Africa	1	0								0				7				6			17494				2		
Tunisia	1							291			5		1376							19		297					
Uganda										5																	
Tanzania										1764	2																
Zambia																											
Zimbabwe																					1						

reporter	Panama	PNGuinea	Poland	Portugal	Qatar	Romania	Russia	St Helena	Saudi Arabia	Senegal	Seychell.	Slovakia	Somalia	South Afr.	Spain	Sudan	Switzerl.	Turkey	Uganda	UAE	UK	Tanzania	USA	Zambia	Zimbabwe	Unspec.	Total
Botswana														97													97
Burkina Faso																											12929
Cameroon																											23
Côte d'Ivoire																										1	1
Ethiopia					9				35				3181			246				193							11606
Gambia										4																	28
Ghana																							2				4
Kenya													0			6			1		9	9				7	40
Madagascar																											75
Malawi																											1
Morocco	5		94	0		33	18003		431	1389		2006			18799		6112	1		82	17802		0			571	372111
Niger																										36	72
Rwanda																						2					2
Senegal																					1672						8585
South Africa		18						3			60													42	2344	137	20405
Tunisia					87				5											32						418	15196
Uganda																											5
Tanzania																											1766
Zambia																											7
Zimbabwe																											1

Table A4.2 – Trade from countries in the Americas. Note, within this region, there were no intraregional exports recorded to: Belize, Costa Rica, Cuba, Dominica, Ecuador, Guyana, Haiti, Montserrat, Peru, St Kitts and Nevis, Venezuela.

reporter	Antigua&Barb.	Argentina	Aruba	Australia	Bahamas	Barbados	Bermuda	Brazil	Brit. Virgin Isl.	Canada	Cayman Isl.	Chile	China	China Hong K.	Colombia	Dominican Rep.	El Salvador	France	Guatemala	Honduras	Jamaica	Japan	Mexico
Argentina								111				42											
Barbados																							
Brazil		3338																20					
Canada													1	3				10				156	
Chile		461																					
Colombia			18															33					
Costa Rica															10		1			231			
Ecuador															3177								
Guatemala																	25800		92	294			
Guyana			8			307												1					
Mexico										22355							7079					52	
Peru								5															
Suriname																		18					
Trinid. & Tob.						492																	
USA	12		56	45	879	96	116		46	190547	114		15	94	36	3	3		358		5	1731	29085
Venezuela			617																				

reporter	Netherlands	NLAntilles	Nicaragua	Panama	Paraguay	Qatar	Rep. Korea	St Lucia	St Pierre & Miquelon	St Vincent and the Grenadines	Singapore	Slovakia	Spain	Suriname	Trini.&Tob.	Turks&Caic. Isl.	UK	USA	Uruguay	Unspec.	Total
Argentina					11542														128		11823
Barbados								2		14											16
Brazil					12														191		3561
Canada				5					10									166686			166871
Chile																	9		313	6	789

reporter	Netherlands	NLAntilles	Nicaragua	Panama	Paraguay	Qatar	Rep. Korea	St Lucia	St Pierre & Miquelon	St Vincent and the Grenadines	Singapore	Slovakia	Spain	Suriname	Trini.&Tob.	Turks&Caic. Isl.	UK	USA	Uruguay	Unspec.	Total
Colombia		86																			137
Costa Rica			450	280													14	876			1862
Ecuador		2																1			3180
Guatemala			148									14						5374			31722
Guyana																					316
Mexico	13																	1480118			1509617
Peru													9								14
Suriname																					18
Trinid. & Tob.										1										0	493
USA		121		28		2	90	16		1	41			5	586	150					224281
Venezuela		102																			719

Table A4.3 – Trade from countries in Asia. Note, within this region, there were no intraregional exports recorded to: Cambodia, India, Philippines, Korea Rep.

reporter	Bahrain	Egypt	Guam	Kazakhstan	Kuwait	Kyrgyzstan	Netherlands	NZ	Oman	Qatar	Russia	Saudi Arabia
China				8431		167					66446	
India	442	23			126			3	2204	20		2261
Japan			3								1	
Malaysia							0			181		35
Rep. Korea			0								5	
Singapore												
Sri Lanka												

reporter	Seychell.	Spain	Suriname	Tajikistan	UAE	UK	USA
China				5			
India			1		33773	11	
Japan							
Malaysia					1740		
Rep. Korea		1					1
Singapore	3						
Sri Lanka					1		

Table A4.4 – Exports from countries in the Near East and Central Asia. Note, within this region, there were no intraregional exports recorded to: Kirghizistan, Uzbekistan, Yemen.

reporter	Afghanist.	Albania	Armenia	Aruba	Austria	Azerbaijan	Bahrain	Belarus	Belgium	Bosnia&Herz.	Bulgaria	Canada	China (HgKg)	Central Af. Rep.	Congo	Côte d'Iv.	Croatia	Cyprus	Czech Rep.	Denmark	Finland
Afghanistan																					
Armenia																					
Azerbaijan																					
Bahrain																					
Georgia						16		123													
Iran	2986		48	75		3924	6							5							
Israel					1578				148			7	253					213		518	1312
Jordan						292	15249			34	2073										
Kyrgyzstan																					
Lebanon							65								1	10					
Pakistan	5290																				
Saudi Arabia																					
Syria		414		2013			1958														
Turkey		1108			1652	11648		5938	112	6733	65541						5776	1776	3048	775	

reporter	Egypt	Estonia	France	Georgia	Germany	Greece	Honduras	Hungary	Iran	Iraq	Israel	Italy	Jordan	Kazakhstan	Kuwait	Latvia	Lebanon	Netherlands	Norway	Oman	Pakistan	Poland
Afghanistan																					5937	
Armenia				49																		
Azerbaijan														1								
Bahrain																				64		
Georgia														19								
Iran			17							251656				205	130						42	
Israel			573		4158	148						14		166				10529	695			2
Jordan				56		35		149		108795	412				32614		7190			12020		
Kyrgyzstan														396								
Lebanon			1							12			28		761					42		
Pakistan									1													
Saudi Arabia																						
Syria	78			104						151179			537		34602		10964			8508		206
Turkey		426	1025	6565	14481	790	6065	1310		11167		402		39	97	1327		3006	67			11522

reporter	Qatar	Moldova	Romania	Russia	Saudi Arabia	Serbia	Slovakia	Slovenia	Spain	Sweden	Switzerl.	Syria Rep.	Tajikistan	FYRMacedonia	Turkey	Turkmenist.	Ukraine	UAE	UK	Unspec.	Total
Afghanistan																					5937
Armenia	18			342																18	427
Azerbaijan				40278																	40279
Bahrain					287													16		2	369
Georgia		3																			161
Iran	20	1		2822	254							39	9		801	365	18	1427			264850
Israel				8086				2912		472	175						9		3853		35821
Jordan	32104	21	4294	719			59			120		68893					233	85895			371257
Kyrgyzstan				8647														4			9047
Lebanon	155				557							26					12	265	3		1938
Pakistan					8															393	5692
Saudi Arabia																				5696	5696
Syria	4069	742	764	3650	174637	142	113							158	128		3046	9464		143	407619
Turkey	22	7294	44584	302484	17729		1061	1988	19	568	350	22		768		38	33635	138	792	388	574276

Table A4.5. Exports from countries in Oceania. Note, within this region, there were no intraregional exports recorded to: Guam, Tuvalu

reporter	Am. Samoa	Australia	Bahrain	Brunei Daruss.	Cameroon	Canada	China	China Hong K.	Cook Isl.	Fiji	French Polynesia	Guam	Indonesia	Japan	Kiribati	Malaysia	Nauru	New Caledonia
Australia			0	39	7			25		22			48			18	0	56
New Zealand	1	2469				245	38	91	10	25	162			530	0			219

reporter	NZ	Niue	PNGuinea	Qatar	Samoa	Singapore	Solomon Isl.	Thailand	Timor-Leste	Tonga	UK	USA	Vanuatu	Wallis&Fut. Isl.	Total
Australia	2188		79	0		116		11	21				13		2643
New Zealand		0			16	17	0	6		1	2	217		16	4065

Annex 5. Origins of imports into EPPO countries from non-EPPO countries (from FAOSTAT)

For both tables:

- 0 refers to quantities < 1 tonne in FAOSTAT.
- For each combination exporting country and importing country, the volume is given as entered by the importing country (- if no data), with the exporting country data between brackets (- if no data)
- Totals are given as the volumes (in tonnes) given by importing EPPO countries in FAOSTAT. If different, the maximum estimated quantity (see Box 4) is indicated after /.

Table A5.1 Origins of imports into EU countries from non-EPPO countries (volumes in tonnes in 2010)

- For EU countries, there are discrepancies in the totals obtained especially for Germany and Italy.

Importer → Exporter ↓	Austria	Belgium	Bulgaria	Croatia	Cyprus	Denmark	France	Germany	Hungary	Italy	Netherlands	Poland	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	UK	Total Imp. country / maximum
Bangladesh							1 (-)													1
Barbados							0 (-)													0
Brazil							23 (20)						0 (-)							23
Canada							- (10)													- / 10
Chile																			- (9)	- / 9
China								14 (-)												14
Colombia							65 (33)				1 (-)									66
Costa Rica							20 (-)												- (14)	20 / 34
Dominican Rep.							964 (-)													964
Ecuador																	1 (-)			1
Egypt		6 (-)	25 (-)	7 (-)	1 (-)	455 (-)	14 (-)	37 (-)	2 (-)	65 (-)	2696 (-)			15 (-)		41 (-)			356 (-)	3720
Guatemala															- (14)					- / 14
Guyana							- (1)													- / 1
India																			3 (11)	3 / 11
Iran							- (17)													- / 17
Kenya							- (6)												- (9)	- / 15
Korea Rep.																	1 (-)			1
Lebanon							0 (1)												- (3)	- / 4
Mayotte						20 (-)														20
New Zealand																			- (2)	- / 2
Panama							16 (-)													16
Peru								0 (-)									4 (9)			4 / 9
Senegal		2841 (285)					2205 (2568)	- (2535)		- (226)	1916 (1299)			20 (20)					1773 (1672)	8755 / 11879
South Africa							- (8)	- (1)											37 (-)	37 / 46
Suriname							- (18)													- / 18
Syria	37 (-)		32 (-)		2 (-)				67 (-)	3 (-)		166 (206)		776 (764)	150 (113)			52 (-)		1285 / 1325
Thailand						0 (-)		0 (-)												0 / 0
Total	37	2847	57	7	3	475	3308 / 3732	51 / 2587	69	68 / 294	4613	166 / 206	0	811	150 / 164	41	6 / 11	52	2169 / 2214	

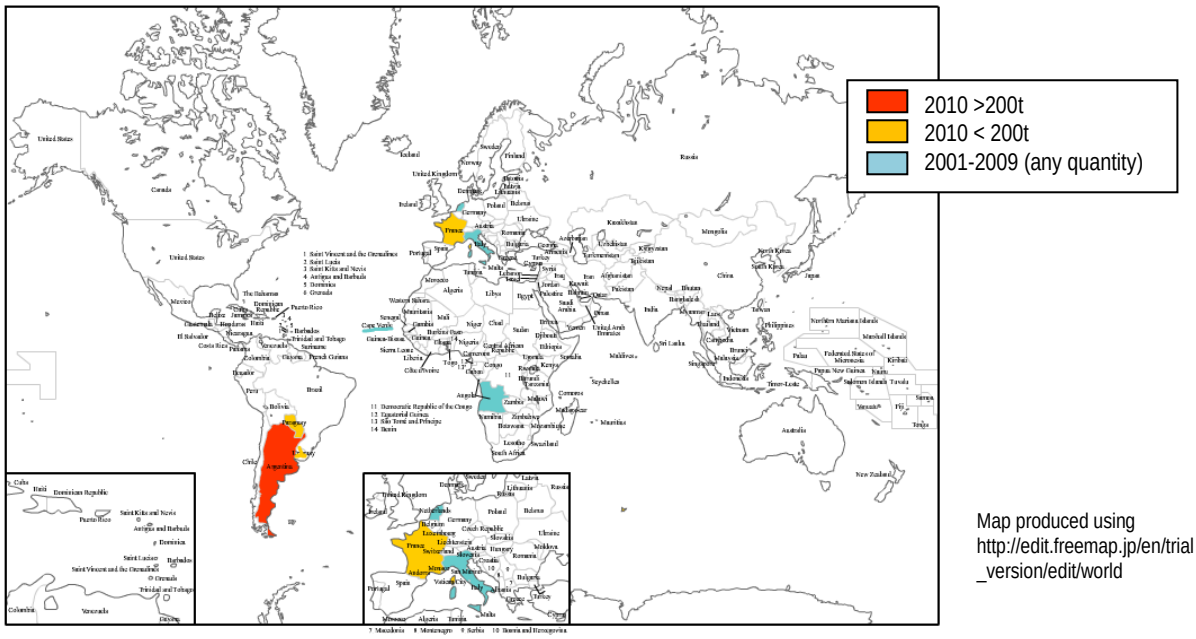
Table A5.2 Origins of imports into EPPO non-EU countries from non-EPPO countries

- There are discrepancies in the totals obtained especially for Azerbaidjan and Kazakhstan.

Importer → Exporter ↓	Albania	Bosnia & Herz.	FYR Macedonia	Serbia	Belarus	Azerbaijan	Moldova	Ukraine	Russia	Kazakhstan	Kyrgyzstan	Jordan	Turkey	Norway	Switzerland	Total Imp. country / maximum
Argentina															1 (-)	1
Armenia									849 (342)							849
Brazil															1 (-)	1
Chile									3 (-)					1 (-)		4
China									66579 (66446)	- (8431)	153 (167)					66732 /75177
Côte d'Ivoire									8 (-)							8
Egypt				0 (-)	0 (-)			55 (-)	499 (-)					20 (-)	14 (-)	588
Georgia					123 (123)	16 (16)	2 (3)			- (19)						141 /161
Iceland									2 (-)							2
Iran					18 (-)	- (3924)	1 (1)	53 (18)	1303 (2822)	- (205)			325 (801)			1700 / 7824
Iraq													22 (-)			22
Japan									2 (1)							2
Korea Rep.									3 (5)							3 /5
Lebanon								- (12)				28 (28)				28 / 40
Montenegro		543 (543)		- (110)											4 (-)	547 / 657
Namibia														4 (-)		4
Saudi Arabia														2 (-)		2
Senegal				1 (-)	6 (-)		0 (-)	3 (-)	287 (-)					32 (-)		329
Syria	495 (414)		- (158)	- (142)	92 (-)	797 (-)	1031 (742)	2965 (3046)	4161 (3650)			431 (537)	- (128)			9972 / 10587
Tajikistan									205 (-)							205
Thailand									19 (-)							19
USA												1 (-)				1
Total	495	543	- / 158	1 / 253	239	813 / 4737	1034 /1035	3076 / 3169	73920 / 75441	- / 8655	153 / 167	460 / 566	347 / 951	59	20	

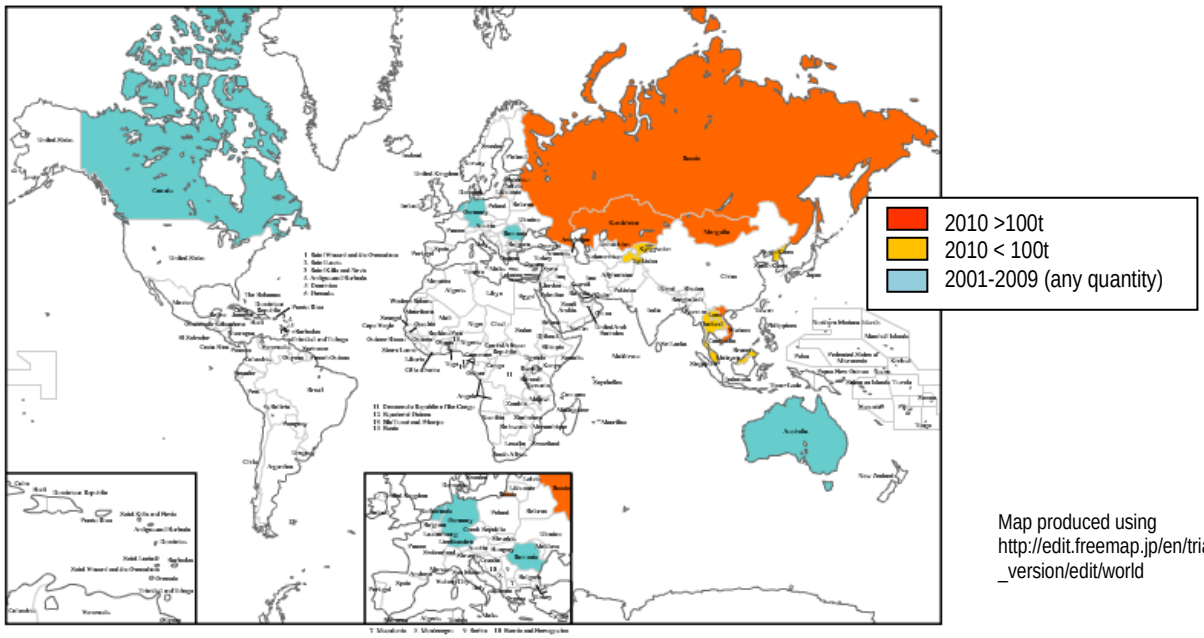
Annex 6. Exports of tomato fruit from selected non-EPPO countries in 2001-2010 (from FAOSTAT, in tonnes)

BRAZIL



	2001	2002	2003	2004	2005	2007	2008	2009	2010
EPPO									
France				2		12	15	22	20
Italy					58				
Netherlands						6			
Africa									
Angola	11	4							
Cape Verde		1	1	1					
Americas									
Argentina	11131	3791	3135	265	380	8005	1982	1519	3338
Paraguay	16		40	623		8		138	12
Uruguay	544	158			38	1698	21	213	191
Asia									
Near East and Central Asia (except EPPO)									
Oceania									
none									
Total	11702	3954	3176	891	476	9729	2018	1892	3561

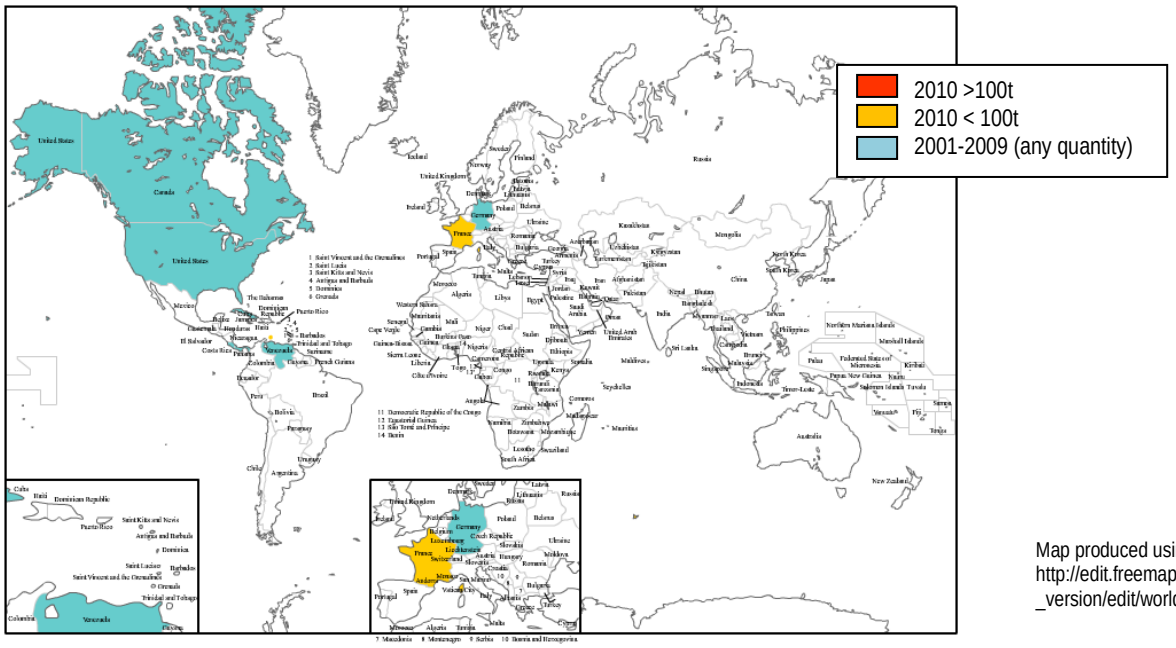
CHINA



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
EPPO										
Germany				23	12					

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Kazakhstan		20		59	209	81	1375	2979	9612	8431
Kyrgyzstan		5			9	157	521	111	392	167
Netherlands								6		
Romania				25						
Russia	12692	22955	25802	31857	40020	46021	56923	72964	61860	66446
Africa (except EPPO countries)										
None										
Asia										
China, Hong Kong	15246	9455	26028	45114	34030	15494	15439	18171	18378	20435
China, Macao			665	224	138	1470	1355	1182	1220	1424
DPRep of Korea				2		19	496	22	19	29
Indonesia		10		9	1					
Lao				1						5
Japan	1					3				
Malaysia	75	368	230	335	620	385	1007	6	9	42
Mongolia	4		131	106			626	3052	4159	5065
Myanmar	2									
Pakistan			20			62				
Philippines		5	5							
Republic of Korea			8							
Singapore	92	844	113	5	2			44	16	
Thailand				10	1		2			221
Viet Nam			5649	4754	10761	12910	12029	18092	12413	1838
Americas										
Canada	6	4		355	126	43		11		
Near East and Central Asia (except EPPO countries)										
Tajikistan					2					5
United Arab Emirat.		24	129			23	4			
Oceania										
Australia							1			
Unspecified			9							
TOTAL	28118	33690	58789	82879	85931	76668	89778	116640	108078	104108

COLOMBIA



Map produced using
http://edit.freemap.jp/en/trial
_version/edit/world

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
EPPO										
France			41	242	377	168	127	93	55	33
Germany	0									
Africa										
Americas										
Aruba			3		3	3	11	10	12	18
Canada				2			1			
Costa Rica							12			
Cuba				116		67	5	19	12	
Netherl. Antilles	1		2	22	65	31	33	63	102	86

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Panama		1	3	4	2	35	21	13	6	
USA					6					
Venezuela	407	284								
Asia										
Near East and Central Asia (except EPPO)										
Oceania										
Unspecified								2		
Total	408	285	49	386	453	304	210	200	187	137

COSTA RICA

years	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
EPPO										
France			79	53	24	5	34			
Germany		1	0							
UK									101	14
Africa										
Americas										
Canada				1	1		4	1		
Cayman Isl.									1	
Colombia	18	9					6	7	6	10
El Salvador			2		23					1
Guatemala				2	5			1	0	
Honduras	24	47	213	134	187	192	47	31	102	231
Nicaragua	464	493	586	320	230	302	315	263	689	450
Panama							43	5	316	280
USA				16	42	40	272	57	779	876
Asia										
Near East and Central Asia (except EPPO)										
Oceania										
Total	2507	2552	2883	2530	2517	2545	2728	2373	4003	3872

GUATEMALA

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
EPPO										
Slovakia										14
Africa										
Americas										
Costa Rica	6	14	0	3	10	3	7			
El Salvador	45247	30904	22520	19740	19838	17163	19175			25800
Guatemala										92
Honduras	737	121	100	381	683	411	618			294
Mexico				69			41			
Nicaragua	235	16	71		24	1				148
Panama	3									
USA		1				17	281			5374
Asia										
Near East and Central Asia (except EPPO)										
Oceania										
Unspecified								26890	24150	
Total	46228	31056	22691	20193	20555	17595	20122	26890	24150	31722

KENYA

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
EPPO										
France			9		1					6
Germany					1					
Malta				1						
Netherlands					0	1				
UK	2		1	8	19			1	4	9
Africa										
Comoros							2		1	2
Djibouti			1	1						
Madagascar					2					
Rwanda								3		
Seychelles			2	1			1			
Somalia										0
Sudan (former)		0		0		7	20	41	13	6

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Uganda					0			4		1
Tanzania			1						4	9
Americas										
Canada					3					
Asia										
Malaysia					1					
Near East and Central Asia (except EPPO)										
Oceania										
Ameri. Samoa		13								
Unspecified	28	2	11	11	13	12	12	12	26	7
Total	30	15	25	22	40	20	35	61	48	34

IRAN

	2001	2002	2003	2004	2005	2006	2007	2008	2010
EPPO									
Bosnia & Herzeg.		9							
France									17
Germany		1	7						
Moldova									1
Russian Fed.	42	393	646	2051	1462				2822
Turkey	3			9	1				801
Ukraine									18
Uzbekistan	17		1						
Africa									
Central Afric. Rep.									5
Americas									
Aruba									75
Asia									
Malaysia		1							
Near East and Central Asia (except EPPO)									
Afghanistan	123	525	821	115	1334				2986
Armenia	20	26	128	218	285				48
Azerbaijan	4111	3571	5357	1876	1013				3924
Bahrain			1						6
Georgia					2				
Iraq	11859	1516	49016	14107	24629				251656
Kazakhstan	58	71	49	21	10				205
Kuwait	2	19	30	312	8				130
Pakistan	17		144		5				42
Qatar		1	117						20
Saudi Arabia									254
Syrian Arab Rep.									39
Tajikistan	22								9
Turkmenistan	4		17	29					365
United Arab Emi.	40	3	411	6	12				1427
Oceania									
Unspecified						136898	139045	86821	
Total	18319	8138	58748	20748	30766	138904	141052	88829	18319

MALAYSIA

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
EPPO										
Netherlands										0
Africa										
Americas										
Asia										
Brunei Darussalam	607	375	294	152	113	60	59	33	11	20
China	111	14	3							1
China, Hong Kong SAR		42	11					3	6	12
Indonesia	27	3	23	63	20	8	11	2053	14	25
Maldives										3
Singapore	14360	16503	18559	19208	19408	22347	22851	24464	26421	28574
Sri Lanka										0
Thailand	1	9	2			36	8	7	5	807
Near East and Central Asia (except EPPO)										
Bahrain									117	

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Qatar									202	181
Saudi Arabia										35
United Arab Emirates								153	1511	1740
Oceania										
Total	15106	16946	18892	19423	19541	22451	22929	26713	28287	31398

MEXICO

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
EPPO										
Austria	94	2663								
Germany		2								
Netherlands	1	1			1					13
Africa										
Americas										
Canada	1350	897	96	1269	7719	10796	4617	6610	9034	22355
Cuba	99	36		14	20	5		137		
El Salvador	1113		69				352	488		7079
Guatemala	28	27								
Mexico (?)		87743								
USA	768813	756924	903219	893841	893027	1020702	1067677	1035458	1127223	1480118
Asia										
Japan								35	41	52
Near East and Central Asia (except EPPO)										
Oceania										
Guam	9									
Unspecified				1						
Total	771507	848293	903384	895125	900767	1031503	1072646	1042728	1136298	1509617

NEW ZEALAND

years	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
EPPO										
UK									1	2
Africa										
Americas										
Canada							24	75	105	245
USA				9	8	3	10	1	75	217
Asia										
China	15	3	14	1	1	11	45	74	66	38
China, Hong Kong SAR	8	20	8	6	19	68	75	81	101	91
Japan	15	4	15	96	359	254	322	42	190	530
Malaysia								1	1	
Singapore	0	34	51	30	29	20	11	11	15	17
Thailand						4	16	3	3	6
Near East and Central Asia (except EPPO)										
United Arab Emirates						6	16	2	10	
Oceania										
American Samoa	0	14	10	6	7	4	3	1	2	1
Australia	186	602	1456	1645	3314	3545	1810	837	2024	2469
Cook Islands	5	5	5	25	23	18	12	7	14	10
Fiji	52	112	88	68	109	71	79	72	2	25
French Polynesia	37	20	58	26	20	72	150	81	99	162
Kiribati			0	1						0
New Caledonia	4	7	58	48	17	69	0	140	225	219
Niue		0		0	1	1	1	1	0	0
Samoa	5	11	13	12	11	9	8	4	9	16
Solomon Islands										0
Tonga	0	3	1	2	2	6	1		1	1
Tuvalu			0							
Vanuatu		2	1	2	7	11	11	6	3	
Wallis and Futuna	4	8	6	2	1	4	9	10	13	16
Total	331	845	1784	1979	3928	4176	2603	1449	2959	4065

PERU

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
EPPO										
France							1			
Germany								0		
Spain							12			9
Africa										
None										
Americas										
Brazil									1	5
Canada			7							
Chile		62								
Panama				1	1	0	1		2	
Asia										
Japan							23			
Near East and Central Asia (except EPPO)										
Oceania										
None										
Unspecified					2	7		26	5	

SENEGAL

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
EPPO										
Belgium	224	259	103	45	9	71	716	1147	329	285
Bulgaria									0	
France	1831	1988	2862	4312	5678	6063	5568	4522	3152	2568
Germany		341	303			38	1227	2012	1884	2535
Italy			47	118	89	36	192	250	152	226
Netherlands	58	84	91	374	12	122	35	665	1065	1299
Spain						0	4			
UK			3	209	621	645	1116	1300	953	1672
Africa										
Côte d'Ivoire				2						
Gambia								5		
Guinea										0
Guinea-Bissau									0	
Liberia				8	19					
Mauritania					4					
Americas										
Asia										
China					8					
Near East and Central Asia (except EPPO)										
Oceania										
Unspecified									1	
Total	2113	2672	3409	5068	6440	6975	8858	9901	7536	8585

SYRIA

	2001	2002	2004	2006	2007	2008	2009	2010
EPPO								
Albania								414
Bulgaria	352	112						
France				228				
Germany		654						
Jordan			471	4880	7620	238	894	537
Poland								206
Moldova								742
Romania	336	415	2054	2832	10676			764
Russian Fed.	4827	3046	561	2607	1490			3650
Serbia								142
Serbia & Montenegro		454						
Slovakia								113
FYR Macedonia								158
Turkey	5	9	3280			294		128
Ukraine		50	10697				183	3046
Africa								
Malawi						50		

	2001	2002	2004	2006	2007	2008	2009	2010
Americas								
Aruba							449	2013
Asia								
Near East and Central Asia (except EPPO)								
Bahrain	2313	1789	3051	2583	26086	1116	3765	1958
Egypt							151	78
Georgia								104
Iraq			4899	99163	569086	66474	253644	151179
Kuwait	6709	11793	18165	45446	14319	13603	32240	34602
Lebanon	66	151	10968	90544	17758	66952	115	10964
Oman	1248	3946	3191	11411	7147	14579	21442	8508
Qatar	3267	4407	5117	8747	2395	3577	7726	4069
Saudi Arabia	140505	156599	175868	636242	337719	177287	279352	174637
United Arab Emirat.	8256	15009	9526	26016	17766	23332	27193	9464
Oceania								
None								
Unspecified			12096	74086	26873		120	143
	167884	198434	259944	1004785	1038935	367502	627274	407619

THAILAND

years	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
EPPO										
Belgium					4					
Czech Republic						1				
Denmark				0						
Faroe Islands					2					
France				0	12					
Germany			0							
Malta					2					
Netherlands						3				
Spain							3			
Africa										
Americas										
Asia										
Bangladesh					0	1	0	1	1	1
China							1		0	
China, Hong Kong SAR						2	3		6	24
Indonesia										1
Japan			23	37	20		25	1		
Lao						1				1
Malaysia	102	277	1090	3515	982	778	272	116	134	
Maldives								0	1	1
Myanmar	8					30	2	1		
Singapore	359	389	781	2485	1914	1427	447	315	338	400
Near East and Central Asia (except EPPO)										
Bahrain				0						
Oman							0			
Saudi Arabia						2				
Oceania										
Australia								0	14	
Fiji		31								
New Zealand									16	
Total	469	697	1894	6037	2936	2245	753	434	510	428

USA

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
EPPO										
Belgium	2640	2747	1493	1284	172					
France	418		97	3	74	34		21		
Germany	55			1	1					
Italy	34			6				6		
Netherlands		586	1842	1105	304	4	3	4		
Portugal	52									
Russian Fed.							2	2		

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Spain	74									
Sweden			29							
Switzerland	2		12				20			
Turkey				22		9				
Ukraine								8		
UK	207	476	320	393						
Africa										
South Africa							20			
Americas										
Antigua and Barbuda	42	34	14	30	50	21	48	29	27	12
Aruba	1	1					1	8	18	56
Bahamas	535	758	840	823	887	958	760	755	703	879
Barbados	4	22	7	25	87	39	57	129	46	96
Bermuda	9		42	61	130	106	103	117	119	116
British Virgin Isl.							2		18	46
Canada	165930	157522	163111	174695	169704	119177	205217	205168	180494	190547
Cayman Islands		20				10		46	172	114
Chile						1				
Colombia								30	39	36
Costa Rica			172		23	8	3			
Cuba				7						
Dominica			108				4			
Dominican Rep.		22		16			67	32	6	3
El Salvador		17								3
Mexico	32303	18114	11687	30871	14338	19691	34949	43793	57918	29085
Montserrat		130								
Guatemala	65	260	112							358
Haiti						4	10	11		
Honduras	630	719								
Jamaica	3	18	114	60	24	8	34	59	43	5
Netherl. Antilles	2	23	20	23	21	22	58	128	203	121
Nicaragua	897	17						18		
Panama							2		5	28
St Kitts & Nevis					1		1	4	3	
Saint Lucia					3	3	2	5	2	16
St Vincent and the Grenadines					2					1
Suriname										5
Trinidad & Tob.	19	9	32	165	209	100	153	204	210	586
Turks & Caicos			13	107	64	31	23	71	60	150
Venezuela		11								
Asia										
China	17	291	182	29	18	40	34	22	5	15
China, Hong Kong SAR	24			15		17	20		1	94
India					1					
Japan	1242	486	343	2443	1936	3769	3653	1044	844	1731
Malaysia			1							
Philippines		0						2	2	
Rep. of Korea	71		110	37	118	132	53	101	114	90
Singapore	4		7	3	6		9			41
Thailand								23		
Near East and Central Asia (except EPPO)										
Kuwait									9	
Pakistan				56						
Qatar										2
Oceania										
Australia	204						4	11		45
French Polynes.								23	2	
New Zealand	2		5				0			
Total	205486	182283	180713	212280	188173	144184	245312	251874	241063	224281

Annex 7. Non-EPPO countries in various categories in relation to their production and exports of tomato fruit

"Recent exports" - Having exported tomato fruit to the EPPO region according to 2010 data (from Table 2.4a)

Argentina	China	Ethiopia	Iraq	Mexico	Senegal
Armenia	Colombia	Georgia	Japan	Montenegro	South Africa
Bangladesh	Costa Rica	Guatemala	Kenya	Namibia	Suriname
Barbados	Côte d'Ivoire	Guyana	Korea	New Zealand	Syria
Brazil	Dominican Rep.	Iceland	Lebanon	Panama	Tadjikistan
Canada	Ecuador	India	Malaysia	Peru	Thailand
Chile	Egypt	Iran	Mayotte	Saudi Arabia	USA

"History of trade to EPPO" - Having exported tomato fruit to the EPPO region in 1986-2009 (irrespective of whether they also exported in 2010) (from Table 2.4b)

Antigua and Barbuda	Chile	Ghana	Korea Rep.	Niger	Sri Lanka	United Arab Emirates
Argentina	China	Guam	Lebanon	Nigeria	Sudan	Uruguay
Armenia	Colombia	Guatemala	Libya	Oman	Suriname	USA
Australia	Comoros	Guinea	Madagascar	Pakistan	Swaziland	Venezuela
Barbados	Congo	Guyana	Malaysia	Panama	Syria	Viet Nam
Botswana	Costa Rica	Honduras	Mauritania	Paraguay	Tajikistan	Yemen
Brazil	Côte d'Ivoire	Iceland	Mauritius	Peru	Tanzania	Zambia
Brunei Darussalam	Cuba	India	Mexico	Philippines	Thailand	Zimbabwe
Burkina Faso	Dominican Rep.	Indonesia	Mongolia	Saudi Arabia	Trinidad and Tobago	
Cameroon	Ecuador	Iran	Montenegro	Senegal	Turkmenistan	
Canada	Egypt	Jamaica	Namibia	Sierra Leone	Turks and Caicos	
Cayman Islands	Ethiopia	Japan	Netherlands Antilles	Singapore	Uganda	
	Georgia	Kenya	New Zealand	South Africa		

"Main exporting countries" - 30 largest exporting countries for tomato fruit in 2010 (from Table 2.1)

Afghanistan	Canada	Egypt	Iran	Nicaragua	Syria
Argentina	China	Ethiopia	Lebanon	Pakistan	Tajikistan
Australia	Costa Rica	Guatemala	Malaysia	Saudi Arabia	United Arab Emirates
Brazil	Dominican Rep.	Honduras	Mexico	Senegal	USA
Burkina Faso	Ecuador	India	New Zealand	South Africa	Yemen

"Main exporting countries to other region than their own region" - History of export outside their region, as per tables in Annex 4 (including countries having exported to the EPPO region in 2010 (in italics), for which exporting countries' data may not be available (from Table 2.4a)

Argentina	China	Georgia	Japan	*Namibia*	Sri Lanka
Armenia	Colombia	Ghana	Kenya	New Zealand	Suriname
Australia	Costa Rica	Guatemala	Korea Rep.	*Panama*	Syria
Bangladesh	*Côte d'Ivoire*	Guyana	Lebanon	Peru	Tanzania
Barbados	*Dominican Rep.*	*Iceland*	Malaysia	*Saudi Arabia*	*Tajikistan*
Brazil	*Ecuador*	India	*Mayotte*	Senegal	*Thailand*
Canada	*Egypt*	Iran	Mexico	Singapore	USA
Chile	Ethiopia	*Iraq*	*Montenegro*	South Africa	

"Main producing countries" - The 30 largest non-EPPO producing countries (in volume) in 2010 (Table 1.2a and Table A1-2 in Annex 1)

Argentina	Chile	Ghana	Iraq	Mexico	Sudan
Australia	China	Guatemala	Japan	Nigeria	Syrian Arab Rep.
Brazil	Colombia	India	Kenya	Pakistan	Tajikistan
Cameroon	Cuba	Indonesia	Korea Rep.	Saudi Arabia	Turkmenistan
Canada	Egypt	Iran	Lebanon	South Africa	USA

"Recent increase in production" - Showing a significant increase in production of tomato (volume) over the global average (from Table 1.2b). Only countries with a production >1000 t were retained

Armenia	Guatemala	Madagascar	Sri Lanka
Bangladesh	Guyana	Malaysia	Syria
Brazil	Honduras	Mozambique	Tajikistan
Cameroon	Iceland	Pakistan	Tanzania
Cape Verde	India	Puerto Rico	Turkmenistan
China	Indonesia	Rwanda	Uganda
Colombia	Iran	Saudi Arabia	Zimbabwe
Congo	Kenya	Senegal	
Costa Rica	Kuwait	Sierra Leone	
Ghana	Liberia	Somalia	

Annex 8. Modes of transport of tomato fruit to the EU in 2008-2012 (from Eurostat, in tonnes)
Note: data was not available for all countries having exported tomato fruit to the EPPO region in 1986-2010

Table A6.1 From the Americas and the Caribbean (from North to South)

Canada	USA	Mexico	Costa Rica		Panama	Dominican Republic	
Sea	Air	Air	Sea	Air	Sea	Sea	Air
6 (FR 2008) 17 (UK 2009)	0 (DE 2009) 48 (NL 2012)	0 (ES 2012) 0 (IT 2008) 85 (NL 2012)	20 (FR 2010) 9 (FR 2011) 127 (FR 2012)	5 (FR 2012)	10 (FR 2009) 16 (FR 2010) 2 (FR 2011)	49 (FR 2008) 247 (FR 2009) 872 (FR 2010) 860 (FR 2011) 1202 (FR 2012)	82 (FR 2008) 63 (FR 2009) 91 (FR 2010) 14 (FR 2011) 6 (FR 2012) 0 (NL 2009) 0 (NL 2011)

Colombia		Suriname	Peru	Brazil	Chile
Sea	Air	Road	Air	Air	Air
120 (FR 2008) 28 (FR 2009) 65 (FR 2010) 9 (FR 2011) 0 (NL 2009) 1 (NL 2010) 0 (NL 2011)	1 (FR 2008) 1 (FR 2009) 1 (LU 2009) 0 (NL 2009)	2 (FR 2010) 7 (FR 2011) 10 (FR 2012)	0 (DE 2009) 0 (DE 2010) 0 (DE 2011) 4 (ES 2010) 0 (FR 2008)	0 (PT 2010)	36 (ES 2008) 57 (ES 2009)

Table A6.2 From Asia (from East to West)

China	Viet-Nam	Thailand	Bangladesh		India
Sea	Sea	Air	Air	Road	Air
14 (DE 2010) 0 (SE 2010)	3 (UK 2008)	4 (DE 2008) 0 (DE 2009) 0 (DE 2010) 0 (DE 2011) 0 (DE 2012) 0 (DK 2008) 0 (DK 2009) 0 (DK 2010) 1 (DK 2011) 0 (DK 2012) 0 (NL 2009) 0 (NL 2012) 0 (SE 2009)	1 (FR 2008)	3 (DK 2009) 5 (FR 2008) 14 (FR 2009) 23 (FR 2010) 29 (FR 2011) 11 (FR 2012)	0 (DE 2009) 0 (FR 2011) 1 (FR 2012) 3 (UK 2010)

Table A6.3 From the Near East (from South to North) (non-EPPO countries only)

Saudi Arabia	Lebanon		Syria		
Air	Road	Air	Sea	Road	Air
1 (NL 2010)	206 (RO 2008)	2 (CY 2008) 0 (FR 2010) 0 (FR 2011) 0 (FR 2012)	38 (BG 2009) 2 (CY 2010) 6 (UK 2008) 6 (UK 2009) 3 (IT 2010) 50 (IT 2011) 15 (NL 2008)	37 (AT 2010) 74 (BG 2008) 2330 (BG 2009) 31 (BG 2010) 67 (HU 2010) 55 (HU 2011) 67 (PL 2009) 166 (PL 2010) 33 (PL 2011) 61 (PL 2012) 2414 (RO 2008) 2027 (RO 2009) 776 (RO 2010) 226 (RO 2011) 21 (RO 2012) 52 (SE 2010) 150 (SK 2010)	0 (CY 2010) 0 (FR 2012) 0 (SE 2010) 3 (SE 2011)

Table A6.4 From Africa (non-EPPO countries only)

Egypt					Ethiopia	Kenya	South Africa
Unknown	Sea	Rail	Road	Air	Air	Air	Sea
1398 (NL 2008)	42 BE 2008)	21 (DK 2008)	5 (BE 2008)	0 (AT 2012)	6 (BE 2011)	0 (BE 2010)	0 (BE 2008)
1258 (NL 2009)	13 (CY 2008)	11 (DK 2009)	0 (BE 2009)	50 (BE 2008)	0 (BE 2012)	0 (DE 2012)	37 (UK 2010)
	0 (CY 2009)		12 (BE 2011)	5 (BE 2009)	0 (NL 2010)	1 (UK 2009)	
	1 (CY 2010)		25 (BG 2010)	6 (BE 2010)			
	22 (DE 2008)		22 (BG 2011)	13 (BE 2011)			
	11 (DE 2009)		40 (DK 2008)	0 (BE 2012)			
	33 (DE 2010)		88 (DK 2009)	0 (CY 2008)			
	2 (DE 2011)		455 (DK 2010)	0 (CY 2010)			
	12 (DK 2011)		300 (DK 2011)	15 (DE 2009)			
	497 (UK 2008)		177 (DK 2012)	4 (DE 2010)			
	661 (UK 2009)		34 (HU 2008)	0 (DE 2011)			
	350 (UK 2010)		2 (HU 2010)	0 (DE 2012)			
	125 (UK 2011)		3 (HU 2011)	6 (DK 2008)			
	128 (UK 2012)		130 (NL 2008)	20 (FR 2008)			
	3 (Italy 2008)		27 (NL 2009)	19 (FR 2009)			
	48 (IT 2009)		681 (NL 2010)	14 (FR 2010)			
	65 (IT 2010)		614 (NL 2011)	6 (FR 2011)			
	21 (IT 2012)		478 (NL 2012)	12 (UK 2009)			
	1 (MT 2009)			6 (UK 2010)			
	364 (NL 2008)			14 (UK 2011)			
	772 (NL 2009)			0 (LT 2009)			
	1994 (NL 2010)			0 (NL 2008)			
	1466 (NL 2011)			0 (NL 2009)			
	1692 (NL 2012)			20 (NL 2010)			
	11 (RO 2009)			63 (NL 2011)			
	31 (RO 2010)			0 (NL 2012)			
	15 (RO 2011)			0 (SE 2009)			
	21 (SI 2008)			0 (SE 2012)			
	41 (SI 2010)						
	17 (SI 2011)						

Senegal			
Unknown	Sea	Road	Air
2689 (NL 2008)	2318 (BE 2008)	87 (BE 2008)	9 (BE 2008)
2308 (NL 2009)	1353 (BE 2009)	4 (BE 2009)	14 (BE 2009)
1300 (NL 2011)	2853 (BE 2010)	11 (BE 2010)	5 (BE 2011)
866 (NL 2012)	1354 (BE 2011)	117 (BE 2011)	0 (DE 2009)
	417 (BE 2012)	1192 (BE 2012)	1 (ES 2008)
	2213 (FR 2008)	55 (FR 2008)	9 (FR 2008)
	2006 (FR 2009)	463 (UK 2012)	6 (FR 2010)
	2202 (FR 2010)	98 (NL 2010)	
	2075 (FR 2011)	1515 (NL 2011)	
	1887 (FR 2012)	1807 (NL 2012)	
	1349 (UK 2008)		
	841 (UK 2009)		
	1773 (UK 2010)		
	2828 (UK 2011)		
	2832 (UK 2012)		
	98 (NL 2008)		
	367 (NL 2009)		
	1818 (NL 2010)		
	433 (NL 2011)		
	82 (NL 2012)		

Annex 9. Outcome of Step 1 and Step 2: organisms not retained for further consideration

Detailed explanations of reasons' codes are given under 7.4.1. Details of reasons are indicated in the Step 1 List and Step 2 List (for those marked with*). This list does not include pests that were not retained during the selection for Step 3.

NO1: No possibility for transport on the fruit pathway
NO2: Pest occurring in all geographic areas of EPPO
NO3: Tomato is not a host
NO4: Other reasons
NO5: Not possible to analyse

Pest name	Type	Taxonomic details	Reason
1. Acalymma sp.	I	Coleoptera: Chrysomelidae	NO3
2. Aceria kuko	I	Prostigmata: Eriophyidae	NO1,3
3. Acizzia sp.	I	Hemiptera: Psyllidae	NO3
4. Acrotylus insubricus	I	Orthoptera: Acrididae	NO 1, 2
5. Aculops lycopersici	A	Acari: Eriophyidae	NO2
6. Acyrthosiphon pisum	I	Hemiptera: Aphididae	NO2
7. Agallia spp.	I	Hemiptera: Cicadellidae	NO4
8. Agriolimax sp.	G	Sygmurethra: Agriolimacidae	NO4
9. Agriotes lineatus	I	Coleoptera: Elateridae	NO1
10. Agromyza spp.	I	Diptera: Agromyzidae	NO4
11. Agrotis ipsilon	I	Lepidoptera: Noctuidae	NO2
12. Agrotis segetum	I	Lepidoptera: Noctuidae	NO2
13. Agrotis spp.	I	Lepidoptera: Noctuidae	NO4
14. Alfalfa mosaic virus	V	Bromoviridae: alfamovirus	NO2
15. Allonemobius spp.	I	Orthoptera: Gryllidae	NO4
16. Alternaria brassicae	F	Ascomycetes	NO2
17. Alternaria solani (see A. tomatophila)	F	Ascomycetes	NO2
18. Alternaria tomatophila	F	Ascomycetes	NO2
19. Altica sp.	I	Coleoptera: Chrysomelidae	NO4
20. Amaranthus albus	P	Plant	NO1, 2
21. Amaranthus blitoides	P	Plant	NO1, 2
22. Amblydromalus limonicus	A	Acari: Phytoseiidae	NO4
23. Anaphothrips dubius	I	Thysanoptera: Thripidae	NO4
24. Andean potato latent virus	V	Tymoviridae: tymovirus	NO3
25. Andrector sp. (= Cerotoma sp?)	I	Coleoptera: Chrysomelidae	NO5
26. Anomala spp.	I	Coleoptera: Scarabaeidae	NO5
27. Anthrenus sp.	I	Coleoptera: Dermestidae	NO4
28. Aphis craccivora	I	Hemiptera: Aphididae	NO2
29. Aphis fabae	I	Hemiptera: Aphididae	NO2
30. Aphis frangulae, A. nasturtii, Aulacorthum circumflexum, Myzus ascanicus, M. certus, M. ornatus, Rhopalosipmonimus latysiphon, Smynthurodes betae	I	Hemiptera: Aphididae	NO2
31. Aphis gossypii	I	Hemiptera: Aphididae	NO2
32. Aphis sp.	I	Hemiptera: Aphididae	NO4
33. Arhyssus spp.	I	Rhopalidae	NO4
34. Aridius bifasciatus	I	Coleoptera: Corticariidae	NO4
35. Arma custos	I	Hemiptera: Pentatomidae	NO4
36. Arracacha virus B oca strain	V	Secoviridae: nepovirus	NO2
37. Arterus sp.	I	Coleoptera: Curculionidae	NO4
38. Aspergillus (Emericella) nidulans	F	Ascomycetes	NO3,4
39. Aspergillus flavus	F	Ascomycetes	NO2
40. Aspergillus fumigatus	F	Ascomycetes	NO2,4
41. Aspergillus niger	F	Ascomycetes	NO2
42. Atherigona sp.	I	Diptera: Muscidae	NO4
43. Atractomorpha sinensis	I	Orthoptera: Acrididae	NO1
44. Atta laevigata	I	Hymenoptera: Formicidae	NO1
45. Atta sexdens rubropilosa	I	Hymenoptera: Formicidae	NO1
46. Aulacorthum (Acyrthosiphon) solani	I	Hemiptera: Aphididae	NO2
47. Aureobasidium sp.	F	Ascomycetes	NO4
48. Autographa gamma	I	Lepidoptera: Noctuidae	NO2
49. Autographa sp.	I	Lepidoptera: Noctuidae	NO4
50. Bactrocera sp.	I	Diptera: Tephritidae	NO4
51. Beet curly top virus	V	Geminiviridae: curtovirus	NO2,4
52. Belonolaimus longicaudatus	N	Tylenchida: Belonolaimidae	NO1
53. Berginus bahamicus	I	Coleptera: Mycetophagidae	NO3
54. Blaniulus guttulatus	M	Diplopoda: Julida: Blaniulidae	NO1,2,3
55. Blissus sp.	I	Hemiptera: Lygaeidae	NO3
56. Botrytis cinerea (= Botryotinia fuckeliana, Sclerotinia fuckeliana)	F	Ascomycetes	NO2
57. Brachycaudus helichrysi	I	Hemiptera: Aphididae	NO2
58. Brachyiulus pusillus	M	Diplopoda: Julida: Julidae	NO4
59. Brachytrupes membranaceus	I	Orthoptera: Gryllidae	NO1
60. Bradysia sp.	I	Diptera: Sciaridae	NO1,2,4
61. Bremia lactucae	C	Pseudofungi: Oomycetes	NO2
62. Brevicoryne brassicae	I	Hemiptera: Aphididae	NO2
63. Brevipalpus obovatus	A	Acari: Tenuipalpidae	NO2
64. broad bean wilt virus	V	Secoviridae: Fabavirus	NO2
65. Burkholderia cepacia	B	Burkholderiales: Burkholderiaceae	NO2
66. Caliothrips phaseoli	I	Thysanoptera: Thripidae	NO3,4
67. Calocoris sp.	I	Hemiptera: Miridae	NO4
68. Calorisca tenera	I	Hemiptera: Miridae	NO4
69. Calyptella campanula	F	Agaricomycetes	NO4
70. Capitophorus elaeagni	I	Hemiptera: Aphididae	NO2
71. Cenchrus echinatus	P	Plant	NO1
72. Ceratocapsus sp.	I	Hemiptera: Miridae	NO4
73. Ceratothrips revelatus	I	Thysanoptera: Thripidae	NO3
74. Cerodontha australis	I	Diptera: Agromyzidae	NO3,4
75. Chaetocnema sp.	I	Coleoptera: Chrysomelidae	NO4
76. Chalcodermus sp.	I	Coleoptera: Curculionidae	NO4
77. Chalcoplastis amabilis	I	Coleoptera: Chrysomelidae	NO5
78. Chamomilla recutita	P	Plant	NO1,2
79. Chenopodium album	P	Plant	NO1,2
80. Chenopodium murale	P	Plant	NO1,2
81. Chromatomyia horticola	I	Diptera: Agromyzidae	NO2
82. Chrysobothris sp.	I	Coleoptera: Buprestidae	NO3
83. Chrysodeixis chalcites	I	Lepidoptera: Noctuidae	NO2
84. Chrysodeixis sp.	I	Lepidoptera: Noctuidae	NO4
85. Circulifer (Eutettix, Neoaliturus) tenellus	I	Hemiptera: Cicadellidae	NO2
86. Circulifer opacipennis	I	Hemiptera: Cicadellidae	NO2
87. Cirsium arvense	P	Plant	NO1,2
88. Cladosporium sp.	F	Ascomycetes	NO4
89. Clavibacter michiganensis	B	Actinobacteria: Microbacteriaceae	NO4
90. Clepsis sp.	I	Lepidoptera: Tortricidae	NO4
91. Clivina rugithorax (australiasae)	I	Coleoptera: Carabidae	NO3,4
92. Cochliobolus lunatus (Curvularia lunata)	F	Ascomycetes	NO2
93. Colaspis sp.	I	Coleoptera: Chrysomelidae	NO1,3
94. Colletotrichum coccodes	F	Ascomycetes	NO2
95. Colletotrichum lycopersici	F	Ascomycetes	NO5
96. Colletotrichum sp.	F	Ascomycetes	NO4
97. Columbonirvana sp.	I	Hemiptera: Cicadellidae	NO4
98. Commelina benghalensis	P	Plant	NO1
99. Condica mobilis	I	Lepidoptera: Noctuidae	NO3
100. Coniontis sp.	I	Coleoptera: Tenebrionidae	NO4
101. Conotrachelus sp.	I	Coleoptera: Curculionidae	NO3
102. Contarinia lycopersici	I	Diptera: Cecidomyiidae	NO1
103. Contarinia maculipennis	I	Diptera: Cecidomyiidae	NO1
104. Conyza canadensis	P	Plant	NO1,2
105. Coriolus (Trametes, Polyporus) versicolor	F	Basidiomycetes	NO4
106. Cornu aspersum (Helix aspersa)	G	Sigmurethra: Helicidae	NO2
107. Cortinicara hirtalis	I	Coleoptera: Latriidae	NO1,3
108. Corynespora melongena	F	Ascomycetes	NO5
109. Corynoptera spp.	I	Diptera: Sciaridae	NO1

Pest name	Type	Taxonomic details	Reason
110. Corythucha ciliata	I	Hemiptera: Tingidae	NO3
111. Cryptamorpha desjardinsi	I	Coleoptera: Silvanidae	NO1,3,4
112. Cryptophlebia sp.	I	Lepidoptera: Tortricidae	NO3
113. Cucumber mosaic virus	V	Bromoviridae: cucumovirus	NO2
114. Cuscuta campestris	P	Plant	NO2,1
115. Cuscuta japonica	P	Plant	NO1
116. Cyclocephala sp.	I	Coleoptera: Scarabaeidae	NO1
117. Cyperus rotundus	P	Plant	NO1
118. Cyrtopeltis sp.	I	Hemiptera: Miridae	NO4
119. Datura stramonium	P	Plant	NO1,2
120. Delia florilega	I	Diptera: Anthomyiidae	NO1
121. Delia platura	I	Diptera: Anthomyiidae	NO1,2
122. Dendroctonus mexicanus	I	Coleoptera: Scolytidae	NO1
123. Dendroctonus sp.	I	Coleoptera: Scolytidae	NO4,1
124. Deraeocoris sp.	I	Hemiptera: Miridae	NO3
125. Diabolocatantops axillaris	I	Orthoptera: Acrididae	NO1
126. Diabrotica balteata	I	Coleoptera: Chrysomelidae	NO1
127. Diabrotica sp.	I	Coleoptera: Chrysomelidae	NO1
128. Diaphania indica	I	Lepidoptera: Crambidae	NO3
129. Diaphania sp.	I	Lepidoptera: Crambidae	NO3
130. Dichroplus elongatus	I	Orthoptera: Acrididae	NO1
131. Dictyonota tricornis	I	Hemiptera: Tingidae	NO2,4
132. Dicyphus hesperus	I	Hemiptera: Miridae	NO1
133. Dicyphus sp.	I	Hemiptera: Miridae	NO4
134. Dicyphus tamaninii	I	Hemiptera: Miridae	NO1
135. Didymella lycopersici (Aschochyta lycopersici)	F	Ascomycetes	NO2
136. Dieuches armatipes	I	Hemiptera: Rhyparochromidae	NO1,3
137. Digitaria ciliaris	P	Plant	NO1
138. Digitaria sp.	P	Plant	NO1
139. Diodia teres	P	Plant	NO1
140. Diplognatha gagates	I	Coleoptera: Scarabaeidae	NO1
141. Diplotaxis sp.	I	Coleoptera: Scarabaeidae	NO4
142. Dipropus sp.	I	Coleoptera: Elateridae	NO4
143. Discus rotundatus	G	Sigmurethra: Discidae	NO1,2, 3,4
144. Disonycha sp.	I	Coleoptera: Chrysomelidae	NO4
145. Ditylenchus destructor	N	Tylenchida: Anguinidae	NO1,3
146. Ditylenchus sp.	N	Tylenchida: Anguinidae	NO4
147. Dociostaurus maroccanus	I	Orthoptera: Acrididae	NO1,2
148. Dolichodorus heterocephalus	N	Tylenchida: Dolichoridae	NO1
149. Drycothaea sp.	I	Coleoptera: Cerambicydae	NO4
150. Drymaria cordata	P	Plant	NO1
151. Dyscinetus spp.	I	Coleoptera: Scarabaeidae	NO4
152. Dysdercus andreae	I	Hemiptera: Pyrrhocoridae	NO3
153. Dysmicoccus boninsis	I	Hemiptera: Pseudococcidae	NO3
154. Dysmicoccus brevipes	I	Hemiptera: Pseudococcidae	NO1,3
155. Echinochloa colona	P	Plant	NO1,2
156. Echinochloa crus-galli	P	Plant	NO1
157. Eleodes sp.	I	Coleoptera: Tenebrionidae	NO1
158. Emex spinosa	P	Polygonaceae	NO1
159. Emilia sonchifolia	P	Asteraceae	NO1
160. Empoasca decipiens	I	Hemiptera: Cicadellidae	NO2
161. Empoasca sp.	I	Hemiptera: Cicadellidae	NO4
162. Epicaerus sp.	I	Coleoptera: Curculionidae	NO4
163. Epitris fuscula	I	Coleoptera: Chrysomelidae	NO1
164. Epitris subcrinata	I	Coleoptera: Chrysomelidae	NO1
165. Epitrix fasciata	I	Coleoptera: Chrysomelidae	NO1
166. Epitrix hirtipennis	I	Coleoptera: Chrysomelidae	NO1
167. Epitrix sp.	I	Coleoptera: Chrysomelidae	NO1
168. Eragrostis cilianensis	P	Cyperales	NO1
169. Erwinia caratovora subsp. atroseptica (Pectobacterium atrosepticum)	B	Enterobacteriales: Enterobacteriaceae	NO2
170. Erwinia carotovora	B	Enterobacteriales: Enterobacteriaceae	NO4
171. Erysiphe (Golovinomyces) cichoracearum	F	Ascomycetes	NO2
172. Erysiphe (Golovinomyces) orontii	F	Ascomycetes	NO2
173. Erysiphe cruciferarum (= E. communis)	F	Ascomycetes	NO2
174. Eunemobius sp.	I	Orthoptera: Gryllidae	NO4
175. Euphrytus sp.	I	Coleoptera: Chrysomelidae	NO4
176. Frankliniella sp.	I	Thysanoptera: Thripidae	NO4
177. Fumaria officinalis	P	Plant	NO1
178. Fusarium chlamydosporum (F. fusarioides)	F	Ascomycetes	NO1
179. Fusarium oxysporum	F	Ascomycetes	NO2
180. Fusarium oxysporum f.sp. lycopersici	F	Ascomycetes	NO2
181. Fusarium solani	F	Ascomycetes	NO2
182. Fusarium sp.	F	Ascomycetes	NO4
183. Fusarium sulphureum (Gibberella cyanogena)	F	Ascomycetes	NO2
184. Galinsoga parviflora	P	Asteraceae	NO2,1
185. Gibberella avenacea	F	Ascomycetes	NO2
186. Gibberella fujikuroi	F	Ascomycetes	NO2
187. Glischrochilus quadrisignatus	I	Coleoptera: Nitidulidae	NO1
188. Globodera tabacum	N	Tylenchida: Heteroderidae	NO1
189. Glomerella cingulata (Colletotrichum gloeosporioides)	F	Ascomycetes	NO2
190. Gnathotrichus sp.	I	Coleoptera: Scolytidae	NO4
191. Gnathotrichus sulcatus	I	Coleoptera: Scolytidae	NO4
192. Gnorimoschema sp.	I	Lepidoptera: Gelechiidae	NO4
193. Gonocephalum carpentariae	I	Coleoptera: Tenebrionidae	NO1
194. Gonocephalum sp.	I	Coleoptera: Tenebrionidae	NO1
195. Graphania sp.	I	Lepidoptera: Noctuidae	NO3,4
196. Gryllotalpa gryllotalpa	I	Orthoptera: Gryllotalpidae	NO1,2
197. Hadula trifolii	I	Lepidoptera: Noctuidae	NO2
198. Helicotylenchus dihystera	N	Tylenchida: Hoplolaimidae	NO1
199. Helicotylenchus multinctus	N	Tylenchida: Hoplolaimidae	NO1
200. Helicotylenchus pseudorobustus	N	Tylenchida: Hoplolaimidae	NO1
201. Helicoverpa sp.	I	Lepidoptera: Noctuidae	NO4
202. Heliothis sp.	I	Lepidoptera: Noctuidae	NO4
203. Heliothrips haemorrhoidalis	I	Thysanoptera: Thripidae	NO2
204. Heliotropium europaeum	P	Boraginaceae	NO1,2
205. Helminthosporium carposaprum	F	Ascomycetes	NO5
206. Helminthosporium carposporum	F	Ascomycetes	NO4
207. Hemiceras sp.	I	Lepidoptera: Notodontidae	NO4
208. Hemicycliophora arenaria	N	Tylenchida: Criconematidae	NO1
209. Hemicycliophora poranga	N	Tylenchida: Criconematidae	NO1
210. Hemicycliophora typica de Man	N	Tylenchida: Criconematidae	NO1
211. Heraeus sp.	I	Hemiptera: Rhyparochromidae	NO4
212. Heterodera glycines	N	Tylenchida: Heteroderidae	NO1
213. Heterodera zeae	N	Tylenchida: Heteroderidae	NO1
214. Heterogaster urticae	I	Hemiptera: Lygaeidae	NO4
215. Heterogastridium pycnidioideum	F	Basidiomycetes	NO1,3
216. Heteropsylla sp.	I	Hemiptera: Psyllidae	NO3,4
217. Hibiscus trionum	P	Plant	NO1
218. Hirschmanniella oryzae	N	Tylenchidae: Pratylenchidae	NO1
219. Holotrichia (Phyllophaga) serrata	I	Coleoptera: Scarabaeidae	NO1
220. Homoeosoma sp.	I	Lepidoptera: Pyralidae	NO4
221. Hoplandrothrips sp.	I	Thysanoptera: Thripidae	NO4
222. Hoplolaimus indicus	N	Tylenchida: Hoplolaimidae	NO1
223. Hoplolaimus seinhorsti	N	Tylenchida: Hoplolaimidae	NO1
224. Humicola fuscoatra	F	Ascomycetes: Chaetomiaceae	NO3
225. Hylastes cunicularius	I	Coleoptera: Scolytidae	NO3,4
226. Hylastes sp.	I	Coleoptera: Scolytidae	NO3,4

Pest name	Type	Taxonomic details	Reason
227. Hypera brunneipennis	I	Coleoptera: Curculionidae	NO3
228. Inopus rubriceps	I	Diptera: Stratyomiidae	NO1
229. Ipomoea triloba	P	Plant	NO1
230. Ips integer	I	Coleoptera: Scolytidae	NO3,4
231. Ips lecontei	I	Coleoptera: Scolytidae	NO3,4
232. Ips pini	I	Coleoptera: Scolytidae	NO3,4
233. Ips sp.	I	Coleoptera: Scolytidae	NO3,4
234. Ischaemum rugosum	P	Poaceae	NO1
235. Lactuca serriola	P	Plant	NO1
236. Laestadia minuscula	F	Ascomycetes	NO4
237. Lampethusa sp.	I	Hemiptera: Miridae	NO4
238. Lehmannia valentiana	G	Sigmurethra: Limacidae	NO2
239. Lestodiplosis sp.	I	Diptera: Cecidomyiidae	NO4
240. Leucinodes sp.	I	Lepidoptera: Crambidae	NO4
241. Leveillula (Oidiopsis) taurica	F	Ascomycota: Erysiphale: Erysiphaceae	NO2
242. Liogenys quadridens	I	Coleoptera: Scarabaeidae	NO1
243. Liriomyza sp.	I	Diptera: Agromyzidae	NO4
244. Lolium temulentum	P	Plant	NO1
245. Longidorus elongatus	N	Dorylaimida: Longidoridae	NO1
246. Longidorus pisi	N	Dorylaimida: Longidoridae	NO1
247. Longidorus sp.	N	Dorylaimida: Longidoridae	NO1
248. Loxigilla noctis	Bird	Bird	NO1
249. Lygus gemellatus	I	Hemiptera: Miridae	NO2
250. Macrolophus caliginosus	I	Hemiptera: Miridae	NO4
251. Macrolophus costalis	I	Hemiptera: Miridae	NO4
252. Macrolophus melanotoma	I	Hemiptera: Miridae	NO4
253. Macrolophus nubilus	I	Hemiptera: Miridae	NO4
254. Macrolophus pygmaeus	I	Hemiptera: Miridae	NO4
255. Macrolophus sp.	I	Hemiptera: Miridae	NO4
256. Macrolopus praeclarus	I	Hemiptera: Miridae	NO4
257. Macroposthonia onoensis	N	Tylenchida: Criconematidae	NO1
258. Macroposthonia xenoplax	N	Tylenchida: Criconematidae	NO1
259. Macrosiphum euphorbiae	I	Hemiptera: Aphididae	NO2
260. Macrosiphum sp.	I	Hemiptera: Aphididae	NO4
261. Macrotylus sp.	I	Hemiptera: Miridae	NO4
262. Mamestra brassicae	I	Lepidoptera: Noctuidae	NO2
263. Manduca sp.	I	Lepidoptera: Sphingidae	NO4
264. Maruca vitrata (M. testulalis, Crochiphora testulalis)	I	Lepidoptera: Crambidae	NO3
265. Medonia deromecoides	I	Coleoptera: Elateridae	NO1,3
266. Megapenthes sp.	I	Coleoptera: Elateridae	NO1
267. Melanagromyza spp.	I	Diptera: Agromyzidae	NO4
268. Melanoplus sanguinipes	I	Orthoptera: Acrididae	NO1
269. Melanotus sp.	I	Coleoptera: Elateridae	NO1
270. Meligethes aeneus	I	Coleoptera: Nitidulidae	NO2
271. Meloidogyne acronea	N	Tylenchida: Meloidogynidae	NO1
272. Meloidogyne arenaria	N	Tylenchida: Meloidogynidae	NO1
273. Meloidogyne brasilensis	N	Tylenchida: Meloidogynidae	NO1
274. Meloidogyne ethiopica	N	Tylenchida: Meloidogynidae	NO1
275. Meloidogyne exigua	N	Tylenchida: Meloidogynidae	NO1
276. Meloidogyne fallax	N	Tylenchida: Meloidogynidae	NO1
277. Meloidogyne floridensis	N	Tylenchida: Meloidogynidae	NO1
278. Meloidogyne hapla	N	Tylenchida: Meloidogynidae	NO1
279. Meloidogyne incognita	N	Tylenchida: Meloidogynidae	NO1
280. Meloidogyne javanica	N	Tylenchida: Meloidogynidae	NO1
281. Meloidogyne mayaguensis	N	Tylenchida: Meloidogynidae	NO1
282. Meloidogyne minor	N	Tylenchida: Meloidogynidae	NO1
283. Meloidogyne phaseoli	N	Tylenchida: Meloidogynidae	NO1
284. Meloidogyne pisi	N	Tylenchida: Meloidogynidae	NO1
285. Meloidogyne polycephannulata	N	Tylenchida: Meloidogynidae	NO1
286. Meloidogyne sp.,	N	Tylenchida: Meloidogynidae	NO1
287. Meloidogyne thamesi	N	Tylenchida: Meloidogynidae	NO1
288. Mesocriconema curvatum	N	Tylenchida: Criconematidae	NO1
289. Metachroma sp.	I	Coleoptera: Chrysomelidae	NO4
290. Metoponium sp.	I	Coleoptera: Tenebrionidae	NO4
291. Micrapate sp.	I	Coleoptera: Bostrichidae	NO4
292. Mimosa diplotricha	P	Plant	NO1
293. Mimosa pudica	P	Plant	NO1

Pest name	Type	Taxonomic details	Reason
294. Monilinia fructigena	F	Ascomycetes	NO2
295. Mucor sp.	F	Ascomycetes	NO4
296. Murdannia nudiflora	P	Plant	NO1
297. Mycovellosiella fulva (Passalora fulva)	F	Ascomycetes	NO2
298. Mylabris occidentalis	I	Coleoptera: Meliodae	NO4
299. Myochrous sp.	I	Coleoptera: Chrysomelidae	NO4
300. Mythimna (Pseudaletia, Leucania) unipuncta	I	Lepidoptera: Noctuidae	NO2
301. Myzus ascalonicus	I	Hemiptera: Aphididae	NO2
302. Myzus ornatus	I	Hemiptera: Aphididae	NO2
303. Myzus persicae	I	Hemiptera: Aphididae	NO2
304. Myzus sp.	I	Hemiptera: Aphididae	NO5
305. Nematospora lycopersici	F	Ascomycetes	NO4
306. Neoconocephalus affinis	I	Orthoptera: Tettigonidae	NO3
307. Neocurtilla hexadactyla	I	Orthoptera: Gryllotalpidae	NO1
308. Neoleucinodes sp.	I	Lepidoptera: Crambidae	NO5
309. Neoparema sp.	I	Hemiptera: Rhyparochromidae	NO4
310. Nesidiocoris callani	I	Hemiptera: Miridae	NO4
311. Nesosteles sp.	I	Hemiptera: Cicadellidae	NO3
312. Nezara viridula	I	Hemiptera: Pentatomidae	NO2
313. Nicandra physalodes	P	Solanaceae	NO1
314. Noctua pronuba	I	Lepidoptera: Noctuidae	NO2
315. Nodonota sp.	I	Coleoptera: Chrysomelidae	NO3
316. Nysius sp.	I	Hemiptera: Lygaeidae	NO4
317. Oebalus insularis	I	Hemiptera: Pentatomidae	NO3
318. Onychiurus fimetarius	E	Collembola: Onychiuridae	NO4
319. Orobanche (Phelipanche) ramosa	P	Plant	NO2
320. Orobanche cernua	P	Plant	NO2
321. Orobanche sp.	P	Plant	NO4
322. Oxygrylius	I	Coleoptera: Scarabaeidae	NO4
323. Ozophora hispaniola	I	Hemiptera: Rhyparochromidae	NO4
324. Panonychus sp.	A	Acari: Tetranychidae	NO4
325. Pantoea agglomerans	B	Enterobacteria: Enterobacteriaceae	NO2,4
326. Paragonatas divergens	I	Hemiptera: Rhyparochromidae	NO3
327. Paratrichodorus minor	N	Dorylaimida: Trichodoridae	NO1
328. Pareuchaetes insulata	I	Lepidoptera: Arctiidae	NO4
329. Paropsis charybdis	I	Coleoptera: Chrysomelidae	NO3,4
330. Parthenicus sp.	I	Hemiptera: Miridae	NO4
331. Parthenium hysterophorus	P	Asteraceae	NO1
332. Pectinophora gossypiella	I	Lepidoptera: Gelechiidae	NO2
333. Penicillium chrysogenum (P. notatum)	F	Ascomycetes	NO2
334. Penicillium citrinum	F	Ascomycetes	NO2
335. Penicillium digitatum	F	Ascomycetes	NO2
336. Penicillium expansum	F	Ascomycetes	NO2
337. Penicillium italicum	F	Ascomycetes	No2
338. Penicillium oxalicum	F	Ascomycetes	NO2
339. Penicillium sp.	F	Ascomycetes	NO2
340. Pennisetum sp.	P	Poaceae	NO1
341. pepper mild tigré virus	V	Geminiviridae: begomovirus	NO4
342. Phalaenodes glycinae	I	Lepidoptera: Noctuidae	NO4
343. Pheloconus sp.	I	Coleoptera: Curculionidae	NO4
344. Phenacoccus sp.	I	Hemiptera: Pseudococcidae	NO4
345. Philaenus spumarius	I	Hemiptera: Cercopidae	NO2
346. Phthorimaea operculella	I	Lepidoptera: Gelechiidae	NO2
347. Phthorimaea sp.	I	Lepidoptera: Gelechiidae	NO5
348. Phyllanthus urinaria	P	Euphorbiaceae	NO1
349. Phytocoris sp.	I	Hemiptera: Miridae	NO4
350. Phytophthora cinnamomi	C	Pseudofungi: Oomycetes	NO2
351. Phytophthora infestans	C	Pseudofungi: Oomycetes	NO2
352. Phytophthora melongenae	C	Pseudofungi: Oomycetes	NO4
353. Phytophthora nicotianae	C	Pseudofungi: Oomycetes	NO2
354. Pityophthorus sp.	I	Coleoptera: Scolytidae	NO3,4

Pest name	Type	Taxonomic details	Reason
355. Planococcus citri	I	Hemiptera: Pseudococcidae	NO2
356. Planococcus sp.	I	Hemiptera: Pseudococcidae	NO4
357. Platynota sp.	I	Lepidoptera: Tortricidae	NO4
358. Platypus sp.	I	Coleptera: Platypodidae	NO3
359. Plutella xylostella	I	Lepidoptera: Plutellidae	NO2
360. Polydrusus sp.	I	Coleoptera: Curculionidae	NO4
361. Polygonum aviculare	P	Plant	NO1
362. Polymerus testaceipes	I	Hemiptera: Miridae	NO4
363. Portulaca oleracea	P	Plant	NO1
364. Potato deforming mosaic virus (Argentina)	V	Unclassified	NO1,3
365. potato leafroll virus	V	Luteoviridae: luteovirus	NO2
366. potato virus X	V	Alphaflexiviridae: potexvirus	NO2
367. potato virus Y	V	Potyviridae: potyvirus	NO2
368. Pratylenchus	N	Tylenchida: Pratylenchidae	NO1
369. Pratylenchus alleni	N	Tylenchida: Pratylenchidae	NO1
370. Pratylenchus brachyurus	N	Tylenchida: Pratylenchidae	NO1
371. Pratylenchus goodeyi	N	Tylenchida: Pratylenchidae	NO1
372. Pratylenchus penetrans	N	Tylenchida: Pratylenchidae	NO1
373. Pratylenchus zeae	N	Tylenchida: Pratylenchidae	NO1
374. Pseudococcus sp.	I	Hemiptera: Pseudococcidae	NO4
375. Pseudococcus viburni	I	Hemiptera: Pseudococcidae	NO2
376. Pseudomonas solanacearum	B	Pseudomonales: Pseudomonadaceae	NO4
377. Pseudomonas spp.	B	Pseudomonales: Pseudomonadaceae	NO4
378. Pseudomonas syringae	B	Pseudomonales: Pseudomonadaceae	NO4
379. pseudomonas syringae pv tomato	B	Pseudomonales: Pseudomonadaceae	NO2
380. Pseudomonas syringae pv. pustulens	B	Pseudomonales: Pseudomonadaceae	NO4
381. Pseudomonas syringae pv. syringae	B	Pseudomonales: Pseudomonadaceae	NO2
382. Pseudopachybrachius basalis	I	Hemiptera: Lygaeidae	NO3,4
383. Ptochiomera nodosa	I	Hemiptera: Lygaeidae	NO3
384. Pyrenochaeta (Phoma) terrestris	F	Ascomycetes	NO2,1
385. Pythium aphanidermatum	C	Pseudofungi: Oomycetes	NO2
386. Pythium butleri	C	Pseudofungi: Oomycetes	NO4
387. Pythium debaryanum	C	Pseudofungi: Oomycetes	NO2
388. Pythium deliense	C	Pseudofungi: Oomycetes	NO1
389. Pythium spp.	C	Pseudofungi: Oomycetes	NO4
390. Radopholus similis	N	Tylenchida: Pratylenchidae	NO1
391. Reuteroscospus sp.	I	Hemiptera: Miridae	NO4
392. Rhagoletis ochraspis	I	Diptera: Tephritidae	NO5
393. Rhagoletis sp.	I	Diptera: Tephritidae	NO4
394. Rhizobium radiobacter (=Agrobacterium tumefaciens)	B	Rhizobiales: Rhizobiaceae	NO2
395. Rhizobium rhizogenes	B	Rhizobiales: Rhizobiaceae	NO2
396. Rhizoecus falcifer	I	Hemiptera: Pseudococcidae	NO2
397. Rhizopus stolonifer	F	Zygomycetes	NO2
398. Rhopalosiphum maidis	I	Hemiptera: Aphididae	NO2
399. Rhopalosiphum rufiabdominale	I	Hemiptera: Aphididae	NO1
400. Richardia brasiliensis	P	Plant	NO1
401. Rotylenchulus reniformis	N	Tylenchida: Hoplolaimidae	NO1
402. Rotylenchus parvus	N	Tylenchida: Hoplolaimidae	NO1
403. Rumex acetosa	P	Plant	NO1
404. Salsola vermiculata	P	Plant	NO1
405. Saltator albicollis	Bird	Bird	NO1
406. Sarocladium (Acremonium) strictum	F	Ascomycetes	NO 1, 2
407. Scapteriscus borellii	I	Orthoptera: Gryllotalpidae	NO1
408. Scapteriscus didactylus	I	Orthoptera: Gryllotalpidae	NO1
409. Scapteriscus sp.	I	Orthoptera: Gryllotalpidae	NO1
410. Scapteriscus variegatus	I	Orthoptera: Gryllotalpidae	NO1
411. Scapteriscus vicinus	I	Orthoptera: Gryllotalpidae	NO1
412. Schizomyia sp.	I	Diptera: Cecidomyiidae	NO4
413. Sclerotinia sclerotiorum	F	Ascomycetes	NO2

Pest name	Type	Taxonomic details	Reason
414. Scolopocerus sp.	I	Hemiptera: Coreidae	NO4
415. Scolypopa (Ricania) australis	I	Hemiptera: Ricaniidae	NO4
416. Scutellonema brachyurus	N	Tylenchida: Hoplolaimidae	NO1
417. Scutellonema bradys	N	Tylenchida: Hoplolaimidae	NO1
418. Scutellonema cavenessi	N	Tylenchida: Hoplolaimidae	NO1
419. Scutellonema clathricaudatum	N	Tylenchida: Hoplolaimidae	NO1
420. Scutigerella immaculata	M	Symphyla: Scutigerellida: Scutigerellidae	NO1
421. Setaria faberi	P	Plant	NO1
422. Setaria viridis	P	Plant	NO1
423. Sicyos angulatus	P	Plant	NO1
424. Sida acuta	P	Plant	NO1
425. Sinoe capsana	I	Lepidoptera: Gelechiidae	NO4
426. Smynthurodes betae	I	Hemiptera: Aphididae	NO2
427. Solanum carolinense	P	Solanaceae	NO1
428. Solanum nigrum	P	Solanaceae	NO1
429. Spilomicrus sp.	I	Hymenoptera: Diapriinae	NO4
430. Spodoptera exigua	I	Lepidoptera: Noctuidae	NO2
431. Spodoptera sp.	I	Lepidoptera: Noctuidae	NO4
432. Spongospora subterranea f.sp. subterranea	Pr	Phytomycea: Plasmodiophoraceae	NO1
433. Stemphylium sp.	F	Ascomycetes	NO4
434. Stephanopachys sp.	I	Coleoptera: Bostrychidae	NO3
435. Synedrella nodiflora	P	Plant	NO1
436. Tana paulseni	I	Diptera: Stratomiidae	NO1
437. Tarsonemus sp.	A	Acari: Tarsonemidae	NO4
438. Tetranychus spp.	I	Acari: Tetranychidae	NO4
439. Tetranychus tellarius	A	Acari: Tetranychidae	NO4
440. Tetranychus urticae	A	Acari: Tetranychidae	NO2
441. Teuchothrips disjunctus	I	Thysanoptera: Thripidae	NO3
442. Thanetophorus cucumeris (Rhizoctonia solani)	F	Basidiomycetes	NO2
443. Thielaviopsis basicola (Chalara elegans)	F	Ascomycetes	NO2
444. Thrips sp.	I	Thysanoptera: Thripidae	NO4
445. Thrips tabaci	I	Thysanoptera: Thripidae	NO2
446. tobacco mild green mosaic virus	V	Virgaviridae: tobamovirus	NO4
447. tobacco mosaic virus	V	Virgaviridae: tobamovirus	NO2
448. tobacco rattle virus	V	Virgaviridae. Tobravirus	No2
449. Tomarus sp.	I	Coleoptera: Scarabaeidae	NO4
450. tomato bunchy top viroid	V	Pospiviroidae: pospiviroid	NO4
451. tomato double virus streak	N/A	N/A	NO4
452. tomato mosaic virus	V	Virgaviridae: tobamovirus	NO2
453. tomato yellow dwarf virus	V	Geminiviridae: begomovirus	NO4
454. tomato yellow net	V	?	NO5
455. tomato yellow whitefly virus	V	?	NO5
456. Tomolips sp.	I	Coleoptera: Curculionidae	NO4
457. Trialeurodes vaporariorum	I	Hemiptera: Aleyrodidae	NO2
458. Tribulus terrestris	P	Plant	NO1
459. Trichodorus sp.	N	Dorylaimida: Trichoridae	NO1
460. Trichoplusia ni	I	Lepidoptera: Noctuidae	NO2
461. Trichoplusia sp.	I	Lepidoptera: Noctuidae	NO4
462. Trichothecium roseum	F	Ascomycetes	NO2
463. Tridax procumbens	P	Plant	NO1
464. Tropidosteptes sp.	I	Hemiptera: Miridae	NO4
465. Trypodendron signatum	I	Coleoptera: Scolytidae	NO4
466. Tylenchorhynchus brassicae	N	Tylenchida: Dolichodoridae	NO1
467. Tylenchorhynchus clarus	N	Tylenchida: Dolichodoridae	NO1
468. Tylenchorhynchus claytoni	N	Tylenchida: Dolichodoridae	NO1
469. Typhaea stercorea	I	Mycetophagidae	NO1,3
470. Urochloa sp.	P	Poaceae	NO1
471. Veronicella sp.	P	Plant	NO1
472. Verticillium albo-atrum	F	Ascomycetes	NO2
473. Verticillium dahliae	F	Ascomycetes	NO2
474. Vespula germanica	I	Hymenoptera: Vespidae	NO2
475. Xanthomonas campestris	B	Xanthomonadales: Xanthomonadaceae	NO4
476. Xanthomonas spp.	B	Xanthomonadales:	NO4

Pest name	Type	Taxonomic details	Reason
		Xanthomonadaceae	
477. Xestia c-nigrum (=X. adela)	I	Lepidoptera: Noctuidae	NO2
478. Xiphinema basiri	N	Dorylaimida: Longidoridae	NO1
479. Xiphinema ifacolum	N	Dorylaimida: Longidoridae	NO1
480. Xiphinema index	N	Dorylaimida: Longidoridae	NO1
481. Xyleborus sp.	I	Coleoptera: Scolytidae	NO1,3

Pest name	Type	Taxonomic details	Reason
482. Xyphon sp.	I	Hemiptera: Cicadellidae	NO4
483. Yuccaborus sp.	I	Coleoptera: Dryophthoridae	NO4
484. Zonocerus variegatus	I	Orthoptera: Pyrgomorphidae	NO1
485. Zygogramma sp.	I	Coleoptera: Chrysomelidae	NO4
486. Zygotylenchus guevarai	N	Tylenchida: Pratylenchidae	NO1,2
487. Apterothrips secticornis*	I	Thysanoptera: Thripidae	NO3

Annex 10. Outcome of Step 1 and Step 2. Organisms present in at least 3 EPPO countries but possibly not in all geographical areas of the EPPO region

For the organisms listed below, records were found at Step 1 or at Step 2 (marked with *) for at least three EPPO countries, and the organism was not considered further (i.e. they may have a wider distribution, but this has not been investigated). Details on the distribution are given in the Step 1 List or Step 2 List. For organisms identified at Step 1, the table below indicates for which part of the EPPO region no country record was found (although there may have been records for non-EPPO countries in the same region). The list below only reflects a few sources, and the organisms may be more widespread in the EPPO region, or have reached the limit of their possible spread in the EPPO region. When an organism was present in more than 3 countries, no further information was sought, and it may also be that the organisms listed here are not pests of tomato, or may not be transported on tomato fruit. Organisms considered as being present in all geographic areas of the EPPO region (North Africa, Central Asia, Europe, Near East) are listed in Annex 9 (code NO2).

Types of pests (see Table 7.2 for more details):

A	Arachnida
B	Bacteria
Bird	Aves
C	Chromista
E	Entognatha
F	Fungi
G	Gastropoda
I	Insecta
M	Myriapoda
N	Nematoda
P	Plantae
V	Viruses and viroids

Pest name	Type	Taxonomic details	Geographic areas of EPPO region for which no record found
1. Acherontia atropos	I	Lepidoptera: Noctuidae	North Africa, Central Asia
2. Adelphocoris lineolatus	I	Hemiptera: Miridae	North Africa
3. Agrotis exclamationis	I	Lepidoptera: Noctuidae	North Africa
4. Aleurothrixus floccosus	I	Hemiptera: Aleyrodidae	Central Asia
5. Alternaria alternata	F	Ascomycetes	Central Asia
6. Alternaria brassicicola	F	Ascomycetes	Central Asia
7. Alternaria dauci	F	Ascomycetes	Central Asia
8. Alternaria japonica	F	Ascomycetes	Central Asia
9. Alternaria tenuissima*	F	Ascomycetes	Identified at Step 2 (search not complete)
10. Aphelenchoides ritzemabosi	N	Tylenchida: Aphelenchoidae	North Africa, Near East
11. Aspidiotus destructor	I	Hemiptera: Diaspididae	North Africa, Near East
12. Aster yellows phytoplasma	B	Acholeplasmatales: Acholeplasmataceae	North Africa, Central Asia
13. Asymmetrasca decedens	I	Hemiptera: Cicadellidae	North Africa, Central Asia
14. beet western yellows virus	V	Luteoviridae: Polerovirus	North Africa, Central Asia
15. Candidatus Phytoplasma asteris	B	Acholeplasmatales: Acholeplasmataceae	North Africa, Near East, Central Asia
16. Candidatus Phytoplasma trifolii	B	Acholeplasmatales: Acholeplasmataceae	North Africa
17. Capitophorus hippophaes*	I	Hemiptera: Aphididae	Identified at Step 2 (search not complete)
18. Cavariella aegopodii	I	Hemiptera: Aphididae	North Africa
19. Cercospora physalidis*	F	Ascomycetes	Identified at Step 2 (search not complete)
20. Chilo suppressalis	I	Lepidoptera: Crambidae	North Africa, Central Asia, Near East
21. Citrus exocortis viroid	V	Viroids: Pospiviroidae	Central Asia
22. Cochliobolus spicifer (Bipolaris spicifera)*	F	Ascomycetes	Identified at Step 2 (search not complete)
23. Colletotrichum dematium	F	Ascomycetes	North Africa, Central Asia, Near East
24. Colombian datura virus	V	Potyviridae: potyvirus	North Africa, Central Asia, Near East
25. Columnea latent viroid*	V	Pospiviridae: pospiviroid	Identified at Step 2 (search not complete)
26. Corynespora cassiicola*	F	Ascomycetes	Identified at Step 2 (search not complete)
27. Cylindrocarpon didymum (Ramularia/Didymaria didyma)*	F	Ascomycetes	Identified at Step 2 (search not complete)
28. Diaporthe phaseolorum (D. p. f. sp. sojae)*	F	Ascomycetes	Identified at Step 2 (search not complete)
29. Diaporthe phaseolorum var. sojae	F	Ascomycetes	North Africa
30. Dickeya dianthicola	B	Enterobacteriales: Enterobacteriaceae	North Africa, Central Asia, Near East
31. Dickeya zeae (Erwinia chrysanthemi pv. zea)	B	Enterobacteriales: Enterobacteriaceae	North Africa, Central Asia
32. Dolycoris penicillatus*	I	Hemiptera: Pentatomidae	Identified at Step 2 (search not complete)
33. Duponchelia fovealis	I	Lepidoptera: Crambidae	Central Asia
34. Eggplant mottled dwarf virus	V	Rhabdoviridae: nucleorhabdovirus	Central Asia
35. Empoasca solani	I	Hemiptera: Cicadellidae	North Africa
36. Epicoccum nigrum (E. purpurascens)	F	Ascomycetes	Central Asia, North Africa
37. Erwinia carotovora subsp. carotovora	B	Enterobacteriales: Enterobacteriaceae	Central Asia
38. Erwinia chrysanthemi	B	Enterobacteriales: Enterobacteriaceae	Central Asia
39. Erwinia rhapontici	B	Enterobacteriales: Enterobacteriaceae	Central Asia, North Africa
40. Euscelis plebeja	I	Hemiptera: Cicadellidae	North Africa, Central Asia, Near East
41. Euzophera osseatella	I	Lepidoptera: Pyralidae	Central Asia
42. Frankliniella intonsa	I	Thysanoptera: Thripidae	North Africa, Central Asia
43. Frankliniella schultzei	I	Thysanoptera: Thripidae	Central Asia (only few records in other areas)
44. Frankliniella tritici	I	Thysanoptera: Thripidae	North Africa, Central Asia, Near East
45. Fusarium acuminatum (Gibberella acuminata)	F	Ascomycetes	North Africa, Central Asia
46. Fusarium equiseti	F	Ascomycetes	North Africa, Central Asia
47. Fusarium merismoides*	F	Ascomycetes	Identified at Step 2 (search not complete)
48. Fusarium oxysporum f. sp. radici-lycopersici	F	Ascomycetes	Central Asia
49. Fusarium pallidoroseam*	F	Ascomycetes	Identified at Step 2 (search not complete)
50. Geotrichum candidum	F	Ascomycetes	North Africa
51. Glomerella acutata	F	Ascomycetes	North Africa, Central Asia

Pest name	Type	Taxonomic details	Geographic areas of EPPO region for which no record found
52. Glomerella gossypii (G. rufomaculans)	F	Ascomycetes	Near East, part of Europe
53. Glomerella lagenarium (Colletotrichum orbiculare)	F	Ascomycetes	North Africa, Central Asia
54. Halyomorpha halys*	I	Hemiptera: Pentatomidae	Identified at Step 2 (search not complete)
55. Hauptidia maroccana	I	Hemiptera: Cicadellidae	Central Asia, Near East
56. Heliothis dipsacea (=H. viriplaca)	I	Lepidoptera: Noctuidae	North Africa
57. Heliothis nubigera	I	Lepidoptera: Noctuidae	Central Asia
58. Heliothis peltigera	I	Lepidoptera: Noctuidae	Central Asia, North Africa
59. Helminthosporium solani	F	Ascomycetes	Central Asia
60. Hercinothrips bicinctus	I	Thysanoptera: Thripidae	North Africa, Central Asia, Near East
61. Hercinothrips femoralis	I	Thysanoptera: Thripidae	North Africa, Central Asia
62. Howardia biclavis *	I	Hemiptera: Diaspididae	Identified at Step 2 (search not complete)
63. Hyalesthes obsoletus	I	Hemiptera: Cixiidae	Central Asia, Near East, North Africa
64. Hydraecia micacea	I	Lepidoptera: Noctuidae	Central Asia, North Africa, Near East
65. Hymenia (Spoladea) recurvalis	I	Lepidoptera: Pyralidae	Central Asia
66. Hyperomyzus lactucae	I	Hemiptera: Aphididae	Central Asia
67. Jacobiasca (Empoasca) lybica	I	Hemiptera: Cicadellidae	Central Asia
68. Lacanobia oleracea	I	Lepidoptera: Noctuidae	North Africa, North Africa
69. Leptoglossus oppositus	I	Hemiptera: Coreidae	Central Asia, North Africa, Near East
70. Limothrips cerealium	I	Thysanoptera: Thripidae	Central Asia
71. Liorhyssus hyalinus	I	Hemiptera: Rhopalidae	Central Asia, North Africa (only few records in other areas, probably more widespread than found))
72. Lipaphis erysimi	I	Hemiptera: Aphididae	Central Asia
73. Liriomyza bryoniae	I	Diptera: Agromyzidae	Central Asia
74. Liriomyza strigata	I	Diptera: Agromyzidae	Central Asia, Near East
75. Lucerne enation virus	V	Rhabdoviridae: rhabdovirus (unassigned)	Near East, Central Asia
76. Lygaeus civilis (L. pandurus, Spilostethus pandurus)	I	Hemiptera: Pentatomidae	Central Asia
77. Macrophomina phaseolina	F	Ascomycetes	Central Asia
78. Melanagromyza cunctans	I	Diptera: Agromyzidae	Central Asia, North Africa
79. Metcalfa pruinosa	I	Hemiptera: Flatidae	North Africa, Central Asia, Near East
80. Microcephalothrips abdominalis*	I	Thysanoptera: Thripidae	Identified at Step 2 (search not complete)
81. Monographella cucumerina	F	Ascomycetes	North Africa, Central Asia
82. Mucor mucedo	F	Ascomycetes	Central Asia
83. Mucor piriformis	F	Ascomycetes	Central Asia, Near East, North Africa
84. Mucor racemosus	F	Ascomycetes	Central Asia, North Africa, Near East
85. Mycosphaerella tassiana	F	Ascomycetes	North Africa, Central Asia
86. Myrothecium roridum	F	Ascomycetes	Central Asia, North Africa
87. Nasonovia ribisnigri	I	Hemiptera: Aphididae	North Africa
88. Nesidiocoris (Cyrtopeltis) tenuis	I	Hemiptera: Miridae	Central Asia, part of Europe
89. Nigrospora sphaerica	F	Ascomycetes	Central Asia, Near East, North Africa
90. Nipaecoccus viridis	I	Hemiptera: Pseudococcidae	Europa or Central Asia
91. Nysius huttoni	I	Hemiptera: Lygaeidae	North Africa, Near East, Central Asia
92. Oidium neolycopersici	F	Ascomycetes	North Africa, Central Asia (distribution probably wider than found)
93. Olive latent virus 1	V	Tombusviridae: necrovirus	Central Asia, North Africa
94. Olpidium brassicae	F	Chytridiomycetes	North Africa, Central Asia
95. Orobanche (Phelipanche) aegyptiaca	P	Plant	Central Asia
96. Orobanche crenata	P	Plant	Central Asia, Near East
97. Orthezia insignis	I	Hemiptera: Ortheziidae	Near East, Central Asia
98. Ostrinia nubilalis	I	Lepidoptera: Pyralidae	Central Asia
99. Oxycarenus hyalinipennis	I	Hemiptera: Lygaeidae	Central Asia
100. Parabemisia myricae	I	Hemiptera: Aleyrodidae	Central Asia (few countries in other areas)
101. Parietaria mottle virus	V	Bromoviridae: ilarvirus	Central Asia, North Africa, Near East
102. peanut stunt virus	V	Bromoviridae: cucumovirus	Near East, Central Asia
103. Pelargonium zonate spot virus	V	Bromoviridae: Anulavirus	North Africa, Central Asia, Near East
104. Pentalonia nigronervosa	I	Hemiptera: Aphididae	Central Asia, North Africa
105. Pepper mild mottle virus	V	Virgaviridae: tobamovirus	Central Asia
106. Peridroma saucia	I	Lepidoptera: Noctuidae	Central Asia
107. Pezothrips (Megalurothrips) kellyanus	I	Thysanoptera: Thripidae	North Africa, Central Asia
108. Phenacoccus madeirensis	I	Hemiptera: Pseudococcidae	North Africa, Near East, Central Asia
109. Phenacoccus solenopsis*	I	Hemiptera: Pseudococcidae	Identified at Step 2 (search not complete)
110. Phoma destructiva*	F	Ascomycetes	Identified at Step 2 (search not complete)
111. Phoma sorghina*	F	Ascomycetes	Identified at Step 2 (search not complete)
112. Phomopsis longicolla	F	Ascomycetes	Central Asia, North Africa
113. Phytometra (Trichoplusia) orichalcea	I	Lepidoptera: Noctuidae	Near East, Central Asia
114. Phytophthora cactorum	C	Pseudofungi: Oomycetes	Central Asia, North Africa
115. Phytophthora capsici	C	Pseudofungi: Oomycetes	Central Asia
116. Phytophthora cryptogea	C	Pseudofungi: Oomycetes	Central Asia
117. Phytophthora drechsleri	C	Pseudofungi: Oomycetes	Central Asia
118. Phytophthora erythroseptica var.	C	Pseudofungi: Oomycetes	North Africa, Central Asia, Near East

Pest name	Type	Taxonomic details	Geographic areas of EPPO region for which no record found
erythroseptica			
119. Phytophthora megasperma	C	Pseudofungi: Oomycetes	North Africa, Central Asia, Near East
120. Phytophthora palmivora	C	Pseudofungi: Oomycetes	Central Asia
121. Pinnaspis aspidistrae	I	Hemiptera: Diaspididae	Central Asia (only few records in other areas)
122. Pinnaspis buxi*	I	Hemiptera: Diaspididae	Identified at Step 2 (search not complete)
123. Pinnaspis strachani*	I	Hemiptera: Diaspididae	Identified at Step 2 (search not complete)
124. Planococcus ficus	I	Hemiptera: Pseudococcidae	Central Asia
125. Plasmodiophora brassicae	Pr	Phytomyxea	North Africa
126. Pleospora allii (Stemphylium vesicarium)	F	Ascomycetes	Central Asia, North Africa
127. Pleospora herbarum (Stemphylium botryosum lycopersici)	F	Ascomycetes	North Africa, Near East, Central Asia
128. Pleospora tarda (Stemphylium botryosum)*	F	Ascomycetes	Identified at Step 2 (search not complete)
129. Pleurophorus caesus	I	Coleoptera: Scarabaeidae	Near East
130. Polyphagotarsonemus latus	A	Acari: Tarsonemidae	Central Asia
131. Polyscytalum pustulans	F	Ascomycetes	North Africa, Near East
132. Pseudaulacaspis pentagona	I	Hemiptera: Diaspididae	North Africa, Central Asia
133. Pseudomonas cichorii	B	Pseudomonales: Pseudomonadaceae	North Africa, Central Asia
134. Pseudomonas corrugata	B	Pseudomonales: Pseudomonadaceae	North Africa, Central Asia
135. Pseudomonas fluorescens	B	Pseudomonales: Pseudomonadaceae	Central Asia
136. Pseudomonas marginalis pv. marginalis	B	Pseudomonales: Pseudomonadaceae	Central Asia, Near East, North Africa
137. Pseudomonas syringae pv. atrofaciens	B	Pseudomonales: Pseudomonadaceae	Near East, North Africa
138. Pseudomonas syringae pv. mellea	B	Pseudomonales: Pseudomonadaceae	North Africa, Central Asia, Near East
139. Pseudomonas syringae pv. tabaci	B	Pseudomonales: Pseudomonadaceae	Near East
140. Pseudomonas viridiflava	B	Pseudomonales: Pseudomonadaceae	Central Asia
141. Pyrenochaeta lycopersici	F	Ascomycetes	North Africa, Central Asia
142. Pyrrhia umbra	I	Lepidoptera: Noctuidae	North Africa
143. Pythium arrhenomanes	C	Pseudofungi: Oomycetes	North Africa, Near East, Central Asia
144. Pythium irregulare	C	Pseudofungi: Oomycetes	Central Asia
145. Pythium myriotylum	C	Pseudofungi: Oomycetes	North Africa, Central Asia
146. Pythium spinosum	C	Pseudofungi: Oomycetes	North Africa, Central Asia, Near East
147. Pythium ultimatum	C	Pseudofungi: Oomycetes	Central Asia, North Africa
148. Pythium vexans	C	Pseudofungi: Oomycetes	Near East, North Africa
149. Rhizopus arrhizus (R. oryzae)*	F	Zygomycetes	Identified at Step 2 (search not complete), probably more widely distributed
150. Rhodococcus fascians	B	Actinomycetales: Nocardiaceae	Central Asia, North Africa
151. Ribgrass mosaic virus	V	Vigaviridae: tobamovirus	North Africa, Near East
152. Sceliodes (Daraba) laisalis*	I	Lepidoptera: Crambidae	Identified at Step 2 (search not complete)
153. Sclerotinia minor	F	Ascomycetes	North Africa, Central Asia
154. Sclerotium (=Corticium, Athelia) rolfsii	F	Basidiomycetes	Central Asia
155. Septoria lycopersici	F	Ascomycetes	Central Asia
156. Setosphaeria rostrata*	F	Ascomycetes	Identified at Step 2 (search not complete)
157. Stegobium paniceum	I	Coleoptera: Anobiidae	Central Asia
158. Tarsonemus bilobatus	A	Acari: Tarsonemidae	Near East, North Africa
159. Tarsonemus waitei*	A	Acari: Tarsonemidae	Identified at Step 2 (search not complete)
160. Tetranychus cinnabarinus	A	Acari: Tetranychidae	Central Asia
161. Theba pisana	G	Sigmurethra: Helicidae	Central Asia
162. Thisoicetrinus pterostichus	I	Orthoptera: Acrididae	Europa, North Africa
163. Thrips flavus	I	Thysanoptera: Thripidae	Near East, Central Asia, North Africa
164. Tobacco etch virus	V	Potyviridae: potyvirus	Central Asia
165. Tobacco leaf curl virus	V	Geminiviridae: begomovirus	Near East, Central Asia
166. Tobacco necrosis virus	V	Tombusviridae: necrovirus	North Africa, Central Asia
167. Tobacco streak virus potato strain	V	Bromoviridae: ilarvirus	North Africa, Central Asia
168. tomato apical stunt viroid*	V	Pospiviroidae: Pospiviroid	Identified at Step 2 (search not complete)
169. Tomato aspermy virus	V	Bromoviridae: cucumovirus	North Africa, Near East, Central Asia (distribution probably wider)
170. tomato big bud phytoplasma*	B	Acholeplasmatales: Acholeplasmataceae	Identified at Step 2 (search not complete)
171. Tomato black ring virus	V	Secoviridae: nepovirus	North Africa, Central Asia
172. Tomato bushy stunt virus	V	Tombusviridae: tombusvirus	Possibly Central Asia, Near East
173. Tomato chlorotic dwarf viroid	V	Pospiviroidae: pospiviroid	North Africa, Near East, Central Asia
174. Tomato torrado virus	V	Secoviridae: torradovirus	North Africa, Central Asia, Near East
175. Ulocladium consortiale	F	Ascomycetes	North Africa, Central Asia (distribution probably wider than found)
176. Verticillium nigrescens*	F	Ascomycetes	Identified at Step 2 (search not complete)
177. Verticillium tricorpus*	F	Ascomycetes	Identified at Step 2 (search not complete)
178. Vesiculaphis caricis*	I	Hemiptera: Aphididae	Identified at Step 2 (search not complete)
179. Xanthomonas campestris pv. raphani*	B	Xanthomonadales	Identified at Step 2 (search not complete)
180. Zonitoides arboreus	G	Sigmurethra: Gastrodontidae	Near East, Central Asia, North Africa

Annex 11. Outcome of Step 1 and Step 2: pests that are on the EPPO A1/A2 list of pests recommended for regulations or EPPO List of Invasive Alien Plants, or currently under consideration

Types of pests (see Table 7.2 for more details):

A	Arachnida
B	Bacteria
Bird	Aves
C	Chromista
E	Entognatha
F	Fungi
G	Gastropoda
I	Insecta
M	Myriapoda
N	Nematoda
P	Plantae
V	Viruses and viroids

Pest name	Type	Taxonomic details	EPPO Status	Data supporting that the pest is not considered further
1. Acroptilon repens	P	Plant	IAP List	Not likely to be associated with tomato fruit
2. Ambrosia artemisiifolia	P	Plant	IAP List	Not likely to be associated with tomato fruit
3. Anastrepha suspensa	I	Diptera: Tephritidae	A1	
4. Andean potato mottle virus	V	Secoviridae: comovirus	A1	Tomato is indicated as an artificial host in PQR, but no other record on tomato
5. Anthonomus eugenii	I	Coleoptera: Curculionidae	A1	
6. Bactericera (Paratrioza) cockerelli	I	Hemiptera: Triozidae	A1	Recent EPPO PRA, risk for tomato covered
7. Bactrocera (Dacus) cucurbitae	I	Diptera: Tephritidae	A1	
8. Bactrocera (Dacus) dorsalis	I	Diptera: Tephritidae	A1	
9. Bactrocera cucumis	I	Diptera: Tephritidae	A1	
10. Bactrocera invadens	I	Diptera: Tephritidae	A1	
11. Bactrocera tryoni	I	Diptera: Tephritidae	A1	
12. Bemisia argentifolii	I	Hemiptera: Aleyrodidae	A2	
13. Bemisia tabaci	I	Hemiptera: Aleyrodidae	A2	
14. Cacoecimorpha pronubana	I	Lepidoptera: Tortricidae	A2	
15. Candidatus *Phytoplasma pruni* (Western X disease phytoplasma in PQR)	B	Acholeplasmatales: Acholeplasmataceae	A1	
16. Candidatus *Phytoplasma solani*	B	Acholeplasmatales: Acholeplasmataceae	A2	
17. Candidatus *Phytoplasma ulmi*	B	Acholeplasmatales: Acholeplasmataceae	A1	
18. Ceratitis capitata	I	Diptera: Tephritidae	A2	
19. Ceratitis rosa	I	Diptera: Tephritidae	A1	
20. Chrysanthemum stem necrosis virus	V	Bunyaviridae: tospovirus	A1	
21. Citrus tatter leaf virus	V	Betaflexiviridae: capillovirus	A1	
22. Clavibacter michiganensis subsp. *michiganensis*	B	Actinobacteria: Microbacteriaceae	A2	
23. Clavibacter michiganensis subsp. *sepedonicus*	B	Actinobacteria: Microbacteriaceae	A2	
24. Cyperus esculentus	P	Plant	IAS List	Not likely to be associated with tomato fruit
25. Dacus ciliatus	I	Diptera: Tephritidae	A2	
26. Diabrotica speciosa	I	Coleoptera: Chrysomelidae	A1	
27. Diabrotica undecimpunctata	I	Coleoptera: Chrysomelidae	A1	
28. Dickeya chrysanthemi	B	Enterobacteriales: Enterobacteriaceae	A2	
29. Drosophyla suzukii	I	Diptera: Drosophilidae	A2	
30. Eggplant mosaic virus	V	Tymoviridae: tymovirus	A1	
31. Epitrix cucumeris	I	Coleoptera: Chrysomelidae	A2	Not likely to be associated with tomato fruit: as for other Epitrix spp., eggs, larvae, pupae and diapausing adults in soil. Adults feed on leaves (and are mobile)
32. Epitrix similaris	I	Coleoptera: Chrysomelidae	A2	Not likely to be associated with tomato fruit: as for other Epitrix spp., eggs, larvae, pupae and diapausing adults in soil. Adults feed on leaves (and are mobile)
33. Epitrix tuberis	I	Coleoptera: Chrysomelidae	A1	Not likely to be associated with tomato fruit: as for other Epitrix spp., eggs, larvae, pupae and diapausing adults in soil. Adults feed on leaves (and are mobile)
34. Frankliniella occidentalis	I	Thysanoptera: Thripidae	A2	
35. Globodera pallida	N	Tylenchida: Heteroderidae	A2	
36. Globodera rostochiensis	N	Tylenchida: Heteroderidae	A2	
37. Helicoverpa armigera	I	Lepidoptera: Noctuidae	A2	
38. Helicoverpa zea	I	Lepidoptera: Noctuidae	A1	
39. Heteronychus arator	I	Coleoptera: Scarabaeidae	A1	
40. Impatiens necrotic spot virus	V	Bunyaviridae: tospovirus	A2	
41. Keiferia lycopersicella	I	Lepidoptera: Gelchiidae	A1	Recent EPPO PRA, risk for tomato covered
42. Leptinotarsa decemlineata	I	Coleoptera: Chrysomelidae	A2	
43. Leucinodes orbonalis	I	Lepidoptera: Crambidae	A1	
44. Liberibacter solanacearum (*L. psyllaurous*)	B	Proteobacteria: Alphabroteobacteria	A1	Recent EPPO PRA, risk for tomato covered
45. Liriomyza huidobrensis	I	Diptera: Agromyzidae	A2	
46. Liriomyza sativae	I	Diptera: Agromyzidae	A2	
47. Liriomyza trifolii	I	Diptera: Agromyzidae	A2	
48. Maconellicoccus hirsutus	I	Hemiptera: Pseudococcidae	A1	
49. Meloidogyne chitwoodi	N	Tylenchida: Meloidogynidae	A2	
50. Meloidogyne enterolobii	N	Tylenchida: Meloidogynidae	A2	
51. Nacobbus aberrans	N	Tylenchida: Pratylenchidae	A1	
52. Naupactus (*Graphognathus*) *leucoloma*	I	Coleoptera: Curculionidae	A1	Not likely to be associated with tomato fruit: adults feed on leaves and are mobile; larvae feed on roots and tubers

Pest name	Type	Taxonomic details	EPPO Status	Data supporting that the pest is not considered further
53. Neoleucinodes elegantalis	I	Lepidoptera: Crambidae	Under PRA	
54. Peach rosette mosaic virus	V	Secoviridae: nepovirus	A1	
55. Pepino mosaic virus	V	Alphaflexiviridae: potexvirus	A2	Recent PRA considered by EPPO, risk for tomato covered.
56. Phoma andigena	F	Ascomycetes	A1	
57. Potato black ringspot virus	V	Secoviridae: nepovirus	A1	
58. Potato spindle tuber viroid	V	Pospiviroidae: pospiviroid	A2	
59. Potato yellow dwarf virus	V	Rhabdoviridae: nucleorhabdovirus	A1	
60. Potato yellowing virus	V	Bromoviridae: ilarvirus	A1	
61. Puccinia pittieriana	F	Basidiomycetes	A1	
62. Ralstonia solanacearum	B	Burkholderiales: Burkholderiaceae	A2	
63. Raspberry ringspot virus	V	Secoviridae: nepovirus	A2	
64. Scirtothrips dorsalis	I	Thysanoptera: Thripidae	A2	
65. Solanum elaeagnifolium	P	Solanaceae	A2	Not likely to be associated with tomato fruit
66. Spodoptera (Prodenia) eridania	I	Lepidoptera: Noctuidae	A1	
67. Spodoptera frugiperda	I	Lepidoptera: Noctuidae	A1	
68. Spodoptera littoralis	I	Lepidoptera: Noctuidae	A2	
69. Spodoptera litura	I	Lepidoptera: Noctuidae	A1	
70. Stolbur phytoplasma	B	Acholeplasmatales: Acholeplasmataceae	A2	
71. Synchytrium endobioticum	F	Chytridiomycetes	A2	Tomato is is indicated as an artificial host in PQR, but no other record on tomato
72. Tetranychus evansi	A	Acari: Tetranychidae	A2	
73. Thaumatotibia (Cryptophlebia) leucotreta	I	Lepidoptera: Tortricidae	EPPO PRA under development	
74. Thecaphora solani	F	Basidiomycetes	A1	
75. Thrips palmi	I	Thysanoptera: Thripidae	A1	
76. Tobacco ringspot virus	V	Secoviridae: nepovirus	A2	
77. Tomato chlorosis virus	V	Closteroviridae: crinivirus	A2	
78. Tomato infectious chlorosis virus	V	Closteroviridae: crinivirus	A2	
79. Tomato mottle virus	V	Geminiviridae: begomovirus	A1	
80. Tomato ringspot virus	V	Secoviridae: nepovirus	A2	
81. Tomato spotted wilt virus	V	Bunyaviridae: tospovirus	A2	
82. Tomato yellow leaf curl virus[1]	V	Geminiviridae: begomovirus	A2	
83. Tuta absoluta	I	Lepidoptera: Gelechiidae	A2	
84. Xanthomonas axonopodis (= campestris) pv. vesicatoria	B	Xanthomonadales: Xanthomonadaceae	A2	
85. Xanthomonas axonopodis (=campestris) pv. citri	B	Xanthomonadales: Xanthomonadaceae	A1	
86. Xanthomonas euvesicatoria[*]	B	Xanthomonadales: Xanthomonadaceae	A2	EPPO A2 lists *X. campestris* pv. *vesicatoria* (which has been divided into *X. euvesicatoria*, *X. vesicatoria*, *X. perforans* and *X. gardneri*) (Jones, 2004; Moretti et al., 2009). Considered as being listed on the EPPO A2 list as "*X. campestris* pv. *vesicatoria* and *X. vesicatoria*", and EU (as *X.* c. pv. *vesicatoria*). Transfer from fruit unlikely
87. Xanthomonas gardneri[*]	B	Xanthomonadales: Xanthomonadaceae	A2	*See X. euvesicatoria*
88. Xanthomonas perforans[*]	B	Xanthomonadales: Xanthomonadaceae	A2	*See X. euvesicatoria*
89. Xanthomonas vesicatoria	B	Xanthomonadales: Xanthomonadaceae	A2	*See X. euvesicatoria*
90. Xiphinema americanum	N	Dorylaimida: Longidoridae	A1	Not likely to be associated with tomato fruit: present in soil and roots

[1] A separate entry was made for locality types.
[*] Added at Step 2

Annex 12. List of references in Step 2

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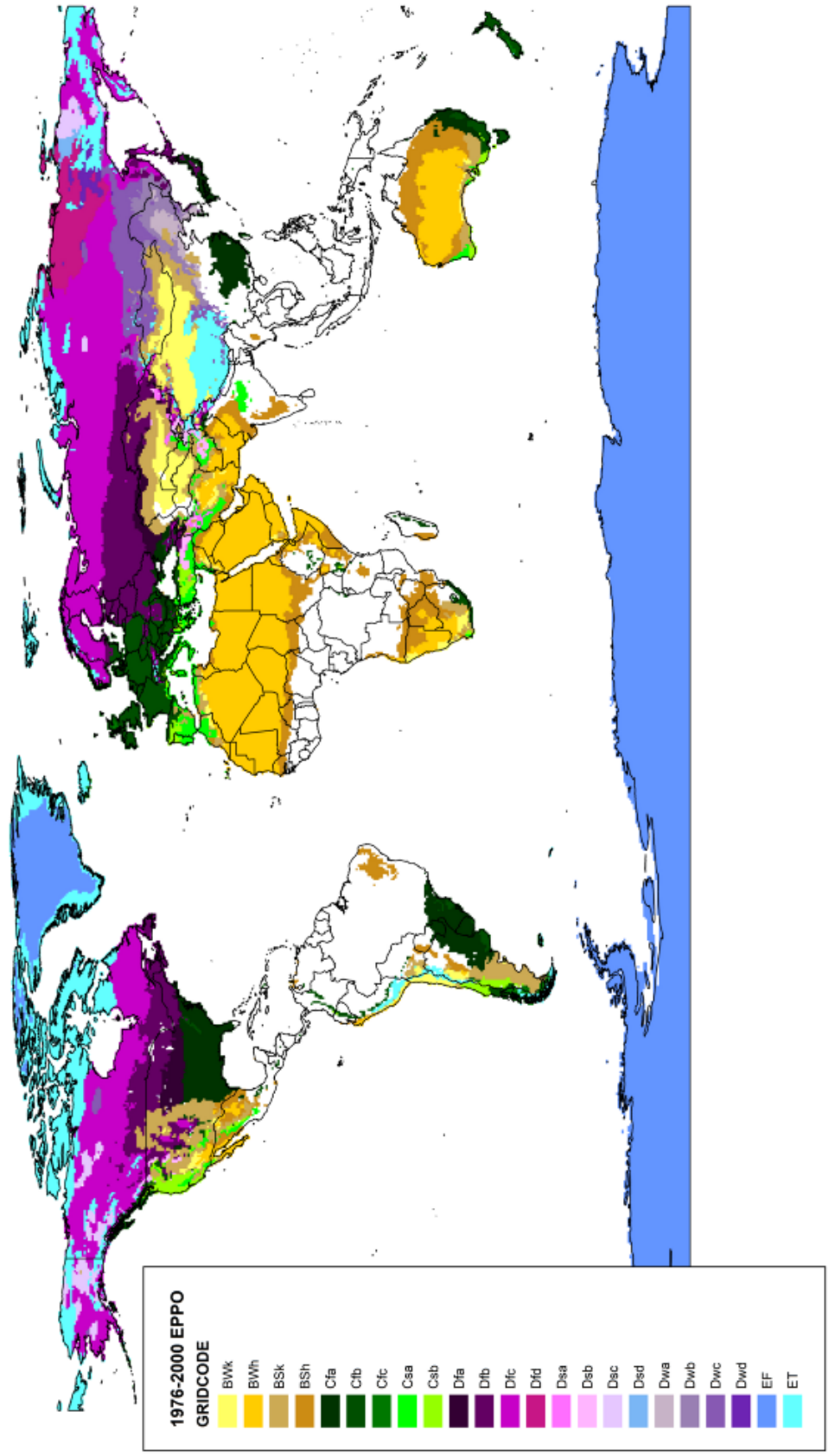
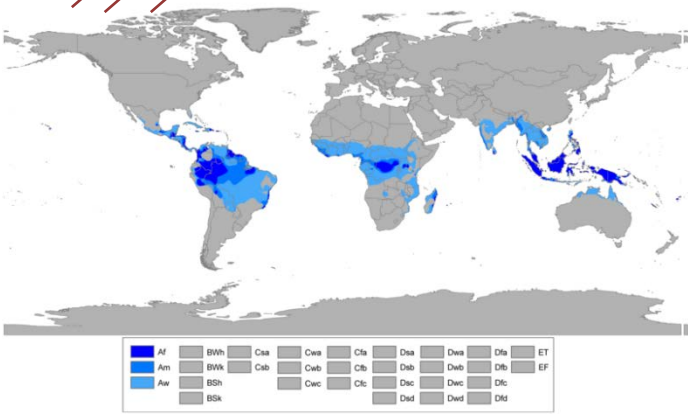
Annex 13. Step 2 – Climatic maps used for the climatic similarity criterion

Map 1. Köppen-Geiger climate classification showing only climates that occur in the EPPO region (based on Rubel and Kottek (2010), adapted by Richard Baker, Fera, UK, August 2013)

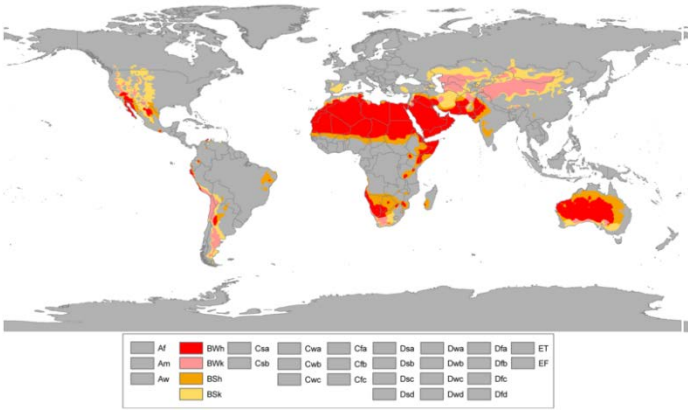


Maps 2-9. Individual maps for groups of Köppen-Geiger climate types (based on Kottek et al., 2006). Climates not considered in the study are crossed (see details in the text) (all from Anon. 2011, except Map 3 from Anon. 2006).

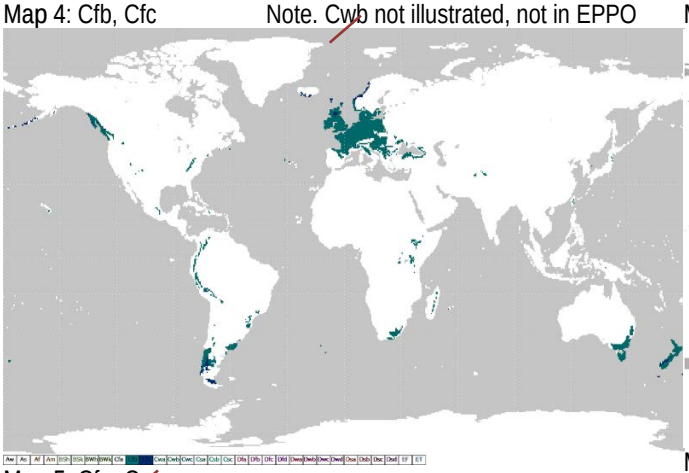
Map 2: Af, Am, Aw



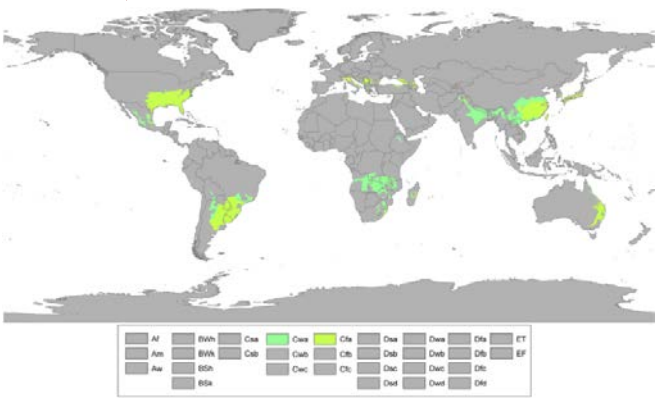
Map 3: BWh, Bwk, Bsh, Bsk



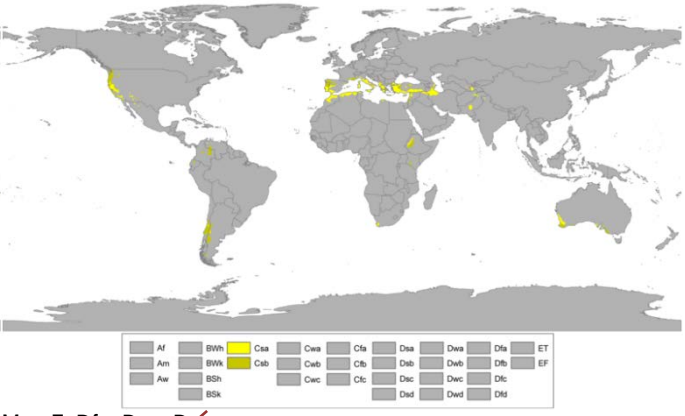
Map 4: Cfb, Cfc



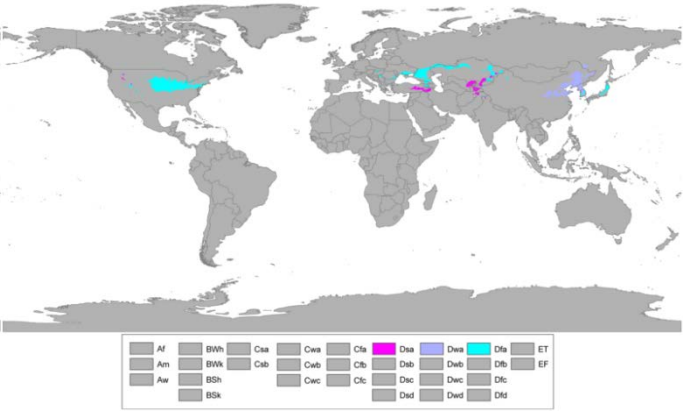
Map 5: Cfa, Cwa



Map 6: Csa, Csb

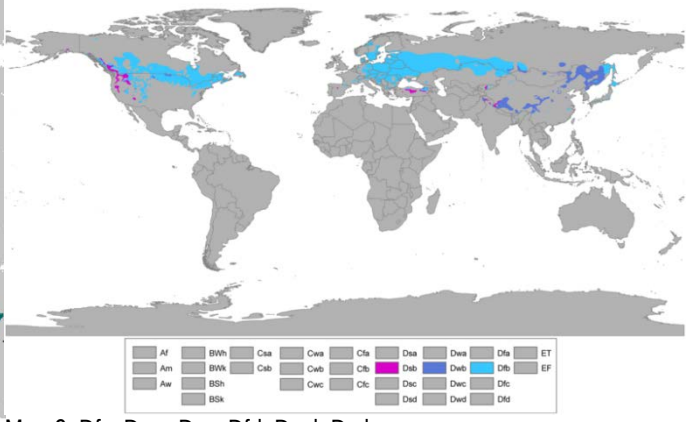


Map 7: Dfa, Dsa, Dwa

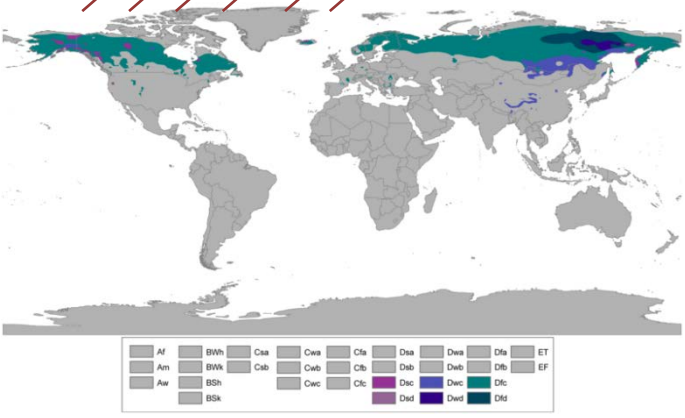


Note. Cwb not illustrated, not in EPPO

Map 8: Dfb, Dsb, Dwb



Map 9: Dfc, Dwc, Dsc, Dfd, Dwd, Dsd



Annex 14. Lists of regulated pests consulted in Step 2

This annex indicates the lists of pests that were consulted at Step 2. They were found on the Ineternational Phytosanitary Portal at https://www.ippc.int/countries/regulatedpests (in the category "List of regulated pests (Art. VII.2i)") or on the Internet (in that case the reference is given).

It should be noted that different types of lists of pests can be found under the category "List of regulated pests" on the IPP:
- regulated pests in the sense of the IPPC Glossary of Phytosanitary Terms (ISPM 5), i.e. quarantine pests and regulated non-quarantine pests
- pests present in the country
- combination of regulated pests and pests present in the country (without clear indication of whether these are under official control)
- unclear content.

List of pests present in countries

Angola. 2010.Lista das principais Pragas e Doenças que atacam as Culturas Económicas na República de Angola (2008-2009)

Benin ISYS Phytosanitaire 1999. Nuisibles dont la présence a été signalée au Bénin. http://www.bj.refer.org/benin_ct/edu/isysphyt/francais/admin/servof/benin/organuis.htm

Lists of regulated pests (sometimes including a list of pests found in the country – without clear indication of whether these are regulated)

Antigua and Barbuda. 2005. Quarantine Pests of Antigua and Barbuda (no date in file but entry date on the IPP). https://www.ippc.int/content/quarantine-pests-antigua-and-barbuda

Argentina. 2011. Listado de plagas cuarentenarias - septiembre 2011. https://www.ippc.int/content/listado-de-plagas-cuarentenarias-septiembre-2011

Brazil. 2010. Anexo I Lista de Pragas Quarentenárias Ausentes - (A1). No date in the file but entered on the IPP in 2010 (possibly from 2007). https://www.ippc.int/content/lista-de-pragas-quarenten%C3%A3%C2%A1rias-ausentes

Burundi. 2006. Liste Des Organismes Nuisibles Reglementes. (combines obligatory control and forbidden import). No date in file, but entered on the IPP in 2006. Possibly 1998. https://www.ippc.int/content/liste-des-organismes-reglementes-au-burundi

Cambodia. 2010. The Cambodia plant quarantine pest list. https://www.ippc.int/content/cambodia-plant-quarantine-pest-list-general-product (specific lists also available for rice, mango and orange at https://www.ippc.int/countries/regulatedpests/)

Canada. 2012. Consolidation of regulated pests for Canada. https://www.ippc.int/content/consolidation-des-organismes-nuisibles-r%C3%A3%C2%A9glement%C3%A3%C2%A9s-pour-le-canada

Chile. 2010. lista De Plagas Reguladas Para Chile - Resolucion Sag NÂ° 4382 DE 2010. https://www.ippc.int/content/lista-de-plagas-reguladas-para-chile-resolucion-sag-n%C3%A2%C2%B0-4382-de-2010

Colombia. 2010. Por Medio De La Cual Se Establecen Las Plagas Cuarentenarias Sometidas A Control Oficial Ausentes Y Presentes En El Territorio Oficial. https://www.ippc.int/content/por-medio-de-la-cual-se-establecen-las-plagas-cuarentenarias-sometidas-control-oficial

Costa Rica. 2012. Lista de plagas reglamentadas Costa Rica 2012. https://www.ippc.int/content/lista-de-plagas-reguladas-para-chile-resolucion-sag-n%C3%A2%C2%B0-4382-de-2010

Cuba. 2007. Lista De Plagas Cuarentenarias De La República De Cuba 2007 https://www.ippc.int/content/lista-de-plagas-cuarentenadas-y-no-cuarentenadas-reglamentadas

Ecuador. 2008. Lista De Plagas Cuarentenarias No Presentes En Ecuador. https://www.ippc.int/content/lista-de-plagas-cuarentenarias-no-presentes-en-ecuador

Georgia. 2011. Quarantine list and pests locally present. No date in file but entered in 2011 on the IPP. https://www.ippc.int/content/q-list

Grenada. 2006. Pests of quarantine importance in Grenada (combines pest that are present and not present). Dated 2006 in the file, loaded in 2006 on the IPP. https://www.ippc.int/content/pests-quarantine-importance-grenada

Guinée. 2009. Organismes Nuisibles De Quarantaine En Republique De Guinee. https://www.ippc.int/publications/liste-des-organismes-nuisibles-de-quarantaine

India. 2011. The plant quarantine order – consolidated version. Linked to on the IPP and available at: http://www.plantquarantineindia.org/pdffiles/Consolidated_Version_PQ_Order_2003-upto_4th_amendment_2008.pdf

Japan. 2011. Quarantine pest list https://www.ippc.int/content/quarantine-pest-list . File entered in 2011 but dated from 2012? Provisional quarantine pest list https://www.ippc.int/content/provisional-quarantine-pest-list . Also gives a "non-quarantine pest list". Several other lists in https://www.ippc.int/countries/regulatedpests/

Korea Rep. 2011. Regulated pest list. https://www.ippc.int/content/list-regulated-plant-pest-republic-korea-2011. Note: the list has two categories, controlled and prohibited. It is unclear if all marked "controlled" are present and under official control. https://www.ippc.int/content/list-regulated-plant-pest-republic-korea-2011

Lao DPR. 2011. Regulated pests of Lao PDR. No date in file but entered on the IPP in 2011. https://www.ippc.int/content/list-regulated-pests-lao-pdr

Madagascar. 2006. Quarantine list (pests and commodities) No date in file but entered on the IPP in 2006. https://www.ippc.int/content/liste-des-organismes-de-quarantaine-madagascar

Malaysia. 1986. Plant Quarantine Regulations 1981 (Amendment 1986). Entered on IPP in 2011. https://www.ippc.int/content/regulated-pest-malaysia-under-plant-quarantine-regulations-1981-amendment-1986

Mauritanie. 2002. Arrêté MDRE n°1257 fixant la liste des organismes de quarantaine. (entered on the IPP in 2006) https://www.ippc.int/content/organisme-de-quarantaines-mauritanie

Mauritius. 2006. Schedule 1. List of Quarantine pests. No date in the file, but entered on the IPP in 2006. https://www.ippc.int/content/list-quarantine-pests-and-regulated-non-quarantine-pests-mauritius

Mexico. 2011. Lista De Plagas Reglamentadas De Mexico 2011. https://www.ippc.int/content/lista-de-plagas-reglamentadas-de-mexico-2011

Mozambique. 2009. Anexo 2. Nomes científicos de organismos de quarantena. No date in file but entered on the IPP in 2009. https://www.ippc.int/content/mozambique-regulated-pest-list

Papua New Guinea. 2005. List of regulated pests. No date in file but entered on the IPP in 2005. https://www.ippc.int/content/png-list-regulated-pest

Paraguay. 2010. Lista de Plagas Cuarentenarias, actualizaza a al fecha 24 de setiembre de 2010. https://www.ippc.int/content/lista-de-plagas-cuarentenarias-actualizaza-al-fecha-24-de-setiembre-de-2010

Peru. 2013. Lista De Plagas Cuarentenarias No Presentes En El Peru. Linked to on the IPP and available at: http://www.senasa.gob.pe/RepositorioAPS/0/2/JER/LISTADO_DE_PLAGAS/LPC%20MARZO%202013.pdf

Saint Kitts and Nevis. 2005a. Lists of regulated pests (note: this is entered under the title of pests present in the country, and is assumed to be pests under official control). No date in file but entered on the IPP in 2005. https://www.ippc.int/content/list-pest-found-stkitts-and-nevis

Saint Kitts and Nevis. 2005b. List of Pest not found in St.Kitts and Nevis. No date in file but entered on the IPP in 2005. https://www.ippc.int/content/list-pest-not-found-st-kitts-and-nevis

Seychelles. 2010. New Quarantine Pests List. No date in file but entered on the IPP in 2010. https://www.ippc.int/content/seychelles-regulated-pest-list

Trinidad and Tobago. 2010. Regulated pests for Trinidad and Tobago. No date in file, but entered on the IPP in 2010 https://www.ippc.int/content/regulated-pests-trinidad-and-tobago

Uruguay. 2007. Listado De Plagas Cuarentenarias Para Uruguay. https://www.ippc.int/content/lista-de-plagas-cuarentenarias-ausentes

USA. 2007. Regulated Plant Pest List. Page last modified in 2007. Linked to on the IPP but available at: http://www.aphis.usda.gov/import_export/plants/plant_imports/downloads/RegulatedPestList.pdf

Annex 15. Step 3 records for selected insects

COLEOPTERA: COCCINELLIDAE

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Epilachna (Henosepilachna) vigintioctopunctata* (Coleoptera: Coccinellidae) (28-spot ladybird, Hadda beetle)**

Why	Identified in the EPPO tomato study. It is a serious pest of solanaceous crops.
Where	**EPPO region**: absent. **Note**: Wikipedia mentions that *E. viginctioctopunctata* occurs in Russia. The reference given (AgroAtlas 2003-2009) refers to *E. vigintioctomaculata*. No record of *E. viginctioctopunctata* in Russia was found. One mention on the English page of the Zoological Institute of the Russian Academy of Science seems to be a mistranslation of the Russian page, which lists only *E. vigintioctomaculata* (ZIN, ND). **Asia:** Bangladesh, Bhutan, China (south-eastern half), India, Indonesia, Japan, Korea, Rep., Laos, Malaysia, Myanmar, Nepal, Pakistan, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam (CABI CPC) **South America**: Brazil (CABI CPC, Schroder et al., 1983) **Oceania**: Australia, Fiji, French Polynesia, New Caledonia, Niue, Samoa, Solomon Islands, Tonga, Vanuatu (CABI CPC), New Zealand (Biosecurity NZ, 2010a & b)
Climatic similarity	High. 11 common climates considering the countries listed above, but probably 8-9. It has established in New Zealand, which has a temperate-type climate, and is present in most of Australia. In China (CABI CPC), it seems to be present in the south-eastern part of the country, broadly south of a line Sichuan to Hebei.
On which plants	Eggplant, potato, tobacco, tomato, and other solanaceous plants (NBAII, 2013). CABI CPC also lists beans and loofah, and Naz et al. (2012) *S. nigrum*, *S. surretanses*, *Datura*, and *Physalis* sp. In Bangladesh, E. v. was found on the following cucurbit crops: *Momordica charantia* (bitter gourd), *Cucurbita moschata* (sweet gourd), *Luffa acutangula* (ribbed gourd), *Trichosanthes asguina* (snake gourd), cucumber and *Momordica dioica* (teasle gourd) (DAE, 2010). Shiri and Katakuro (1999) note that Solanaceae are preferred hosts, with some cucurbits also being hosts.
Damage	Eggs, larvae, pupae are on leaves. Adults are mobile and may be on fruit. *E. vigintioctopunctata* is a major pest of eggplant in India (NBAII, 2013) and identified as a serious pest in Naz et al. (2012).
Dissemination	Adults fly (up to 500 m) and the pest is also moved in plant material and hitchhiker (Biosecurity NZ, 2010a). It has been introduced in New Zealand (Biosecurity NZ, 2010 a&b). It seems to have also been introduced in Brazil recently (Schroeder et al., 1993 – from abstract, full text not available).
Pathway	Plants for planting, fruits and vegetables (especially if green parts attached) of host plants from countries where *E. vigintioctopunctata* occurs.

Possible risks	Eggplant, tomato, potato are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is high. Eradication in New Zealand was attempted but failed (Biosecurity NZ, 2010b).
Categorization	From PQR: Eastern Africa A1 2001, Southern Africa A1 2001, Chile 1995. It was regulated in New Zealand for tomatoes from Tonga and Australia (Biosecurity NZ, 1998, 2000).
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COLEOPTERA: CURCULIONIDAE

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Phyrdenus divergens* (no common name found) and *Phyrdenus muriceus* (broca da batatinha [Portuguese] gorgojo del tomate, barrenador del tallo de tomate [Spanish]) (Coleoptera: Curculionidae)**

Why	Identified in the EPPO tomato study. These species seemed very similar at Step 2, but there are much fewer publications on *P. divergens* as a pest.
Where	**EPPO region**: absent *Phyrdenus divergens* **North America**: Mexico, USA (Texas, Illinois, New York, Florida) (Peck and Thomas, 1998) **Central America**: Guatemala, Nicaragua, Costa Rica, Panama (Maes and O'Brien, 1990) **Caribbean**: Cuba (Peck and Thomas, 1998) **South America**: Brazil, Bolivia, Argentina (Maes and O'Brien, 1990); Brazil (Agrolink Brazil, ND), Venezuela (Morales et al., 2003). *Phyrdenus muriceus* **North America**: Mexico, USA (Arizona, Florida) (Peck and Thomas, 1998; Maes and O'Brien, 1990) **Central America**: Belize, Guatemala, Honduras, Nicaragua, Costa Rica, Panama (Maes and O'Brien, 1990); Central America (Peck and Thomas, 1998) **Caribbean**: Cuba (Maes and O'Brien, 1990; Peck and Thomas, 1998) **South America**: Colombia, Brazil, Bolivia, Uruguay, Paraguay, Argentina (Maes and O'Brien, 1990); Venezuela (Morales et al. (2003).
Climatic similarity	Medium. 6-7 common climates considering the distribution above, possibly lower (occurring in specific areas).
On which plants	Both species are pests of Solanaceae, and reported by Agrolink Brazil (ND) on potato, eggplant, tobacco, peppers and tomato. For *P. divergens*, tomato is also mentioned in Morales et al. (2003). Costa Lima (1956) also mentions several other *Solanum* spp. for Brazil.
Damage	The biology of these species and organs attacked is not clear. Some sources indicate that they mostly attack roots and stems, while others consider they are also on foliage and fruit. SENESA (2010) mentions that eggs are laid in stems and the upper part of the plants, and that on tomato, larvae are located at the axils. Damage is due to larvae, which bore galleries in the foliage, stems, roots and branches, causing fall of fruit and flowers, and death of seedlings. Larval galleries are mainly located in the lower part of the stem, or in roots, and on potato also in tubers (SENESA, 2010; Agrolink Brazil, ND). Adults also attack tomato fruit, but damage is less important than that caused

by larvae. Pupae are in the soil (SENESA, 2010). Peck and Thomas (1998) indicate that it attacks roots and seeds of tomato and eggplant. USDA (2013b) based on several sources, note that P. muriceus is present in stems and roots. Early publications mention that larvae prefer roots to stems (Costa Lima, 1956). Details on the biology of P. diver*gens* were found only in Agrolink Brazil (ND), which indicates that larvae are in leaves and stems. It is not sure if there is a difference in biology (the same source indicating damage by both adults and larvae on leaves and on potato tubers for *P. muriceus*).

P. muriceus is a pest of tomato in Argentina, where treatment is applied (Novo et al., 2002; INTA, 2012). King and Saunders (1984) indicate that *P. muriceus* is normally minor but may become locally important. Vreugdenhil et al. (2011) mention that *P. muriceus* is a potato pest, especially in Bolivia, with larvae feeding in tubers, and adults on leaves and stems. Both species are mentioned amongst major pest of economic importance for tomato for South America by Berlinger (1987), although this is not really supported by the sources found.

Dissemination: Adults fly.

Pathway: Plants for planting, fruit (esp. if green parts attached)?, potato tubers? of host plants, soil, from countries where *Phyrdenus divergens* or *P. muriceus* occur.

Possible risks: Solanaceous hosts of *P. divergens* and *P. muriceus* are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where they occur and the EPPO region is medium. The reason to retain these species for Step 3 was because of a potential association with fruit (while other Curculionidae, such as *Faustinus*, *Trichobaris* and *Listroderes*, were eliminated at Step 2 as no life stage was associated directly with fruit). Association of *P. divergens* and *P. muriceus* with tomato fruit is still unclear, but it seems to be a pest of potato.

Categorization: None found.

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COLEOPTERA: MELOIDAE

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Epicauta atomaria* and other *Epicauta* species (Coleoptera: Meloidae)**

Why: *Epicauta* spp. was identified in the EPPO tomato study as USDA (2013a) reported interceptions of adults on tomato fruit (without indication of species). There are many species of *Epicauta* in the Americas, which generally seem to be polyphagous on hosts in several families. *E. atomaria* seemed

	to be the most important pest from the literature available, and was mentioned in recent publications. However, other species were also mentioned in the literature in association with tomato. This record focuses on *E. atomaria*, and few data on other species are given in a table. Note: Adams and Selander (1979) provided a comprehensive review of part of *Epicauta* (vittata group), including their biology, hosts and distribution. Due to the volume of this publication, it was possible to exploit it all in this screening, but it could be used if these pests are further studies.
Where	**EPPO region**: absent. **South America**: Brazil, Argentina (Diaz de Almeida et al., 2009; Hallan, 2010). Diaz de Almeida et al., 2009 also mention Colombia but in relation to a list of several pests (it is not certain that they all are in Colombia). Within Brazil (Netto and Guilhem, 2000): Bahia, Espírito Santo, Goiás, Minas Gerais, Rio de Janeiro, São Paulo, Paraná, Santa Catarina, Rio Grande do Sul.
Climatic similarity	Medium. 9 common climates considering Argentina and Brazil, but likely to be lower. There are only 3 common climates with the Brazilian distribution indicated above. The distribution in Argentina was not searched.
On which plants	*E. atomaria* is polyphagous and recorded on tomato, potato, sweet potato, chilli, pepper, *Solanum aethiopicum*, eggplant, lucerne, *Nicotiana* sp., beet, chard, soybean, spinach, cotton, passionfruit, horticultural plants (Netto and Guilhem, 2000; Boica Junior et al., 2007).
Damage	Eggs are laid in the soil or on plants (in case of high population levels) (Netto and Guilhem, 2000). Larvae are in the soil, and feed on roots and tubers (mainly potato in Netto and Guilhem, 2000). Adults leave in the aerial parts of plant and feed on leaves (Netto and Guilhem, 2000). They are mobile, and move into crops in large numbers (up to 4000 individuals), consume leaves and may leave only stems, petioles and fruits (CNPH, ND; Netto and Guilhem, 2000). In passionfruit, individual plants may lose 100% of flower buds, but production losses were only 5% (localized attacks). *E. atomaria* is one of the insect pests that can reduce tomato yield (Diaz de Almeida et al., 2009). It is mentioned amongst major pest of economic importance for tomato for South America by Berlinger (1987). In Brazil, *E. atomaria* and *E. suturalis* were considered as rare due to insecticide use, but may take more importance with the shift to biological control (CNPH, ND). Note: the adults of some other species are recorded to sometimes feed on flowers or fruit, but it does not seem to be the case for *E. atomaria*.
Dissemination	The biology of the pest does not seem favourable to its association with consignments of fruit, apart that it may be present in very large numbers in a crop or that eggs may be laid on plants in case of high populations levels. Some other species are said to sometimes feed on fruit or flowers, but this does not seem to be the case for *E. atomaria*. USDA (2013a) reports 3 interceptions (adults) of *Epicauta* sp. on tomato fruit. Larvae could be associated with potato tubers.
Pathway	Fruit?, plants for planting of host plants, tubers (potato and sweet potato?), soil, from countries where *E. atomaria* occurs.
Possible risks	Some hosts of *E. atomaria* are important crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is medium. It may also establish in glasshouses. It is not clear if control methods are available.
Categorization	None found.

Summary of other *Epicauta* species

	Hosts	Distribution	Comments
Epicauta abadona	tomato and polyphagous (table in Adams and Selander, 1979)	North America: Mexico, USA (Adams and Selander, 1979)	
Epicauta albicincta	Tomato (Morales et al. 2003) No other reference found.	South America: Venezuela (Morales et al., 2003). GBIF (2013) only contains 1 record, for Venezuela. No other records found, probably incomplete.	Only one reference found. Rated "2" at Step 2 due to low climatic similarity
Epicauta apure	tomato and polyphagous (see table in Adams and Selander, 1979)	Caribbean: Trinidad, South America: Venezuela (Adams and Selander, 1979)	Downgraded to "2" at Step 2 due to low climatic similarity. Part of the records for *E. grammica* may relate to *E. apure* (see *E. grammica*)
Epicauta aragua	Possibly *Solanum tuberosum* and others (Adams and Selander, 1979)	Central America and South America: Colombia, Costa Rica, El Salvador, Honduras, Panama, Venezuela (Adams and Selander, 1979)	Part of the records for *E. grammica* may relate to *E. aragua* (see *E. grammica*)
Epicauta grammica	Tomato (Morales et al., 2003) No other publication giving hosts was found. Likely to be incomplete	South America: Venezuela (Morales et al., 2003). Also Brazil, Argentina (Adams and Selander, 1979)	Adams and Selander (1979) note that there may be several species linked to *E. grammica* records in the literature, and propose that those in the Northern part of the range be attributed to *E. apure* and *E. aragua*.
Epicauta immaculata	tomato (USDA, 2013b). Surely others (not searched further)	At least Mexico (USDA, 2013b), not searched further	Added at Step 3 from USDA (2013b). Not searched further
Epicauta leopardina	tomato and polyphagous (table in Adams and Selander, 1979)	South America: Argentina, Brazil (Adams and Selander, 1979)	Economic importance (Adams and Selander, 1979)

	Hosts	Distribution	Comments
Epicauta luteolineata	tomato and polyohagous (table in Adams and Selander, 1979)	South America: Argentina (Adams and Selander, 1979)	
Epicauta monachia	tomato and polyphagous (table in Adams and Selander, 1979)	South America: Argentina, Bolivia (Adams and Selander, 1979)	Economic importance (Adams and Selander, 1979)
Epicauta ocellata	tomato (USDA, 2013b). Surely others (not searched further)	At least Mexico (USDA, 2013b), not searched further	Added at Step 3 from USDA (2013b). Not searched further
Epicauta occidentalis	tomato and polyphagous (table in Adams and Selander, 1979)	North America: USA (Adams and Selander, 1979)	Economic importance (Adams and Selander, 1979)
Epicauta pestifera	tomato and polyphagous (table in Adams and Selander, 1979)	North America: USA, but not detailed (Adams and Selander, 1979)	Economic importance (Adams and Selander, 1979)
Epicauta pilme	potato (Bayer Chile, ND), also alfalfa (Anon. ND)	South America: Chile (Bayer Chile, ND), Also Argentina (Anon., ND)	This species was identified during the Dutch Quickscan screening for tomato pests from South America. The reference used (Bayer Chile) mentioned potato but not tomato. No reference to tomato was found, but as *Epicauta* species generally seem polyphagous, this pest was kept.
Epicauta suturalis	tomato (CNPH, ND), Polyphagous, incl. Capsicum (Pinho de Moura et al., 2013)	South America: Brazil (Pinho de Moura, 2013). Dvorak (2008) describes *E. suturalis* from Asia: China, but it is not clear if it refers to the same species	Downgraded to "2" at Step 2 due to low climatic similarity
Epicauta tamara	tomato and polyphagous (table in Adams and Selander, 1979)	North America: Mexico (Adams and Selander, 1979)	
Epicauta temexa	tomato and polyphagous (table in Adams and Selander, 1979)	North America: Mexico, USA (Adams and Selander, 1979)	Economic importance (Adams and Selander, 1979)
Epicauta unilineata	tomato and polyphagous (table in Adams and Selander, 1979)	North America, Central America: El Salvador, Guatemala, Mexico (Adams and Selander, 1979)	
Epicauta vittata	lucerne, potato (CABI CPC); tomato, potato (Adams and Selander, 1979)	North America: Canada USA (Adams and Selander, 1979), not searched further	Economic importance (Adams and Selander, 1979). An EPPO PRA was prepared (EPPO, 2001). The pest was not added to the EPPO lists (considered unlikely to be associated with the pathway considered (potato only) and rather a soybean and lucerne pest) (see EPPO website). Quarantine pest for Colombia 2010, Ecuador 2008, Peru 2013 (from the IPP)
Epicauta vitticolis	tomato (USDA, 2013b). Surely others (not searched further)	Mexico, Guatemala, Honduras, Nicaragua (Adams and Selander, 1979)	Added at Step 3 from USDA (2013b). Not searched further

Source(s)

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Quarantine lists of Colombia 2010, Ecuador 2008, Peru 2013 (from the IPP)

USDA. 2013a. Interceptions on tomato fruit in 2007-2012.

USDA. 2013b. Importation of Live Greenhouse-Grown Tomato Plantlets on Approved Growing Media from Mexico into the Continental United States. A Qualitative, Pathway-Initiated Pest Risk Assessment. December 23, 2013 Version 2. Available at http://www.aphis.usda.gov/import_export/plants/plant_imports/process/downloads/Mexico%20tomato%20transplants%20in%20AGM%20RA_12-23-2013.pdf. (Accessed January 2014)

DIPTERA: CECIDOMYIIDAE

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Prodiplosis longifila* (Diptera: Cecidomyiidae) (citrus gall midge; in Spanish: negrita, chamusca, liendrilla, mosquilla de los brotes, caracha)**

Why: Identified in the EPPO tomato study. *P. longifila* is an important pest of tomato in some countries of the northern part of South America and of pepper in Jamaica. It is also a pest of various other crops. In South America, it gained importance as a pest from the 1980s onwards.

Where: **EPPO region**: absent

North America: USA (Florida – reported on the 1930s on wild cotton, but for the first time on lime in the 1980s; Pena et al., 1989)

Caribbean: Jamaica (Lawrence et al., 2000)

Note: several publications mention "West Indies", citing in particular Gagné (1986) (full text not found). However, this is not in Gagné (1994), and Jamaica is the only specific record found.

South America: Colombia (Perez-Rosero, 2010), Ecuador (first reported in 1986, probably entered from Peru, coastal part; Valarezo et al., 2003), Peru (first reported in 1979; Valarezo et al., 2003; at least La Libertad region, coastal North-West; Agra CEAS Consulting, 2008).

Climatic similarity: Medium. 6 common climates considering the countries listed above, but possibly lower (its distribution within the South American countries mentioned is not known, and some common climates occur in a very little part of their territory).

The pest is favoured by warm climates according to Castillo-Valiente (2010), with high relative humidity, and it is affected by temperatures below 11 C and above 28 C.

On which plants: *Solanum lycopersicum, Tagetes patula, Asparagus officinalis, Allium* spp., *Gossypium* spp., *Persea americana, Citrus* spp., *Solanum tuberosum, Cynara scolymus* (artichoke), *Persea americana, Phaseolus vulgaris, Phaseolus* sp. (beans); *Capsicum* spp. (pepper), Cucurbits, *Ricinus communis*, as well as some weed species, *Gossypium hirsutum, Citrus aurantifolia*, alfalfa, soybean, melon and cucumber (Castillo Valiente, ND and 2010; Pena et al, 1989; According to Valarezo et al. (2003) it was also reported on *Pisum sativum, Malus domestica, Spinacia oleracea, Coriandrum sativum, Brassica oleracea, Phaseolus lanatus* in Peru, and Cucurbitaceae in general (Castillo-Valiente, ND).

Damage: Eggs are laid on the plant (leaves, buds, calyx of small fruit on tomato; Valarezo et al., 2003) and pupae are in the ground. Damage is caused by larvae. On lime, they are reported to feed on flowers (Pena, 1989); on tomato, they feed on flowers, leaves, small fruit, buds (Chavez-Vergara, 2002). On pepper, larvae feed on flowers, stems and calyx (of mature green or ripe fruit), and sometimes inside the fruit; all stages of fruit may be affected in case of high infestation (Caripest, ND). Photos of damage are given for several crops in Castillo-Valiente (2010), which also mentions that larvae are protected on the plants (Castillo Valiente, 2010).

P. longifila is considered as a pest of different crops in different countries. In the USA (Florida), it is a pest of lime. It is reported as a significant pest of chilli in Jamaica, where it also impacts exports (Carinet, ND). In Peru, it is reported as a pest of various crops, including tomato, potato, alfalfa, asparagus, marigold. It became a problem on tomatoes in the 1980s and feeds on many other crops (Castillo-Valiente, 2010). In Ecuador, it was the most important pest of tomato according to Valarezo et al. (2003) and, although it attacked other crops, it had economic importance only on tomato; losses up to 60% were reported, with attacks in field and protected tomatoes, and abandonment of tomato cropping in some cases. In Colombia, it is an important pest of tomato indoors and outdoors (A. Diaz Montilla, Corporación Colombiana de Investigación Agropecuaria, Antioquia, Colombia; pers. comm. during PRA EWG on *Neoleucinodes elegantalis*). Use of plant protection products has increased in areas where this pest emerged as a problem.

Dissemination	Adults fly and are also dispersed by the wind (Castillo-Valiente, 2011; Caripest, ND). Eggs and larvae are present in different plant parts, and pupae are in the soil. In Jamaica, the pest is identified to possibly move with fruit of hot pepper in trade (Caripest, ND).
Pathway	Fruits, vegetables, plants for planting, cut flowers of host plants, potato tubers with soil associated?, soil, from countries where *P. longifila* occurs.
Possible risks	Tomato, potato, alfalfa, as well as other host plants, are major crops throughout the EPPO region, whereas some other hosts such as lime, asparagus or melon are cultivated mainly in the southern part of the region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is medium. It may also establish in glasshouses.
Categorization	Quarantine pest for Antigua and Barbuda 2005, Argentina 2011 (as *P. "longifolia"* – for asparagus), Brazil 2010, Trinidad and Tobago 2010
Source(s)	Agra CEAS Consulting. 2008. Country-based Plans for SPS Development - Peruvian Field Study - Cost Benefit Analysis - Draft Report for the World Trade Organization - Updated by the Government and Private Sector of Peru. Castillo-Valiente J. 2010. Prodiplosis longifila in Peru. Presentation at the Invasive Pests Conference Florida. 2010. http://conference.ifas.ufl.edu/TSTAR/presentations/Tuesday/pm/4%2020pm%20J%20Castillo.pdf (Accessed August 2013) Castillo-Valiente J. ND. Avances En El Manejo Integrado De De Prodiplosis Longifila En El Cultivo Del Espárrago. http://www.agronegociosperu.org/downloads/24Castillo_Valiente_PRODIPLOSIS.pdf Chavez Vergara, JA. 2002. Estudio De La Dinámica Poblacional De Prodiplosis Longifila Gagné (Diptera : Cecidomyiidae) En El Cultivo De Tomate En La Localidad De Lodana- Manabí. Tesis De Ingeniero Agrónomo. Universidad Tecnica De Manabi, Facultad De Ingenieria Agronomica. Portoviejo – Manabi – Ecuador Gagné RJ. 1986. Revision of Prodiplosis (Diptera: Cecidomyiidae) with Descriptions of Three New Species. Annals of the Entomological Society of America, Volume 79, Number 1, January 1986 , pp. 235-245(11). Gagné RJ. 1994. The Gall Midges of the Neotropical Region. 352 pages Cornell University Press. http://books.google.dk/books?id=37t2nCi3ifUC&dq=Revision+of+Prodiplosis+(Diptera:+Cecidomyiidae)+with+Descriptions+of+Three+New+Species&hl=da&source=gbs_navlinks_s Lawrence JL, Edwards CA, Schroeder M, Martin RD, McDonald FD, Gold-Smith J. 2000. An integrated approach for managing hot pepper pests in the Caribbean. The BCPC Conference: Pests and diseases, Volume 1. Proceedings of an international conference held at the Brighton Hilton Metropole Hotel, Brighton, UK, 13-16 November 2000 2000 pp. 239-244. British Crop Protection Council, Farnham, UK Pena JE. 2011. Prodiplosis longifila. Featured Creatures. University of Florida. http://entnemdept.ufl.edu/creatures/fruit/citrus_gall_midge.htm Pena, JE, Gagne R., Duncan R. 1989. Biology and Characterization of Prodiplosis Longifila (Diptera: Cecidomyiidae) on Lime in Florida. USDA Systematic Entomology Laboratory. Paper 15. http://digitalcommons.unl.edu/systentomologyusda/15 (Accessed August 2013) Pérez Rosero M. 2010. Mejoramiento Genético en Solanum Lycopersicum para la Resistencia al Pasador del Fruto Neoleucinodes Elegantalis Guenée (Lepidoptera: Crambidae). Universidad Nacional De Colombia Facultad De Ciencias Agropecuarias Coordinacion General De Postgrados Palmira 2010 (Thesis) Quarantine lists of Antigua and Barbuda 2005, Argentina 2011 (as P. "longifolia" – for asparagus), Brazil 2010, Trinidad and Tobago 2010 Valarezo OC, Cañarte MCB, Navarrete BC, Arias M. Proyeto. 2003. Prodiplosis longifila (Diptera: Cecidomyiidae): principal plaga del tomate en Ecuador. Estacion Esperimental Porto Viejo.

DIPTERA: LONCHADEIDAE

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Lamprolonchaea brouniana* (Diptera: Lonchadeidae) (Australian metallic green tomato fly) (syn. *L. rugosifrons*, *Lonchaea brouniana*)**

Why	Identified in the EPPO tomato study. Although this pest is mentioned as a pest of tomato on several website (e.g. http://lonchaeidae.myspecies.info/lamprolonchaea-brouniana-metallic-green-tomato-fly), only one detailed publication was found (Blacket and Malipatil, 2010). Other references seem to refer to the taxonomy and description of the species.
Where	**EPPO region**: absent **Oceania**: Australia (New South Wales, Northern Territory, Queensland, Victoria, Western Australia - Blacket and Malipatil, 2010) Note: Another metallic green tomato fly (*L. smaragdi)* occurs in the Pacific (incl. Australia), Africa and the Mediterranean region.
Climatic similarity	High. 8 common climates, considering the distribution map in Blacket and Malipatil (2010), which also mention that it is most common in the temperate south of Australia. The climates where it has been recorded in Australia occur in the EPPO region in Western, Northern and Central Europe as well as the Mediterranean Basin and Near East to the Black Sea.

On which plants	(All from Blacket and Malipatil, 2010). Preference for *Lycopersicon* and *Solanum*. Also found on potato, eggplant, and other Solanaceae. Larvae are more frequent in tomato, and regularly occur in other Solanaceae (Capsicum and eggplant), Rosaceae (apricot, nectarine, peach), Rutaceae (grapefruit, lemon, mandarin, orange), and Lauraceae (avocado) (some larvae also raised from cow dung, rockmelon, walnut fruit). Note: the record for potato is not clear, possibly referring to decaying stems only.
Damage	The species is described in Bezzi (1923). Blacket and Malipatil (2010) cite old record of serious damage on tomato (from the 1910-20s). *L. brouniana* was previously thought to be a secondary pest on damaged or infested fruit, but there is evidence of primary pest role. No detail of damage or pest importance was found in contemporary literature. Some sites or fora refer to the "tomato fly" or "metallic tomato fly" in advice on tomato growing, but both *Bactrocera tryoni* and *Ceratitis capitata* also occur in the same areas, and advice often first target those (e.g. http://agspsrv34.agric.wa.gov.au/ento/medfly.htm).
Dissemination	Larvae are in fruit, and trade of fruit could spread the pest. Stages may be associated with plants for planting. Adults fly.
Pathway	Fruit and vegetable, plants for planting? of host plants from countries where *L. brouniana* occurs.
Possible risks	Solanaceous hosts and other fruit mentioned are important in the EPPO region, and tomato is a main host. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is high. The pest is regulated at least by New Zealand and the USA for tomatoes from Australia (Biosecurity NZ, 2000, GPO, 2007?). It has been intercepted on tomatoes from Australia to New Zealand (Blacket and Malipatil, 2010). Although the pest risk is not clear, it is one which clearly may be introduced with tomato fruit.
Categorization	New Zealand (Biosecurity 2000, MPI, 2013), USA (GPO, 2007?)
Source(s)	Bezzi, M. 1923. On the Australian Lonchaeidae. Australian Zoologist 3:183-185 (1923) http://biostor.org/reference/102131
	Biosecurity NZ. 2000. Import Health Standard Commodity Sub-class: Fresh Fruit/Vegetables Tomato, Lycopersicon esculentum from Australia. Issued pursuant to Section 22 of the Biosecurity Act 1993. Date Issued: 9 June 2000.
	Blacket MJ, Malipatil BM. 2010. Redescription of the Australian metallic-green tomato fly, Lamprolonchaea brouniana (Bezzi) (Diptera: Lonchaeidae), with notes on the Australian Lamprolonchaea fauna Zootaxa 2670: 31–51 (2010)
	GPO. 2007?. 7 CFR 319.56-2dd - Administrative instructions: conditions governing the entry of tomatoes. In CFR (Code of Federal Regulations), 7 (Agriculture), B (REGULATIONS OF THE DEPARTMENT OF AGRICULTURE), Chapter III (ANIMAL AND PLANT HEALTH INSPECTION SERVICE, DEPARTMENT OF AGRICULTURE), PART 319 (FOREIGN QUARANTINE NOTICES). US Government printing office. Page available at http://www.gpo.gov/fdsys/pkg/CFR-2006-title7-vol5/pdf/CFR-2006-title7-vol5-sec319-56-2ee.pdf and google books
	MPI. 2013. Risk Management Proposal Alternatives to dimethoate to manage the export of fruit fly host commodities: Irradiation of fresh Capsicum annuum L. (capsicum) and Lycopersicon esculentum L. (tomato) for human consumption from Australia to New Zealand. FOR PUBLIC CONSULTATION, May 2013. http://www.biosecurity.govt.nz/files/biosec/consult/rmp-irradiation-of-fresh-capsicum-and-tomatoes.pdf
	PADIL. ND. Lamprolonchaea brouniana. http://www.padil.gov.au:80/maf-border/Pest/Main/140544
	Two references by McAlpine were not found.
	McAlpine JF. 1964. Descriptions of new Lonchaeidae (Diptera). I. Canadian Entomologist, 96, 661-700.
	McAlpine JF. 1987. Chapter 62. Lonchaeidae. In: McAlpine JF, Peterson BV, Shewell GE, Teskey HJ, Vockeroth JR & Wood DM (eds.), Manual of Nearctic Diptera, Volume 2, Number 28, Ottawa, pp.791-797.

DIPTERA: TEPHRITIDAE

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Bactrocera latifrons* (Diptera: Tephritidae) (Solanum fruit fly, Malaysian fruit fly)**

Why	Identified in the EPPO tomato study.
Where	**EPPO region**: absent (Jordan – absent, unreliable record – PQR) **Africa:** Africa (Kenya, Tanzania) **Asia:** Brunei Darussalam, China (Guangdong, Guanxi, Yunnan, Xinggang (Hong Kong), Hainan – PQR; Fujian – McQuate and Liquido, 2013), India, Japan (Ryukyu), Lao, Malaysia, Pakistan, Singapore, Sri Lanka, Taiwan, Thailand, Viet Nam (PQR). Plant Health Australia (2011) and CABI CPC also mentions Indonesia. McQuate and Liquido mention "Burma" (Myanmar?) **North America**: USA (Hawaii only). Eradicated in California (PQR).
Climatic similarity	Medium. 4-5 common climates considering the countries listed above, and the distribution within China.
On which plants	In a new biography on hosts of *B. latifrons*, McQuate and Liquido (2013) mention 59 plant species from 14 plant families as field records. Most hosts belong to the families Solanaceae and Cucurbitaceae. Hosts include *Lycopersicon esculentum* and *L. pimpinellifolium*, *Capsicum annuum* and *C. frutescens*, *Physalis peruviana*, *Solanum melongena*, *S. torvum*, *S. xanthocarpum* and many

other *Solanum* species, *Cucumis sativus* and *C. melo*, *Cucurbita maxima*, *Lagenaria siceraria*. In Africa, new hosts were recorded in Tanzania (Mziray et al., 2010): *S. aethiopicum*, *Capsicum annuum* var. *longum* and *C. chinense*, *S. scabrum*, *S. sodomeum*, *Citrullus lanatus*, *Cucumis dipsaceus*, *Momordica*. For other families, hosts include for example *Punica granatum*, *Citrus aurantifolia*, *Lagerstroemia indica* (each only once) (McQuate and Liquido, 2013; De Meyer et al. 2012). A number of host records are also considered doubtful in McQuate and Liquido (2013).

Damage: Larvae are in fruits, pupae in the soil. *B. latifrons* is mostly a pest of Solanaceae, although it also attacks some Cucurbitaceae. De Meyer et al. (2012) mention that the major hosts in Asia are *Capsicum annuum*, *Solanum melongena* and *Lycopersicon esculentum*. Infestation rates of different hosts are given in McQuate and Liquido (2013). Mziray et al. (2010) reported that it outnumbered *B. invadens*, *B. cucurbitae* and *Ceratitis capitata* in most of the common solanaceous hosts in Tanzania. NBAII (ND) considers it as minor and sporadically serious in India. In Tanzania, the pest is considered as widespread in low numbers due to its limited host range (PQR).

Dissemination: The pest is known to have been introduced into other regions from its Asian origin: Hawaii (around 1983, De Meyer et al., 2012), Africa (first found in Tanzania in 2006, then Kenya in 2007; Mziray et al., 2010, PQR, De Meyer et al., 2012), Japan (Okinawa) (McQuate and Liquido, 2013). Many interceptions in various countries are mentioned in McQuate and Liquido (2013) on *Capsicum*, *Capsicum annuum*, *Mangifera indica*, *Passiflora*, *Solanum*, *S. aculeatissimum*, *Lycopersicon* and *L. esculentum (S. lycopersicum*).

Pathway: Fruits and vegetables of host plants, soil, from countries where *B. latifrons* occurs.

Possible risks: Tomato, eggplant, pepper, *Cucumis*, *Cucurbita* are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is medium. Tephritidae (non-European) are regulated in the EU (and probably in some other countries too), but the EU specific phytosanitary measures target only Rutaceae fruit.

Categorization: Quarantine pest for New Zealand 2000 (from PQR); Korea Rep 2011, Seychelles 2010, Trinidad and Tobago 2010 (from the IPP)

Source(s):

CABI CPC, 2013

De Meyer M, Mohamed S, White IM. 2012. Invasive Fruit Fly Pests in Africa. A diagnostic tool and information reference for the four Asian species of fruit fly (Diptera, Tephritidae) that have become accidentally established as pests in Africa, including the Indian Ocean Islands. http://www.africamuseum.be/fruitfly/AfroAsia.htm

Hawaii Edu. 2005. Database of pests and crops – tomato. http://www.extento.hawaii.edu/kbase/crop/crops/tomato.htm. (Accessed August 2013)

McQuate GT, Liquido NJ. 2013. Annotated World Bibliography of Host Fruits ofBactrocera latifrons (Hendel) (Diptera: Tephritidae). Insecta Mundi.Paper 792. http://digitalcommons.unl.edu/insectamundi/792/

Mziray HA, Makundi RH, Mwatawala M, Maerere A, De Meyer M. 2010. Host use of Bactrocera latifrons, a new invasive tephritid species in Tanzania. J Econ Entomol. 2010 Feb;103(1):70-6.

NBAII. 2013. Bacterocea latifrons. National Bureau of Agriculturally Important Insects. http://www.nbaii.res.in/insectpests/Bactrocera-latifrons.php (Accessed January 2014)

PQR

Quarantine lists for Korea Rep 2011, Seychelles 2010, Trinidad and Tobago 2010 (from the IPP)

USDA. 2009. Importation of Tomatoes, Solanum lycopersicum, from the Economic Community of West African States (ECOWAS) into the Continental United States. A Qualitative, Pathway-Initiated Pest Risk Assessment. June 5, 2009.

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Bactrocera tau* complex (Diptera: Tephritidae)**

Why: Identified in the EPPO tomato study. *B. tau* is a pest of Cucurbitaceae and other fruit in Asia. *B. tau* is now considered as a complex of species. In Thailand, *B. tau* consists of several forms in different hosts and habitats (Kitthawee and Rungsri, 2011; Sumrandee et al., 2011). Although there may be several species or forms involved, tomato is mentioned as a host of *B. tau* in publications from India (where it occurs also in the Northern part of the country).

Where: **EPPO region**: absent

Asia: Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China (Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hong Kong, Hubei, Shaanxi, Sichuan, Yunnan, Zhejiang), India (Andaman and Nicobar Islands, Arunachal Pradesh, Bihar, Delhi, Haryana, Himachal Pradesh, Jammu and Kashmir, Karnataka, Maharashtra, Meghalaya, Punjab, Sikkim, Tamil Nadu, Uttarakhand, West Bengal), Indonesia, Laos, Malaysia, Myanmar, Singapore, Taiwan, Thailand, Vietnam (CABI CPC, for India distribution, Singh et al., 2010 citing others), Sri Lanka (specimen origin in Nakahara and Muraji, 2008 – although CABI CPC mentions that records for Sri Lanka may arise from misidentification)

Recorded to have spread from China (Wu et al., 2011)

Climatic similarity	Low/medium. 3-4 common climates considering the countries and regions listed above.
On which plants	Hosts in the families Anacardiaceae, Cucurbitaceae, Elaeocarpaceae, Moraceae, Myrtaceae, Oxalidaceae, Rutaceae, Sapotaceae, Solanaceae (Carroll et al., 2004 onwards). Plant Health Australia (2011) also mentions Arecaceae, Fabaceae, Loganiaceae, Oleaceae, Vitaceae. Kapoor (2005/6) and Singh et al. (2010) mentions that it is especially on cucurbitaceous plants, tomatoes and other fleshy fruits, and the latter also mention hosts such as *Citrullus lanatus, Citrus grandis, Cucumis sativus, Cucurbita maxima, Lagenaria siceraria, Luffa acutangula, Momordica charantia, Passiflora edulis, Syzygium samarangensis*. Several publications do not mention tomato as a host (e.g. Huque, 2006), but publications from India do (e.g. Singh et al., 2010; Sharma et al., 2011).
Damage	*B. tau* is an important horticultural pest (Singh et al., 2010) and qualified as a "devastating pest of tomato" by Sharma et al. (2011). The damage is done by larvae that feed in the fruit. Life stages are studied in Singh et al. (2010).
Dissemination	Adults fly. Larvae are in fruit and pupae in the soil.
Pathway	Fruit of host plants and soil from countries where *B. tau* occurs.
Possible risks	Cucurbits and tomato are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is low to medium. Although the taxonomy of the species or forms in the *Bactrocera tau* complex is not clear from the above, there is a *B. tau* in India that causes damage to tomato.
Categorization	Quarantine lists of Japan 2011, Korea Rep 2011, Seychelles 2010 (from IPP), Jordan 2007 (from PQR)
Source(s)	Carroll LE, Norrbom AL, Dallwitz MJ, Thompson FC. 2004 onwards. Pest fruit flies of the world – larvae. Version: 8th December 2006. http://delta-intkey.com' (accessed January 2014) Huque R. 2006. Comparative Studies on the Susceptibility of Various Vegetables to Bactrocera tau (Diptera:Tephritidae). Pakistan Journal of Biological Sciences, 9: 93-95. Kapoor VC. 2005-6. Taxonomy and Biology of Economically Important Fruit Flies of India. In Biotaxonomy of Tephritoidea. Isr. J. Entomol. Vol. 35-36, 2005/6, pp. 459-475 Kitthawee S, Rungsri N. 2011. Differentiation in wing shape in the Bactrocera tau (Walker) complex on a single fruit species of Thailand. ScienceAsia 37 (2011): 308–313 Nakahara S, Muraji M. 2008. Phylogenetic Analyses of Bactrocera Fruit Flies (Diptera: Tephritidae) Based on Nucleotide Sequences of the Mitochondrial COI and COII Genes Res. Bull. Pl. Prot. Japan No. 44: 112 (March, 2008) Plant Health Australia (2011). The Australian Handbook for the Identification of Fruit Flies. Version 1.0. Plant Health Australia. Canberra, ACT. http://www.planthealthaustralia.com.au/wp-content/uploads/2012/12/Australian-Handbook-for-the-Identification-of-Fruit-Flies.pdf (Accessed January 2014) PQR Quarantine lists of Japan 2011, Korea Rep 2011, Seychelles 2010 (from the IPP) Sharma ID, Kumar S, Chandel RS, Patyal SK. 2011. Evaluation of drek, Melia azadirach for the management of fruitflies, Bactrocera tau in tomato. Journal of Biopesticides, 4 (1): 1 - 5 (2011) Singh SK, Kumar D, Ramamurthy VV. 2010. Biology of Bactrocera (Zeugodacus) tau (Walker) (Diptera: Tephritidae). Entomological Research 40 (2010) 259–263 Sumrandee C, Milne JR, Baimai V. 2011.Ovipositor morphology and host relations of the Bactrocera tau complex (Diptera: Tephritidae) in Thailand. Songklanakarin J. Sci. Technol. 33 (3), 247-254, May - Jun. 2011. Wu B, Shen K, An K, Huang J, Zhang R. 2011. Effect of Larval Density and Host Species on Preimaginal Development of Bactrocera tau (Diptera: Tephritidae). Journal of Economic Entomology, Volume 104, Number 6, December 2011 , pp. 1840-1850(11) Zhang B, Liu YH, Wu WX, Wang ZE. 2010. Molecular Phylogeny of Bactrocera Species (Diptera: Tephritidae: Dacini) Inferred From Mitochondrial Sequences of 16S RDNA and COI Sequences. Florida Entomologist 93(3). 369-377.

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Zonosemata electa* (Diptera: Tephritidae)**

Why	Identified in the EPPO tomato study. *Z. electa* is a pest of Solanaceae. It seems to be a sporadic pest of pepper and eggplant, but tomato is also a host.
Where	**EPPO region**: absent **North America**: Canada (southern Ontario & Quebec), USA (Iowa, Massachusetts, south to Texas & Florida)
Climatic similarity	High-medium. 13 common climates considering the countries listed above, but likely to be lower (possibly 6 considering the specific States where mentioned and possibly under protected conditions in Canada – no details found).
On which plants	Solanaceae. Larvae feed on fruit of *S. carolinense*, *S. scabrum*, *Physalis longifolia* var. *subglabrata* (perhaps, as record not well documented), *Capsicum annum* (sweet pepper), *S. lycopersicon* (tomato), *S. aculeatissimum*, *S. melongena* (eggplant) incl. var. *esculentum* (Norrbom, 2003, citing others). Records for a *Rosa* and for *S. elaeagnifolium* are doubtful.

Damage	*Z. electa* larvae feed in and develop in fruit. It attacks healthy fruit. On pepper (Bessin, 2003), *Z. electa* is a sporadic pest in parts of the USA. Eggs are deposited in the flesh of the fruit, and larvae tunnel in the cap of the fruit and in the fruit. There is little evidence of attack on the outside of the fruit, but considerable internal tunnelling and discoloration. In Georgia, it is a sporadic to rare pest attacking pepper and eggplant, rarely tomato (University of Georgia, ND).
Dissemination	Adults fly. Eggs are laid in fruit, larvae develop in fruit, pupae in the soil.
Pathway	Fruits and vegetables of host plants, soil, from countries where *Z. electa* occurs.
Possible risks	Tomato, sweet pepper, eggplant are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is medium. It may also establish in glasshouses. Where it occurs, *Z. electa* is controlled by cultural control (removal and destruction of rotted and infested fruit, rotation, destruction of the alternate host *S. carolinense*) and sprays based on trapping (yellow sticky traps) (for pepper, Bessin, 2003). Larvae are difficult to detect in fruit until they produce an exit hole (University of Georgia, ND).
Categorization	Quarantine lists of Japan 2011, Mexico 2011, Peru 2013, Korea Rep 2011 (from the IPP)
Source(s)	Bessin R. 2003. Pepper maggot in Kentucky. Zonosemata electa (Say) • Family: Tephritidae . ENTFACT 316. University of Kentucky, Cooperative Extension Service. http://www2.ca.uky.edu/entomology/entfacts/ef316.asp Carroll LE, Norrbom AL, Dallwitz MJ, Thompson FC. 2004 onwards. Pest fruit flies of the world – larvae. Version: 8th December 2006. http://delta-intkey.com. Norrbom. 2003. USDA SEL. Pepper maggot. The Diptera site. Systematic entomology laboratory, ARS-USDA and Department of entomology NSHM-SI http://www.sel.barc.usda.gov/diptera/tephriti/Zonosem/electa.htm Zonosemata electa (Say) Quarantine lists of Japan 2011, Mexico 2011, Peru 2013, Korea Rep 2011(on the IPP) University of Georgia. ND. Pepper maggot (Order: Diptera, Family: Tephritidae, Zonosemata electa (Say)). http://www.ent.uga.edu/veg/solanaceous/pepper_maggot.pdf

HEMIPTERA: ALEYRODIDAE

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Aleurotrachelus trachoides* (Hemiptera: Aleyrodidae)**

Why	Identified in the EPPO tomato study.
Where	**EPPO region**: absent **Africa:** Gambia, Reunion Island (Evans, 2007) – the record for Gambia is based on interceptions in the UK (Malumphy, 2005) **North America**: Mexico, USA (California, Florida, Louisiana, Texas, Hawaii) (Evans, 2007, Hodges and Evans, 2005; Hara, 2011). **Central America**: Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama (Dooley, 2006; Evans, 2007). **Caribbean**: Antigua and Barbuda, Bahamas, Barbados, Belize? (Martin, 2005), Cuba, Dominica, Dominican Rep., Guadeloupe; Haiti, Jamaica, Martinique, Puerto Rico, Trinidad and Tobago (Trinidad), Virgin Islands (CABI CPC, Evans, 2007). **South America**: Brazil, Colombia, Ecuador (Galapagos), Guyana, Peru, Suriname, Venezuela (CDF, 2013; CABI CPC, 2013; Evans, 2007, Morales et al., 2003) **Oceania**: Fiji, Guam, Tahiti and Rangiroa (Dumbleton, 1961; Evans, 2007).
Climatic similarity	Low/medium. 5 common climates considering the countries and zones listed above. Considered as neotropical by Malumphy (2005)
On which plants	Highly polyphagous. Evans (2007) lists species in 28 families, among which the following Solanaceae hosts are: *Capsicum annuum, Capsicum frutescens, Capsicum* sp., *Cestrum nocturnum, Datura stramonium, Solanum lycopersicon, Lycopersicon* sp., *Nicotiana* sp., *Solanum melongena, Solanum nigrum, Solanum seaforthianum, Solanum* sp., *Solanum torvum* (Evans, 2007; Morales et al., 2003). The host list in Evans (2007) includes fruit trees, ornamentals and many other plants, e.g. *Annona muricata, Chamaedorea* sp., *Cocos nucifera, Bidens pilosa, Ipomoea batatas; Dioscorea* sp.*; Leucaena* sp.*; Persea americana, Hibiscus elatus; Ficus membranaceae and F. retusa, Psidium guajava, Morinda citrifolia, Citrus limon, Cleome* sp.*; Theobroma cacao*. Finally CABI CPC lists (among hosts not mentioned in Evans, 2007): Brassicaceae, Cucurbitaceae, *Lactuca sativa* (lettuce).
Damage	Whiteflies cause direct and indirect damage to plants by larval and adult feeding on leaves and stems. Feeding reduces productivity. The cosmetic value of fruit is reduced by honeydew production. The pest feeds on plants and sometimes fruit (http://www.ecured.cu/index.php/Mosca_blanca_del_aj%C3%AD)
Dissemination	Eggs, larvae and adults on leaves and stems, and may also feed on fruit. This pest was intercepted in the UK on sweet potato leaves (Malumphy, 2005; Mifsud et al., 2010), and in the USA on various species (Evans, 2007; not tomato, but various species such as *Capsicum*, herbs, *Mentha*, *Musa*,

Hibiscus rosa-sinensis, *Jasminum*, *Chamaedora*, *Punica granatum*). It is known to have spread to Hawaii (late 1990s) and Guam (2003) (Martin, 2005), probably also Gambia. The pest is known to have spread in the Americas (e.g. Galapagos).

Pathway: Plants for planting, fruits and vegetables (incl. leaves), cut flowers of host plants from countries where *A. trachoides* occurs.

Possible risks: *A. trachoides* has major host crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is low to medium. It may also establish in glasshouses.

Categorization: From PQR: Eastern Africa and Southern Africa, A1, 2001

Source(s):

CABI CPC, 2013

CDF. 2013. Galapagos Species Checklist. http://checklists.datazone.darwinfoundation.org/introduced-species/introduced-invertebrates/aleurotrachelus-trachoides-back-1912/ (Accessed August 2013)

Dooley J. 2006. Whitefly pupae. Aleurotrachelus. http://keys.lucidcentral.org/keys/v3/whitefly/key/Aleyrodid%20Pupal%20Key%20to%20the%20Genera/Media/Html/Aleurotrachelus.htm

Dumbleton LJ. 1961. Aleyrodidae (Hemiptera: Homoptera) from the South Pacific. N.Z. J. SCI.: 4(4):770-774.

Evans GA. 2007. The Whiteflies (Hemiptera: Aleyrodidae) Of The World and Their Host Plants and Natural Enemies. USDA/Animal Plant Health Inspection Service (APHIS) http://keys.lucidcentral.org/keys/v3/whitefly/PDF_PwP%20ETC/world-whitefly-catalog-Evans.pdf (Accessed August 2013)

Hara AH. 2011. Invasive species: impact and control. PDF presentation at Hawaii Pest Control Association Learning Conference. Ko`olina Resort. September 23, 2011. http://www.ctahr.hawaii.edu/haraa/HPCAInvasiveSpecies092311_rev%20(NXPowerLite%20pptx).pdf (Accessed January 2014)

Hodges GS, Evans GA. 2005. An identification guide to the whiteflies (Hemiptera: Aleyrodidae) of the Southeastern United States. Florida Entomologist 88(4) December 2005.

Martin JH. 2005. Whiteflies of Belize (Hemiptera: Aleyrodidae) Part 2—a review of the subfamily Aleyrodinae Westwood. (Zootaxa 1098)

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HEMIPTERA: CICADELLIDAE

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Austroasca (Empoasca) viridigrisea* (Hemiptera: Cicadellidae) (vegetable leafhopper)**

Why: Identified in the EPPO tomato study. It is a pest of vegetables in Australia.

Where: **EPPO region**: absent

Oceania: Australia (all States and territories, Lord Howe Island – from NSW, ND)

Climatic similarity: High. 8 common climates.

On which plants: Originally native Solanaceae, then potato, tomato, beans, tobacco, lucerne (Page, 1983). NSW (ND) also mentions leafy vegetables and carrots. Cotton (Cotton CRC, 2012). Lettuce (Asteraceae), other vegetables and a wide range of other herbaceous plants (NSW. NDb) (according to AusVeg, ND, leafhoppers may be key pests of lettuce, celery and spinach)

Damage: Eggs are laid into plant tissue (leaf, stem, petiole – depending on host, Page, 1983). Nymphs and adults feed on plant (mostly foliage). They mostly suck sap from leaves; fruit may be attacked (whitish spots) (ACIAR, 2013). *A. viridigrisea* is reported as a pest of leafy vegetables in most parts of Australia, also attacking beans, carrots, potato and non-irrigated tomatoes (NSW, ND). Feeding leads to distortion of leaves and stunting. Trebicki et al. (2010) note it is a common pest of potatoes, tomatoes, beans, tobacco and lucerne (referring to Page), and mention it among economically-important leafhoppers of Australia. On cotton, the pest feeds preferably on mature leaves after flowering, but occasionally damages seedlings and new growth. Yield is reduced only when very high numbers occur before the production of new growth ceases (Cotton CRC, 2012). Mensah (1996) notes it is an important early season pest of cotton. ACIAR (2013), in relation to tomato, chilli, capsicum and eggplant, mentions that it is normally not a problem in these crops, for which it is minor and infrequent. No mention of virus or phytoplasma transmission found.

Dissemination: Adults fly and hop, nymphs can walk (to the other side of leaf or stem if disturbed). Several life stages may be associated with host material.

Pathway	Fruit if green parts attached, plants for planting, leaf vegetables, vegetables, of host plants from countries where *A. viridigrisea* occurs.
Possible risks	The host plants are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is high.
Categorization	Regulated by New Zealand for tomatoes from Australia (Biosecurity NZ, 2000)
Source(s)	ACIAR. 2013. Tomato, capsicum, chilli and eggplant. Australian Centre for International Agricultural Research

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NSW. NDb. Subfamily Typhlocybinae: Tribe Empoascini. New South Wales Government. http://www1.dpi.nsw.gov.au/keys/leafhop/typhlocybinae/empoascini.htm

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HEMIPTERA: COREIDAE

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Leptoglossus zonatus* (*Theognis zonatus*, *Veneza zonata*) (Hemiptera: Coreidae) (western leaf-footed bug, large-legged bug, chinche patona)**

Why	Identified in the EPPO tomato study. *Leptoglossus zonatus* is a polyphagous pest that causes damage to various crops. Note: CABI CPC (2013) contains separate entries for *Veneza zonata* and *Leptoglossus zonatus*. However, they are synonyms according to other publications (incl. Coreoidae Species File (ND), Buss et al. (2011), Arnal et al. (2005) etc.)
Where	**EPPO region**: absent **North America**: Mexico (Tepole-Garcia et al., 2012; Tarango-Rivero and Gonzalez Hernández, 2009), USA (south and west, incl. Alabama, Arizona, California, Florida, Louisiana, Texas) (Chi and Mizell, 2012; Xiao and Fadamiro, 2010). **Central America**: through Mexico and Central America (incl. Nicaragua, Honduras) into the northern half of South America (Chi and Mizell, 2012; Xiao and Fadamiro, 2010). Costa Rica (GBIF, 2013), El Salvador (Gonzalez-Chavez, 2002). Probably others (see below) **South America**: Brazil (De Oliveira et al., 2004), Venezuela (PAV, 2013) (both as *V. zonata*), Colombia (Duarte Sanchez, 2006). In addition: Coreoidae Species File (ND), citing Packauskas (2010) (not found) mentions Argentina, Bolivia, Ecuador, Guatemala, Panama, Peru (a quick search did not allow to find specific records for these countries) "Caribbean" is indicated in King and Saunders (1984), but no specific record was found.
Climatic similarity	Medium. 7 common climates considering the countries and US States listed above. These correspond in the EPPO region to the Mediterranean Basin, Near East and possibly part of Central Asia.
On which plants	*L. zonatus* feeds on a wide variety of crops. Tomato, *Jatropha curcas* (cultivated for biofuel), Satsuma mandarin (but unknown if host), maize, cotton, eggplant, peach, pecan, pomegranate, watermelon (Chi and Mizell, 2012). Other hosts listed in the literature are *Citrus aurantiifolia*, *Citrus sinensis*, *Cucumis melo*, *Cucurbita* (pumpkin) , *Persea americana* (avocado) , *Psidium guajava* (guava) , *Punica granatum* (pomegranate), *Sorghum bicolor* (sorghum) (CABI CPC), *Cyphomandra betacea* (Arnal et al., 2005). Schaefer and Panizzi (2000) mention pomegranate and a few other plants as breeding hosts. It is unclear if it can complete its life cycle on satsuma mandarin (Chi and Mizell, 2012).

Damage	Eggs are laid on leaves, stems. Nymphs and adults feed on leaves, flowers, fruit, seeds, and are mobile. Adults fly and are attracted by light (Chi and Mizell, 2012; Buss et al., 2011). Feeding causes deformations, spots, aborted fruit, malformed seeds (Buss et al., 2011). Feeding on fruit and seeds affects the quality and cause yield reduction (Marchiori, 2002). In the USA, it became a major pest of citrus, and is considered an emerging pest on various other of crops such as maize, cotton, eggplant, peach, pecan, pomegranate, tomato, watermelon (Xiao and Fadamiro 2011; Chi and Mizell, 2012). In South America, it is a pest of various crops, and also a vector of plant trypanosomatids (de Oliveira et al., 2004). On maize in Brazil, losses of 15% were registered (Marchiori, 2002). In Colombia, damage is caused to citrus (Duarte Chavez, 2002). In Central America (King and Saunders, 1984), it is a minor pest that can be serious on tomato. Shaefer and Panizzi (2000) mention damage on many crops, including cotton, tomato, citrus, avocado, cucurbits, sorghum, eggplant, pomegranate, passionfruit, maize, soybean.
Dissemination	This pest has spread at least within the USA (for example first recorded in Florida in 2005 – Buss et al., 2005). Adults fly. No additional data on spread was found.
Pathway	Fruit, plants for planting, vegetables of host plants from countries where *L. zonatus* occurs.
Possible risks	Many hosts of *L. zonatus* are major crops in the EPPO region, especially in the southern part. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is medium.
Categorization	None found
Source(s)	Arnal E, Ramos F, Aponte A, Suárez ZH, Cermeli M, Rojas T. 2005. Reconocimiento de insectos y enemigos naturales asociados al tomate de árbol en Aragua y Miranda, Venezuela CENIAP HOY, Revista Digital del Centro Nacional de Investigaciones Agropecuarias de Venezuela, Número 9 septiembre-diciembre 2005
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	CABI CPC.2013.
	Chi AA, Mizell RF III. 2012. Leptoglossus zonatus. Featured creatures. University of Florida. http://entnemdept.ufl.edu/creatures/citrus/leptoglossus_zonatus.htm (Accessed December 2013)
	Coreoidae Species File. ND. Version 5.0 http://coreoidea.speciesfile.org/Common/editTaxon/SearchForTaxon.aspx (Accessed August 2013)
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	Gonzalez-Chavez MO. 2002. Informe De Consultorõa Sobre:Diagnostico De Las Especies Invasoras De Fauna Invertebrada Y Sus Efectos Sobre Ecosistemas En El Salvador. Ministerio De Medio Ambiente Y Recursos Naturales.
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	Schaefer CW and Panizzi AR. 2000. Heteroptera of economic importance, CRC Press, Boca Raton, FL, 828 pp. http://books.google.dk/books?id=AVcBI0GL-fQC&pg=PA193&lpg=PA193&dq=nysius+clevelandensis+biology&source=bl&ots=xWYygyiZVT&sig=SwfKG-c128yJdli3YX44xP5dGsA&hl=da&sa=X&ei=Ae2FUuf4D6i34wSahICABQ&ved=0CCwQ6AEwAA#v=onepage&q=nysius%20clevelandensis%20biology&f=false (Accessed December 2013)
	Tarango Rivero SH, González Hernández A. 2009. Especies, Fluctuación Poblacional y Enemigos Naturales de Chinches (Hemíptera: Pentatomidae, Coreidae, Largidae) Asociadas a Nogal Pecanero. Southwestern Entomologist 34(3):305-318. 2009.
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Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Phthia picta* (Hemiptera: Coreidae) (Brazil: percevejo-do-tomateiro, Argentina: chinche de tomate; USA: leaffooted bug [one of several species])**

Why	Identified in the EPPO tomato study. It is an important pest of tomato in South America. It seems that the name has changed to *Dallacoris picta* (Schaefer and Panizzi, 2000) and more recently to *Phthiacnemia picta* (Brailovsky, 2009). However, most publications refer to *Phthia picta*, and this name was kept here.
Where	Distributed nearly throughout the neotropical region according to Barankowski and Slater (1986), with some records in southern USA. The distribution in Caribbean and Central America is not completely clear. **EPPO region**: absent **North America**: USA (California, Texas, Florida) (Barankowski and Slater, 1986), Mexico (Da Silva and Carvalho, 2001, King and Saunders, 1984, Barilovsky, 2009) **Central America**: Guatemala, Honduras, Costa Rica (Barilovsky, 2009), Costa Rica, El Salvador, Honduras, Nicaragua (Packauskas, 2010 cited in Coreoidae Species File, ND), Guatemala, Nicaragua (specimen record in GBIF. 2013). Several publications mention Central America generally, and the pest may be present in more countries. **Caribbean**: Cuba (Barilovsky, 2009) Cuba Puerto Rico, St. Martin (Packauskas, 2010 cited in Coreoidae Species File, ND). CABI CPC (2013) also contain the following records (originating from a publication from Schotman, 1989), but these are not mentioned in the publications specifically on this species: Antigua and Barbuda, Barbados, British Virgin Islands, Dominican Republic, Grenada, Jamaica, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago (CABI CPC). **South America**: Argentina, Brazil, Colombia, Surinam, Paraguay, Uruguay, Venezuela (Barilovsky, 2009). In addition to these, Packauskas (2010, cited in Coreoidae Species File, ND) mentions Guyana.
Climatic similarity	Medium. 7 common climates considering the countries listed above (most due to the presence of the pest in southern USA).
On which plants	It is not clear on which plants *P. picta* breeds and on which ones it only feeds on. Da Silva et al. (2001, citing others) mention Solanaceae and Cucurbitaceae as host plants, with a preference for tomato. Barakowski and Slater (1986) notes that it breeds on *Solanum nigrum* and that other authors also reported it breeding on tomato, squash, cowpeas, *Datura metel* (or feeding on the last three?). Attacks on many other plants are reported including *S. sysimbrifolium*, *S. tuberosum*, *S. melongena*, *Capsicum annuum*, *Nicotiana tabacum*, *Cucurbita pepo*, *Cucurbita maxima*, *Cucumis melo*, *Momordicha charantia*, *Pisum sativum*, *Phaseolus vulgaris*, *Vicia faba*, *Sesamum indicum*, *Helianthus annuus*, *Ipomoea batata*, *Gossypium hirsutum*, *Oryza sativa*, *Punica granatum* (Barakowski and Slater, 1986). King and Saunders (1984) list tomato, eggplant, cucurbitaceae, also rice, sweet potato, maize. CABI CPC (2013) lists pumpkin, Cucurbitaceae, tomato, sugarcane, rice as hosts, but without details.
Damage	Eggs on stems or under leaves (Schuster, ND), nymphs and adults feed on leaves, stems, blossoms and fruit, and are mobile. Economic damage result mostly from feeding on fruit, leading to uneven ripening and deformation. Feeding punctures also expose the fruit to infestation by pathogens or other insects (Da Silva et al., 2001 and 2003). *P. picta* is mentioned amongst major pest of economic importance for tomato for South America by Berlinger (1987), and is an important pest of tomato in Brazil (Da Silva et al., 2001 and 2003), from which there are many publications, also recent. In Florida, it seems to be an occasional pest on tomato and pepper, and the action threshold recommended on these crops for stink bugs and leaf-footed bugs (incl. *Phthia picta*) is low, at 1 nymph or adult per plant (Schuster, ND). In Texas, it is recorded as being common in gardens (Texas A&M, ND). *P. picta* is not identified as a pest throughout its distribution. It is not considered a pest in Honduras and Cuba according to Schaefer and Panizzi (2000), and is a minor pest of tomatoes in Central America according to King and Saunders (1994).
Dissemination	Adults fly. Several life stages may be associated to fruit and associated green parts. There is an uncertainty on whether nymphs fly and could be associated to consignments of fruit. Adults fly and could leave consignments.
Pathway	Plants for planting, fruits and vegetables (especially if green parts are attached) of host plants from countries where *P. picta* occurs.
Possible risks	The main pest risk seems to be for tomato. Hosts on which the pest is recorded to breed occur in the EPPO region, as well as many plants on which it feeds. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is medium, corresponding, in the EPPO region to the Mediterranean Basin, possibly through to the Black Sea and Central Asia.
Categorization	None found
Source(s)	Coreoidae Species File. ND. Version 5.0 http://coreoidea.speciesfile.org/Common/editTaxon/SearchForTaxon.aspx (Accessed January 2014)

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Packauskas R. 2010. Catalog of the Coreidae, or Leaf-Footed Bugs, of the New World, Fort Hays Studies, Fourth Series, Number 5. Fort Hays State University (note: publication was not found, but distribution was mentioned in Coreoidae Species File, ND)

Schaefer CW and Panizzi AR. 2000. Heteroptera of economic importance, CRC Press, Boca Raton, FL, 828 pp. http://books.google.dk/books?id=AVcBI0GL-fQC&pg=PA193&lpg=PA193&dq=nysius+clevelandensis+biology&source=bl&ots=xWYygyiZVT&sig=SwfKG-c128yJdli3YX44xP5dGsA&hl=da&sa=X&ei=Ae2FUuf4D6i34wSahICABQ&ved=0CCwQ6AEwAA#v=onepage&q=nysius%20clevelandensis%20biology&f=false (Accessed January 2014)

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HEMIPTERA: MIRIDAE

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Cyrtopeltis modesta* (*Engytatus modestus*) (Hemiptera: Miridae) (tomato bug, tomato suck bug)**

Why	Identified in the EPPO tomato study.
Where	**EPPO region**: absent **North America**: Canada (in glasshouses; Anon. 2009; Colorado University, 2011; Agriculture and Agri-food Canada, 2006); Mexico (Schuh, 2002-2013; Carvalho and Da Silva, 1977); USA (Texas, Georgia – Schuh, 2002-2013; California - UC IPM, 2011; Mississippi, South Carolina Hawaii - Carvalho, 1960, Colorado (in glasshouses? Colorado University, 2011), **Central America**: Guatemala, El Salvador (Schuh, 2002-2013; Carvalho and Da Silva, 1977) **Caribbean**: Puerto Rico, Cuba (Schuh, 2002-2013) **South America**: Ecuador (Galapagos), Peru, Brazil, Chile (Schuh, 2002-2013, CDF, 2013; Carvalho and Da Silva, 1977) Uncertain record: Argentina (http://www.coleoptera-neotropical.org/6_Arthropoda/6a/pais/Hemiptera_Argentina.html). This record comes from a very general website and original publications were not found.
Climatic similarity	Medium. 7 common climates or fewer considering the countries and the southern USA States listed above. It is recorded to have been introduced in greenhouses in Colorado and Ontario (Colorado University, 2011).
On which plants	Tomato (UC IPM, 2011; Hawaii Edu, ND, Anon., 2009, Schuh, 2002-2013). Also *Amaranthus*, *Cleome*, *Mikania congesta*, tobacco (Schuh, 2002-2013). Squash, gourd, tobacco, potato, watermelon, eggplant, beans, weeds (Colorado University, 2011)
Damage	Eggs are laid in stems; nymphs and adults feed on stems and are mobile (UC IPM, 1998, 2011; Colorado University 2011). Damage may lead to blossom drop, dropping of young fruit, and breakage, stunted growth (UC IPM, 2011; Agriculture and Agri-food Canada, 2006). The only reported association with fruit was found in Canadian publications: Agriculture and Agri-food Canada (2006) report that nymphs and adults can feed on stems and fruit, and Anon. (2009 – publication not

available, cited in a list of pests) mention that this species was found on fruit in Canada. Economic damage on tomato is occasional in California (UC IPM, 2011). The pest was introduced to Hawaii, where it became a pest of tomato and tobacco (Carvalho, 1960). In Canada, it causes occasional damage to greenhouse tomatoes in British Columbia and Ontario (Agriculture and Agri-food Canada, 2006) [Reminder for searches: mispelled "Crytopeltis" in UC IMP (2011)].

Dissemination: Adults fly. *C. modestus* seems to have spread (introduced at least to Hawaii; in Colorado and Canada, introduced in greenhouses; Colorado University, 2011). *Cyrtopeltis* spp. was intercepted on tomato in the USA (USDA, 2009).

Pathway: Fruits and vegetables (only if parts of stems attached?), plants for planting of host plants from countries where *C. modesta* occurs.

Possible risks: Tomato and several other hosts are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is medium. It may also establish in glasshouses. It is not clear if control methods are available.

Categorization: Quarantine pest for Korea Rep 2011 (from IPP)

Source(s):

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Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Lygus hesperus, L. lineolaris* and other American *Lygus* pest species (Hemiptera: Miridae) (common name)**

Why: Identified in the EPPO tomato study. *Lygus* species are highly polyphagous and several species occur in the Americas. This record focuses on *L. hesperus* and *L. lineolaris*, which seem to be the most important *Lygus* pest species in North America. Few data on host range and distribution of other American *Lygus* species are also given (*L. borealis*, *L. eliseus*, *L. keltoni*, *L. shulli*).

L. lineolaris was added to the EPPO Alert in 1998 because it was a pest of ornamentals in south-eastern USA. It was deleted in 2008 as no particular international action had been requested by EPPO member countries during that period. Information from the original Alert List record is used here. A PRA was performed in 2000 (EPPO, 2002) and concluded that the risk was not unacceptable (limited damage and restricted economic impact). However, there is still evidence of damage in the literature, and this species was retained here.

Where:

Lygus hesperus

EPPO region: absent

North America: North America: USA (CABI CPC, UC IPM, 2011 etc.), Canada (Gillespie et al. 2003) Mexico (Carvalho and da Silva Afonso, 1977).

Lygus lineolaris

EPPO region: Absent. Netherlands (absent, confirmed by survey) (PQR)

North America: Canada, Mexico, USA (PQR, Carvalho and da Silva Afonso, 1977; Gillespie et al. 2003; King and Saunders, 1984). Widespread, prefers warm, humid to dry climates in the South, Southeast and Southwest (EPPO; 2008)

	Caribbean: Bermuda, Canada, Mexico, USA; Central America: El Salvador, Guatemala, Honduras (PQR) **Central America:** El Salvador, Guatemala, Honduras (PQR, Carvalho and da Silva Afonso, 1977, King and Saunders, 1984) *Lygus borealis* - **North America**: USA , Canada (Schuh, 2002-2013) *Lygus elisus* - **North America**: Canada (Gillespie et al. 2003), Mexico (Carvalho and da Silva Afonso, 1977), USA (Mueller et al., 2003) *Lygus keltoni* - **North America**: USA, Canada, Mexico (Schuh, 2002-2013) *Lygus shullii* - **North America**: Canada (Gillespie et al. 2003), USA (Schuh, 2002-2013)
Climatic similarity	High. 12-13 common climates considering the countries and areas listed above.
On which plants	*Lygus* species are highly polyphagous on fruits, vegetables, [also ornamentals for *L. lineolaris*,] field and forage crops, and weeds and cause damage in the field and under glasshouse (Mueller et al., 2003, Ellsworth and Mason, ND). *Lygus hesperus* - Recorded on 110 hosts (Holtz, 2002). Hosts include: apple, pear, sugarbeet, tomato, cotton, strawberry bean, grapevine, pistachio, carrot, lucerne, safflower, weeds, pome and stone fruit, vegetable crops cucumber (Holtz, 2002, CABI CPC, Mueller et al., 2003, Agriculture and Agri-Food Canada, 2008, La Rue and Johnson, 1989). *Lygus lineolaris* - More than 300 host plants (EPPO, 2002). Host include: fruit trees (apple, apricot, cherry, grape), beans, cotton, carrot, potato, cabbage, lettuce, small fruits, *Cucurbita maxima*, *Medicago*, *Persea*, *Amaranthus*, cucumber (Mueller et al., 2003; Schuh, 2002-2013, Wheeler, 2001, Agriculture and Agri-Food Canada, 2008) and glasshouse hosts include *Aster*, chrysanthemums, *Dahlia*, *Impatiens* and *Tagetes* (EPPO, 2008). For the four species below, a few specific hosts were found, but these species are possibly polyphagous as indicated in Ellsworth and Mason, ND. *Lygus borealis* Specific hosts mentioned: *Medicago* (Schuh, 2002-2013), peppermint, Indian mustard (CABI CPC). *Lygus elisus* - Specific hosts mentioned: cucumber, carrot, pome and stone fruit, cotton, tomato (Agriculture and Agri-Food Canada, 2008, CABI CPC, La Rue and Johnson, 1989). *Lygus keltoni* - Specific hosts mentioned: Asteraceae, Chenopodium album (Schuh, 2002-2013). *Lygus schulli* - Specific hosts mentioned: herbaceous spp., lupinus (Schuh, 2002-2013), strawberry, quinoa, peach (Wheeler, 2001) cucumber (Agriculture and Agri-Food Canada, 2008).
Damage	Eggs on plants, nymphs and adults feed on flowers, buds, also fruit, and are mobile. Nymphs and adults feed on young tissue and immature fruit, causing deformation, yellowing, distortion of terminal growth and reduced plant growth. Flowers from damaged buds sometimes fail to develop on one side or the whole bud aborts (EPPO, 2008 and others). *L. lineolaris* and *L. hesperus* seem to be the most important *Lygus* pest species. Ellsworth and Mason (ND) note that they are the main *Lygus* pests in North America, but that *L. elisus, L. borealis, L. schulli* and *L. keltonia* are pests in some regions. In Canada, *L. lineolaris, L. schulli, L. hesperus, L. elisus* are considered as pests on cucumber in glasshouse (Agriculture and Agri-Food Canada, 2008). Gillespie et al. (2003), mention specifically tomato, cucumber and pepper, and indicate that *Lygus* bugs are important pests attacking glasshouse vegetable crops in Canada; they are associated with lucerne or weedy habitats, and invade glasshouses. In Ontario and British Colombia, *L. hesperus*, *L. lineolaris*, *L. schulli* and *L. elisus* were collected during surveys around glasshouses (Gillespie et al., 2003). In Ontario, the only important *Lygus* is *L. lineolaris*, which is common on greenhouse pepper, also present on greenhouse cucumbers, and rarely a problem on tomato (Ferguson et al., 2012). In California, *Lygus* species (cited as "*L. hesperus* and others") move to tomato when their primary hosts are dry or harvested (UC IPM, 2011). Wheeler (2001) lists damage and economic losses recorded for Miridae pests, and reports damage on (among others) lucerne seed crops by *L. hesperus;* blackberry, raspberry, grape, pepper by *L. lineolaris*; strawberry by *L. hesperus* and *L. lineolaris;* apple and pear by *L. hesperus*, *L. elisus* and *L. lineolaris*; on peach by *L. lineolaris*, *L. hesperus*, *L. elisus* and *L. schulli*. Feeding on fruit is more serious than on flower or leaves (Wheeler, 2001). EPPO (2002) considered that *Lygus lineolaris* causes damage to foliage and flowers, of similar importance to common European *L. rugulipennis* (not considered a major pest).
Dissemination	Adults fly. No indication of international spread was found.
Pathway	Plants for planting (cut flowers?) of host plants (EPPO, 2008), fruit? (especially if green parts attached?).
Possible risks	The *Lygus* species considered have many hosts in the EPPO region, both in the field and in glasshouse. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is high. One major parameter of the risk is damage and association with fruit. Only

one source mentions *L. borealis* as a pest, and it is probably very minor. Other species seem to have some importance in some circumstances. EPPO (2002), focusing on the ornamental pathway, considered that the risk by *L. lineolaris* is not unacceptable, as there is limited damage to host plants and restricted economic impact. The risk was considered as similar to that posed by the common European *L. rugulipennis*, which is not considered a major pest. One issue to assess the risk for these *Lygus* species is whether this assessment also applies to fruit crops, and whether there is a pathway into the region.

Categorization: *L. hesperus* : Quarantine pest for Japan 2011, Korea Rep 2011
L. elisus: Quarantine pest for Japan 2011, Korea Rep 2011
L. lineolaris: Israel 2009, Brazil 1995 (from PQR), EPPO Alert List, 1998-2008; Quarantine pest for Costa Rica 2012, Ecuador 2008, Japan 2011 (from the IPP).

Source(s):

Agriculture and Agri-Food Canada. 2008. Table of crops, pests and active ingredients http://www4.agr.gc.ca/resources/prod/doc/pmc/pdf/mup_snp08_ent_e.pdf (Accessed January 2014)

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EPPO. 2002. Report of a PRA for Lygus lineolaris. EPPO document 00-8439. Available from http://www.eppo.int/QUARANTINE/Pest_Risk_Analysis/PRA_documents.htm (Accessed January 2014)

EPPO. 2008. Alert List. Lygus lineolaris.

Gillespie DR, Foottit RG, Shipp JL, Schwartz MD, Quiring DMJ, Wang K. 2003. Diversity, distribution and phenology of Lygus species (Hemiptera: Miridae) in relation to vegetable greenhouses in the lower Fraser Valley, British Columbia, and southwestern Ontario. J. Entomol. Soc. Brit. Columbia 100, December 2003 43

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King ABS and Saunders JL. 1984. The invertebrate pests of annual food crops in Central America. Overseas Development Administration, London. From Google Books (Accessed January 2014)

LaRue JH, Johnson RC. 1989. Peaches, Plums, and Nectarines: Growing and Handling for Fresh Market. UCANR Publications 246 pages. From Google Books (Accessed January 2014)

Mueller SC, Summers CG, Goodell PB. 2003. A field key to the most common Lygusspecies found in agronomic crops of the central San Joaquin Valley of California. Univ. California, Agric. Nat. Res. Publ. No. 8104. http://cottoninfo.ucdavis.edu/files/133229.pdf (Accessed January 2014)

PQR

Quarantine lists of Costa Rica 2012, Ecuador 2008, Japan 2011, Korea Rep 2011 (from the IPP)

Schuh, R.T. 2002-2013. On-line Systematic Catalog of Plant Bugs (Insecta: Heteroptera: Miridae). http://research.amnh.org/pbi/catalog/index.php (Accessed January 2014)

UC IPM. 2011. Pest Management Guidelines: tomato. University of California.

Wheeler AG. 2001. Biology of the Plant Bugs (Hemiptera: Miridae): Pests, Predators, Opportunists (Cornell Series in Arthropod Biology). Cornell University Press, 2001 - 507 pp. From Google Books (Accessed January 2014).

HEMIPTERA: PENTATOMIDAE

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Arvelius albopunctatus* (Hemiptera: Pentatomidae) (green white spotted bug)**

Why: Identified in the EPPO tomato study. It is an important pest of Solanaceae in Brazil (Campos, 2007) and is recorded to have gained importance in the 1990s (Martinez and Folcia, 1999).

Where: **EPPO region**: absent
North America: USA (Arizona, Florida, Texas) (NDSU, NDa)
Central America: Guatemala, El Salvador, Honduras, Nicaragua, Panama (NDa)
South America: Argentina (Misiones, Buenos Aires, Entre Rios – Martinez and Folcia, 1999; Rebagliati et al., 2005), Brazil (CABI CPC). NDSU (NDa) mentions Bolivia, Colombia, Ecuador, Guyana, Paraguay, Peru, Surinam, Uruguay, Venezuela.
Caribbean: Barbados, Dominican Republic, Puerto Rico (CABI CPC from Shotman, 1989). NDSU (NDa) mentions Antigua, Bahamas, Cuba, Grenada, Haiti, Jamaica, Montserrat, St. Vincent, Trinidad, US Virgin Islands (St. Croix, St. Thomas)

Climatic similarity: Medium. 7 common climates considering the countries and US states listed above, but possibly lower (occurring in specific areas of the countries mentioned). Neotropical according to Martinez and Folcia (1999).

On which plants: Nymphs and adults feed on fruit and plants in the Solanaceae family, but according to some authors in other families. Tomato (*Solanum lycopersicum*), eggplant (*Solanum melongena*), sweet pepper (*Capsicum annuum*) (CABI CPC). Potato (*Solanum tuberosum*) and a number of wild hosts: *Solanum ciliatum, S. bonariense, S. paniculatum, S. variabile, S.flagellare, S. acculeatissimun, S. gracile* and

	Datura sp. (Martinez and Folcia, 1999). Martinez and Folcia (1999, citing others) note that some authors mention as host plants beans (*Phaseolus vulgaris*), soja (*Glycine max*), rice (*Oryza sativa*), cotton (*Gossypium*) and tobacco (*Nicotiana tabacum*). Recorded on mango (*Mangifera indica*) in Florida (USA) in 2009 (new plant record - Halbert, 2009 – no details)
Damage	Eggs are laid on the plant. Damage is done by nymphs and adults, feeding on fruit. At the damaged points, depressed areas are formed, which decrease the commercial quality of the tomato fruit. Sucking spots favour entry of secondary infection by pathogens. In Argentina, the duration of the life cycle was approximately 80 days on average (Martinez and Focia, 1999). The pest status of this species is not entirely clear. Martinez and Focia (1999) note that it has secondary importance on tomato but has gained importance in recent years. It is an important pest of Solanaceae, including tomato and potato, in Brazil according to Campos et al. (2007). However, although pest importance is mentioned in the latter two publications, Panizzi and da Silva (2010) mention that its pest status is controversial, and Garlet et al. (2010) consider it a predatory species. It is considered as a quarantine pest in California, where it was intercepted from Florida (CDT, 2009).
Dissemination	Adults fly. Nymphs have legs and walk (but do not fly?). Eggs can be carried on leaves and fruit.
Pathway	Plants for planting, fruits and vegetables of host plants from countries where *A. albopunctatus* occurs. (Not potato tubers).
Possible risks	Tomato, potato, eggplant and sweet pepper are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is medium. It may also establish in glasshouses. It is not clear if control methods are available.
Categorization	None found.
Source(s)	CABI CPC. 2013.

Campos LA, Teixeira RA, De S. Martins F. 2007. Três Padrões Novos de Coloração de Ninfas de Arvelius albopunctatus (De Geer) (Hemiptera: Pentatomidae). Neotropical Entomology 36(6):972-975 (2007)

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Garlet J, Roman M, Corrêa Costa E. 2010. Pentatomídeos (Hemiptera) associados a espécies nativas em Itaara, RS, Brasil. Biotemas, 23 (1): 91-96, março de 2010. mas.ufsc.br/volumes/pdf/volume231/91a96.pdf

Halbert S. 2009. Entomology specimen report. Entomology section. DACS-P-00124 Volume 48, Number 1, January - February 2009. http://www.freshfromflorida.com/Divisions-Offices/Plant-Industry/Plant-Industry-Publications/Tri-ology-FDACS-DPI/Volume-48-Number-1-January-February-2009/January-February-2009-Entomology-Section

Martínez LE, Folcia AM. 1999. Aspectos morfológicos y biológicos de Arvelius albopunctatus (De Geer, 1773) (Hemíptera: Pentatomidae). Bol. San. Veg. Plagas, 25: 13-20, 1999. http://www.magrama.gob.es/ministerio/pags/Biblioteca/Revistas/pdf_plagas%2FBSVP-25-01-013-020.pdf

Panizzi AR, Da Silva JJ. 2010. New Records of Pentatomids as Hosts of Hexacladia smithii Ashmead (Hymenoptera: Encyrtidae) in Southern Brazil. Neotropical Entomology 39(4):678-679 (2010)

Rebagliati PJ, Mola LM, Papeschi AG, Grazia J. 2005. Cytogenetic studies in Pentatomidae (Heteroptera): A review. 5) 43(3), 199–213.

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Chinavia hilaris* (*Acrosternum hilare*, *Nezara hilaris*) (Hemiptera: Pentatomidae) (green stink bug)**

Why	Identified in the EPPO tomato study. It is reported as a pest of a wide range of crops. The name *Acrosternum hilare* is used in many publications, although it seems that the current name is *Chinavia hilaris* (Rider, 2011).
Where	**EPPO region**: absent **Asia:** Pakistan (Sarwar, 2006). [This is the only record found outside of North America.] **North America**: Canada (British Columbia, Ontario, Quebec), USA (Alabama, Arkansas, California, Florida, Georgia, Illinois, Kentucky, Louisiana, Maryland, Massachusetts, Missouri, New Jersey, North Carolina, Ohio, Oklahoma, South Carolina, Texas, Virginia, Washington) (CABI CPC), also USA (Arizona, CN?, Colorado, Connecticut, District of Columbia, Iowa, Indiana, Kansas, Maine, Michigan, Mississippi, Nebraska, New York, Pennsylvania, Rhode Island, Utah in Rider, 2011), Mexico (Jalisco?, Nuevo Leon) (Rider, 2011). Doubtful record: South America: Brazil. Schwertner and Grazia (2007), in a study on *Chinavia* spp. in Brazil, note that the presence of *C. hilaris* in Brazil was reported in the literature, but did not find specimens confirming this record and, in one case, the record was a misidentification.
Climatic similarity	High. 14 common climates considering the countries and regions listed above.
On which plants	*C. hilaris* is highly polyphagous, with hosts in many families. UF (2010) mention it as a pest of seed, grain, nut and fruit, with favourite hosts such as black cherry and elderberry, flowering dogwood, evergreen blackberry, basswood and pine trees, and attacking a large number of important economic crops, including *Malus domestica* (apple), *Prunus armeniaca* (apricot), *Asparagus officinalis* (asparagus), *Phaseolus* (beans), cherries, *Zea mays* (maize), *Gossypium* (cotton), *Solanum melongena*

(aubergine), *Prunus persica* (peach), *Pyrus communis* (pear), *Pisum sativum* (pea), *Glycine max* (soybean), *Nicotiana tabacum* (tobacco), *Solanum lycopersicum* (tomato). Daane et al. (ND & 2005) also mention pistachio. CABI CPC also refers to hosts such as *Citrus sinensis* (navel orange), *Medicago sativa* (lucerne), *Brassica oleracea* var. *capitata* (cabbage), *Corylus avellana* (hazel), *Fragaria ananassa* (strawberry), *Fraxinus* (ashes), *Juglans nigra* (black walnut), *Prunus domestica* (plum), *Rubus idaeus* (raspberry), *Ulmus rubra*, *Vitis vinifera* (grapevine), Wisteria (other hosts – CABI CPC).

Damage: Eggs are laid on leaves, stems, and occasionally fruit. Nymphs and adults feed on leaves, pods, seeds, buds and fruit. They are mobile, and adults fly. The pest is univoltine in the north and bivoltine in the South of its distribution. Reported as a serious pest of tomato and other vegetable crops, more damaging in Southern USA (Clemson Cooperative Extension, 2009). *C. hilaris* attacks fruit and seeds and reduce their quality. It also favours entry of pathogens. It causes different types of damage depending on the host and the stage of the fruit (depressions, scarring, corky areas etc.). Chemical control is often required (UF, 2010). Feeding on cotton and soybean leads to reduced yield and quality (Herbert and Toews, 2009). The pest is recorded to cause more damage to soybean and green beans in its southern distribution (Panizzi et al., 2000).

Dissemination: Eggs may be associated mostly to green parts associated to fruit, while nymphs and adults may also be associated with fruit (but are mobile). Adults fly.

Pathway: Plants for planting, fruit?, vegetables?, of host plants from countries where *C. hilaris* occurs.

Possible risks: Many host plants occur in the EPPO region, including vegetable crops, fruit trees, ornamental trees. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is high.

Categorization: Quarantine pest for Japan 2011, Korea Rep 2011 (from IPP)

Source(s):

CABI CPC, 2013

Clemson Cooperative Extension. 2009. Tomato insect pests. HGIC 2218 Home & Garden Information Center http://www.clemson.edu/extension/hgic. (Accessed August 2013)

Daane KM, Yokota GY, Krugner R, Steffan SA, da Silva PG, Beede RH, Bentley WJ, Weinberger GB. 2005. Large bugs damage pistachio nuts most severely during midseason. California Agriculture, Volume 59, no. 2, 95-102

Daane KM, Millar JG, Rice RE, da Silva PG, Bentley WJ, Beede RH, Weinberger G. ND. Stink bugs and leaffooted bugs. Unidentified publication, University of California, pp. 186-196. http://fruitsandnuts.ucdavis.edu/files/73703.pdf

Herbert JJ, Toews MD. 2012. Seasonal Abundance and Population Structure of Chinavia hilaris and Nezara viridula (Hemiptera: Pentatomidae) in Georgia Farmscapes Containing Corn, Cotton, Peanut, and Soybean. Annals of the Entomological Society of America 105(4):582-591.

Panizzi AR, McPherson JE, James DG, Javahery M, McPherson RM. Chapter 13 - Stink Bugs, Pentatomidae. P 444 In Schaefer CW and Panizzi AR. 2000. Heteroptera of economic importance, CRC Press, Boca Raton, FL, 828 pp. . http://books.google.dk/books?id=AVcBl0GL-fQC&pg=PA444&lpg=PA444&dq=panizzi+piezodorus+hybneri+heteroptera&source=bl&ots=xWYAcCiWPZ&sig=WiiyPXuww4-19WnYLd35oHNgJbw&hl=da&sa=X&ei=3_GeUuCZH4Ld4QTprYC4AQ&ved=0CEIQ6AEwAg#v=onepage&q=Chapter%2013&f=false (Accessed January 2014)

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UF. 2010. Chinavia hilaris. University of Florida. Featured Creatures. http://entomology.ifas.ufl.edu/creatures/veg/bean/green_stink_bug.htm. (Accessed August 2013)

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Chinavia marginata* (*Acrosternum marginatum*, *Nezara marginata*) (Hemiptera: Pentatomidae)**

Why: Identified in the EPPO tomato study. It was identified based on a record in CABI CPC (2013), but little information was found in the literature. The name *Acrosternum marginatum* is used in many publications, although it seems that the current name is *Chinavia marginata* (Rider, 2011).

Where: **EPPO region**: absent

North America: USA (Arizona, California, Florida, Texas), Mexico (Rider, 2011)

Central America: Belize, Costa Rica, Guatemala, Honduras, Nicaragua, Panama (Rider, 2011)

Caribbean: Dominica, Dominican Rep., Grenada, Guadeloupe, Haiti, Jamaica, Puerto Rico, US Virgin Islands (St. Croix) (Rider, 2011); CABI CPC (2013, based on Schotman et al., 1989) also mention Antigua and Barbuda, Trinidad and Tobago (CABI CPC).

South America: Bolivia, Brazil (Rio Grande do Sul), Colombia, Ecuador, Guyana, Peru, Venezuela (Rider, 2011)

	Doubtful record: Brazil. Schwertner and Grazia (2007), in a study on *Chinavia* spp. in Brazil, note that the presence of *C. marginata* in Brazil was reported in the literature, but did not find specimens confirming this record and, in one case, the record was a misidentification of *C. ubica* (which has tomato as a potential host, but a more tropical distribution: Dominican Rep., Bahamas, Grenada, Panama, Suriname, Guiana, Venezuela, Colombia, Brazil, Ecuador, Bolivia).
Climatic similarity	Medium. 7 common climates considering the countries listed above, possibly lower (occurring in specific areas of the countries mentioned).
On which plants	Soybean, *Jatropha curcas*, beans (Panizzi et al., 2000); legumes, tomato, various crops and weeds (King and Saunders, 1984); *Abelmoschus esculentus*, *Capsicum annuum*, *Glycine max*, *Nicotiana tabacum*, *Phaseolus*, *Solanum lycopersicum* (CABI CPC).
Damage	King and Saunders (1984) note that the biology is similar to that of *N. viridula* (eggs on leaves, nymphs and adults feed on fruit, pods, seeds and young tissues. (for *C. hilaris*, eggs are also laid on stems, and occasionally fruit). They are mobile, and adults fly. In Central America, *C. marginata* is a minor pest that may be serious locally (King and Saunders, 1984).
Dissemination	Eggs may be associated mostly to green parts associated to fruit, while nymphs and adults may also be associated with fruit (but are mobile). Adults fly.
Pathway	Plants for planting, fruit?, vegetables?, of host plants from countries where *C. marginata* occurs.
Possible risks	The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is medium. In areas of its distribution which have higher climatic similarity with part of the EPPO region (e.g. southern USA), and where both *C. marginata* and *C. hilaris* occur, records were found only for *C. hilaris* as a pest. This may indicate that *C. marginata* is less important than *C. hilaris* in these areas.
Categorization	None found.
Source(s)	CABI CPC. 2013 King ABS and Saunders JL. 1984. The invertebrate pests of annual food crops in Central America. Overseas Development Administration, London. http://books.google.dk/books?id=qMwOAQAAIAAJ&dq=agrotis+repleta+king&source=gbs_navlinks_s (Accessed January 2014) Panizzi AR, McPherson JE, James DG, Javahery M, McPherson RM. Chapter 13 - Stink Bugs, Pentatomidae. P 444 In Schaefer CW and Panizzi AR. 2000. Heteroptera of economic importance, CRC Press, Boca Raton, FL, 828 pp. . http://books.google.dk/books?id=AVcBI0GL-fQC&pg=PA444&lpg=PA444&dq=panizzi+piezodorus+hybneri+heteroptera&source=bl&ots=xWYAcCiWPZ&sig=WiiyPXuww4-19WnYLd35oHNgJbw&hl=da&sa=X&ei=3_GeUuCZH4Ld4QTprYC4AQ&ved=0CEIQ6AEwAg#v=onepage&q=Chapter%2013&f=false (Accessed January 2014) Rider D. 2011. Pentatomidae Home page. North Dakota State University. http://www.Rider.nodak.edu/Rider/rider/Pentatomoidea/index.htm (Accessed January 2014) Schwertner CF, Grazia J. 2007. O gênero Chinavia Orian (Hemiptera, Pentatomidae, Pentatominae) no Brasil, com chave pictórica para os adultos. Revista Brasileira de Entomologia 51(4): 416-435, dezembro 2007.

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Chlorochroa sayi* and *C. uhleri* (Hemiptera: Pentatomidae) (respectively Say's stink bug and Uhler stink bug)**

Why	Identified in the EPPO tomato study. These two North American species were considered together here because they have a similar biology, and differ slightly in their distribution and host plants.
Where	**EPPO region**: absent **North America**: *C. sayi:* USA (throughout the Western USA; Anon., ND; UC IPM, 2011). Throughout the west, from Montana and eastern Texas west to California; found in Arkansas (although unusually east) (SimplyKitchenGarden, ND). Map in Buxton and Thomas (1983) (does not include Arkansas). Canada: doubtful. Several publications mention British Columbia (e.g, Anon. ND, SimplyKitchenGarden, ND). However, University of Alberta (ND) mentions that there is no record for *C. sayi* north of 46°N (map in Buxton and Thomas, 1983). Scudder and Thomas (1987) mention that *C. sayi* does not occur in Canada and that records were misidentifications of *C. uhleri*. No recent record of *C. sayi* in Canada was found. *C. uhleri*: USA, Canada (UC IPM, 2011, University of Alberta, ND). From Saskatchewan and the Dakotas, Nebraska and New Mexico west to the Pacific Ocean (SimplyKitchenGarden, ND). The map in Buxton and Thomas (1983) does not include Saskatchewan, only Alberta and British Columbia. Scudder and Thomas (1987) mention that records of *C. sayi* in Canada were misidentifications of *C. uhleri*.
Climatic similarity	High. 9 common climates for *C. sayi* and 11 for *C. uhleri* considering the areas mentioned above.

On which plants	*For both*: tomato (UC IPM, 2011, Berlinger, 1987); wheat, alfalfa, *Salsola iberica*, *Sisymbrium altissimum* (Buxton and Thomas, 1983; University Alberta, ND; Anon., ND). Alfalfa, barley, oat, rye, wheat, occasionally asparagus, bean, cabbage, lettuce, pea, tomato (SimplyKitchenGarden, ND, considering *C. sayi* and *C. uhleri* together). Daane et al. (ND & 2005) also mention pistachio. *C. uhleri*: *Descurainia pinnata* (Buxton and Thomas, 1983; University Alberta, ND). *Salsoa* spp., *Balsamorhiza sagittata* (University Alberta, ND). *C. sayi*: Barley, rye *Atriplex* spp., *Ephedra* spp., *Grayia spinosa*, *Artemisia* spp. (Buxton and Thomas, 1983); also red clover, grasses, weeds (Anon., ND). Regulated by New Zealand on pears from Idaho (Biosecurity NZ, 1999).
Damage	Both species have a similar biology. Eggs are laid on leaves. Nymphs and adults feed on fruit and seeds, also leaves and stems (SimplyKitchenGarden, ND; UC IPM, 2011), and are mobile. UC IPM (2011) refers to green fruit, but no more information was found on whether these are preferred or whether mature fruit are also attacked. Both are mentioned amongst major pest of economic importance for tomato for North America by Berlinger (1987). In California, Hoffman et al. (1987) mention that *C. sayi* and *C. uhleri* are the less important of the stink bugs attacking tomato (compared to *Euschistus conspersus*, *Nezara viridula*, *Thyantha accerra*); however UC IPM (2011) indicate areas where they are more prevalent than others. Both species are part of a group of bugs attacking tomato in North America (that also include *Thyantha accerra*, *Euschistus conspersus*, *Nezara viridula*).
Dissemination	Adults fly. For tomato fruit, eggs may be associated mostly to green parts, while nymphs and adults may also be associated with fruit (but are mobile). No additional data on dissemination was found.
Pathway	Plants for planting, seeds, fruits and vegetables of host plants from countries where *C. sayi* or *C. uhleri* occurs.
Possible risks	Several hosts are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is high.
Categorization	*C. sayi* : quarantine pest for Korea Rep. 2011 (from IPP) *C. uhleri* : none found
Source(s)	Anon. ND. Stink bugs Chlorochroa sayi and Euschistus conspersus. http://insects.ippc.orst.edu/pdf/reb73.pdf (Accessed January 2014) Berlinger MJ. 1987. Pests. pp 391-441 In The Tomato Crop, A scientific basis for improvement (eds Atherton JG and Rudich J). Chapman and Hall, London - New York. Biosecurity NZ. 1999. Import Health Standard Commodity Sub-class: Fresh Fruit/Vegetables Pear, Pyrus communis from the United States of America - State of Idaho. Date Issued: 4 November 1999. http://www.biosecurity.govt.nz/files/ihs/pear-us-id.pdf Buxton GM, Thomas DB, Froeschner RC. 1983. Revision of the species of the Sayi-group of Chlorochroa Stal (Hemiptera: Pentatomidae). Occasional papers in Entomology No. 29. State of California, Dept. of Food and Agriculture, Division of Plant Industry, Laboratory Services. Daane KM, Millar JG, Rice RE, da Silva PG, Bentley WJ, Beede RH, Weinberger G. ND. Stink bugs and leaffooted bugs. Unidentified publication, University of California, pp. 186-196. http://fruitsandnuts.ucdavis.edu/files/73703.pdf (Accessed January 2014) Daane KM, Yokota GY, Krugner R, Steffan SA, da Silva PG, Beede RH, Bentley WJ, Weinberger GB. 2005. Large bugs damage pistachio nuts most severely during midseason. California Agriculture, Volume 59, no. 2, 95-102 Hoffmann MP, Wilson LT, Zalom FG. 1987. Control of stink bugs in tomatoes. California Agriculture, May-June 1987,. http://ucce.ucdavis.edu/files/repositoryfiles/ca4105p4-63016.pdf Quarantine list for Korea Rep 2011 (from IPP) Scudder GGE, Thomas DB. 1987. The Green Stink Bug Genus *Chlorochroa* Stål (Hemiptera: Pentatomidae) In Canada. The Canadian Entomologist / Volume 119 / Issue 01 / January 1987, pp 83-93 SimplyKitchenGarden. ND. Say stink bug Chlorochroa sayi (Stal) and Uhler Stink Bug Chlorochroa uhleri (Stal) (Hemiptera: Pentatomidae). http://www.simplykitchengarden.com/vegetablepests/117.html (Accessed January 2014) UC IPM. 2011. Pest Management Guidelines: tomato. University of California. University Alberta. NDb. Chlorochroa uhleri. Entomology collections. http://www.entomology.ualberta.ca/searching_species_details.php?b=Hemiptera&c=7&PHPSESSID=955f26cdf7d893f5d5dc161b6d53f0e8&s=4755 (Accessed August 2013)

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Euschistus conspersus* (Hemiptera: Pentatomidae)**

Why	Identified in the EPPO tomato study. *E. conspersus* is one of several polyphagous stink bugs that attack tomato in the North America. Another *Euschistus*, *E. servus* was dealt with separately as many references differ, but *E. conspersus* and *E. servus* should be reviewed in parallel.
Where	**EPPO region**: absent **North America**: Common Pacific coast (California to British Columbia) (Alcock 1971, citing others); California (UCI PM, 2011), Oregon (OSU, ND), Idaho? (regulated on pears from that State, Biosecurity NZ, 1999); USA (California, Maryland?); Washington State (Krupke et al., 2006 - endemic to western North America); Canada (Maw, 2011);. Western North America (Schaefer and Panizzi, 2000).
Climatic similarity	High. Possibly 8-10 common climates considering the areas listed above, but its detailed distribution (including its eastern limit) is not known.
On which plants	Tomato (CABI CPC; UC IPM, 2011, Cullen and Zalom, 2006); apple, pear (Krupke et al., 2006), apricot (McPherson and McPherson, 2000). Note: some early publications may contain other fruit tree crops, but were not easily available. Spring host plants: black mustard (Brassica nigra), wild radish (*Raphanus sativus*), *Malva parviflora* (Cullen and Zalom, 2006). Lucerne, sorghum, cotton, sugarbeet, tomato (Schaefer and Panizzi, 2000). Blackberry, vegetables, almond, pome fruit?, peach?, cherry? (Krupke, 2007). Wild plants are important in the life cycle of the pest. It feeds on mullein (*Verbascum thapsus*), bitterbrush (*Purshia tridentata*), red-osier dogwood (*Cornus stolonifera*), currant (*Rhus trilobata*) (Krupke et al., 2001). In a host experiement, Krupke et al. (2002) found that it could complete its life cycle on *Trifolium repens*, *Verbascum thapsus* and *Malva neglecta*, but not *Taraxacum officinale*, *Dactylis glomerata* or *Chenopodium album*.
Damage	Eggs are laid on foliage, adults and nymphs feed on fruit, and are mobile. Damage is due to the feeding by nymphs and adults. Schaefer and Panizzi (2000) mention that *E. conspersus* causes occasional damage to alfalfa, sorghum, cotton and sugarbeet and is the most common stink bug on tomato in California. *E. conspersus* is mentioned amongst major pest of economic importance for tomato for North America by Berlinger (1987). It is a key pest of processing tomatoes in California's Central valley; adults (offsprings of the first generation) move to tomato fields when their spring host plants or cultivated hosts senesce or are harvested, and reproduce for a second generation in tomato fields (Cullen and Zalom, 2006). The pest has caused increased damage to fruit in apple orchards in Washington State, where adults also move to orchards when their wild hosts senesce (Krupke and Brunner, ND; Krupke et al., 2001). Finally Krupke et al. (2006) report occasional damage on pear and apple in Washington State.
Dissemination	Adults fly and disperse between fields and crops.
Pathway	Fruits (especially if green parts attached?), plants for planting, of host plants from countries where *E. conspersus* occurs.
Possible risks	Tomato, apple, pear, lucerne and sugarbeet are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is high.
Categorization	Quarantine list for Japan 2011, Korea Rep 2011 (from the IPP); regulated by New Zealand on pears from Idaho (USA) (Biosecurity NZ, 1999)
Source(s)	Alcock J. 1971. The behavior of a stinkbug, Euschistus conspersus Uhler (Hemiptera: Pentatomidae). Psyche, 78:4, 215-228 Berlinger MJ. 1987. Pests. pp 391-441 In The Tomato Crop, A scientific basis for improvement (eds Atherton JG and Rudich J). Chapman and Hall, London - New York. Biosecurity NZ. 1999. Import Health Standard Commodity Sub-class: Fresh Fruit/Vegetables Pear, Pyrus communis from the United States of America - State of Idaho. Date Issued: 4 November 1999. http://www.biosecurity.govt.nz/files/ihs/pear-us-id.pd CABI CPC. 2013 Cullen EM, Zalom FG. 2006. Euschistus conspersus female morphology and attraction to methyl (2E,4Z)-decadienoate pheromone–baited traps in processing tomatoes. Entomologia Experimentalis et Applicata 119: 163–173. Krupke CH, Brunner JF, Doerr MD, Kahn AD. 2001. Field Attraction of the Stink Bug Euschistus conspersus (Hemiptera: Pentatomidae) to Synthetic Pheromone-Baited Host Plants. Journal of Economic Entomology Vol. 94, no. 6, 1500-1505. Krupke CH, Brunner JF, Jones VP. 2003. The growth and development of the consperse stink bug, Euschistus conspersus, on selected potential host plants present in orchard ground cover. Washington State University, Tree Fruit Research and Extension Center, Wenatchee, WA. Proceedings of the 77th Annual Western Orchard Pest & Disease Management Conference. 15-17 January 2003, Hilton Hotel, Portland, OR v Publ. by Washington State Univ., Pullman, Washington Krupke CH, Brunner JF. ND. Biology and management of the consperse stink bug, Euschistus conspersus. http://entomology.tfrec.wsu.edu/jfbhome/growerarticles/sbhort.pdf (Accessed December 2013) Krupke CH, Jones VP, Brunner JF. 2006. Diel Periodicity of Euschistus conspersus (Heteroptera: Pentatomidae). Aggregation, Mating, and Feeding. Ann. Entomol. Soc. Am. 99(1): 169-174. http://extension.entm.purdue.edu/fieldcropsipm/pubs/9.pdf (Accessed December 2013)

Krupke CH, Jones VP, Brunner JF. 2011. Evaluating aggregation membership and copulatory success in the stink bug, Euschistus conspersus, using field and laboratory experiments. Journal of Insect Science: Vol. 11 | Article 2

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McPherson JE, McPherson R. 2000. Stink Bugs of Economic Importance in America North of Mexico. CRC Press, 19/09/2000 - 272 pages. http://books.google.dk/books?id=sPoMyfDh5sYC&dq=Stink+Bugs+of+Economic+Importance+conspersus&hl=da&source=gbs_navlinks_s

OSU. ND. Euschistus conspersus - Consperse stink bug. Oregon State University. http://horticulture.oregonstate.edu/content/euschistus-conspersus-consperse-stink-bug

Quarantine lists of Japan 2011, Korea Rep 2011 (from the IPP)

Schaefer CW and Panizzi AR. 2000. Heteroptera of economic importance, CRC Press, Boca Raton, FL, 828 pp. http://books.google.dk/books?id=AVcBl0GL-fQC&pg=PA193&lpg=PA193&dq=nysius+clevelandensis+biology&source=bl&ots=xWYygyiZVT&sig=SwfKG-c128yJdli3YX44xP5dGsA&hl=da&sa=X&ei=Ae2FUuf4D6i34wSahICABQ&ved=0CCwQ6AEwAA#v=onepage&q=nysius%20clevelandensis%20biology&f=false (Accessed December 2013)

UC IPM. 2011. Pest Management Guidelines: tomato. University of California.

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Euschistus servus* (Hemiptera: Pentatomidae) (brown stink bug)**

Why	Identified in the EPPO tomato study. *E. servus* is one of several polyphagous stink bugs that attack tomato in the North America (see also *E. conspersus*). Another *Euschistus*, *E. conspersus* was dealt with separately as many references differ, but *E. conspersus* and *E. servus* should be reviewed in parallel. McPherson and McPherson (2000) note that there are two subspecies *E. s. servus* and *E. s. euschistoides*, which have different distributions (respectively, South-East USA to California, and northern part of North America; overlapping in a band from Maryland to Kansas). Subspecies are distinguished here only when such distinction is made in publications.
Where	**EPPO region**: absent **North America**: Canada (British Columbia as *E.s. euschistoides*, Maw, 2011; across the southern part, Gomez and Mizell. 2013). USA (throughout; Gomez and Mizell, 2013), Mexico (CABI CPC,Tarango-Rivero and González-Hernández, 2009). Most of eastern North America (Borges et al., 2001). See under "why" for distribution of subspecies.
Climatic similarity	High. 13 common climates considering the countries listed above, but likely to be lower (occurring in specific areas of the countries mentioned).
On which plants	Tomato, peach, cotton, pecan, maize, lucerne, soybean, sorghum, okra, millet, wheat, beans, peas, tobacco, mullein (Borges et al., 2001 citing others; Gomez and Mizell, 2013; Mizell, ND; Hall and Teetes, 1981, Schaefer and Panizzi, 2000, citing others, CABI CPC).
Damage	Eggs are laid on foliage, adults and nymphs feed on fruit, and are mobile. Adults and nymphs feed on vegetative parts, flowers, stems and foliage of the plant, as well as seed, nut or fruit (Gomez and Mizell, 2013) *E. servus* is the most economically important stink bug according to Schaefer and Panizzi (2000). It is a serious pest of tomato and various other vegetable crops in South Carolina (Clemson Cooperative Extension, 2009). This is the main stink bug on fruit in north Florida (Mizell, ND). Together with other stink bugs, it is a serious pest of seed, grain, nut and fruit crops in the southern USA (Gomez and Mizell, 2013). In cotton, stink bugs, incl. *E. servus* for Georgia, emerged as major pests following changes in cultural practices and control measures against other pests (Tillman and Cottrell, 2012). *E. servus* is not mentioned amongst stink bugs pests of tomato for California in UC IPM (2011) (unlike *E. conspersus*).
Dissemination	Adults fly and disperse between fields and crops.
Pathway	Fruits (especially if green parts attached?), plants for planting, of host plants from countries where *E. servus* occurs.
Possible risks	Many hosts are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is high.
Categorization	Quarantine pest for Korea Rep 2011
Source(s)	Borges M, Zhang A, Camp M, Aldrich J. 2001. Adult diapause morph of the brown stinkbug, *Euschistus servus* (Heteroptera). Neotropical Entomology 30(1): 179-182 (2001) CABI CPC. 2013

Clemson Cooperative Extension. 2009. Tomato insect pests. HGIC 2218HOME & GARDEN INFORMATION CENTER http://www.clemson.edu/extension/hgic. (Accessed August 2013)

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McPherson JE, McPherson R. 2000. Stink Bugs of Economic Importance in America North of Mexico. CRC Press, 19/09/2000 - 272 pages. http://books.google.dk/books?id=sPoMyfDh5sYC&dq=Stink+Bugs+of+Economic+Importance+conspersus&hl=da&source=gbs_navlinks_s

Mizell RF. ND. Monitoring Stink Bugs with the Florida Stink Bug Trap. University of Florida. http://nfrec.ifas.ufl.edu/MizellRF/stink_bugs/stink_bugs.htm (Accessed December 2013)

Quarantine List of Korea Rep. 2011 (from IPP)

Tarango Rivero SH, González Hernández A. 2009. Especies, Fluctuación Poblacional y Enemigos Naturales de Chinches (Hemíptera: Pentatomidae, Coreidae, Largidae) Asociadas a Nogal Pecanero. Southwestern Entomologist 34(3):305-318. 2009.

Tillman PG, Cottrell TE. 2012. Case Study: Trap Crop with Pheromone Traps for Suppressing Euschistus servus (Heteroptera: Pentatomidae) in Cotton. Psyche Volume 2012 (2012), Article ID 401703, 10 pages

HEMIPTERA: PYRRHOCORIDAE

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Dindymus versicolor* (Hemiptera: Pyrrhocoridae) (harlequin bug)**

Why	Identified in the EPPO tomato study.
Where	**EPPO region**: absent **Oceania**: Australia, New Zealand (Cassis and Gross, 2002). *For Australia:* New South Wales (south-east coast), South Australia (south gulf, south-east coast), Tasmania, Victoria (south-east coast), Western Australia (Queensland Government, 2000) *For New Zealand*: the record is uncertain. No other reference was found, and the pest is regulated on capsicum and tomato from Australia (Biosecurity NZ, 2000 & 2013) (i.e. it should be absent or under official control).
Climatic similarity	Medium. 8 similar climates for Australia, but probably only 5 considering the distribution within Australia.
On which plants	The only specific reference found to tomato is that it is regulated on tomatoes from Australia to New Zealand (Biosecurity NZ, 2000 & 2013). *D. versicolor* attacks a wide range of crops, such as cotton, pome fruits, stone fruits, fig, grape, kurrajong, strawberry, vegetables, wisteria, dahlia and violet (Fletcher, 2007), artichoke, fig, strawberry, sunflower, apple, almond, apricot, peach, pear, gooseberry, black currant, raspberry, potato, grape (Cassis and Gross, 2002), abutilon, alyogone, dahlia, fig, grape, hibiscus, kurrajong, pome and stone fruit, strawberry, Thomasia, violet, wisteria (Queensland Government 2000).
Damage	*D. versicolor* feeds on leaves and fruit. Feeding in swarms causes wilting and fruit damage (Queensland Government, 2000; Fletcher, 2007). It was considered as a pest of soft fruit orchards and gardens (Stahle, 1979). *D. versicolor* is reported as a key pest in Victoria, and a minor pest in Western Australia (about ornamentals, Queensland Government, 2000).
Dissemination	No details were found, but adults fly. One recommendation for control is to avoid spreading the pest with infested material (Fletcher, 2007)
Pathway	Plants for planting, fruits, vegetables, cut flowers of host plants from countries where *D. versicolor* occurs.
Possible risks	This pest has a wide host range, and may attack tomato among all its vegetable hosts. Several hosts are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is medium.
Categorization	Quarantine pest for New Zealand (peppers and tomato from Australia, Biosecurity NZ 2000 & 2013), Korea Rep 2011 (from IPP).
Source(s)	Biosecurity NZ. 2000. Import Health Standard Commodity Sub-class: Fresh Fruit/Vegetables Tomato, Lycopersicon esculentum from Australia. Issued pursuant to Section 22 of the Biosecurity Act 1993. Date Issued: 9 June 2000. Biosecurity NZ. 2013. Draft For Public Consultation May 2013. Risk Management Proposal Alternatives to dimethoate to manage the export of fruit fly host commodities: Irradiation of fresh Capsicum annuum L. (capsicum) and Lycopersicon esculentum L. (tomato) for human consumption from Australia to New Zealand

http://www.biosecurity.govt.nz/files/biosec/consult/rmp-irradiation-of-fresh-capsicum-and-tomatoes.pdf (Accessed August 2013)

Cassis G, Gross GF. 2002. Hemiptera. Csiro Publishing, 2002 - 737 pp. http://books.google.dk/books?id=UWifn5wT6D8C&pg=PA110&lpg=PA110&dq=Fabrictilis+australis&source=bl&ots=NO251icBHe&sig=yDjmcTNk7Me0BUFHFa-6MKsXgus&hl=en&sa=X&ei=rC24UbjqHs6z0QXPqoC4AQ&ved=0CE0Q6AEwBw#v=onepage&q=packauskas&f=false (Accessed December 2013)

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Quarantine list for Korea Rep 2011 (from the IPP)

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Stahle PP. 1979. The immature stages of the harlequin bug, Dindymus versicolor. J. Aust. ent. Soc. 18: 271-276 271.

LEPIDOPTERA: CRAMBIDAE

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Lineodes integra* (Lepidoptera: Crambidae) (eggplant leafroller, nightshade leaf tier)**

Why	Identified in the EPPO tomato study. The main source of data on this pest was a data sheet in Hayden (2013). Very little information could be found on its biology and distribution, and no mention of its importance or control.
Where	This pest occurs in all parts of the Americas and in the Caribbean, but its distribution (other than North America) is not clear. **EPPO region**: absent **North America**: Canada (Ontario) (OMNR, 2000); Mexico (Hayden, 2013), USA (Alabama, California, Florida, Louisiana, Mississippi, Texas, Illinois, Wisconsin, Washington (Hayden, 2013) Michigan, Nebraska (NatureSearch, 2008) Iowa (Insects of Iowa, 2008). Hayden (2013) mentions that it is present from Florida to California, and as far north as Illinois, Wisconsin, and Washington (Hayden, 2013). It may occur in States that are in-between and not listed above (not fully checked). **Central America**: Costa Rica, Honduras (Hayden, 2013), Nicaragua (Maes and Tellez Robleto, 1988; Maes, ND). **Caribbean**: Bahamas (Hayden, 2013). Cuba (Wikipedia citing Nunez Aguila and Barro Canamero, 2012; Patterson, ND citing the same, Ecosis ND); Note: Maes (ND) lists Jamaica, Granada, Cuba (citing Maes and Tellez, 1988, which does not contain this information). No other record were retrieved for Granada and Jamaica **South America**: Argentina, Brazil (Hayden, 2013), Chile? (no other record found. Only Nature Search, 2008), Ecuador (at least Galapagos, introduced in 1989; DII Galapagos, 2013), Uruguay (Biezanko et al., 1974) Note: Maes (ND) lists Colombia and Brazil (citing Maes and Tellez, 1988, which does not contain this information). No other record was found for Colombia. For Brazil, only an old record was found (listing Lepidoptera in Florida) was (Grossbeck, 1917). Note: Boldsystems (2013) includes specimens for USA, Mexico, Ecuador, Argentina, Costa Rica.
Climatic similarity	High. 13 common climates considering the countries listed above, which is probably the case as the pest has a wide distribution in the USA.
On which plants	The main hosts seem to be eggplant, tomato and *Physalis*. Other hosts mentioned are *Capsicum annuum*, *Nicotiana glauca* (tree tobacco), *Solanum angustifidum*, *S. asperum*, *S. carolinense*, *S. incarceratum*, *S. lycopersicum*, *S. melongena*, *S. torvum*, *S. tuberosum*, *S. umbelliferum*, "*S. verbascifolium*", *S. viarum*, *S. xanti*, *Solanum* spp. (Hayden et al., 2013). *Capsicum* spp, *Nicotiana* spp. (DII Galapagos, 2013), tobacco (Biezancko et al., 1974), *Physalis peruviana* and *P. philadelphica* (Solis, 2006).
Damage	(All from Hayden, 2013) Damage is done by larvae, which feed on leaves, occasionally on the surface of petioles and at the surface of fruits (at all stages, buds to ripe - they do not bore into the fruit). On leaves, larvae web leaves and hide in withered foliage. They feed on fruit when in high densities. Pupation occurs on the plant (rolled leaf edge, axil or crevices of the stem).
Dissemination	Adults fly. No details were found.
Pathway	Plants for planting, fruit and vegetables of host plants from countries where *L. integra* occurs. USDA (2009) reports 3 interceptions on tomato fruit in the USA. Hypothesis is made that it was imported to northern USA by nursery plants (NatureSearch, 2008). Solis (2006) lists interceptions on *Capsicum* sp., *Lavandula* sp., *Physalis peruviana*, *Physalis philadelphica*, *Solanum lycopersicum*, *Solanum torvum*, *Thymus* sp. (Solis, 2006).

Possible risks	Solanaceae are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is high. There is a lack of information on this pest, and its present importance. No mention of the pest's importance or control was found.
Categorization	None found.
Source(s)	Biezanko CM, de Ruffinelli A, Link D. 1974. Plantas y otras sustancias alimenticias de las orugas de los lepidopteros uruguayos. Rev. Centro Ciencias Rurais, Santa Maria, 4(2): 107-148. BugGuide. 2009. http://bugguide.net/ (Accessed December 2013) DII Galapagos. 2013. Database of Invertebrates Introduced to Galápagos, Fundación Charles Darwin, Islas Galápagos. http://rockbugdesign.com/invert_ref/en/species/show/473/ (Accessed December 2013) Ecosis. ND. Diversidad biologica cubana. http://www.ecosis.cu/biocuba/biodiversidadcuba/05_animalia/06_insecta1.html Grossbeck JA. 1917. Article I. -Insects Of Florida. IV. Lepidoptera. (Edited By Frank E. Watson). In Bulletin of The American Museum Of Natural History. Volume XXXVII, 59.57,8(75.9), 1917. Hayden, J.E., S. Lee, S.C. Passoa, J. Young, J.-F. Landry, V. Nazari, R. Mally, L.A. Somma, and K.M. Ahlmark. 2013. Digital Identification of Microlepidoptera on Solanaceae. USDA-APHIS-PPQ Identification Technology Program (ITP). Fort Collins, CO. <http://idtools.org/id/leps/micro/> - See more at: http://idtools.org/id/leps/micro/about_citation.php#sthash.jhPVIFrD.dpuf (Accessed December 2013) Insects of Iowa. 2008. http://www.insectsofiowa.com/Moths/families/63-06%20-%20live%20crambidae_pyraustinae%204934-5298.htm Maes JM and Tellez Robleto J. 1988. Catálogo de los insectos y artrópodos terrestres asociados a las principales plantas de importancia económica en Nicaragua. Rev. Nica. Ent., 5:1-95. Maes JM. ND. Fauna entomologica de Nicaragua. Lepidoptera, Pyralidae. http://www.bio-nica.info/Ento/Lepido/PYRALIDAE.htm Nature Search. 2008. Eggplant leafroller. Lineodes integra. Fontenelle Nature Association. http://www.fnanaturesearch.org/index.php?option=com_naturesearch&task=view&id=1958 (Accessed December 2013) Núñez Aguila R, Barro Cañamero A. 2012. A list of Cuban Lepidoptera (Arthropoda: Insecta). Zootaxa 3384: 1–59 OMNR. 2000?. Ontario Butterflies and Moths.xls. Available at http://find.gov.on.ca/?q=lineodes&search.x=-1063&search.y=-143&type=ANY&searchType=simple&offset=0&lang=en&url=http%3A%2F%2Fwww.mnr.gov.on.ca&collection=&owner=mnr (other publication on same site does not seem accessible) (Accessed December 2013) Patterson B. ND. Checklist of the Lepidoptera of the Antilles. http://mothphotographersgroup.msstate.edu/Antilles/AntillesChecklist.shtml Solis A. 2006. Key To Selected Pyraloidea (Lepidoptera) Larvae Intercepted At U. S. Ports Of Entry: Revision Of Pyraloidea In "Keys To Some Frequently Intercepted Lepidopterous Larvae" By Weisman 1986. USDA. http://www.ars.usda.gov/SP2UserFiles/Place/12754100/PyraloideaKey.pdf (Accessed December 2013)

Notes: original description available here (in German): http://www.archive.org/stream/verhandlungender2373zool#page/327/mode/1up

Not found: Campbell, R.E. 1938. The pyralid moth, Lineodes integra Zell., as a pest of eggplant. Journal of Economic Entomology 31: 457-458.

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Sceliodes cordalis* (*Margaritia cordalis*) (Lepidoptera: Crambidae) (poroporo fruit borer)**

Why	Identified in the EPPO tomato study. *S. cordalis* is an important pest of eggplant and other Solanaceae in Australia and New Zealand.
Where	**EPPO region**: absent **Oceania**: Oceania: Australia (throughout – Herbison-Evans & Crossley, 2013, Queensland Government, 2012; Martin, 2010)), Present throughout Australia, also in remote inland localities (Common, 1990); New Zealand (Martin, 2010)
Climatic similarity	High. 9 common climates considering the countries listed above (probably 8 as one is present in a very limited area of New Zealand).
On which plants	Eggplant, tomato, capsicum and pepino (*S. muricatum*), and solanaceous weeds (*Datura*, quena) (Queensland Govt, 2012); Cape gooseberry (*Physalis edulis*) (Herbison-Evans and Crossley, 2013); Two main native host plants: *Solanum aviculare* (poroporo) and *S. laciniatum* (Martin, 2010), as well as *Capsicum annuum*, *S. tuberosum*, *S. linnaeanum*, *S. muricatum* (Martin, 2010 - tomato not mentioned).
Damage	Eggs are laid mostly on the calyx (sometimes on leaves). Larvae are mostly in fruit, but may burrow in stem (Martin, 2010; Queensland Govt, 2012). Larvae tunnel into stem and fruit (Herbison-Evans and Crossley, 2013). It is not clear where pupae are located: Herbison-Evans & Crossley (2013) indicate that pupation occurs in the tunnels where mature larvae are located; Martin (2010) that mature larvae leave the plant to pupate, and pupates in crevices or protected places, covered with debris; Queensland Government (2012) that pupae are outside the fruit. Infestation is apparent only when mature larvae leave the fruit. High levels of fruit infestation can occur in the field and more than one larva may infest a fruit (Queensland Government, 2012). Several publications indicate that *S. cordalis* is a serious pest of eggplant in Australia, and occasionally of tomato, capsicum and pepino, and a pest of pepino in New Zealand (e.g. Queensland Govt, 2012; Kay, 2010 & 2012; Kay and

Brown, 2009). Kay and Brown (2009) report 10-58% of eggplant fruit damaged in the absence of treatment. *S. cordalis* is regulated for tomatoes from Australia destined to the USA (AQIS, 2003).

Dissemination: Adults fly. Infestation becomes apparent only when mature larvae exit the fruit, and infested fruit may be marketed (Queensland Government, 2012).

Pathway: Plants for planting, fruits and vegetables of host plants, soil?, packaging, from countries where *S. cordalis* occurs.

Possible risks: Eggplant, tomato, capsicum and potato are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is high. It may also establish in glasshouses. It is not clear if control methods are available.

Categorization: Regulated on tomatoes from Australia to USA (AQIS, 2003). No other record found in lists of quarantine pests.

Source(s):

AQIS. 2003. Industry Advice Notice no. 2003/13: Shade-House Tomato Exports To USA. http://www.daff.gov.au/biosecurity/export/plants-plant-products/ian/03/13 (Accessed January 2014)

Common IFB. 1990. Moths of Australia. Brill, 535 pages. http://books.google.com.au/books?id=magzbmvdRvQC&vq=sceliodes&dq=moths+australia+ian+common&hl=da&source=gbs_navlinks_s (Accessed January 2014)

Herbison-Evans D, Crossley S. 2013. Crambidae, Spilomelinae, Sceliodes cordalis. Caterpillars: especially Australian ones. Butterfly House. http://lepidoptera.butterflyhouse.com.au/spil/cordal.html (Accessed January 2014)

Kay IR, Brown JD. 2009. Evaluating the efficacy of insecticides to control Sceliodes cordalis (Doubleday) (Lepidoptera: Crambidae) in eggplant. Australian Journal of Entomology, Volume 48, Issue 2, pages 177–181, May 2009

Kay IR. 2010. Effect of constant temperature on the development of Sceliodes cordalis (Doubleday) (Lepidoptera: Crambidae) on eggplant. Australian Journal of Entomology 2010 Vol. 49 No. 4 pp. 359-362.

Kay IR. 2012. Notes on the biology of Sceliodes cordalis (Doubleday) (Lepidoptera: Crambidae). Australian Entomologist, 39 (2). pp. 89-95. ISSN 1320-6133 [abstract]

Martin NA. 2010. Factsheet on poroporo fruit borer - Sceliodes cordalis. http://nzacfactsheets.landcareresearch.co.nz/factsheet/OrganismProfile/Poroporo_fruit_borer_-_Sceliodes_cordalis.html (Accessed January 2014)

Queensland Government. 2012. Sceliodes cordalis. http://www.daff.qld.gov.au/plants/fruit-and-vegetables/a-z-list-of-horticultural-insect-pests/eggfruit-caterpillar (Accessed January 2014)

Not found: Kay IR. 2012. Notes on the biology of Sceliodes cordalis (Doubleday) (Lepidoptera: Crambidae). Australian Entomologist, 39 (2). pp. 89-95. ISSN 1320-6133 (only abstract available)

LEPIDOPTERA: NOCTUIDAE

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Achaea lienardi* (Lepidoptera: Noctuidae)**

Why: Identified in the EPPO tomato study. It is mentioned as a pest of tomato in Ghana (Ghana IPM, 1996). Note: Little information was found on this pest.

Where: **EPPO region**: absent

Africa: Cameroon, Congo Dem. Rep., Egypt, Eritrea, Gabon, Gambia, Ghana, Kenya, Madagascar, Malawi, Mauritania, Mozambique, Nigeria, Reunion, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, Zimbabwe (African Moths, ND); Mauritius (Wikipedia)

Climatic similarity: low-medium. 6 common climates considering the countries listed above. This relatively high rating is due to the presence of arid-type climates in some countries especially South Africa, Zimbabwe, Egypt, Sudan.

On which plants: Citrus, tomato, cocoa (Ghana IPM, 1996), tomato (USDA, 2009). African Moths (ND) mention that larval hosts are: *Acacia mearnsii*, *Acacia karoo*, *Acacia ataxacantha*, *Acacia decurrens*, *Allophylus decipiens*, *Cirtus*, *Croton rivularis*, *Maerua triphylla*, *Pappea capensis*, *Pinus patula*, *Pyaeroxylon obliquum*, *Rhus mucronifolia*, *Ricinus communis*, *Schotia latifolia*, *Scutia myrtina*, *Sideroxylon inerme*. It is not sure whether citrus, tomato and cocoa are hosts (i.e. whether eggs may be laid on these plants and larvae develop) or if their fruit only are attacked by adults.

Damage: Larvae feed on leaves; adults pierce ripe fruit to suck juice. No indication of damage was found.

Dissemination: Adult fly, larvae feed on leaves of their host plants. Adults feed nocturnally and are highly mobile, and USDA (2009) concluded that they are unlikely to be packed with fruit. Larvae may be associated with green parts, but only if tomato is a host of the pest (unknown, see comments above).

Pathway: Plants for planting?, fruit? of host plants from countries where *A. lienardi* occurs. Unknown if pupae are in soil. Association with the pathway depends if the traded hosts (e.g. tomato, citrus) are hosts of immature stages.

Possible risks: Tomato and citrus are major crops in the EPPO region, but it is not certain whether they are true hosts, or whether only adults attack fruit (in which case association with traded hosts). The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is low

to medium, and common climates are arid climates of the Mediterranean Basin, especially in North Africa and the Near East. No information was found regarding biology, damage and control.

Categorization: None found

Source(s):
African Moths. No date. Website. http://www.africanmoths.com (Accessed August 2013)

Ghana IPM. 1996. List of pests. http://ghana.ipm-info.org/list_insects.htm#Tomato (Accessed August 2013)

USDA. 2009. Importation of Tomatoes, Solanum lycopersicum, from the Economic Community of West African States (ECOWAS) into the Continental United States. A Qualitative, Pathway-Initiated Pest Risk Assessment. June 5, 2009.

Wikipedia

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Anomis leona* (Lepidoptera: Noctuidae)**

Why: Identified in the EPPO tomato study. Unlike *Achaea lienardi*, larvae are reported to feed on fruit (USDA, 2009, citing CABI). Little information was found on this pest.

Where: **EPPO region**: absent

Africa: Ghana (USDA, 2009; Ghana IPM, 1996; CABI CPC); Liberia (USDA, 2009), Cote d'Ivoire? (CABI CPC) Benin, Congo Dem. Rep., Côte d'Ivoire, Ghana, Guinea, Kenya, Malawi, Nigeria, Rwanda, Sierra Leone, South Africa, Togo (AfricanMoths, ND)

Climatic similarity: Low-medium. 5 common climates considering the countries listed above, because of the presence of Nigeria and Kenya (with arid-type climates in part of their territory) and South Africa (arid and Mediterranean –type climates). Other countries on the list have tropical-type climates. The climatic similarity is likely to be lower (occurring in specific areas of the countries mentioned).

On which plants: Tomato (Ghana IPM, 1996; USDA, 2009), *Theobroma cacao* (CABI CPC). Larval hosts in AfricanMoths (ND): *Triplochiton scleroxylon, Ceiba pentandra, Nesogordonia papaverifera, Theobroma cacao, Cola nitida, Sterculia tragacantha, Cola simiarum, Cola pallida, Dombeya cymosa, Abelmoschus esculentus, Hibiscus, Mangifera indica, Zea mays.* Most references seem to refer to cocoa.

Damage: On cocoa in West Africa, *A. leona* is the most common insect feeding on leaves, normally feeding on young leaves, sometimes on mature leaves, green stems and the outside of unripe pods (Cudjoe et al., ND). USDA (2009, citing CABI 2004) note that *Anomis* species tend to damage young and immature tomatoes.

Dissemination: Adults fly. No more detail was found on its biology, on possible spread within Africa.

Pathway: fruit? plants for planting, cut flowers and branches? of host plants from countries where *A. leona* occurs.

Possible risks: Only tomato and maize are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is low-medium. No detail was found specifically for *A. leona* on tomato. USDA (2009) did not retain this pest as risk for the pathway tomato fruit from West Africa, because *Anomis* species tend to damage young and immature tomatoes and are relatively large and noticeable. However, tomatoes may be picked in an immature stage if transported by ship. There is no regulation applying to tomato fruit in part of the EPPO region, and consignments may not be regularly inspected.

Categorization: None found

Source(s):
African Moths. No date. Website. http://www.africanmoths.com (Accessed January 2014)

CABI CPC. 2013.

Cudjoe AR, Sarfo JE, Ackonor JB. ND. Minor and Emerging Cocoa Pest in West Africa. Cocoa Research Institute of Ghana (CRIG), New Tafo-Akim, Ghana

Ghana IPM. 1996. List of pests. http://ghana.ipm-info.org/list_insects.htm#Tomato (Accessed January 2014)

USDA. 2009. Importation of Tomatoes, Solanum lycopersicum, from the Economic Community of West African States (ECOWAS) into the Continental United States. A Qualitative, Pathway-Initiated Pest Risk Assessment. June 5, 2009.

The three references given in USDA (2009) were not found:

Decazy, B., N. Coulibaly, G. Mossu, and D. Paulin. 1985. Long-term effect of insecticide treatments on pollination conditions and on the yield of cocoa trees in the Ivory Coast.

The Cafe, Cacao 29(2):99-106. Forsyth, J. 1966. Agricultural Insects of Ghana. Ghana Universities Press, Accra, Ghana. 163 pp.

Srivastava, R. P. 1997. Mango Insect Pest Management. International Book Distributing Co, Lucknow, India. 272 pp.

Also not found: Nutsugah, D. 1976. The biology of two lepidopterous pests, Anomis leona Schaus, and Earias biplaga Wlk, on cocoa (Theobroma cacao) in Ghana

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Chrysodeixis* (*Pseudoplusia*) *includens* (Lepidoptera: Noctuidae) (soybean looper)**

Why	Identified in the EPPO tomato study. This species is highly polyphagous but is mostly a pest of soybean and tomato (CABI CPC).
Where	**EPPO region**: absent **North America**: Bermuda, Canada (Nova Scotia, Ontario, Quebec, few occurrences), USA (Florida, Texas; throughout the rest of the USA – few occurrences) (CABI CPC) **Central America**: Costa Rica, Honduras, Nicaragua (CABI CPC) **Caribbean**: Cuba, Puerto Rico (CABI CPC) Martinique & Guadeloupe (uncommon), St-Kitts, Montserrat, Dominica, St-Lucia, St-Vincent, Jamaica, Hispaniola, Virgin Islands (Zagatti et al., 1995-2006) **South America**: Argentina (few occurrences), Bolivia, Brazil, Chile (few occurrences), Colombia, Ecuador, Guyana, Peru (CABI CPC), Venezuela (Eichlin and Cunningham, 1978) **Oceania**: Australia-Doubtful? (This is indicated in CABI CPC, referring to Eichlin and Cunningham (1978). However, the latter does not mention the presence of *C. includens* in Australia ("Quebec to West Indies; Florida to California; south to South America"). Herbison-Evans and Crossley (2013), which list moths of Australia, incl. several *Chrysodeixis* species, do not mention *C. includens*. No record was found for Australia in a general Internet search.)
Climatic similarity	High. 13 common climates considering the countries listed above, but likely to be lower. In North America, *C. includens* migrates northwards from areas where it overwinters (tropics and subtropics, between the equator and the tropic of cancer). In the USA, overwintering populations occur only in south Florida and south Texas (CABI CPC). In areas of North America that have most similarity with the EPPO region, it is a migrant only, and does not overwinter. Southern Texas and southern Florida, where it overwinters, have climates that correspond to certain areas of the Mediterranean Basin.
On which plants	*C. includens* is highly polyphagous (28 families), but is generally only considered to be a pest of soyabean and tomato (CABI CPC, 2013). From Eichlin and Cunningham (1978, citing others): *Medicago sativa, Nicotiana tabaccum, Phaseolus* sp., *Glycine max, Gossypium hirsutum, Solanum esculentum, Commelina* sp.. *Crotón capitatus, Lactuca sativa, Solidago* sp., *Brassica olerácea, Eupatorium* sp., *Geranium* sp., *Hibiscus esculentus*, *Pelargonium* sp., *Zebrina péndula*, *Chrysanthemum* sp., *Coleus* sp., *Lantana* sp., *Persea americana*. Main hosts in CABI CPC are *Abelmoschus esculentus* (okra), Brassicaceae (cruciferous crops), *Cajanus cajan* (pigeon pea), Cucurbitaceae (cucurbits), *Daucus carota* (carrot), *Glycine max* (soyabean), *Gossypium* (cotton), *Ipomoea batatas* (sweet potato), *Lactuca sativa* (lettuce), *Phaseolus* (beans), *Saccharum officinarum* (sugarcane), *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Sorghum bicolor* (sorghum), *Zea mays* (maize). Many other hosts are also listed in CABI CPC, such as *Allium sativum* (garlic), *Asparagus officinalis* (asparagus), *Capsicum annuum* (sweet pepper), *Mentha* (mints), *Solanum tuberosum* (potato) and many ornamentals.
Damage	Eggs on leaves, larvae on leaves or fruit (feed on fruit on tomato), pupae on leaves. Although this species feeds on a wide range of host plants, it is generally only considered to be a pest of soyabean and tomato. On soybean, it feeds on pods if plants have been completely defoliated; on tomato, it normally feeds on fruit, even when foliage is present (CABI CPC, 2013). *C. includens* is reported as a severe pest of tomatoes, soyabean, other beans, sunflower and aubergine in Puerto Rico; damage to tomato fruit can exceed 90% and total defoliation is common in heavy infestations (CABI, 2013). It is considered as one of the most destructive pest of soyabean in the USA as well as in Northern Argentina (Barrionuovo et al., 2012). *C. includens* (and *Rachiplusia nu*) are reported by Barrionuovo et al. (2012, citing others) to cause damage to several high value crops, including aromatic and oleraceous plants, as well as many field and vegetable crops (incl. *Helianthus annus, Glycine max, Medicago sativa, Gossypium hirsutum, Phaselous vulgaris, Linum usitatissimum* and *Nicotiana tabacum*). Note: *C. includens* also feeds on kudzu (*Pueraria lobata*) (invasive plant) (CABI CPC, 2013).
Dissemination	Adults fly, and migrate from areas where it overwinters (tropics and subtropics, between the equator and the tropic of cancer). This is the case in North America, where overwintering populations are reported in South Florida and South Texas (CABI CPC).
Pathway	Fruit and vegetables, plants for planting, cut flowers, pods, capsules? of host plants from countries where *C. includens* occurs.
Possible risks	*C. includens* has many host plants that are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is high. For the pest to establish in the EPPO region, it would need to enter in areas where it may overwinter, from which it could migrate to other areas in summer.
Categorization	Quarantine pest for Japan 2011, Korea Rep 2011 (as *Chrysodeixis* spp.), Mexico 2011 (from the IPP)

Source(s)

Barrionuevo MJ, Murúa G, Goane L, Meagher R, Navarro F. 2012. Life Table Studies of Rachiplusia nu (Guenée) and Chrysodeixis (= Pseudoplusia) Includens (Walker) (Lepidoptera: Noctuidae) on Artificial Diet. Source: Florida Entomologist, 95(4):944-951

Eichlin TD, Cunningham HB. 1978. The Plusiinae (Lepidoptera: Noctuidae) of America north of Mexico, emphasizing genitalic and larval morphology. Technical Bulletin No. 1567. USDA

Herbison-Evans D, Crossley S. 2013. Caterpillars of Australian moths. Plusiinae. http://lepidoptera.butterflyhouse.com.au/plus/plusiinae.html http://lepidoptera.butterflyhouse.com.au/plus/plusiinae.html (Accessed January 2014)

Quarantine lists for Japan 2011, Korea Rep 2011, Mexico 2011 (from the IPP)

Zagatti P, Lalanne-Cassou B, le Duchat d'Aubigny J. 1995-2006. Catalogue of the lepidoptera of the French Antilles. INRA Database. http://www7.inra.fr/papillon/indexeng.htm (Accessed January 2014) (referred to as INRA, NDb in Step 2)

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Eudocima fullonia (Othreis fullonia)* (Lepidoptera: Noctuidae) (fruit-piercing moth)**

Why

Identified in the EPPO tomato study. Adults of *E. fullonia* cause damage to fruit of tomato and a large number of other species.

Where

EPPO region: absent

Africa: Angola, Benin, Cameroon, Congo, Congo Democratic Republic, Côte d'Ivoire, Ghana, Guinea, Kenya, Liberia, Madagascar, Malawi, Mozambique, Namibia, Nigeria, Réunion, Sao Tome and Principe, Sierra Leone, Tanzania, Uganda, Zimbabwe (CABI CPC); also Gabon, South Africa, Togo (Davis et al., 2005)

Asia: Bhutan, Brunei Darussalam, China, Christmas Island (Indian Ocean), India, Indonesia, Japan (Honshu, Kyushu, Shikoku), Korea, DPR, Korea, Republic of, Laos, Malaysia, Mongolia (questionable according to Davis, 2005), Myanmar, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam (CABI CPC) Cambodia is also mentioned in the distribution in CABI CPC, but the pest is a quarantine pest for that country (QL for Cambodia, 2010 and this record is also not in PQR)

North America: USA (Hawaii) (CABI CPC, Hawaii Edu, 2005)

Oceania: American Samoa, Australia (New South Wales, Northern Territory, Queensland), Cook Islands, Fiji, French Polynesia, Guam, Micronesia, Federated states of, New Caledonia, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Vanuatu, Wallis and Futuna Islands (CABI CPC), also Kiribati (Davis et al., 2005). New Zealand and Norfolk Island are listed in Davis et al. (2005), but the pest is considered as "absent no longer present" in PQR and CABI CPC (and recorded as migrant in both New Zealand and Norfolk Island in Moths of Borneo, 2013)

Climatic similarity

Medium/high. 12 common climates considering the countries listed above, but possibly lower depending on where it occurs in the countries mentioned. Davis et al. (2005) considered it is associated with broadleaf and mixed forests, tropical and subtropical grasslands, savannas and shrubs, and tropical and subtropical moist broadleaf forests.

On which plants

According to Davis et al. (2005), *E. fullonia* was recorded from over 100 plant species in over 34 families.

Larvae feed on foliage of (mostly) wild hosts, most belonging to the families Menispermaceae and Fabaceae; example of larval hosts listed in Davis et al. (2005) are *Carronia*, *Erythrina*, *Cocculus*, *Fawcettia*, *Hypserpa*, *Stephania*, *Pleogyne*, *Tiliacora*, *Tinospora*, *Triclisia* as well as cocoa (*Theobroma cacao*). Larval hosts seem to vary with places; in the Pacific they belong mostly to *Erythrina* (Hawaii Edu, 2005). Some species have also been shown as larval hosts experimentally, of which *Diospyros autralis* and *Malus domestica* (Davis et al., 2005). Tomato is not identified as a larval host.

Adults feed on fruit of a wide range of plants, including crops such as citrus, apple, pear, stone fruit, grape, melon, tomato, mango, papaya, pineapple, strawberry, capsicum, eggplant. Davis et al. (2005) give a very long host list, which also includes *Cucumis*, *Rubus*, and CABI CPC (2013) also mentions *Actinidia chinensis*, *Diospyros kaki* (persimmon) and *Litchi chinensis* (lichi).

Damage

Damage is caused by adult feeding on fruit. Feeding punctures affect the quality of the fruit and favour entry of pathogens and bacteria. Adults are reported to have a preference for ripe fruit, although other stages may be attacked (CABI CPC). CABI CPC (2013) mentions that fruit-piercing moth generally attack fruit too close to harvest for pesticides to be used. If damage is not detected at harvest or packing, healthy fruit may be contaminated by fermenting juices during transport. Primary damage of 50-70% by fruit-piercing moths on citrus in Thailand is reported, 95% of citrus and 100% of tomatoes in New Caledonia in outbreak years, entire crops of navel oranges during outbreaks in Queensland (Australia), 40-60% of citrus fruits damaged in China. Eggs and larvae are on larval hosts, and pupae on the host or on the ground.

Dissemination	Adults are strong fliers (Davis et al., 2005 citing others); they fly, feed and mate at night. *E. fullonia* may be transported as adult on fruit on which it feeds on, and as eggs and larvae (or pupae) on plants for planting of its larval hosts. Among these, a first rapid screening found only *Erythrina* sp. among plants imported into some countries of the EPPO region in 2010 (in data used for the EPPO study on plants for planting). Because adult fly and are nocturnal, the likelihood of association with consignments of fruit is questionable. Davis et al. (2005) mention only one interception of *Eudocima* in the USA (without mention of the type of commodity or life stage) (although noting some interceptions of Noctuidae, without identification at the genus level).
Pathway	Plants for planting of larval hosts and fruit (?) of adult hosts from countries where *E. fullonia* occurs
Possible risks	Many fruit crops attacked by adults of *E. fullonia* are major crops in the EPPO region. The climatic similarity, according to the EPPO Study, between the area where the pest occurs and the EPPO region is probably medium-high. For the pest to establish, it would need larval hosts, and there is an uncertainty on whether any of the larval hosts at origin occur in the EPPO region, or if the pest may use other hosts (such as *Malus domestica*, shown as larval host in the laboratory). *E. fullonia* is an important pest, although its probability of entry on fruit depends on highly mobile nocturnal adults. The pest is regulated in a large number of countries. It is not known on which pathways it has spread within its current distribution.
Categorization	Quarantine pest for Argentina 2011 (Citrus, tomato), Brazil 2010, Cambodia 2010, Costa Rica 2012, Mexico 2011, Paraguay 2010, Trinidad and Tobago 2010 (From IPP), New Zealand (Biosecurity NZ, 1998); Southern Africa A2 2001; Uruguay 1995 (from PQR)
Source(s)	CABI CPC, 2013 Biosecurity NZ. 1998. Import Health Standard Commodity Sub-class: Fresh Fruit/Vegetables Tomato, Lycopersicon esculentum from Tonga. Issued pursuant to Section 22 of the Biosecurity Act 1993. Date Issued: 14 December 1998 Davis EE, French S, Venette RC. 2005. Mini Risk Assessment Fruit Piercing Moth: Eudocima fullonia Green [Lepidoptera: Noctuidae]. http://www.aphis.usda.gov/plant_health/plant_pest_info/pest_detection/downloads/pra/efulloniapra.pdf (Accessed December 2013) Ghana IPM. 1996. List of pests. http://ghana.ipm-info.org/list_insects.htm#Tomato (Accessed August 2013) Hawaii Edu. 2005. Database of pests and crops – tomato. http://www.extento.hawaii.edu/kbase/crop/crops/tomato.htm. (Accessed August 2013) Moths of Borneo. 2013. http://www.mothsofborneo.com (Accessed January 2014) PQR Quarantine lists of Argentina 2011, Brazil 2010, Cambodia 2010, Costa Rica 2012, Mexico 2011, Paraguay 2010, Trinidad and Tobago 2010 (from the IPP) USDA. 2009. Importation of Tomatoes, Solanum lycopersicum, from the Economic Community of West African States (ECOWAS) into the Continental United States. A Qualitative, Pathway-Initiated Pest Risk Assessment. June 5, 2009.

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Helicoverpa assulta* (Lepidoptera: Noctuidae) (oriental tobacco budworm, cape-gooseberry budworm)**

Why	Identified in the EPPO tomato study.
Where	**EPPO region**: absent **Africa:** Angola, Cameroon, Central African Rep., Christmas Island (Indian Ocean), Comoros, Congo Dem. Rep., Côte d'Ivoire, Gambia, Ghana, Kenya, Liberia, Malawi, Mali, Nigeria, Senegal, Sierra Leone, South Africa, Tanzania, Uganda, Zimbabwe (CABI CPC). **Asia:** Bangladesh, Bhutan, Brunei Darussalam, China (all provinces except Tibet - Wang et al., 2009), Cocos Islands, India, Indonesia, Japan, Korea Rep., Laos, Malaysia, Myanmar, Pakistan, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam (CABI CPC). **Oceania**: American Samoa, Australia, Fiji, French Polynesia, New Caledonia, Norfolk Island, Northern Mariana Islands, Papua New Guinea, Samoa, Solomon Islands, Vanuatu (CABI CPC).
Climatic similarity	High. Possibly 10 common climates considering the countries listed above, and its wide distribution in China.
On which plants	Hosts are mainly solanaceous plants, and this species has a more reduced host range than other polyphagous *Helicoverpa*, such as *H. armigera* (Li et al., 2013, citing others). Tobacco, pepper (Wang et al., 2009), Physalis, tomato, lettuce, maize (CABI CPC). USDA (2009) mention publications (incl. Wu et al., 2006) that raise doubt about the host status of tomato, and the possibility that it may have been confused by *H. armigera*. However, many other publications, including after 2006, refer to tomato as a host (e.g. Wang et al., 2009). The pest is also regulated by New Zealand on tomatoes from Tonga and Australia (Biosecurity NZ, 1998 & 2000).
Damage	Larvae feed on leaves, flowers, buds, fruits, stems. This pest was intercepted in the USA on various commodities (USDA, 2009). It is reported as a serious pest of *Capsicum annuum* (damage by larvae feeding inside the fruit) and tobacco (damage by larvae feeding on leaves and buds) in CABI CPC (2013). Cai et al (2003) in Japan showed a strong preference of *H. assulta* for tobacco. Wang et al.

(2009) note that it has become a serious threat in tobacco and peppers in China in recent years, causing serious losses (5-15% on tobacco; 20-30% on peppers).

Dissemination: Adults fly. No details was found in the literature.

Pathway: Fruits and vegetables, plants for planting of host plants from countries where *H. assulta* occurs.

Possible risks: The pest seems to present a risk for peppers and tobacco. There is an uncertainty as to which extend tomato is a host. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is high.

Categorization: New Zealand (Biosecurity NZ 1998, 2000)

Source(s):

Biosecurity NZ. 1998. Import Health Standard Commodity Sub-class: Fresh Fruit/Vegetables Tomato, Lycopersicon esculentum from Tonga. Issued pursuant to Section 22 of the Biosecurity Act 1993. Date Issued: 14 December 1998

Biosecurity NZ. 1999. Import Health Standard Commodity Sub-class: Fresh Fruit/Vegetables Papaya, Carica papaya from Fiji. Issued pursuant to Section 22 of the Biosecurity Act 1993. Date Issued: 9 November 1999.

Biosecurity NZ. 2000. Import Health Standard Commodity Sub-class: Fresh Fruit/Vegetables Tomato, Lycopersicon esculentum from Australia. Issued pursuant to Section 22 of the Biosecurity Act 1993. Date Issued: 9 June 2000.

CABI CPC

Cai CY, Konno Y, Matsuda K. 2003. Studies on Ovipositional Preferences of Helicoverpa assulta and Helicoverpa armigera Annual Report of the Society of Plant Protection of North Japan, Vol. 2003; NO.54; PAGE.140-141

USDA. 2009. Importation of Tomatoes, Solanum lycopersicum, from the Economic Community of West African States (ECOWAS) into the Continental United States. A Qualitative, Pathway-Initiated Pest Risk Assessment. June 5, 2009.

Wang K-Y, Zhang Y, Wang H-Y, Xia X-M, Liu T-X. 2008. Biology and life table studies of the oriental tobacco budworm,Helicoverpa assulta (Lepidoptera: Noctuidae), influenced by different larval diets. Insect Science Volume 15, Issue 6, pages 569–576

Wu K-J, Gong P-Y, Ruan Y-M. 2006. Is tomato plant the host of the oriental tobacco budworm, Helicoverpa assulta (Guenée) ? Acta Entomologica Sinica, Vol. 49, Issue (3): 421-427

Xia XM, Wang KY, Wang HY. 2009. Resistance of Helicoverpa assulta (Guene´e) (Lepidoptera: Noctuidae) to fenvalerate, phoxim and methomyl in China. Crop Protection 28 (2009) 162–167

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Helicoverpa gelotopoeon* (Lepidoptera: Noctuidae) (oruga bolillera, lagarta bolillera, isoca bolillera)**

Why: Identified in the EPPO tomato study. *H. gelotopoeon* is polyphagous, including on tomato, and has gained importance especially on soybean in the 2000s (Perotti et al., 2008).

Where: **EPPO region**: absent

South America: Argentina (Mazza et al., 2007), Uruguay (Biezanko et al,, 1974), Brazil (Specht et al., 2005), Paraguay (Czepak et al., 2013), Chile (Cork and Lobos, 2003).

Czepak et al. (2013), reporting the first finding of *H. armigera* in Brazil, note that *H. gelotopoeon* and *H. armigera* are externally similar, and cause similar damage, and recommend that specimen from Argentina be examined. However, Argentinian authors reporting on recent serious damage on soybean mention *H. gelotopoeon*.

Climatic similarity: Medium-high. 9 common climates considering the countries listed above, but probably lower (as it probably does not occur in all areas). The pest distribution within these countries is not known in details, but it is known to occur and to be a serious pest in the provinces of Cordoba (Avalos et al., 2010), Santa Fe (Perotti et al., 2012) and Santiago del Estero (Cork and Lobos, 2003) in Argentina, which seem to have a climate type (Cfa) similar to that in for example northern Italy or part of the Balkans.

On which plants: Tomato, cotton, maize, alfalfa (*Medicago sativa*), "line" (flax?), beans, soybean, sunflower, weed *Physalis angulata* (Cork and Lobos, 2003, citing others); also in other publications: soybean (SENESA, 2010), *Helianthus debilis, Pisum sativum, Allium cepa, Linum usitatissimum* (Specht et al., 2004), cotton (Mazza et al., 2007), *Cicer arietinum* (chickpea) (Fichetti et al., 2009; Avalos et al., 2010).

Damage: Eggs on leaves, larvae on plants, pupae in soil. Damage is done by larvae feeding on leaves, pods and seeds (chickpea - Avalos et al., 2010). Larvae first may feed on the tender parts of buds and bind them with silk. Then they attack leaves and tender shoots. They may cut seedlings, cut stems above the cotyledons, defoliate plants, attack flower, pods, grain, leaves, buds, etc. (SENESA, 2010; Alvarez and Abbate, 2013). The pest feeds on seeds and attacks capsules of flax and cotton and soja pods (Alvarez and Abbate, 2013). On soybean, the major damage is done by mature larval stages feeding on grain (one larva can consume 15 grains) (Alvarez and Abbate, 2013). In the North of Argentina, it was originally considered as a sporadic pest of soybean, and damage was observed where other oleaginous crops were grown, favouring the maintenance of populations; however, it has been causing serious damage to soybean from the end of the 2000s (Alvarez and Abbate, 2013; Perotti et al., 2012). No details was found on damage on tomato (although Cork and Lobos, 2003 conduct their trapping experiments in tomato and cotton fields), but *Helicoverpa/Heliothis* generally feed on fruit too and *H.*

	gelotopoeon attacks seeds. On cotton in Argentina, *H. gelotopoeon* and *Heliothis virescens* form a bollworm complex (Cork and Lobos, 2003).
Dissemination	Adults fly. No further details were found.
Pathway	Plants for planting, fruits?, vegetables?, pods, capsules of host plants, soil, from countries where *H. gelotopoeon* occurs.
Possible risks	Most host plants are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is medium-high.
Categorization	Presumed to be a quarantine pest for Korea Rep. 2011 (which lists"Heliothis gelotopeon")
Source(s)	Álvarez D, Abbate S. 2013. Nuevos problemas de plagas en soja: Helicoverpa gelotopoeon (lagarta bolillera) http://webcache.googleusercontent.com/search?q=cache:http://www.lares-srl.com/descargas/prensa/IsocaBolillera2013.pdf
	Avalos S, Mazzuferi V, Fichetti P, Berta C, Carreras J. 2010. Entomofauna asociada a garbanzo en el noroeste de Córdoba (Argentina). Horticultura Argentina 29(70): Sep.-Dic. 2010
	Biezanko CM, de Ruffinelli A, Link D. 1974. Plantas y otras sustancias alimenticias de las orugas de los lepidopteros uruguayos. Rev. Centro Ciencias Rurais, Santa Maria, 4(2): 107-148.
	Cork A, Lobos EA. 2003. Female sex pheromone components of Helicoverpa gelotopoeon: first heliothine pheromone without (Z)-11-hexadecenal. Entomologia Experimentalis et Applicata 107: 201–206, 2003
	Czepak C, Cordeiro Albernaz K, Vivan LM, Oliveira Guimarães U, Carvalhais T. 2013. First reported occurrence of Helicoverpa armigera (Hübner) (Lepidoptera: Noctuidae) in Brazil Pesq. Agropec. Trop., Goiânia, v. 43, n. 1, p. 110-113, Jan./Mar. 2013
	Fichetti P, Avalos S, Mazzuferi VE, Carreras J. 2009. Lepidópteros asociados al cultivo de garbanzo (Cicer arietinum L.) en Córdoba (Argentina). Boletín de sanidad vegetal. Plagas, Vol. 35, Nº 1, 2009, págs. 49-58
	Mazza, S. M.; Sosa, M. A.; Avanza, M. A. 2007. Spatial distribution pattern of lepidopteron cotton pests in Argentine. World Cotton Research Conference-4, Lubbock, Texas, USA, 10-14 September 2007 2007 pp. International Cotton Advisory Committee (ICAC), Washington, USA
	Perotti E, Crepo F, Gamundi JC. 2012. Evaluación del daño simulado de "oruga bolillera" Helicoverpa gelotopoeon (Dyar) en estados vegetativos del cultivo de soja. Unpublished report, Instituto Nacional de Tecnología Agropecuaria (INTA), 6 pp.
	Quarantine list for Korea Rep. 2011.
	SENESA. 2010. Sistema Nacional Argentino de Vigilancia y Monitoreop de Plagas. [Data sheets for pests in Argentina] http://www.sinavimo.gov.ar/ (Accessed December 2013)
	Specht A, Silva EJE, Link D. 2004. Noctuídeos (Lepidoptera, Noctuidae) Do Museu Entomológico Ceslau Biezanko, Departamento De Fitossanidade, Faculdade De Agronomia "Eliseu Maciel", Universidade Federal De Pelotas, Rs1R. bras. Agrociência, v.10, n. 4, p. 389-409, out-dez, 2004
	Specht A, Teston JA, Di Mare RA, Corseuil E. 2005. Noctuídeos (Lepidoptera, Noctuidae) coletados em quatro Áreas Estaduais de Conservação do Rio Grande do Sul, Brasil. Revista Brasileira de Entomologia 49(1): 130-140, março 2005. http://www.scielo.br/pdf/rbent/v49n1/23807.pdf (Accessed December 2013)

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Helicoverpa punctigera* (Lepidoptera: Noctuidae) (native budworm)**

Why	Identified in the EPPO tomato study. It is a serious pest in Australia, together with *H. armigera*, on a wide variety of crops.
Where	**EPPO region**: absent **Oceania**: Australia (throughout). CABI CPC also mentions New Zealand; however, it is considered as being vagrant in New Zealand according to Cameron and Walker (2004), and larvae are rarely found.
Climatic similarity	High. 8 common climates, as it is present throughout Australia (although its detailed distribution is not known). It is adaptable to a range of conditions according to CABI CPC.
On which plants	Highly polyphagous, with 270 plant species in 47 families (CABI CPC). These include cotton, sunflower, linseed (flax), legumes, tomato, tobacco, lucerne (CABI CPC). It is considered as a pest of tomato, capsicum, chilli, eggplant as well as beans, lettuce, sweet corn, range of field crops and weeds (ACIAR, 2013)
Damage	Larvae feed on leaves, buds, flowers and fruits, and most feeding concentrate on flowers and fruits when present. Pupae may be in soil as for other *Helicoverpa* species, although no data was found on this. *H. punctigera* and *H. armigera* combined represent the most significant insect pests of extensive agriculture in Australia (CABI CPC).
Dissemination	*H. punctigera* is highly migratory and the most mobile of *Helicoverpa* pests (CABI CPC).
Pathway	Plants for planting, fruits and vegetables of host plants, soil?, from countries where *H. punctigera* occurs.
Possible risks	Many hosts are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is high.
Categorization	Quarantine pest for: New Zealand (Biosecurity NZ, 2000), Japan 2011 and Korea Rep 2011? (as *Heliothis punctigera*) (from IPP), USA (AQIS, 2003)
Source(s)	ACIAR. 2013. Tomato, capsicum, chilli and eggplant. Australian Centre for International Agricultural Research

AQIS. 2003. Industry Advice Notice no. 2003/13: Shade-House Tomato Exports To USA. http://www.daff.gov.au/biosecurity/export/plants-plant-products/ian/03/13 (Accessed August 2013)

Biosecurity NZ. 2000. Import Health Standard Commodity Sub-class: Fresh Fruit/Vegetables Tomato, Lycopersicon esculentum from Australia. Issued pursuant to Section 22 of the Biosecurity Act 1993. Date Issued: 9 June 2000.

CABI CPC. 203.

Cameron PJ, Walker GP. 2004. Helicoverpa armigera resistance management strategy. http://resistance.nzpps.org/insecticides.php?p=helicoverpa (Accessed December 2013)

Quarantine lists for Japan 2011, Korea Rep. 2011

Note: there are many references given in CABI CPC, which have not been used here.

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Heliothis virescens* (Lepidoptera: Noctuidae) (tobacco budworm)**

Why	Identified in the EPPO tomato study. *H. virescens* is highly polyphagous and especially pest of cotton, tobacco, tomato and maize (CABI CPC).
Where	**EPPO region**: absent **North America**: Canada, Mexico, USA (CABI CPC - eastern and southwestern United States, also known from California – Capinera, 2012; also reported from some western States in CABI CPC) **Central America**: Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama (CABI CPC) **Caribbean**: Antigua and Barbuda, Bahamas, Barbados, Bermuda, Cayman Islands, Cuba, Dominica, Dominican Rep., Greater Antilles, Grenada, Guadeloupe, Haiti, Jamaica, Lesser Antilles, Martinique, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, United States Virgin Islands (CABI CPC) **South America**: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, French Guyana, Guyana, Paraguay, Peru, Uruguay, Venezuela (CABI CPC)
Climatic similarity	High. 13 common climates considering the countries listed above, possibly lower. In the USA, it overwinters generally in southern states, but may survive cold climates in greenhouses and sheltered locations. It disperses northwards annually. Its precise limit of overwintering is not known.
On which plants	*H. virescens* is highly polyphagous (55 species in 14 families CABI CPC). Cotton, tobacco, tomato, sweet potato, beans, pigeon pea, chickpea, lettuce, squash, maize, flax sunflower, sweet pepper (CABI CPC). Capinera (2012) mentions alfalfa, clover, cotton, flax, soybean and tobacco, sometimes vegetables such as cabbage, cantaloupe, lettuce, pea, pepper, pigeon pea, squash, tomato, common pest of geranium and other flower crops (e.g. ageratum, chrysanthemum, gardenia, geranium, petunia, marigold, petunia, verbena, zinnia) (Capinera, 2012).
Damage	Eggs are deposited on/near flowering or fruiting part of the plant, and larvae feed on leaves, flowers, fruit (CABI CPC). Larvae feed on buds and blossoms, sometimes on leaves, petioles and stalks, and may enter fruit; pupae are in the soil (Capinera, 2012). Larvae also feed on leaves (Bayer Chile, ND). Larvae bore in pods and fruit, and feed on seed (King and Saunders, 1984). The pest causes significant damage on cotton, tomato, tobacco, maize (CABI CPC). It is mentioned as a pest of tobacco and maize (at least), but not tomato, in Bayer Chile (ND). *H. virescens* became a major pest of cotton in the Americas from the 1930s (Reed and Sarwar, 1982). In Central America, it is a minor and occasional pest, but may be important in tomato and pigeon pea (King and Saunders, 1984). In North America, it is not a pest at northern latitudes (e.g. New York) and is sporadic in Central and South America (Capinera, 2012).
Dissemination	Adults fly at long distance (CABI CPC). During summer, the pest spread northwards in North America (CABI CPC).
Pathway	Fruits and vegetables?, plants for planting of host plants, cut flowers, soil, from countries where *H. virescens* occurs.
Possible risks	Tomato and other hosts are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is high. For the pest to establish, it would have to be introduced in areas where it could overwinter, which is probably limited to the Southern part of the EPPO region.
Categorization	Quarantine pest for Guinea 2009 (for cotton, tomato), Japan 2011, Mozambique 2009, Korea Rep 2011, Mexico 2011, Seychelles 2010 (from IPP); Eastern Africa A1 2001, Southern Africa A1 2001, Israel 2009 (from PQR)
Source(s)	Bayer Chile. ND. Heliothis virescens. http://www.bayercropscience.cl/soluciones/fichaproblema.asp?id=1033 (Accessed August 2013) CABI CPC. 2013 Capinera JL. 2012. Heliothis virescens. http://entnemdept.ufl.edu/creatures/field/tobacco_budworm.htm (Accessed December 2013) King ABS and Saunders JL. 1984. The invertebrate pests of annual food crops in Central America. Overseas Development Administration, London.

http://books.google.dk/books?id=qMwOAQAAIAAJ&pg=PA149&lpg=PA149&dq=agrotis+repleta+king&source=bl&ots=xopGOSMmfD&sig=wjUkG49Wwcre-l9xI7AA6UImE4g&hl=en&sa=X&ei=eGP3Uc-yHunJ0AX78oD4BQ&ved=0CDIQ6AEwAg#v=onepage&q=agrotis%20repleta%20king&f=false (Accessed August 2013)

Morales V P, Cermeli M, Godoy F, Salas B. 2003. Lista de insectos relacionados a las solanáceas ubicados en el Museo de Insectos de Interés Agrícola del CENIAP _ INIA. Entomotropica 18(3):193-209.

Quarantine lists for Guinea 2009 (for cotton, tomato), Japan 2011, Mozambique 2009, Korea Rep 2011, Mexico 2011, Seychelles 2010 (from IPP)

PQR

Reed W, Pawar CS. Heliothis: a Global Problem. In Proceedings of the International workshop on Heliothis management, 15-20 November 1981, Patancheru, India International crops Research Institute tor the semi-Arid tropics.

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Spodoptera albula* (Lepidoptera: Noctuidae) (Costa Rican armyworm, unbarred Spodoptera moth, gray-streaked armyworm, gusano rayado)**

Why	Identified in the EPPO tomato study. It is one of many American *Spodoptera* species reported as attacking tomato.
Where	**EPPO region**: absent **North America**: USA (Florida, Southern Texas) (Montezano et al., 2013) Southern USA to South America (Bugguide, 2009) Heppner (1998) mentions it occurs in extreme Southern Florida, and strays north to central Florida (see below). **Central America**: Costa Rica, Honduras, Nicaragua (CABI CPC) throughout Caribbean and Central America (Montezano et al., 2013). Note this species is not mentioned in King and Saunders (1984), on pests in Central America. **Caribbean**: Cuba?, Puerto Rico? (CABI CPC) throughout the Caribbean and Central America (Montezano et al., 2013) Guadeloupe, Martinique St-Kitts, Antigua, Dominica, St-Lucia, St-Vincent, Grenada. Throughout the Greater Antilles (incl. Dominican Republic) (Zagatti et al., 1995-2006), Jamaica, Cuba, Hispaniola (Haiti plus Dominican Republic), Puerto Rico, Virgin Islands, French West Indies, St. Vincent Group (Patterson, ND citing others) **South America**: Colombia, French Guiana? (CABI CPC) "from Venezuela south to Paraguay and southern Brazil" (Montezano et al., 2013, citing others). Brazil (Zenke et al., 2010). Chile (Montezano et al. 2013, citing Angulo et al. 2008 – not available). Colombia, French Guyana (Zagatti et al., 1995-2006) – Note: *S. albula* is a quarantine pest for Brazil (QL Brazil 2010); however it is present there (Zenker et al., 2010) and this does not seem a new introduction (Teixeira et al., 2001).
Climatic similarity	Medium-low. 5 common climates considering the countries and areas listed above, but according to Heppnner (1998) it is present only in the south of Florida.
On which plants	At least 55 plant species, from 29 families (larvae), including *Capsicum annuum, Solanum tuberosum, Solanum lycopersicon, Nicotiana tabacum, Solanum melongena* and others such as cotton, cabbage, sesame, soybean, peanuts, sunflower, papaya, forestry seedling production (complete table in Montezano et al., 2013 citing others), *Amaranthus* (Bugguide, 2009), many incl. tomato, sweet pepper, tobacco, pea (CABI CPC).
Damage	*Spodoptera* have a similar biology (Heppner, 1998). Eggs are laid on leaves. Larvae feed on leaves, fruit and sometimes stems, generally at night. Pupae in soil. Detailed study of immature stages in Montezano et al. (2013). Tropical and of little economic importance according to Heppner (1998 – for Florida). They overwinter in the extreme south of the USA and migrate north during warm summers (although *S. albula* is encountered at most in Central Florida).
Dissemination	Adults fly. Heppner (2008) mention that *S. latifascia* migrates in summer within the USA.
Pathway	Fruit? plants for planting? of host plants and soil from countries where S. albula occurs.
Possible risks	Many hosts are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is medium-low. It seems to be one of the most tropical species retained for Step 3.
Categorization	Quarantine pest for Brazil 2010, Japan 2011 (from the IPP)
Source(s)	BugGuide. 2009. http://bugguide.net/ (Accessed January 2014) King ABS and Saunders JL. 1984. The invertebrate pests of annual food crops in Central America. Overseas Development Administration, London. http://books.google.dk/books?id=qMwOAQAAIAAJ&pg=PA149&lpg=PA149&dq=agrotis+repleta+king&source=bl&ots=xopGOSMmfD&sig=wjUkG49Wwcre-l9xI7AA6UImE4g&hl=en&sa=X&ei=eGP3Uc-yHunJ0AX78oD4BQ&ved=0CDIQ6AEwAg#v=onepage&q=agrotis%20repleta%20king&f=false (Accessed January 2014) Montezano DG, Specht A, Bortolin TM, Fronza E, Sosa-Gómez DR, Roque-Specht VF, Pezzi P, Luz PC, Barros NM. 2013. Immature stages of Spodoptera albula (Walker) (Lepidoptera: Noctuidae): Developmental parameters and host plants. An. Acad. Bras. Ciênc. [online]. 2013, vol.85, n.1, pp. 271-284. http://www.scielo.br/pdf/aabc/v85n1/0001-3765-aabc-85-01-271.pdf (Accessed January 2014)

Patterson B. ND. Checklist of the Lepidoptera of the Antilles. http://mothphotographersgroup.msstate.edu/Antilles/AntillesChecklist.shtml (Accessed January 2014)

PQR

Quarantine lists for Brazil 2010, Japan 2011 (from the IPP)

Teixeira EP, Novo JPS, Stein CP, Godoy IJ.2001. Primeiro Registro da Ocorrência de Spodoptera albula (Walker) (Lepidoptera: Noctuidae) Atacando Amendoim (Arachis hypogaea L.) no Estado de São Paulo. Neotrop. Entomol. vol.30 no.4 Londrina Dec. 2001.

Zagatti P, Lalanne-Cassou B, le Duchat d'Aubigny J. 1995-2006. Catalogue of the lepidoptera of the French Antilles. INRA Database. http://www7.inra.fr/papillon/indexeng.htm (Accessed January 2014)

Zenker MM, Botton M, Teston JA, Specht A. 2010. Noctuidae moths occurring in grape orchards in Serra Gaúcha, Brazil and their relation to fruit-piercing. Rev. Bras. entomol.[online]. 2010, vol.54, n.2, pp. 288-297.

Not found: Angulo AO, Olivares TS, Weigert GTH. 2008. Estados inmaduros de lepidópteros nóctuidos de importancia agrícola y forestal en Chile y claves para su identificación (Lepidoptera: Noctuidae). 3a edición. Concepción: Universidad de Concepción, 154 p.

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Spodoptera latifascia* and *S. cosmioides* (Lepidoptera: Noctuidae) (*S. latifascia*: garden armyworm, lateral lined armyworm)**

Why

Identified in the EPPO tomato study as *S. latifascia* (syn. *S. cosmioides*), and one of many American *Spodoptera* species reported as attacking tomato. *S. cosmioides* was originally listed as a synonym of *S. latifascia*, in line with several publications (incl. PQR). However, others consider them as separate species based on Silvain and Lalanne-Cassou (1997) and Lalanne-Cassou et al. (1999). In particular there are many recent Brazilian publications on *S. cosmioides*. The situation is not clear, especially with regards to the geographic distribution, and to which species distribution records refer to (if there are two separate species). Both species are reported as attacking tomato.

Where

Some authors may consider *S. cosmioides* as a synonym of *S. latifascia* and give one distribution (Heppner, 1998, possibly CABI CPC). Zagatti et al (1995-2006) note that *S. latifascia* occurs in Central America, and is replaced in South America by the sibling species *S. cosmioides*, information also repeated in, for example, Bavaresco et al. (2004). However, the situation seems more complicated as some publications list both *S. latifascia* and *S. cosmioides* in Brazil (Silvie and Silvain, 2004?). If *S. cosmioides* is a different species, it seems that it occurs only in South America, while *S. latifascia* occurs from southern USA to South America (at least in Brazil).

EPPO region: absent

North America: USA (Florida) (Heppner, 1998), straying north to South Carolina and Arkansas; Mexico (CABI CPC). These records are understood to refer to *S. latifascia*. No reference was found to *S. cosmioides* for North America.

Central America: Belize, Honduras (CABI CPC) Honduras (Passoa, 1991). No reference was found to *S. cosmioides* for Central America. These records are understood to refer to *S. latifascia*.

Caribbean: Antigua and Barbuda, Barbados, Belize, Cayman Islands, Cuba, Dominica, Honduras, Jamaica, Leeward Islands, Puerto Rico, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, Windward Islands (CABI CPC). Throughout Caribbean, south to Central America and South America (Heppner, 1998) Guadeloupe, Martinique, throughout the Antilles (Jamaica: type specimen of *S. latifascia*). (Zagatti et al, 1995-2006), Jamaica, Cuba, Hispaniola (Haiti plus Dominican Republic), Puerto Rico, Virgin Islands, French West Indies, St. Vincent Group (Patterson, ND citing others) – Main catalogues, like Zagatti et al (1995-2006) and Patterson (ND) do not mention *S. cosmioides* in the Caribbean. These records are understood to refer to *S. latifascia*.

South America: ***S. latifascia***: Brazil (Santos et al., 1980). Argentina, Brazil, Ecuador?, French Guiana, Guyana, Venezuela (CABI CPC – not clear if some of these refer to *S. cosmioides* – Guyana and Venezuela refer to a publication on the Caribbean). ***S. cosmioides***: Brazil (Zenker et al., 2007 & 2010; Santos et al., 2010). Both species are present in Brazil according to Silvie and Silvain (2004?).

Climatic similarity

Medium. 9 common climates considering the countries and areas listed above, but likely to be lower (as it may not occur to the extreme South of Argentina), also if *S. latifascia* and *S. cosmioides* are separate species.

On which plants

Spodoptera species are highly polyphagous and, even if *S. latifascia* and *S. cosmioides* are separate species, it is not certain that their host range would be very different. The records below are as mentioned in the literature.

S. latifascia. Frequent on tomato and eggplant in the Antilles (Zagatti et al., 1995-2006). Tomato, beans, chili, sesame, maize, vegetables, also cotton (King and Saunders, 1984), citrus, capsicum, maize, cotton, tomato, tobacco (Silvain and Thiberville, 1984), many, incl. tomato, sweet pepper, carrot, etc. (CABI CPC),

S. cosmioides: pineapple, cotton, rice, eggplant, onions, eucalyptus, pepper and tomato, among other vegetables, soyabean (Bavaresco et al., 2004; Zaché et al., 2012); soybean, *Ricinus communis*, cotton (Pomari et al., 2012; Silvie and Silvain, 2004?).

Damage — *Spodoptera* have a similar biology (Heppner, 1998). Eggs are laid on leaves. Larvae feed on leaves, fruit and sometimes stems, generally at night. Pupae in soil. King and Saunders (1984) mentions a moderate to considerable importance on tomato, minor on others (applying presumably to S. latifascia as is related to Central America). *S. cosmioides* is considered as a pest in at least Brazil. *S. latifascia* is considered as one of the important species of *Spodoptera* in Cuba (with *S. eridania*, *S. albula* and *S. ornithogalli* (Ecured, ND).

Dissemination — Adults fly. Heppner (2008) mention that *S. latifascia* migrates in summer within the USA.

Pathway — Fruit? plants for planting? of host plants and soil from countries where *S. latifascia* (or *S. cosmioides*) occurs.

Possible risks — Many hosts are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is medium-low. S. latifascia has a less tropical distribution than *S. albula*. The situation for *S. cosmioides* is not clear in the absence of clear data on its distribution in South America.

Categorization — *S. latifascia:* Quarantine pest for Japan 2011, Mozambique 2009 (from the IPP);
S. cosmioides: none found.

Source(s)

Bavaresco A, Garcia MS, Grützmacher AD, Ringenberg R, Foresti J. 2004. Adequação de uma dieta artificial para a criação de Spodoptera cosmioides (Walk.) (Lepidoptera: Noctuidae) em laboratório. Neotrop. Entomol. vol.33 no.2 Londrina Mar./Apr. 2004

CABI CPC, 2013

Dos Santos KB, Meneguim AM, dos Santos WJ, Neves PMOJ, dos Santos RB. 2010.Caracterização dos danos de Spodoptera eridania (Cramer) e Spodoptera cosmioides (Walker) (Lepidoptera: Noctuidae) a estruturas de algodoeiro. Neotrop. entomol. vol.39 no.4 Londrina July/Aug. 2010

Ecured. ND. Mantequillas (Spodoptera spp.). http://www.ecured.cu/index.php/Spod%C3%B3pteras

King ABS and Saunders JL. 1984. The invertebrate pests of annual food crops in Central America. Overseas Development Administration, London. http://books.google.dk/books?id=qMwOAQAAIAAJ&pg=PA149&lpg=PA149&dq=agrotis+repleta+king&source=bl&ots=xopGOSMmfD&sig=wjUkG49Wwcre-l9xI7AA6UImE4g&hl=en&sa=X&ei=eGP3Uc-yHunJ0AX78oD4BQ&ved=0CDIQ6AEwAg#v=onepage&q=agrotis%20repleta%20king&f=false (Accessed January 2014)

Lalanne-Cassou, B., J.F. Silvain, L. Monti, & C. Malosse. 1999. Mecanismes d'isolement reproducteur chez les especes du complexe neotropical Spodoptera latifascia S. cosmioides S. descoinsi (Lepidoptera: Noctuidae). Actes de la IV Conference Internationale Francophone d'Entomologie. Saint-Malo, France, 5-9 juillet, 1998. Ann. Soc. Entomol. Fr. 35: 109-116.

Patterson B. ND. Checklist of the Lepidoptera of the Antilles. http://mothphotographersgroup.msstate.edu/Antilles/AntillesChecklist.shtml (Accessed January 2014)

Pomari AF, De Freitas Bueno A, De Freitas Bueno RCO, De Oliveira Menezes Junior A. 2012. Biological Characteristics and Thermal Requirements of the Biological Control Agent Telenomus remus (Hymenoptera: Platygastridae) Reared on Eggs of Different Species of the Genus Spodoptera (Lepidoptera: Noctuidae). Annals of the Entomological Society of America, 105(1):73-81. 2012.

PQR

Quarantine lists for Japan 2011, Mozambique 2009 (from the IPP)

Santos GP, Cosenza GW, Albino JC. 1980. Biologia de Spodoptera latifascia (Walker, 1856) (Lepidoptera: Noctuidae) sobre folhas de eucalipto. Revista Brasileira de Entomologia 1980 Vol. 24 No. 2 pp. 153-155

Silvain J-F, Lalanne-Cassou B. Distinction entre Spodoptera latifascia (Walker) et Spodoptera cosmioides (Walker), bona species (Lepidoptera, Noctuidae). Revue fr. Ent., v. 19, n. 3-4, p. 95-97,1997

Silvain JF, Thiberville F. 1984. Les noctuelles (Lepidoptera: Noctuidae) nuisibles aux cultures industrielles et vivrieres en Guyane Francaise. 19th Annual meeting, Porto Rico, 1983 of the Caribbean Food Crops Society. Proceedings of the Caribbean Food Crops Society, 19, 217-30.

Silvie P and Silvain JF. 2004?. Spodoptera frugiperda And Others Species Captured In Pheromone Traps In Cotton Cropping Systems (Mato Grosso State, Brazil). V Congresso brasileiro de algodao. http://www.cnpa.embrapa.br/produtos/algodao/publicacoes/trabalhos_cba5/138.pdf

Zaché B, Wilcken CF, Rodrigues da Costa Zaché R, Medeiros de Souza N. 2012. Novo registro de Trichospilus diatraeae Cherian & Margabandhu, 1942 (Hymenoptera: Eulophidae), como parasitóide de Spodoptera cosmioidesWalker, 1858 (Lepidoptera: Noctuidae) no Brasil. Biota Neotropica vol.12 no.1 Campinas Jan./Mar. 2012

Zagatti P, Lalanne-Cassou B, le Duchat d'Aubigny J. 1995-2006. Catalogue of the lepidoptera of the French Antilles. INRA Database. http://www7.inra.fr/papillon/indexeng.htm (Accessed January 2014)

Zenker MM, Botton M, Teston JA, Specht A. 2010. Noctuidae moths occurring in grape orchards in Serra Gaúcha, Brazil and their relation to fruit-piercing. Rev. Bras. entomol.[online]. 2010, vol.54, n.2, pp. 288-297.

Zenker MM, Specht A, Corseuil E. Estágios imaturos de Spodoptera cosmioides (Walker) (Lepidoptera, Noctuidae). Rev. Bras. Zool. vol.24 no.1 Curitiba Mar. 2007

Not found: Angulo AO, Olivares TS, Weigert GTH. 2008. Estados inmaduros de lepidópteros nóctuidos de importancia agrícola y forestal en Chile y claves para su identificación (Lepidoptera: Noctuidae). 3a ed. Concepción: Universidad de Concepción, 154 p.

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Spodoptera ornithogalli* (Lepidoptera: Noctuidae) (yellow-striped armyworm)**

Why	Identified in the EPPO tomato study. This pest is highly polyphagous on a wide range of field and vegetable crops.
Where	**EPPO region**: Absent. CABI CPC includes a record for Denmark, considered here as doubtful (according to web, this record originates from Karsholt (1994) and Karsholt & Nielsen (2013), but *S. ornithogalli* is considered as not established on the site http://allearter-databasen.dk/index.php?taksonomi=Spodoptera+ornithogalli) **North America**: Canada, USA (East to Rocky mountains (north to southern Canada), and all southern USA, incl. California – Capinera, 2005), Mexico (King and Saunders, 1984; Bugguide, 2009, Troubridge and Lafontaine, ND) **Central America**: Honduras? (CABI CPC) Nicaragua, Guatemala, Costa Rica, Central America (King and Saunders, 1984) Mexico to Brazil (Bugguide, 2009) **Caribbean**: West Indies (Bugguide, 2009) **South America**: Brazil? (CABI CPC) Uruguay (Biezancko et al., 2007), Brazil (Bugguide, 2009)
Climatic similarity	High. 13 common climates considering the countries listed above. However, in the USA it is considered to be a pest only in southern States, corresponding to a lower number of climates. It is not known if it also overwinters in the northern part of its distribution, or migrate northwards, as *S. praefica*
On which plants	Highly polyphagous on a wide range of plants, including tomato, *Allium*, *Arachis hypogaea*, Brassicaceae, *Capsicum annuum*, Cucurbitaceae, *Gossypium*, *Ipomoea batatas*, *Manihot esculenta* (cassava), *Oryza sativa* (rice), *Phaseolus* (beans), *Solanum tuberosum*, *Zea mays* (maize) (CABI CPC), also in Biezancko et al. (2007), asparagus, *Glycine max*, *Helianthus annuus*, *Linum usitatissimum*, *Medicago sativa*, *Nicotiana alata* and *N. tabacum*, *Pisum sativum*, *Solanum melongena*. Beet, cabbage, cantaloupe, carrot, cucumber, lettuce, onion, pea, rhubarb, rutabaga, salsify, turnip, watermelon, blackberry, clover, grape, lentil, peach, rape, raspberry, sorghum, soybean, sugarbeet, sweet clover, sunflower, wheat, and several flower crops and weeds (Capinera, 2005).
Damage	Eggs are on leaves. Larvae feed on leaves, but also on fruit of plants such as tomato, pepper, cotton; pupae are in the soil (Bessin, ND; Capinera, 2005). *S. ornithogalli* is mentioned amongst major pest of economic importance for tomato for North America by Berlinger (1987). In the USA, it is a pest mostly in the southern States (Capinera, 2005). In Kentucky it is recorded as a pest on vegetables (including greens, tomatoes, peppers, beans, cucurbits, cole) as well as tobacco, soybean, maize, alfalfa.
Dissemination	Adults fly.
Pathway	Fruits and vegetables, plants for planting, cut flowers of host plants, soil, from countries where *S. ornithogalli* occurs.
Possible risks	*S. ornithogalli* has many hosts that are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is high (although its northern limit of overwintering is uncertain). To establish in the EPPO region, the pest would have to enter in an area where it can overwinter.
Categorization	Eastern Africa A1 2001, Southern Africa A1 2001 (from PQR); Quarantine pest for Guinea 2009 (for cotton, tomato), Japan 2011, Korea Rep 2011 (from the IPP)
Source(s)	Berlinger MJ. 1987. Pests. pp 391-441 In The Tomato Crop, A scientific basis for improvement (eds Atherton JG and Rudich J). Chapman and Hall, London - New York. Biezanko CM, de Ruffinelli A, Link D. 1974. Plantas y otras sustancias alimenticias de las orugas de los lepidopteros uruguayos. Rev. Centro Ciencias Rurais, Santa Maria, 4(2): 107-148. CABI CPC. 2013 Capinera JL. 2005. Spodoptera ornithogalli (Guenée). Featured creatures. University of Florida. http://entnemdept.ufl.edu/creatures/veg/leaf/yellowstriped_armyworm.htm (Accessed January 2014) Karsholt O, Nielsen PS. 2013. Revideret fortegnelse over Danmarks Sommerfugle. 121 pages. Available from http://snm.ku.dk/english/staffsnm/vip/profile/?id=663&f=3 (Accessed January 2014) Karsholt, O. 1994. Nogle indslæbte sommerfugle i Danmark, samt bemærkninger om dette emne. Entomologiske Meddelelser 1994 Vol. 62 No. 1 pp. 1-6 King ABS and Saunders JL. 1984. The invertebrate pests of annual food crops in Central America. Overseas Development Administration, London. http://books.google.dk/books?id=qMwOAQAAIAAJ&pg=PA149&lpg=PA149&dq=agrotis+repleta+king&source=bl&ots=xopGOSMmfD&sig=wjUkG49Wwcre-l9xI7AA6UImE4g&hl=en&sa=X&ei=eGP3Uc-yHunJ0AX78oD4BQ&ved=0CDIQ6AEwAg#v=onepage&q=agrotis%20repleta%20king&f=false (Accessed August 2013)

PQR

Quarantine lists for Guinea 2009 (for cotton, tomato), Japan 2011, Korea Rep 2011 (from the IPP)

Troubridge JT, Lafontaine JD. ND. The Moths of Canada, Part 1: Noctuoidea. Tribe Caradrinini. http://www.biology.ualberta.ca/facilities/strickland/noctuoidea/noctuidae3g.htm (Accessed January 2014)

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Spodoptera praefica* (Lepidoptera: Noctuidae) (Western yellow-striped armyworm)**

Why	Identified in the EPPO tomato study. It is identified as a pest of vegetable and herbaceous plants in the USA. It has a more limited distribution than *S. ornithogalli*, being limited to the Western USA and Canada.
Where	**EPPO region**: absent **North America**: USA (at least California, Oregon, Utah, Idaho, Colorado, Nevada, Wyoming? - Capinera, 2005, UC IPM, 2011, PNW Moths, 2013), Canada (southern part of Alberta, British Colombia –PNW Moths, 2013; Troubridge and Lafontaine, ND; Entomology Collection, 2013)
Climatic similarity	Medium-High. 8 common climates considering the areas listed above, possibly fewer. It is migratory and spreads northwards from the Southwest each year (PNW Moths, 2013). It may not be able to overwinter throughout its range. In Alberta, it is probably only migratory (Entomology Collection, 2013)
On which plants	No comprehensive host list was found, but this pest seems to have a more limited host range than *S. ornithogalli*. The following hosts are mentioned in various publications: tomato (UC IPM, 2011; CABI CPC), lucerne, potato, rice, sugarbeet, sweet potato, various herbaceous plants (Opler et al., 2012; PNW Moths, 2013). It is regulated by New Zealand on pears from Idaho (Biosecurity NZ, 1999)
Damage	On tomato, *S. praefica* feeds on foliage and fruit (rarely deeply, eats at surface, creating cavities) (UC IPM, 2011, Ephytia, 2013). It is mentioned amongst major pest of economic importance for tomato for North America by Berlinger (1987). In California, it is not a serious pest of tomato every year, but is occasionally very destructive (UC IPM, 2011). PNW Moths (2013) note it is often a major agricultural pest in herbaceous crops (without details).
Dissemination	Adults fly. The pest is migratory, moving northwards in North America. In Alberta (Canada), it is probably only migratory (Entomology Collection, 2013)
Pathway	Plants for planting, fruits and vegetables of host plants from countries where *S. praefica* occurs.
Possible risks	Tomato and lucerne are grown in many areas of the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is medium-high (although its northern limit of overwintering is uncertain). To establish in the EPPO region, *S. praefica* would have to enter in an area where it can overwinter.
Categorization	Quarantine pest for Korea Rep 2011 (from IPP)
Source(s)	Berlinger MJ. 1987. Pests. pp 391-441 In The Tomato Crop, A scientific basis for improvement (eds Atherton JG and Rudich J). Chapman and Hall, London - New York. Biosecurity NZ. 1999. Import Health Standard Commodity Sub-class: Fresh Fruit/Vegetables Pear, Pyrus communis from the United States of America - State of Idaho. Date Issued: 4 November 1999. http://www.biosecurity.govt.nz/files/ihs/pear-us-id.pdf CABI CPC. 2013 Entomology Collection. 2013. Searchable database of the E.H. Strickland Entomological Museum of the Department of Biological Sciences at the University of Alberta. http://entomology.museums.ualberta.ca/index.html. (Accessed January 2014) Ephytia. 2013. Portail ePhytia de l'INRA. http://ephytia.inra.fr (Accessed January 2014) Opler PA, Lotts K, Naberhaus T (coordinators). 2012. Butterflies and Moths of North America. http://www.butterfliesandmoths.org/. (Accessed January 2014) PNW Moths. 2013. http://pnwmoths.biol.wwu.edu/browse/family-noctuidae/subfamily-noctuinae/tribe-prodeniini/spodoptera/spodoptera-praefica/ (Accessed January 2014) Quarantine list for Korea Rep 2011 (from the IPP) Troubridge JT, Lafontaine JD. ND. The Moths of Canada, Part 1: Noctuoidea. Tribe Caradrinini. http://www.biology.ualberta.ca/facilities/strickland/noctuoidea/noctuidae3g.htm (Accessed January 2014) UC IPM. 2011. Pest Management Guidelines: tomato. University of California.

LEPIDOPTERA: SPHINGIDAE

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Manduca quinquemaculata* and *M. sexta* (Lepidoptera: Sphingidae) (respectively tomato hornworm and tobacco hornworm)**

Why: Identified in the EPPO tomato study. *M. quinquemaculata* and *M. sexta* are pests of Solanaceae. Their distribution differs, but they are dealt with together in US publications, and therefore considered together here.

Where: **EPPO region**: absent

Manduca quinquemaculata

North America: Canada, USA (CABI CPC), Mexico? (Bayer Mexico ND mentions M. quinquemaculata in relation to treatments with Sevin on tomato), Opler et al (2012) also mention Mexico, but no other record found). In the USA, uncommon in the south-east and Great Plains, occasionally southern Canada (Opler et al., 2012), common in northern States (Villanueva, 2009)

Central America: Nicaragua? (Maes and Schmit, ND - mention that although recorded this species may not exist in Nicaragua).

The site http://www.silkmoths.bizland.com/mquinqui.htm mentions Brazil, Uruguay, Hawaii, Nicaragua, Mexico. For Nicaragua, it refers to Maes, but Maes and Schmidt (ND) (see above). No records were found for other countries.

Manduca sexta

North America: Canada (Ontario, Quebec), Mexico, USA (throughout) (CABI CPC)

Caribbean: Antigua and Barbuda, Bahamas, Barbados, British Virgin Islands, Caribbean, Cayman Islands, Cuba, Dominica, Dominican Rep., Grenada, Guadeloupe, Haiti, Jamaica, Martinique, Montserrat, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, United States Virgin Islands (CABI CPC); Guadeloupe, Martinique (also Les Saintes, St-Martin, St-Bartholomew, Marie-Galante) and throughout the Antilles (Zagatti et al., 1995-2006).

Central America: Belize, Costa Rica, Guatemala, Honduras, Nicaragua, Panama (CABI CPC)

South America: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, French Guiana, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela (also Morales et al., 2003) (CABI CPC)

Doubtful record: CABI CPC (2013) lists Oceania: Papua New Guinea, referring to the CABI/EPPO 2002 distribution map, which does not list Papua New Guinea. No other record was found for Papua New Guinea.

Climatic similarity: High. 13 common climates considering the countries and areas listed above, but possibly lower depending on the distribution within countries (*M. quinquemaculata* uncommon in the south-east and Great Plains). No information was found on whether *M. sexta*, recorded under tropical climates in the Caribbean and Central America, overwinters in the northern part of its range.

On which plants: For both species, Solanaceae, incl. tobacco, tomato, sweet pepper, eggplant, potato, some weeds (CABI CPC, Clemson University Extension, ND, also King and Saunders, 1984 for *M. sexta*). Tomato and tobacco are the most common hosts according to Villanueva (2009), rarely on eggplant, pepper and potato (in Florida only?).

For *M. sexta*, CABI CPC (2013) lists non-solanaceous hosts: sesame and verbena, and Zagatti et al. (1995-2006) also mentions Verbenaceae as larval hosts.

Damage: For both species. Eggs are on leaves. Damage is done by larvae, which mostly feed on leaves (fruit damage is less common than leaf damage). They may totally defoliate plants. In high infestations, larvae may also feed on fruit. Pupae are in the soil. Adults fly (CABI CPC, ClemsonCooperativeExtension, 2009). Mature larvae of both species are big (8 cm length) (Georgia University, ND). On tomato, larvae feed on blossom, leaves and fruit (UC IPM, 2011).

For North America. *M. quinquemaculata* and *M. sexta* are mentioned amongst major pest of economic importance for tomato by Berlinger (1987). However, Wold-Burkness & Hutchison (ND – Minnesota), Georgia University (ND), UC IPM (2011) note that they normally do not cause economic damage on commercial farms, but may cause damage in gardens.

For *M. sexta* in other regions. In Argentina SENESA (2010) cite publications relating to tomato and tobacco. For Central America, King and Saunders (1984) note it most damaging for tobacco, and is minor (although common) on tomato.

Dissemination: Adults fly. There was an incursion of *M. sexta* in Germany in 2003 (EPPO RS 2004/01), with adults suspected to have escaped from a research facility; the pest was eradicated.

Pathway: Fruit and vegetables (especially if green parts attached), plants for planting of host plants, soil, from countries where *M. quinquemaculata* / *M. sexta* occurs.

Possible risks: Solanaceae that are hosts are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where they occur and the EPPO region is high.

Categorization: None found.

Source(s)

Bayer Mexico. ND. Productos Fitosanitarios. Sevin http://www.bayercropscience.com.mx/bayer/cropscience/bcsmexico.nsf/id/B761D798DA10FE13C125706C005C06E7/$file/ind_sevin-80.pdf (Accessed January 2014)

Berlinger MJ. 1987. Pests. pp 391-441 In The Tomato Crop, A scientific basis for improvement (eds Atherton JG and Rudich J). Chapman and Hall, London - New York.

CABI CPC. 2013

Clemson Cooperative Extension. 2009. Tomato insect pests. HGIC 2218HOME & GARDEN INFORMATION CENTER http://www.clemson.edu/extension/hgic, http://www.clemson.edu/extension/hgic/pests/pdf/hgic2218.pdf (Accessed January 2014)

Georgia University. ND. Hornworms (Order: Lepidoptera, Family: Sphingidae) - Tomato hornworm (Manduca quinquemaculata (Haworth)), Tobacco hornworm (Manduca sexta (Linnaeus)) http://www.ent.uga.edu/veg/solanaceous/hornworm.pdf (Accessed January 2014)

King ABS and Saunders JL. 1984. The invertebrate pests of annual food crops in Central America. Overseas Development Administration, London. http://books.google.dk/books?id=qMwOAQAAIAAJ&dq=agrotis+repleta+king&source=gbs_navlinks_s (Accessed January 2014)

Maes JM, Schmit P. ND. Familia Sphingidae, specific page for Manduca quinquemaculata http://www.bio-nica.info/Ento/Lepido/sphingidae/Manduca%20quinquemaculatus.htm. In Catalogo De Insectos Y Artropodos Terrestres De Nicaragua http://www.bio-nica.info/Ento/0-Ordenes.htm. (Accessed December 2013 - not active at January 2014 – see printout)

Morales V P, Cermeli M, Godoy F, Salas B. 2003. Lista de insectos relacionados a las solanáceas ubicados en el Museo de Insectos de Interés Agrícola del CENIAP _ INIA. Entomotropica 18(3):193-209.

SENESA. 2010. Sistema Nacional Argentino de Vigilancia y Monitoreop de Plagas. [Data sheets for pests in Argentina] http://www.sinavimo.gov.ar/ (Accessed January 2014)

Villanueva JR. 2009. Manduca sexta, Manduca quinquemaculata. Featured creatures. University of Florida. http://entomology.ifas.ufl.edu/creatures/field/hornworm.htm (Accessed January 2014)

Wold-Burkness SJ, Hutchison WD. ND. Tomato Hornworm. University of Minnesota. http://www.vegedge.umn.edu/vegpest/hornworm.htm (Accessed January 2014)

Zagatti P, Lalanne-Cassou B, le Duchat d'Aubigny J. 1995-2006. Catalogue of the lepidoptera of the French Antilles. INRA Database. http://www7.inra.fr/papillon/indexeng.htm (Accessed January 2014)

THYSANOPTERA: THRIPIDAE

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Ceratothripoides brunneus* (Thysanoptera: Thripidae) (tomato thrips)**

Why

Identified in the EPPO tomato study. This thrips is mostly a pest of Solanaceae. It is of African origin, but has spread to Asia and the Caribbean.

Note: *C. revelatus* was long considered as a synonym for *C. brunneus*, but was recalled from synonymy by Mound and Nickel (2009), which identifies its distribution as being Ghana, Sierra Leone, Nigeria, San Tome, Angola, Congo, Mozambique, Kenya and Uganda. In Kenya and Uganda, both species occur. *C. revelatus* is apparently not as widespread. It was found on passionfruit, banana, papaya, tomato and *Nerium* sp. (ICIPE, 2013).

Where

EPPO region: absent. Mound and Nickle (2009) indicate that a population was studied from a greenhouse in the Netherlands (citing Mound & Azidah, 2009, which refer to specimen seen on *Ensete* in a glasshouse). However several other sources mention that this was an interception.

Africa: Angola, Cameroon, Congo, Côte d'Ivoire, Ethiopia, Ghana, Nigeria, Sierra Leone, Uganda, South Africa (Mound and Nickle, 2009); Kenya (Biovision, ND; ICIPE, 2009). According to the map provided by ICIPE (2013) (without details), it also occurs in Tanzania.

Asia: Malaysia (peninsular) (Mound and Nickle, 2009); China (Tibet) (Mirab-Balou et al, 2011); Indonesia (Sartiami and Mound, 2013). Note: the record for Tibet is in a totally different climate zone than others.

Uncertainty: Sartiami and Mound (2013) mention Thailand, citing Mound and Nickle (2009), which (as well as Mound and Azidah, 2009) does not refer to *C. brunneus* in Thailand (but other species of *Ceratothripoides*).

Caribbean: Puerto Rico (Mound and Nickle, 2009), Cuba (Suris and Rodriguez-Romero, 2011)

Climatic similarity

Medium. 5 common climates considering the countries listed above, but possibly lower (occurring in specific areas of the countries mentioned). In East Africa, *C. brunneus* was not found above 2000 m (Sevgan et al., 2009)

On which plants

Found on 23 species in 15 families (ICIPE, 2009). Solanaceous vegetables such as tomato, eggplant, capsicum, chillies African nightshade, African eggplant, potato, as well as non-solanaceous such as pumpkin, papaya, carrot, banana, passion fruit, tea, amaranthus, watermelon, Karela, French beans, cowpea, sweet pea, and various weeds (ICIPE, 2013) *Hibiscus sinensis*, *Cola* spp., *Citrus*? (Mound

	and Nickel, 2009). In Malaysia, adults collected from: *Asystasia, Hibiscus, Impatiens, Ocimum, Orthosiphon, Rhodomyrtus, Salvia, Solanum, Tabernaemontana* and *Thunbergia* (Mound and Azidah, 2009). In Indonesia, collected from *Rosa* spp. (Sartiami and Mound, 2013).
Damage	Pupae are in the soil. Larvae and adults feed on leaves, also buds, flowers, fruits (Biovision, ND). Thrips feed on tomato at all stages, but feeding on seedlings is particularly damaging (Biovision, ND). In surveys in Kenya, *C. brunneus* was the most dominant thrips species on tomato in most regions surveyed (except above 2000 m) (ICIPE, 2009). Damage of 30% due to *C. brunneus* on tomato are noted (ICIPE, 2011).
Dissemination	Adults fly and the species is presumed transported with horticultural trade (Mound and Azidah, 2009). Mound and Nickel (2009) note that it was found recently on three continents other than its native Africa. There are many reports of interception for *C. brunneus*: on Karela exported from Kenya in 2005 in UK (ICIPE, 2009); one interception in the USA on tomato fruit (USDA, 2009), 9 interceptions in the USA on various commodities (Mound and Nickel, 2009); on *Momordica* vegetables from Kenya to Germany (EPPO RS0809) and to Germany and UK (RS0511); in Japan, from Uganda and Singapore [no record of presence in Singapore was found] on *Chrysanthemum* and *Oncidium* (Masumoto et al., 2012). USDA (2009) considered unlikely that this thrips would follow the pathway tomato, as most interceptions were on flowers and leaves of hosts. However, it has also been intercepted on fruit of several species.
Pathway	Fruits and vegetables, cut flowers?, plants for planting of host plants, soil, from countries where *C. brunneus* occurs.
Possible risks	Tomato, capsicum, eggplant, potato, pumpkin, carrot are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is medium. It is commonly intercepted.
Categorization	None found
Source(s)	Biovision. ND. Tomato. http://www.infonet-biovision.org/print/ct/113/crops (Accessed August 2013)

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USDA. 2009. Importation of Tomatoes, Solanum lycopersicum, from the Economic Community of West African States (ECOWAS) into the Continental United States. A Qualitative, Pathway-Initiated Pest Risk Assessment. June 5, 2009.

Africa	Asia	Oceania	North America	South-Central America and Caribbean

***Ceratothripoides claratris* (Thysanoptera: Thripidae) (Oriental tomato thrips)**

Why	Identified in the EPPO tomato study. This thrips is a serious pest of field and glasshouse tomato in Thailand. It is of Asian origin, but seems to have spread to Africa in recent years. Mound and Nickle (2009) mention that *C. claratris* may be a variant (different colour form and more humid habitats) of *C. cameroni*, which occurs in Africa and the Near East (Sudan, Nigeria, Saudi Arabia, Senegal). However, they retain the two names as *C. claratris* is used for a form with economic significance. *C. claratris* is recorded (originally) from Asia. Both species are now recorded in Africa (ICIPE, 2011 and 2013).
Where	**EPPO region**: absent **Africa:** Kenya, Tanzania, Uganda, (ICIPE, 2011 and 2013). The presence of this species in Africa was not recorded by Mound and Nickle (2009). **Asia:** India, Thailand, Philippines (Mound and Nickle, 2009), Malaysia (Premachandra and Borgemeister, 2006). Nguyen and al. (2009) refer to "South East Asia", but no other specific record for Asia was found. **Caribbean**: A record of *C. claratris* in Cuba was later corrected as being a misidentification of *C. brunneus* (Suris and Rodriguez-Romero, 2011).
Climatic similarity	Low-medium. 8 common climates considering the countries listed above, but likely to be much lower. *C. claratris* is referred to as a pest of hot and humid tropics of South East Asia (Nguyen et al., 2009). It is adapted to high temperatures of the tropics (Premachandra and Borgemeister, 2006). In East Africa, it is observed in humid coastal and low–mid altitude zones of Kenya and Uganda (ICIPE, 2013)
On which plants	*C. claratris* is a specialised feeder on tomato according to Premachandra and Borgemeister (2006), although other crops may be suitable hosts, such as *Luffa acutangula*, *Clitoria ternatea*. In host tests, Steenken and Halaweh (2011) concluded that *Cucumis melo* (melon), *Cucumis sativus* (cucumber), *Phaseolus vulgaris* (common bean), *Momordica charantia* (bitter gourd) were preferred hosts, while Premachandra and Borgemeister (2006) made the hypothesis that all the species they studied could be hosts (i.e. watermelon, eggplant, pumpkin, cucumber, yard-long bean, chilli, cowpea, some being more suitable than others). In East Africa, it is observed on solanaceous crops (such as tomato, eggplant and capsicum), and was collected from other crops such as cowpea, onion, maize and African spiderplant (as well as on some weeds) (ICIPE, 2013)
Damage	Larvae and adults feed on plants and fruits. Pupae are in the soil. *C. claratris* is one of the most destructive insect pests of tomato (Panyasiri et al., 2007) and causes significant yield losses in field and glasshouse tomatoes. Larvae and adults cause direct damage on leaves, stems and fruit by feeding (Premachandra et al. 2005a, Premachandra and Borgemeister, 2006). Oviposition on fruit causes deformation (Premachandra et al., 2005a). Indirect damage is caused by virus transmission: *Capsicum chlorosis virus* (Premachandra et al. 2005b), and the newly described *Tomato necrotic ringspot virus* (Seepiban et al., 2011). It is the predominant tomato thrips in Thailand (Premachandra et al., 2005a; Ranamukhaarachchi & Wickramarachchi, 2007). No indication of damage was found for other Asian countries or East Africa.
Dissemination	Adults fly. The species seems to have been found recently in Africa (ICIPE, 2011 and 2013). No records of interception was found, unlike for *C. brunneus*.
Pathway	Fruits and vegetables, cut flowers?, plants for planting of host plants, soil, from countries where *C. claratris* occurs.
Possible risks	Several hosts (including tomato, eggplant, cucumber, common bean) are major vegetable crop in the EPPO region. The climatic similarity according to the EPPO Study between the area where it occurs and the EPPO region is low to medium, but it is known to be present in glasshouse in Thailand, and may establish in glasshouses.
Categorization	None found

Source(s) ICIPE. 2011. Integrated Control of Thrips in Vegetable Ecosystems of East Africa. http://www.icipe.org/index.php/plant-health/364-integrated-control-of-thrips-in-vegetables-ecosystems-of-east-africa.html

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Annex 16. Outcome of Step 3: insect pests that may be considered for future action

Data below was extracted from the Step 2 List, which contains additional information on each pest. A conclusion was added.

Name	Taxonomy	Host plants	Distribution	Comments	Interest for future action
Autographa californica	Lepidoptera : Noctuidae	Medicago sativa (lucerne), Mentha piperita, Solanum lycopersicum (tomato) (CABI CPC). UniversityAlberta (ND) mentions that Eichlin and Cunningham (1978) list over 50 genera in over 25 families of herbaceous plants and woody shrubs used as hosts by larvae. Eichlin and Cunningham (1978) refer in particular to tomato and potato.	Asia: Malaysia, North America: USA (California, Oregon) (CABI CPC); Canada, USA, Mexico (Eichlin and Cunningham, 1978). Note: the record for Malaysia is not repeated in the list of pests for Malaysia (CABI CPC) and no further information was found. Doubtful record.	damage usually insufficient to require control measures (UC IPM, 2011)	From category 2. Although not much damage is reported, this pest has a host range and distribution that is interesting in relation to the EPPO region.
Bactrocera carambolae	Diptera: Tephritidae	Averrhoa carambola (major host - PQR); fruit trees (minor host - PQR). Annona, averrhoa and many others, incl. tomato (CABI CPC); van Sauers-Muller (2005) gives a list of hosts in Surinam, and compares to other locations	South America (Brazil, French Guiana, Suriname); Asia (Brunei Darussalam, India, Indonesia, Malaysia, Singapore, Thailand). Eradicated from Guyana.	B. carambolae is part of the B. dorsalis complex, and is considered with B. dorsalis (EPPO A1 list) in the corresponding data sheet and in PQR. It is also stated that it has a more tropical distribution, and that its pest status is difficult to establish. However, Plant Health Australia (2011) notes that it is a major economic pest where it occurs. QP for a number of countries.	From category 2. It is currently covered for EPPO together with B. dorsalis (EPPO A1 list) in the corresponding data sheet and in PQR. Its status for EPPO may be considered
Bactrocera depressa	Diptera: Tephritidae	CABI CPC: Cucurbita moschata (pumpkin). USDA (2010). Predominantly Cucurbitaceae (Cucurbita moschata, C. maxima, Cucumis metuliferus, C. sativus, Citrullus lanatus, Lagenaria siceraria, Trichosanthes kirilowii). Also tomato (Solanum lycopersicum). Possibly other non-cucrbit hosts.	Asia: Japan, Korea Rep., Taiwan, China (Sichuan) (CABI CPC, Carroll et al. 2004onwards).	Evidence of spread (Mun et al., 2003)	This fruit fly is more important on Cucurbitaceae. Could be considered for further study.
Bactrocera jarvisi	Diptera: Tephritidae	This species is mentioned for tomatoes exported to the USA from Australia (but not to NZ, whereas the pest does not occur there), and is considered as a risk for the USA (Margosian et al., no date). Host list in CABI CPC does not include tomato. Neither does Leblanc et al. (2012). Mango and guava are the main hosts (Plant Health Australia, 2011) Also mentions famiilies: Anacardiaceae, Annonaceae, Arecaceae, Cactaceae, Caricaceae, Celastraceae, Chrysobalanaceae, Clusiaceae, Combretaceae, Curcurbitaceae, Ebenaceae, Elaeocarpaceae, Lauraceae, Lecythidaceae, Malpighiaceae, Meliaceae, Moraceae, Musaceae, Myrtaceae, Oleaceae, Oxalidaceae, Passifloraceae, Punicaceae, Rosaceae, Rubiaceae, Rutaceae, Sapindaceae, Sapotaceae, Solanaceae	Oceania: Australia	major pest in Queensland and Northern Territory, Australia, where it attacks large number of fruits and vegetables (Plant Health Australia, 2011) Main hosts are guava and mango	This is a polyphagous serious pest of fruit, but tomato is not a main host. Important pest that could be considered for future action. May be considered in DROPSA.

Name	Taxonomy	Host plants	Distribution	Comments	Interest for future action
Bactrocera neohumeralis	Diptera: Tephritidae	Major hosts incl. Psidium guajava, Psidium cattleianum (wild, little economic use), Coffea arabica (no damage), Terminalia catappa (little economic use). Anacardium occidentale (cashew nut), Annona glabra (pond apple), Annona muricata (soursop), Annona reticulata (bullock's heart), Annona squamosa (sugar apple), Averrhoa carambola (carambola), Calophyllum inophyllum, Cananga odorata, Capsicum annuum (bell pepper), Carica papaya (papaw), Casimiroa edulis , Chrysophyllum cainito, Citrus aurantiifolia (lime), Citrus limon (lemon), Citrus maxima (pummelo), Citrus reticulata (mandarin), Citrus sinensis (navel orange), Citrus x paradisi (grapefruit), Clausena lansium, Coffea arabica (arabica coffee), Crateva religiosa, Cyphomandra betacea (tree tomato), Diospyros blancoi, Diospyros kaki (persimmon), Eriobotrya japonica (loquat), Eugenia dombeyi, Eugenia uniflora, Feijoa sellowiana, Fortunella japonica (round kumquat), Malpighia emarginata, Malus sylvestris (crab-apple tree), Mangifera indica (mango), Manilkara zapota (sapodilla), Morus nigra (black mulberry), Muntingia calabura, Musa x paradisiaca (plantain), Myrciaria cauliflora, Passiflora edulis (passionfruit), Passiflora foetida, Passiflora quadrangularis, Passiflora suberosa , Phoenix dactylifera (date-palm), Pouteria caimito, Prunus armeniaca (apricot), Prunus domestica (plum), Prunus persica (peach), Prunus salicina (Japanese plum), Psidium guajava, Psidium cattleianum, Pyrus communis (European pear), Rollinia mucosa, Rubus rosaefolius, Solanum laciniatum, Solanum lycopersicum (tomato), Solanum seaforthianum, Spondias mombin, Spondias purpurea, Synsepalum dulcificum, Syzygium aqueum, Syzygium jambos, Syzygium malaccense , Syzygium paniculatum, Syzygium samarangense, Terminalia, Terminalia catappa, Vitis labrusca, Ziziphus jujuba (common jujube)	Oceania: Australia, Papua New Guinea	major pest of commercial fruit crops in Queensland, Australia (Plant Health Australia, 2011). Measures taken in Australia for tomatoes to USA (AQIS, 2003)	Polyphagous but seems to have a more tropical distribution. Not proposed for Step 3. May be considered for DROPSA
Blapstinus sp.	Coleoptera: Tenebrionidae	soybean (CABI CPC, abstract), tomato (Bayer Mexico, Le Strange et al., 2000), rice, cotton, sorghum (King and Saunders, 1984); tomato, pepper, cotton, strawberry, cucumber, grape, hop (White, 1983)	For genus: South America: Paraguay (CABI CPC abstract), North America: USA (White, 1983; Le Strange et al., 2000); Mexico (Bayer Mexico ND, King and Saunders, 1984), Central America: Honduras, Panama, Caribbean (King and Saunders, 1984)	Biology not favourable to association with tomato fruit. However, intercepted on this commodity in the USA (8 in 1986-2006 (USDA, 2009) and 35 adults in 2007-2012 (USDA, 2013). It was not possible to identify individual species, as the genus is most often mentioned. White (1983) mentions 52 species (not clear if this is for North America, subject of the book, or for the whole genus). Mentioned amongst major pest of economic importance for tomato for North America by Berlinger (1987).	From category 2. There are many records of interceptions on tomato fruit, although adults feed on plants, especially seedlings. This is the most striking example of pests (esp. Tenebrionidae) found in that study that were not likely to be associated with tomato fruit (sometimes not tomato pests), but are intercepted in tomato fruit consignments (hitchhikers). Other such cases were Ulus sp. and Lobometopon mettalicum (Tenbrionidae), Phyllophaga sp. (Scaraboidae), Phydotricha erigens (Pyralidae).

Name	Taxonomy	Host plants	Distribution	Comments	Interest for future action
Chaetocnema confinis	Coleoptera: Chrysomelidae	Primarily convolvulaceae. Has adapted to other host plants, incl. beetroot, tomato, maize (CABI CPC). Convolvulaceae (Convolvulus arvensis in USA and Canada; has adapted to many other Convolvulaceae: sweet potato, Ipomoea aquatica, I. pandurata, Calystegia sepium, Pharbitis purpurea, P. cathartica, etc.). Has become secondarily polyphagous, adapted in North America to corn (Zea mays), sugarbeet, tomato, and many other crops and weeds (Jolivet, 2008)	ASIA , India, Japan, Taiwan, Thailand, Vietnam, AFRICA , Comoros, Gambia, Ghana, Madagascar, Malawi, Mauritius, Réunion, Senegal, Seychelles, South Africa, NORTH AMERICA , Canada, USA, CENTRAL AMERICA AND CARIBBEAN , El Salvador, Nicaragua, SOUTH AMERICA , Brazil, Ecuador, EUROPE , Guernsey, OCEANIA , French Polynesia, Guam, Marshall Islands, Palau (CABI CPC). Other records in Jolivet (2008): most of tropical and southern Africa, Ecuador (Galapagos), Central America, New Caledonia. At origin it is present in a wide range of climate (e.g. Maritime provinces of Canada - Majka and LeSage, 2010), while new introductions are mostly tropical	Damage to sweet potato in the USA (CABI CPC) USDA (2009) considers it is not likely to be associated with fruit (but throughout do not consider association with leaves)	From category 2. There is no good reason to consider this pest in relation to tomato fruit, as the pathway is not likely to transport the pest. However a record or article could be developed for other possible pathways (sweet potato, beet?)
Chaetocnema confinis	Coleoptera: Chrysomelidae	Primarily convolvulaceae. Has adapted to other host plants, incl. beetroot, tomato, maize (CABI CPC). Convolvulaceae (Convolvulus arvensis in USA and Canada; has adapted to many other Convolvulaceae: sweet potato, Ipomoea aquatica, I. pandurata, Calystegia sepium, Pharbitis purpurea, P. cathartica, etc.). Has become secondarily polyphagous, adapted in North America to corn (Zea mays), sugarbeet, tomato, and many other crops and weeds (Jolivet, 2008)	ASIA , India, Japan, Taiwan, Thailand, Vietnam, AFRICA , Comoros, Gambia, Ghana, Madagascar, Malawi, Mauritius, Réunion, Senegal, Seychelles, South Africa, NORTH AMERICA , Canada, USA, CENTRAL AMERICA AND CARIBBEAN , El Salvador, Nicaragua, SOUTH AMERICA , Brazil, Ecuador, EUROPE , Guernsey, OCEANIA , French Polynesia, Guam, Marshall Islands, Palau (CABI CPC). Other records in Jolivet (2008): most of tropical and southern Africa, Ecuador (Galapagos), Central America, New Caledonia. At origin it is present in a wide range of climate (e.g. Maritime provinces of Canada - Majka and LeSage, 2010), while new introductions are mostly tropical	Damage to sweet potato in the USA (CABI CPC) USDA (2009) considers it is not likely to be associated with fruit (but throughout do not consider association with leaves)	From category 2. It has adapted to new hosts
Copitarsia decolora (turbata)	Lepidoptera: Noctuidae	tomato (Estay, ND), cut flowers, lettuce, peas, beets, carrots, beans, potatoes (INIA, Chile), lettuce, quinoa, potato, alfalfa, melloco (Gould et al., 2000); tomato (Bayer Chile, NDc) Ammi, Asparagus, Aster, Callostephus, Iris, Lysimachia (Gould et al., ND) raps, grape, alfalfa, chili pepper, artichoke, onion, raspberry, strawberry, chickpea, jojoba, asparagus, corn, apple, sunflower, potato, pistachio, sugar beet, cabbage, tobacco, wheat, garlic, alfalfa, ballica, onion, carnation, feijoa, kiwi (Angulo and Olivares, 2003)	North America, South America, Central America: Southern Mexico through northern Chile, eastward to Argentina (Buenos Aires) (Simmons and Pogue, 2004) Mexico, Guatemala, Honduras, Panama (Gould et al., ND) Venezuela, Uruguay, Peru, Colombia, Costa Rica, Ecuador, Guatemala, Mexico. Argentina (Angulo and Olivares, 2003)	See notes for other Copitarsia spp. Reported as pest (e.g. Gould et al., 2000) Note: there are inconsistencies in the distributions by different authors, probably due to associated difficulties in the taxonomy.	From category 2. Although Copitarsia are not important in relation to tomato fruit, they seem important for leaf vegetables and could be studied further for those.

Name	Taxonomy	Host plants	Distribution	Comments	Interest for future action
Earias vittella	Lepidoptera : Noctuidae	Gossypium (cotton), Gossypium arboreum (cotton, tree), Hibiscus (rosemallows), Solanum lycopersicum (tomato) (other hosts – CABI CPC), Abutilon (Indian mallow) (wild host – CABI CPC); Abelmoschus esculentus (okra), Gossypium hirsutum (Bourbon cotton) (Main hosts – CABI CPC);	From CPC - PQR also includes a distribution list, not cross-checked) ASIA , Afghanistan, Bangladesh, Brunei Darussalam, Cambodia, China, India, Iran, Korea, DPR, Laos, Malaysia, Myanmar, Pakistan, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam, AFRICA , Seychelles, Sudan, OCEANIA , Australia, Fiji, Guam, Micronesia, Federated states of, Northern Mariana Islands, Palau, Papua New Guinea, Solomon Islands, Tonga	One of the most important pests of cotton (Dhillon and Sharma, 2004). Tomato is not a major host	From category 2. This is a very serious pest of cotton, which is a quarantine pest for many countries. EPPO countries with cotton production may be interested in investigating it further
Empoasca fabae	Hemiptera: Cicadellidae	potato, leguminous hosts. Tomato and eggplant are mentioned as other hosts (CABI CPC) tomato, potato (Brust, 2008) alfalfa, beans, soybeans, potatoes, and to a lesser extent, eggplant, celery, cucumber, Jerusalem artichokes, squash, sweet potato and rhubarb (Jude Boucher, 2005)	ASIA , India, NORTH AMERICA , Canada, USA, CARIBBEAN , Cuba (CABI CPC); China, North America, South America (Zhang et al., 2008). This distribution is probably not complete. Zhang et al. (2008) mentions South America, but this may refer to older publications, before redescription of the species. No specific record were found,	more common on potato than on tomato (Brust, 2008). De Long (1938) gives details on biology and climatic conditions in the USA. Note: the species was redescribed and some early records may not be E. fabae.	Tomato is not a main host and possibly not a host. However, it is important for other hosts, in particular potato.
Eudocima (Othreis) materna	Lepidoptera : Noctuidae	larval hosts are Menispermaceae (Hill and Matyot, 2003); citrus fruits, carambola and mangoes sometimes attacked (Hill and Matyot, 2003); tomato (Ghana IPM, USDA, 2009). African Moths (ND) mention Cocculus, Lycopersicon, Malus pumila, Mangifera indica, Musa x paradisiaca, Tinospora caffra, vitus as larval hosts. To be clarified if studied further	Asia: India, Oceania: Australia (CABI CPC); Africa: Ghana (Ghana IPM, ND); Sierra Leone (USDA, 2009). Seychelles (Hill and Matyot, 2003 - wind-dispersed or ship-assisted vagrants); tropics, from India to Indonesia, Oceania: Australia and the Pacific, throughout Afro-tropics and Neotropics from Florida and Texas to Brazil (Hill and Matyot, 2003); Cameroon, DRCongo, Eritrea, Ethiopia, Gambia, Kenya, Madagascar, Malawi, Mozambique, Nigeria, Rwanda, Somalia, South Africa, Tanzania, Uganda, Zambia, Zimbabwe (African Moths, ND). North America, Central America, South America (from the south of the United States to Brazil), India, Australia and tropical Africa (INRA, ND)	USDA (2009) noted that adult moths pierce tomato fruit, and the pest is unlikely to follow the pathway. This was not retained here. However, because larvae are mostly associated with wild hosts (Menispermaceae - Hill and Matyot, 2003), the probability of entry would be low on host crops.	More reduced distribution than E. fullonia (which was selected at Step 3), and the same presumed association of immature larvae with wild hosts. If E. fullonia is investigated further, it could be considered if more information should be found for *E. materna*

Name	Taxonomy	Host plants	Distribution	Comments	Interest for future action
Frankliniella australis (= F. cestrum?)	Thysanoptera: Thripidae	Cestrum parqui (Funderburk et al., 2002); Taraxacum officinale (Manosalva et al., 2011); Vicia faba, Pisum sativa, Medicago sativa, Raphanus nigra, Rapistrum rugosum, Melilotus alba (Zamar and Arce de Hamity, 1999). Tomato sweet pepper, melon, potato, lettuce, spinach, cauliflower, etc. (?), tomato (Estay, 2005), plum, peach, pear, grapevine (CABI CPC - F. cestrum), grapevine (PQR), cherry (Rodriguez et al., 2012 - not found in fruit) . No direct reference that tomato is a host. The pest is regulated in the USA, and therefore treatments applied on crops in at least Chile (BayerChile, NDh)	South America: Chile (Funderburk et al., 2002), also Argentina (Gonzalez, 1999, Rodriguez et al., 2012); Bolivia? (DAFF, 2003;); Brazil (Cavalleri and Mound, 2012). The record for Bolivia is also mentioned in Sakimura and O'Neill (1979), who mention australis and cestrum as two separate species.	Not important as pest, but because considered as quarantine pests by others (Bayer Chile, NDh; Estay, 2005, Gonzalez, 1999)	Only eggs could be transported on fruit. Oviposition damage is however recorded as very rare. The importance of *F. australis* is due to the fact that it is considered a quarantine pest by other countries. Not convincing evidence of its importance as a pest, and not proposed for Step 3. However, it may be interesting to consider why it is regulated by so many countries
Frankliniella bispinosa	Thysanoptera: Thripidae	Abundant on pepper not shown if reproductive host (Avila et al, 2006); sweet pepper, strwaberry, tobacco, citrus, wild radish, roses, rye, wheat (unknown host status for all - CABI CPC). Citrus, also flowers of Hibiscus, chrysanthemum, snapdragon, bell pepper, black-eyed peas, blueberry, eggplant, corn, cucumber, peanut, watermelon, and juniper; also avocado fruits, tomato fruits and fruit and flowers of strawberry, avocado, and passion fruit (Childers and Nakara, 2006)	North America: USA(Florida), Caribbean: Bahamas, Bermuda (Avil et al., 2006); North America and Caribbean: USA (Florida, Georgia?), Puerto Rico?, Asia: Georgia (probably USA, Georgia)	economic pest on Florida citrus (Childers and Nakara, 2006), vector of TSWV (Avila et al, 2006)	Seems to be associated with fruit (at least on citrus). Important pest. May be considered for future action, especially in relation to citrus. May be considered in DROPSA
Hypercompe (Ecpantheria) indecisa	Lepidoptera: Arctiidae	Maize and 20 hosts incl. Solanum tuberosum, Brassica oleracea, Lactuca sativa, Persea americana, Diospyros kaki, Fragaria ananassa, Prunus persica (tomato not mentioned) (Nava et al., 2008) tomato mentioned in Biezanko et al (1974), with many others. Pear, poplar (Dapoto et al., 2010) Citrus? (wikipedia on citrus)	South America: Argentina, Brazil (Nava et al., 2008), Uruguay (Biezanko et al., 2008), Dapoto (2010), Bolivia? (BoldSystems, 2013)	No other source than Bezanko was found for tomato, but the pest is polyphagous, in many families incl. Solanaceae and has been retained here. Has adapted to new hosts (poplar and pear in Patagonia - Dapoto et al., 2010)	This is a polyphagous pest, that has adapted to new hosts recently.
Metoponium abnorme	Coleoptera: Tenebrionidae	Feeds on: grapevine, grapefruit, strawberry, tomato (White, 1983; Eberling, 2002). Accidental invaders in houses (Robinson, 2005) Hosts not found. Damage seem to be caused by adults (Flaherty, 1992)	North America: USA [possibly incomplete]	M. abnorme is a regulated pest for Vitis in NZ (Biosecurity NZ, 2012). In a PRA on table grape, but not considered associated with the pathway fruit (DAFF Australia, 2004) Negligible damage on grape (leaves and buds) by adults (Flaherty, 1992). It is adults that may cause damage, but they are mobile.	May be interesting to consider in relation to grapevine
Naupactus xanthographus	Coleoptera: Curculionidae	Many, incl. potato, pear, apple, grapevine, plum, peach, almond, soyabean, lucerne, olive (CABI CPC) Grapevine as main host in PQR, and tomato, potato, citrus, apple, cherry, peach and pear as minor hosts (PQR)	South America: Argentina, Brazil (absent, unreliable record), Chile, Paraguay (absent, unreliable record), Uruguay	In Chile (introduced), one of the most important pests of grape (CABI CPC) potential contaminant of fruit while it is being picked or standing in open bins (CABI CPC)	From category 1. Serious, polyphagous, on fruit, but tomato is not a main host. It is not proposed for Step 3, but may be interested for future action. May be considered in DROPSA

Name	Taxonomy	Host plants	Distribution	Comments	Interest for future action
Paracoccus marginatus	Hemiptera: Pseudococcidae	>55 host plants in more than 25 genera. Economically important host plants of the papaya mealybug include papaya, hibiscus, avocado, citrus, cotton, tomato, eggplant, peppers, beans and peas, sweet potato, mango, cherry, and pomegranate (Walker et al, 2006). Many hosts. Main hosts are papaya, cassave, also coffee, eggplant and others. Tomato and sweet pepper mentioned as other hosts (CABI CPC)	Asia and Near East: Bangladesh, Cambodia, India, Indonesia, Malaysia, Oman, Philippines, Sri Lanka, Taiwan, Thailand, AFRICA , Benin, Ghana, Réunion, Togo, NORTH AMERICA , Mexico, USA, CENTRAL AMERICA AND CARIBBEAN , Antigua and Barbuda, Barbados, Belize, British Virgin Islands, Cayman Islands, Costa Rica, Cuba, Dominican Republic, Guadeloupe, Guatemala, Haiti, Montserrat, Netherlands Antilles, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Sint Maarten, United States Virgin Islands, SOUTH AMERICA , French Guiana, OCEANIA , Guam, Northern Mariana Islands, Palau,	Known to have spread to and within the USA (Walker et al., 2006)	Tomato is not a main host, and the distribution of this pest seems more tropical/subtropical. It is not propsoed here. However, it is known to have spread within the USA and it could be considered separately
Rachiplusia (Plusia) nu	Lepidoptera : Noctuidae	soybean, sunflower, clover, bean (CABI CPC), Cucurbita pepo, Glycine max, sunflower, Linum usitatissimum, Medicago sativa, Melilotus indicus & officinalis, anis, Pisum sativum, potato, Trifolium incarnatum (Biezanko et al., 1974) Helianthus annuus, Helianthus debilis, Brassica oleracea acephala, Brassica oleracea botrytis, Brassica oleracea capitata, Glycine max, Medicago sativa, Pisum sativum, Trifolium incarnatum, Linum usitatissimum (Specht et al., 2004) 18 host plants in 9 families, and Nicotiana tabacum (Specht et al., 2006). Also chard, artichoke, tomato in Luna and Greco (1998)	South America: Argentina (Rizzo et al., 1999), Uruguay (Biezanko et al., 1974), Brazil (Specht et al., 2005) Chile (CABI CPC) Paraguay, Uruguay, Brazil, Argentina, Bolivia, Chile (Lafontaine and Poole, 1991)	Emerged as major soybean pest in Argentina in recent years (Barrionuevo et al., 2012)	This is mostly an emerging pest of of soybean, occasionally feeding on fruit. Not proposed for Step 3, but may be interesting for future action
Serrodes partita (S. inara)	Lepidoptera : Noctuidae	Jasminum, Pappea, Grewia (AfroMoths, ND), tomato (Ghana IPM, 1996, USDA, 2009), citrus (Robinson et al., 2012) Sapindus (Rao, 1992), grape (Swart et al, 1976)	Africa: Cape Verde, Democratic Republic of Congo, Eritrea, Kenya, La Réunion, Lesotho, Madagascar, Mauritius, Sierra Leone, South Africa, São Tomé & Principe, Zimbabwe. Oceania: Australia; Asia: India, Indonesia, Sri Lanka. (AfroMoths, ND) Ghana (Ghana IPM, 1996), India (Rao, 1992) South Africa (Robinson et al. 2012)	damages on citrus. Adults feed nocturnally, highly mobile, unlikely to be packed with fruit (USDA, 2009)	The association with tomato fruit is less likely. It may be considered for future action, especially in relation to citrus and grape. May be considered for DROPSA
Symmetrischema tangiolas (=S. plaesiosema)	Lepidoptera : Gelechiidae	potato (main) tomato (other), S. nigrum (wild host) (CABI CPC). Regulated by Argentina for tomato, potato and pepino (Argentina QL, 2011)	NORTH AMERICA , USA, SOUTH AMERICA , Bolivia, Chile, Colombia, Ecuador, Peru, OCEANIA , Australia, New Zealand	increased importance in recent years as pest of potato in Peru and Bolivia (CABI CPC). On Argentina QL for Papa, tomate, pepino dulce. Current distribution more temperate than S.solanivora [note: Tecia solanivora?], "recently added to EU list" (mentioned in NL Quickscan). Has spread.	From category 2. There is no good reason to consider this pest in relation to tomato fruit, as the pathway is not likely to transport the pest. However a record or article could be developed as this is an important pest of potato.

Annex 17. Outcome of Step 2. Pests of Category 1 not selected for Step 3 because present in 1-2 EPPO countries (or Canary Islands, Madeira, Azores)

The content is extracted from the Step 2 List xls file, and has not been edited. EPPO countries for which records were found are indicated. Details on hosts, worldwide distribution and references are in the Step 2 List.

Name	Taxonomy	Comments	Records for EPPO countries
Aleurodicus dispersus	Hemiptera: Aleyrodidae	Note: the distribution in PQR indicates some spread. Was listed on EPPO Alert List in 2000-2006 and withdrawn as no particular action was required by EPPO countries. Introduced into different parts of the world (EPPO AL, 2006). Many references in EPPO AL, 2006. In USDA (2009), this pest was not retained (not expected to follow the pathway on tomatoes without stems and calyces, should be readily noticed and eliminated during handling and packing). However, it is retained here as it could be on fruit, and calyxes are often attached to tomato fruit. Discussed by the PPM in 2004 based on a PRA; an updated PRA was planned, but then not considered as a priority for the EPPO PRA process and no new information or update of the PRA was made available (EPPO, 2004a; EPPO website).	Portugal (Madeira), Spain (Canary Islands)
Atherigona orientalis	Diptera: Muscidae	Mostly secondary pest, but may be primary pest (sweet pepper in Nigeria, tomato in Australia). QP in NZ, Korea Rep., Cambodia. Atherigona sp. intercepted once in USA. Pan-tropical within 200 N and S of the equator. Outside that range, reported from Australia, China and USA, maybe others (Hibbard and Overholt, 2013)	Israel, Cyprus, Spain (Tenerife)
Bagrada hilaris	Hemiptera: Pentatomidae	Recent (2008) introduction to USA, spreading (CSIR, 2013; Scott et al., 2012). major pest of Brassicaceae (CSIR, 2013). migrating from cauliflower and cabbage into tomato crops. Damage to fruit observed (Singh et al., 2011). Due to uncertainties on distribution, has not been considered to occur in 3 EPPO countries	Malta, Italy, Macedonia? Uncertainty on the European distribution (see Step 2 List)
Chrysodeixis (Phytometra) acuta	Lepidoptera: Noctuidae	USDA (2009) concl. that fruit is attacked, but the pest is not expected to follow the pathway with minimal post-harvest processing. This was not retained here, as eggs or larvae may also be associated with green parts	Algeria, Spain (Canary Islands). Uncertain records: France?, UK?, Portugal (Madeira)?
Chrysodeixis eriosoma	Lepidoptera: Noctuidae	Serious pest in various crops (CABI CPC) . Deleted from EPPO AL (listed for more than 3 years (2000-2007), and no international action requested by EPPO member countries). Reviewed by the PPM; an updated PRA was planned, but then not considered as a priority for the EPPO PRA process and no new information or update of the PRA was made available (EPPO, 2004; EPPO website)	Russia. Records of interceptions or absence for some other EPPO countries (see Step 2 List)
Colletotrichum capsici	Ascomycetes	Reported as serious on some crops (CABI CPC). Uncertainty on the distribution in the EPPO region (more widespread?)	Poland. Occasionally in Southern Europe (Mordue, 1971). No detailed records found.
Cowpea mild mottle virus	Betaflexiviridae: carlavirus	Transmitted by whiteflies. Not seed transmitted. Transfer would require acquisition by whiteflies at destination	Israel, Jordan
Dysmicoccus neobrevipes	Hemiptera: Pseudococcidae	cosmopolitan pest of pineapple (CABI CPC)	Portugal (Madeira, Azores), Spain (Canary Islands), Italy
Epilachna vigintioctomaculata	Coleoptera: coccinellidae	potato is the only optimal host (AgroAtlas, ND) The distribution in USDA (1965) is quite different from others (the pest is for example not present in Australia according to recent databases)	Russia (Far East)
Epiphyas (Teras) postvittana	Lepidoptera: Tortricidae	Serious pest on many crops, including pome fruit, citrus, grape (CAPS, 2007). Has spread internationally. Many interceptions, incl. on pepper (Venette et al., 2003) European distribution to be clarified before it is studied further	Portugal (Azores), Ireland, UK. Uncertain records: Sweden? Jersey? Guernsey?

Name	Taxonomy	Comments	Records for EPPO countries
Ferrisia virgata	Hemiptera: Pseudococcidae	NZ regulated pest for tomatoes from Tonga and Australia (Biosecurity NZ, 1998 & 2000). Earlier records may not be Ferrisia virgata (Kaydan and Gulan (2012). It has not been checked if the distribution in CABI CPC covers earlier records referring to other species (some identifications of F. virgata were F. malvastra). Due to the uncertainty on the taxonomy, the distribution would have to be studied further. F. virgata was intercepted in the USA (USDA, ND). Occasionally serious (NBAII, 2013)	France (Hyères Islands)
Frankliniella fusca	Thysanoptera: Thripidae	Important pest of several crops, incl. tobacco and peanuts in E USA, and vector of TSWV (Wang et al., 2010) Important as a pest of field crops (tobacco, peanuts, tomatoes, capsicums) particularly in south eastern USA (Hoddle et al., 2012). Mentioned amongst major pest of economic importance for tomato for North America by Berlinger (1987).	Israel. Uncertain for the Netherlands (see details in Step 2 List)
Icerya aegyptiaca	Hemiptera: Margarodidae	Minor pest for NBAII (2013) Serious pest of citrus, fig and shade trees in Egypt, now controlled through BC, pest of breadfruit, avocado, banana, citrus and ornamentals in the South Pacific (CABi CPC)	Israel
Icerya seychellarum	Hemiptera: Margarodidae	Regulated by NZ on tomatoes from Tonga (Biosecurity NZ, 1998)	France, Portugal (Madeira only)
Lasioptera	Diptera: Cecidomyiidae	unidentified species - thought to have been introduced, but not identified to species yet. No further information found. Impossible to pursue, not pursued further. Not enough information at this stage, present in the EPPO region, but interesting case for follow-up	Greece
Leptoglossus gonagra (L. australis, L. membranaceus , L. gonagra, Fabrictilis australis)	Hemiptera: Coreidae	Cassis and Gross (2002) consider all these species as synonyms based on Packauskas and Schaefer (2001), who reconsidered previous separation of Leptoglossus into separate genera (including Fabrictilis) and proposed these new genera as synonyms for Leptoglossus. This approach seems to be accepted, but this may need to be checked if these species are studied further in detail. Mentions of different species remain in the literature, esp. prior to 2001. PQR has separate entries for Leptoglossus australis and L. gonagra (and the distribution for L. australis which does not indclude records for the Americas, unlike Cassis and Gross, 2002). NZ regulates Fabrictalis australis and Fabrictilis gonagra separately on watermelon from Australia (Biosecurity NZ 2000b), and F. australis for tomatoes from Tonga and Australia (Biosecurity NZ, 1998&2000).	Spain (Islas Canarias)
Moroccan pepper virus (Lettuce necrotic stunt virus)	Tombusviridae: tombusvirus	unknown transmission (Blancard, 2009), transmitted mechanically? (Vetten and Koenig, 2003) also plant contact? Seed?	Germany, Morocco
Nematospora (Eremothecium) coryli	Ascomycetes	on tomato fruit, associated with pumpkin bugs and leaf-footed plant bugs (Horst, 2008). Regulated by Paraguay on Glycine max, Phaseolus vulgaris, Gossypium hirsutum, Coffea sp., Cajanus cajan, Lycopersicon esculentum, Crotalaria juncea (Paraguay QL 2010) Serious pathgens in some places, but in Australia was present for app. 90 yers before being detected (Shivas et al., 2005) Transmitted by vectors (Shivas et al., 2005)	Greece, Italy
pepper veinal mottle virus	Potyviridae: potyvirus	transmitted by aphids, mechanically and by grafting, not by contact (Brunt et al., 2006 onwards). Not seedborne (CABI CPC). Major constraint to pepper production in Tunisia (Gorsane, 1999)	Tunisia
Phenacoccus parvus	Hemiptera: Pseudococcidae		Israel
Planococcus minor	Hemiptera: Pseudococcidae	regulated by NZ on tomatoes from Australia (Biosecurity NZ, 2000). Frequently intercepted in the USA (not on tomato - Venette and Davis, 2004)	Portugal (Madeira), Spain (Azores)
Platynota stultana	Lepidoptera: Tortricidae	Has been spreading in the USA, major economic hosts incl. alfalfa, Citrus sp., corn, cotton, grape, peach, pear, pepper; has expanded its host range (Gilligan and Epstein, 2009). EPPO AL (2002) Greenhouses and outdoors.	Spain
Pseudococcus (Dysmicoccus) cryptus	Hemiptera: Pseudococcidae	one of the most destructive insect pests of tomato in greenhouse in Thailand (Panyasiri et al, 2007). No Solanaceae mentioned as host in Ben-Dov et al. (2006)	Israel, Spain
Pulvinaria urbicola (P. grabhami)	Hemiptera: Coccidae	Intercepted in the USA (USDA, ND - on other than tomato)	Israel, Portugal (Madeira)

Name	Taxonomy	Comments	Records for EPPO countries
tomato leaf curl New Delhi virus	Geminiviridae: begomovirus	moved to eggplant (possibly as variant - Pratap et al., 2011). Transmitted by B. tabaci (no transmission by contact or seed (EPPO AL)). Transfer from tomato fruit would require a vector. Introduction of B. tabaci with fruit considered unlikely in EFSA (2013) (due to cold chain and transfer). Serious (Pratap et al., 2011). In Spain, it seems to be a problem for Cucurbita pepo (Juarez et al., 2014? under publication)	Spain
Trialeurodes ricini	Hemiptera: Aleyrodidae	Intercepted in the UK (CSL, 2005b). Known to have been introduced to the Canary Isl. And Egypt (CSL, 2005b, EPPO 2000-2006) Virus vector (TYLCV in Egypt - EPPO 2000-2006)	Israel, Spain (Islas Canarias)