Insecticide Resistance Action Committee

IRAC EUROPE
Proposal: European insecticides & acaricides resistance status document

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CropLife INTERNATIONAL

IRAC Europe: Background

- Establish a new IRAC regional group focused on insecticide resistance management in the geographic region of Europe, Including non-EU member states of the European and Mediterranean Plant Protection Organisation (EPPO).
- In order to avoid overlap with existing IRAC International working groups (lepidoptera, sucking pest, etc.) IRAC Europe will focus its activities on resistance management policy, advocacy and IRM implementation rather than pest specific activities.
- First meeting in March 2019
- Representatives from Adama, Bayer CS, BASF, Corteva, FMC, Nihon Nohyaku, Syngenta & Sumitomo.

European insecticides & acaricides resistance status document

- Insecticide/acaricide registrants are asked to provide resistance monitoring data for their active ingredients and asked to provide resistance risk assessment.
- Monitoring data either needs to be generated or gathered from existing sources (i.e. peer reviewed publications).
- Peer reviewed publications not always the best source of up to date information.
- Collectively companies, researchers and institutes have most up to date information, but difficult to capture this in a single source (e.g. database).
- Databases also struggle to provide the context of a resistance situation (e.g. distribution, intensity, crop specificity, cross-resistance, etc)
- Individual companies gathering information for same active ingredients or modes of action can be very inefficient and can lead to different risk assessments for same insecticide.
- As an alternative to individual assessments by registrants, one potential solution would be to have a single source of information on the status of resistance which companies and regulators could reference.
- IRAC Europe would like to propose the production of an **'European insecticides and acaricide resistance status document'** for each of the EPPO climatic zones.
- Documents would be divided in sections based on host crops and include a status of the resistance situation for the significant pests (See oilseed rape/maritime zone example).
- Information would be based on peer reviewed literature and information provided by companies and independent researchers (all information reviewed by peer reviewed by IRAC Europe panel).
- Yearly or 2 yearly updates. Significant commitment from IRAC Member companies to provide up to date information
- Does not hinder opportunity for regulators to request specific data from individual companies/actives.
- Document would be available to public and non-IRAC companies.
- This is a format already used by FRAC for fungicide resistance.

- QUESTION: If IRAC Europe produced an insecticide resistance status document would EU regulators accept this as a reference document that could be used in biological dossiers ?

IRAC

EXAMPLE: IRAC Insecticide Resistance Status Summary

EPPO Maritime climatic zone: United Kingdom, Ireland, France, Belgium, Netherlands, Luxembourg, Switzerland, Germany, Denmark, Sweden, Norway, Austria, Czech Republic, Slovenia

Oilseed Rape (Winter & Spring)

Oilseed rape summary table: Maritime EPPO Region

Common name	Species	Insecticide MoA	Status in EPPO climatic zone (For details please see resistance status text)
Pollen beetle	*Meligethes aeneus*	Group 1	No known resistance based on monitoring
		Group 3	Wide spread significant cases of resistance in climatic region
		Group 4	Evidence of resistance or shift in sensitivity or localised resistance cases.
		Group 5	No known resistance / no monitoring available
		Group 9	No known resistance / no monitoring available
		Group 22	No known resistance based on monitoring
Cabbage Seed Weevil	*Ceutorhynchus obstrictus* *Ceutorhynchus assimilis*	Group 3	Evidence of resistance or shift in sensitivity or localised resistance cases.
		Group 4	No known resistance based on monitoring
Rape Stem Weevil	*Ceutorhynchus napi*	Group 1	No known resistance / no monitoring available
		Group 3	Evidence of resistance or shift in sensitivity or localised resistance cases.
Cabbage Stem Weevil	*Ceutorhynchus pallidactylus*	Group 3	No known resistance based on monitoring
Rape Winter Stem Weevil	*Ceutorhynchus picitarsis*	Group 3	Significant cases of resistance in part of climatic region
Cabbage Stem Flea Beetle	*Psylliodes chrysocephala*	Group 3	Significant cases of resistance in part of climatic region
Crucifer Flea Beetle	*Phyllotreta cruciferae*	Group 3	No known resistance based on monitoring
Brassica Pod Midge	*Dasineura brassicae*	Group 3	No known resistance / no monitoring available
		Group 4	No known resistance / no monitoring available
Green Peach Aphid	*Myzus persicae*	Group 1	Wide spread significant cases of resistance in climatic region
		Group 3	Wide spread significant cases of resistance in climatic region
		Group 4	No known resistance based on monitoring
		Group 9	No known resistance based on monitoring
		Group 23	No known resistance / no monitoring available
		Group 29	No known resistance / no monitoring available
Mealy Cabbage Aphid	*Brevicoryne brassicae*	Group 1	No known resistance / no monitoring available
		Group 3	No known resistance / no monitoring available
		Group 4	No known resistance / no monitoring available
		Group 9	No known resistance / no monitoring available
		Group 23	No known resistance / no monitoring available
		Group 29	No known resistance / no monitoring available

Pollen beetle (*Meligethes aeneus*)

GROUP 1: There is currently no evidence of resistance to group 1B (organophosphates) insecticides in resistance monitoring surveys conducted in Czech Republic, France, Germany and the UK in 2018 (1).

GROUP 3: The occurrence of resistance to pyrethroid insecticides (Group 3A) has been recorded in all of the Maritime EPPO region countries. The first reports of pyrethroid resistance were reported in 1999 in France, but have subsequently been reported across most European countries. In the Maritime zone at least 60% of all populations are considered resistant, but in most countries this figure is greater than 90% (1). Resistance is primarily based on enhanced metabolism through the over expression of the CYP6BQ23 P450 enzyme (3) The level of resistance expressed is known to significantly reduce the performance of most pyrethroid based insecticides, although some pyrethroids such as tau-fluvalinate, bifenthrin and etofenprox are significantly less affected and may still provide effective control of some pyrethroid resistant populations (2). A second less common mechanism of pyrethroid resistance has also been identified in populations of pollen beetle from Denmark and Sweden. The L1014F *kdr* mutation is known to affect the performance of all pyrethroid insecticides (4).

GROUP 4: The majority of pollen beetle populations in the Maritime EPPO region are susceptible to neonicotinoids (Group 4A), however there are clear indications of a reduction of susceptibility of populations in Germany and Sweden based on 2018 surveys. The reduction in neonicotinoid susceptibility is not believed to have a significant impact on field performance, but continued selection pressure may eventually lead to product performance issues (1). Only minor changes in susceptibility were observed in France and Norway in the same survey.

GROUP 5: Resistance is not suspected to group 5 (spinosad) but resistance monitoring data is not available to confirm the status.

GROUP 9: Resistance is also not suspected group 9B (pymetrozine) but resistance monitoring data is not available to confirm the status.

GROUP 22: There is currently no evidence of resistance to group 22A (indoxacarb) insecticides in resistance monitoring surveys in France, Germany and Norway in 2017 and again in Germany and Norway during 2018 (1).

OTHER REGIONS: Pyrethroid resistant populations of pollen beetles have been reported in the Mediterranean, North-East and South East climatic regions of Europe, whilst pollen beetle with reduced susceptibility to neonicotinoids have also been recorded in the EPPO North East climatic zone (1). There have been a number of historically published reports of organophosphate (Group 1B) resistance in Poland, but there is little information to validate this conclusion and no validated reports of reduced activity of organophosphate based insecticides in this country.

REFERENCES

1. www.irac-online.org/pests/meligethes-aeneus/
2. Heimbach & Müller, 2012, Incidence of pyrethroid-resistant oilseed rape pests in Germany.
3. Zimmer et al, 2014, Molecular and functional characterisation of CYP6BQ23, a cytochrome P450 conferring resistance to pyrethroids in European populations of pollen beetle, Meligethes aeneus.
4. Nauen et al, 2012, Target-site resistance to pyrethroids in European populations of pollen beetle, *Meligethes aeneus*.

Cabbage Seed Weevil (*Ceutorhynchus obstrictus/assimilis*)

GROUP 3: Localised populations of cabbage seed weevil collected from Germany have been demonstrated as having reduced susceptibility to pyrethroid insecticides, however It is not clear if the measured reduced susceptibility are related to a reduced performance of the insecticides under field conditions (1,2). The majority of populations across Europe have however been demonstrated to be susceptible to pyrethroid insecticides, but the risk of localised cases of resistance remains a possibility (3). Resistance is suspected as being at least in part to the presence of the L1014F target site mutation in resistant weevils.

GROUP 4: There is no current evidence of the reduced sensitivity of the cabbage seed weevil to group 4 insecticides (3).

OTHER REGIONS: There is no current evidence of insecticide resistance to cabbage seed weevils in other regions.

REFERENCES

1. Heimbach & Müller, 2012, Incidence of pyrethroid-resistant oilseed rape pests in Germany.
2. Brandes & Heimbach, 2018, Pyrethroid resistance of insect pests of oilseed rape in Germany.