

## **Beneficial arthropods and pesticides: building selectivity lists for IPM**

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**Abstract:** The results of the last meetings of the IOBC Working group “Pesticide and Beneficial Organisms” organized between 2001 and 2008 and that were published in the IOBC/wprs Bulletin have been reviewed and all new interesting records, obtained with methods fulfilling IOBC standards, have been compiled in an extensive table. This corresponds to more than 300 records, concerning 120 different products and 20 different beneficial species.

**Key words:** Pesticide database, selectivity, IOBC

### **Introduction**

Information concerning the compatibility of pesticides and beneficial arthropods are urgently needed for the practice in the context of IPM. The IOBC working group (WG) Pesticides and Beneficial Organisms has worked since the 70's on the standardization of test methods and has provided a large amount of information with the realization of 9 Joint Pesticide testing Programs (Franz et al., 1980; Hassan et al., 1983, 1987, 1988, 1991, 1994, Sterk et al., 1999). During these programs, more than 200 pesticides were assessed on a set of 15 to 25 beneficial species related to IPM in greenhouses, orchards and arable crops. This information has been compiled for the IOBC/WPRS Commission “Integrated Production guidelines and Endorsement” in a database available on the Commission website (Anonymous, 2005).

Since the last Joint Pesticide Testing Program, several group members have continued assessing the toxicity of pesticides on beneficial species in order to provide useful information for IPM. Most of the results were presented at the different IOBC WG meetings organized since 2001 and the results were published in the IOBC bulletin related to these meetings.

The objective of this work is to compile all the interesting results from these publications that can further enrich the database of the IP Commission and/or be used in the future to build up new pesticide databases. The analysis was only focused on results obtained with methods fulfilling IOBC standards because the extrapolation from laboratory results to field, due to validation and acceptance of these standards, is possible with a large confidence and with a low risk of error, even if mistakes cannot be excluded. The non-inclusion of other test methods is not a quality judgment and it only responds to the lack of information on how the data presented in papers could be interpreted from a practical point of view.

### **Material and methods**

#### ***Publication origin***

The publications used in this work were the manuscripts published in the IOBC bulletin corresponding to the proceedings of the Working Group Pesticides and Beneficial Organisms meetings for the period 2001-2008.

### ***Validity of test methods***

All the publications were carefully reviewed in order to extract all interesting data that could enrich the pesticide database. Only data obtained according to IOBC standard principles were retained. This corresponds to:

1. Residual contact toxicity tests with freshly applied pesticide residues on glass plates, sand, detached leaves, whole plants or soil in the laboratory (initial toxicity and extended lab test), with an adequate time of exposure and the most susceptible life stage which corresponds, depending on the type of natural enemy with: larvae of ladybirds, adults of parasitoids, first instars of predatory mites and bugs, etc. and a assessment of lethal and sublethal effects (reproduction, feeding or parasitism rates,...).

2. The same experiments with the less susceptible life stage of beneficials (e.g. pupae, parasitized hosts, etc), if the information was available.

3. Residual contact toxicity tests on natural substrates with aged residues (several days after treatment, DAT), in order to assess duration of harmful activity. Treated substrates can be kept in the laboratory between treatment and assessment (extended lab test) or staying outside (field aged residues);

4. Semi-field and field trials for single species or well characterized groups of beneficials, like phytoseiid mites, predatory bugs, etc for a single treatment of one pesticide or a set of pesticides that must obligatory be applied together (product + surfactant or wetting agent) or repeated treatments of the same product, with comparison to a control.

### ***Quality criteria***

The results were used in this study when the publication included a clear description of methods or referred to a method previously published. In case of doubt, the data were rejected.

The experiments had to include a control and the control mortality had to be acceptable (according to standard guidelines if available or mortality <20% for initial toxicity and <30% for extended tests if no validated guidelines were found). The products tested had to be clearly identified, in terms of active ingredient and tested rate. Botanical, mineral and organic natural compounds were only retained when they were well characterized (e.g. formulated commercial products). The rates were expressed in g a.i./ha, with a standard conversion volume of 400l/ha for run-off application or in g product/hl (e.g. 100g/hl  $\Leftrightarrow$  400g/ha) for applications in glasshouses and orchards. For field tests, the data were used only when results were reported at species level or group of species closely related (e.g. phytoseiid mites, ladybirds, anthocorid bugs, Aphidiidae,...). The data only presented by large group level such as “predators”, “parasitic wasps” or general taxa levels (e.g. Coleoptera, Diptera,...) were not retained. The presence in the test protocol of a toxic reference compound that gave positive results were considered advantageous when new methods were used.

Publications dealing with methodology, testing scheme development, studies on side-effects of pesticide drifts, comparison of different pesticide regimes (e.g. conventional versus reduced-risk, IPM or organic) and with no effects that could be related to one particular were not considered for this work.

### ***Data accepted with restrictions***

In several publications, only part of the data generated could be integrated into the pesticide selectivity database. This was the case of experiments where the exposure time to treated surfaces was too short according to IOBC standards and/or there was not assessment of sublethal effects (reproduction, parasitism, feeding activity...) as described in the IOBC guidelines. In these cases, products that were harmless in the laboratory were only considered

with caution because the risk that they were harmful under field conditions exists. On the other hand, harmful products were integrated into the database without restrictions because if the number of surviving organisms is very low or absent, fertility assessment is not needed and because if products are toxic after a short exposure period they never will become harmless if the exposure period is extended to fulfill IOBC standards.

A similar problem occurred when the mortalities were expressed under the form of LR50. If the LR50 is higher than the recommended field rate, there is no problem to consider the product as harmless. If the LR50 is lower than the recommended field rate, the difficulty is to rate the product in one of the 3 remaining categories, slightly harmful, moderately harmful or harmful. This could only be done if the relationship effect = f (dose) is given in the publication because in this case, it is possible to estimate the effects that would be caused by the field rate.

In conclusion, irrespective of the difficulties and due to their interest for the publication, partial results of these papers have been integrated into the tables with an indication of their limitation in remarks.

### ***Explanation of the tables***

The structure of the table is as follows:

1. Active ingredient
2. Product category (I=insecticides and acaricides, F=fungicides, H=herbicides and plant growth regulator, M=miscellaneous, others)
3. Test organism species or group species identification (for field trials)
4. Category of test:
  - Initial toxicity: glass plates or sand. If there is no special mention, the product was assessed on the most susceptible life stage according to IOBC standard. When it is not the case, the life stage tested is added.
  - Ext lab test: plants, leaves or soils, natural substrate. If there is no special mention, the product was assessed on the most susceptible life stage according to IOBC standard. When it is not the case, the life stage tested is added.
  - (x) DAT: experiments realized with aged pesticide residues, several days after treatment (x DAT). When several assessments were made, the limits in time are given for each toxicity class if possible (e.g. **4** 0-7DAT, **2** 15DAT, **1** 21DAT; product in category 4 in assessments carried out 0 and 7days after treatments, in category 2 in assessments at 15 DAT and in category 1 in assessments at 21 DAT). When there are some minor variations in the different assessments, the results have been rounded for simplification (e.g. category 1-1-2-1 at day 0, 3, 7 and 10 has been changed into **1** 0-10DAT, 4-3-4-4 into **4** 0-10DAT, etc...).
  - Field + crop: field test. Number of field site is given (by default, one site only)
  - Tested rate, expressed in g a.i./ha (or l/ha for liquid products as oils) by default. Conversion factor for run-off application is g a.i./l x 400 (based on application of 400l spray mixture/ha). By example, an application of 160g a.i./ha correspond to an application of 40g a.i./100l, independently of the total volume applied and vice-versa.
  - Results, expressed in IOBC category.
  - Initial toxicity test: 1 = E<50%, 2 = 50%≤E < 75%, 3 = 75%≤E < 99%, 4 = 99%≤E
  - Other tests: 1 = E<25%, 2 = 25%≤E < 50%, 3 = 50%≤E < 75%, 4 = 75%≤E. (Note: In some publications, the toxicity classes used in the table were different that those used by the authors).
  - References.

## Results

### Tables

The results are reported in table 1 (19 pages), listed firstly by active ingredient (a.i.), then by species and finally by type of test, from initial toxicity to field tests. The tables are giving an indication of the results obtained in the different publications but do not prevent to consult directly the different publications for a finest assessment. This is particularly true with semi-field and field tests because the results and their interpretation are clearly depending of the field sites, the climatic conditions and the sampling methods used.

The tables present more than 300 records, concerning 120 products and 20 different species (5 predatory mites, 6 parasitic hymenoptera, 6 plant dwelling predators and 3 ground dwelling predators). The most frequently tested products since 2001 were imidacloprid (15 records), deltamethrin, pymetrozine and sulfur (10), abamectine, carbaryl, natural pyrethrins, spinosad and triazamate (9).

## References

- Abdelgader, H. & Hassan, S. A. 2002: Side effects of plant protection products on *Trichogramma cacoeciae* Marchal (Hym. Trichogrammatidae). IOBC/WPRS Bull. 25(11): 63-70.
- Angeli, G., Forti, D. & Finato, S. 2001: Extended laboratory methods to determine effects of plant protection products on two strains of *Amblyseius andersoni* Chant and their resistance level. IOBC/WPRS Bull. 24(4): 53–60.
- Baier, B. & Moll, E. 2002: Extended laboratory investigations for evaluating the effect of Karate® on females of the predatory mite species *Typhlodromus pyri* Scheuten (Acari: Phytoseiidae). IOBC/WPRS Bull. 25(11): 27-36.
- Blümel, S. & Hausdorf, H. 2002: Results of the 8th and 9th IOBC Joint Pesticides Testing Programme: Persistence test with *Phytoseiulus persimilis* Athias Henriot (Acari: Phytoseiidae). IOBC/WPRS Bull. 25(11): 43-52.
- Caroli, L. & Pasqualini, E. 2004: Laboratory tests of the impact of insect growth regulators on *Anthocoris nemoralis* F. IOBC/WPRS Bull. 27(6): 81-86.
- Cavaco, M., Gonçalves, M., Nave, A., Santos, J., Silvino, P., Veiga, C. & Rodrigues, R. 2003: Evaluation of the side effects of five insecticides on predatory mites (Acari: Phytoseiidae), in apple orchards in two different regions of Portugal. IOBC/WPRS Bull. 26(5): 1-8.
- Franz, J. M., Bogenschütz, H., Hassan, S. A., Huang, P., Naton, E., Suter, H. & Viggiani, G. 1980: Results of a joint pesticide testing programme by the IOBC/WPRS-Working group: Pesticides and Beneficial Arthropods. Entomophaga 25: 231-236.
- Güven, B. & Göven, M. A. 2003: Side effects of pesticides used in cotton and vineyard areas of Aegean Region on the green lacewing, *Chrysoperla carnea* (Steph.) (Neuroptera: Chrysopidae), in the laboratory. IOBC/WPRS Bull. 26(5): 21- 24.
- Güven, B. & Göven, M. A. 2006: Side effects of insecticides used in cotton and vineyard areas of Aegean Region of Turkey on the green lacewing, *Chrysoperla carnea* (Steph.) (Neuroptera: Chrysopidae) under semi field conditions. IOBC/WPRS Bull. 29(10): 81-84.

- Hassan, S. A., Albert, R., Bigler, F., Blaisinger, P., Bogenschütz, H., Boller, E., Brun, J., Chiverton, P., Edwards, P., Englert, W., Huang, P., Inglesfield, C., Naton, E., Oomen, P., Overmeer, W., Rieckmann, W., Samsøe-Petersen, L., Tuset, J., Viggiani, G. & Vanwetswinkel, G. 1987: Results of the third joint pesticide testing programme of the IOBC/WPRS-Working Group "Pesticides and Beneficial Organisms". *J. Appl. Entomol.* 103: 92-107.
- Hassan, S. A., Bigler, F., Bogenschütz, H., Boller, E., Brun, J., Calis, J. N., Coremans-Pelseneer, J., Duso, C., Grove, A., Heimbach, U., Helyer, N., Hokkanen, H., Lewis, G. B., Mansour, F., Moreth, L., Polgar, L., Samsøe-Petersen, L., Sauphanor, B., Stäubli, A., Sterk, G., Vainio, A., Van de Veire, M., Viggiani, G. & Vogt, H. 1994: Results of the sixth joint pesticide testing programme of the IOBC/WPRS-Working Group "Pesticides and Beneficial Arthropods". *Entomophaga* 39: 107-119.
- Hassan, S. A., Bigler, F., Bogenschütz, H., Boller, E., Brun, J., Calis, J. N., Chiverton, P., Coremans-Pelseneer, J., Duso, C., Lewis, G. B., Mansour, F., Moreth, L., Oomen, P. A., Overmeer, W. P., Polgar, L., Rieckmann, W., Samsøe-Petersen, L., Stäubli, A., Sterk, G., Tavares, K., Tuset, J. J. & Viggiani, G. 1991: Results of the fifth joint pesticide testing programme carried out by the IOBC/WPRS-Working Group "Pesticides and Beneficial Arthropods". *Entomophaga* 36:55-67.
- Hassan, S. A., Bigler, F., Bogenschütz, H., Boller, E., Brun, J., Chiverton, P., Edwards, P., Mansour, F., Naton, E., Oomen, P. A., Overmeer, W. P. J., Polgar, L., Rieckmann, W., Samsøe-Petersen, L., Stäubli, A., Sterk, G., Tavares, K., Tuset, J. J., Viggiani, G., Vivas, A. G. 1988: Results of the fourth joint pesticide testing programme by the IOBC/WPRS-Working Group "Pesticides and Beneficial Arthropods". *J. Appl. Entomol.* 105: 321-329.
- Hassan, S. A., Bigler, F., Bogenschütz, H., Brown, J. U., Firth, S. I., Huang, P., Ledieu, M., Naton, E., Oomen, P. A., Overmeer, W. P., Rieckmann, W., Samsøe-Petersen, L., Viggiani, G., Van Zon, A. Q. 1983: Results of the second joint pesticide testing programme by the IOBC/WPRS-Working Group "Pesticides and Beneficial Arthropods". *J. Appl. Entomol.* 95: 151-158.
- Hautier, L., Jansen, J.-P., Mabon, N. & Schiffers, B. 2006: Building a selectivity list of plant protection products on beneficial arthropods in open field: a clear example with potato crop. *IOBC/WPRS Bull.* 29(10): 21-32.
- Heise, J., Heimbach, U. & Schrader, S. 2004: Influence of insecticide coated seeds on larvae of *Poecilus cupreus* (L.) (Coleoptera; Carabidae) using different container sizes and quantities of substrate. *IOBC/WPRS Bull.* 27(6): 73-80.
- Jansen, J. P. 2001: Toxicity of insecticides used in wheat to adults of *Aphidius rhopalosiphii* DeStefani Perez (Hymenoptera: Aphidiidae) with field treated plants. *IOBC/WPRS Bull.* 24(4): 17-24.
- Jansen, J.-P., Hautier, L., Mabon, N. & Schiffers, B. 2008: Pesticides selectivity list to beneficial arthropods in four field vegetable crops. *IOBC/WPRS Bull.* 35: 66-77.
- Rodrigues, J. R., Miranda, N. R. C., Rosas, J. D. F., Maciel, C. M. & Torres, L. M. 2002: Side-effects of fifteen insecticides on predatory mites (Acari: Phytoseiidae) in apple orchards. *IOBC/WPRS Bull.* 25(11): 53-62.
- Rodrigues, R., Gonçalves, R., Silva, C. & Torres, L. 2004: Toxicity of five insecticides on predatory mites (Acari: Phytoseiidae) in vineyards in two Portuguese regions. *IOBC/WPRS Bull.* 27(6): 37-44.
- Schneider, M. I., Smagghe, G. & Viñuela, E. 2003: Susceptibility of *Hyposoter didymator* (Hymenoptera: Ichneumonidae) adults to several insect growth regulators and spinosad by different exposure methods. *IOBC/WPRS Bull.* 26(5): 111- 122.

- Sterk, G., Hassan, S. A., Baillod, M., Bakker, F., Bigler, F., Blümel, S., Bogenschütz, H., Boller, E., Bromand, B., Brun, J., Calis, J. N., Coremans-Pelseneer, J., Duso, C., Garrido, A., Grove, A., Heimbach, U., Hokkanen, H., Jacas, J., Lewis, G. B., Moreth, L., Polgar, L., Rovesti, L., Samsøe-Petersen, L., Sauphanor, B., Schaub, L., Stäubli, A., Tuset, J., Vainio, A., Van de Veire, M., Viggiani, G., Vinuela, E. & Vogt, H. 1999: Results of the seventh joint pesticide testing programme carried out by the IOBC/WPRS-Working Group "Pesticides and Beneficial Organisms". *Biocontrol* 44: 99-117.
- Tedeschi, R., Tirry, L., Van de Veire, M. & de Clercq, P. 2002: Toxicity of different pesticides to the predatory bug *Macrolophus caliginosus* (Heteroptera: Miridae) under laboratory conditions. *IOBC/WPRS Bull.* 25(11): 71-80.
- Van de Veire, M. & Tirry, L. 2003: Side effects of pesticides on four species of beneficials used in IPM in glasshouse vegetable crops: "worst case" laboratory tests. *IOBC/WPRS Bull.* 26(5): 41-50.
- Van de Veire, M., Cornelis, W. & Tirry, L. 2001: Development of a laboratory test method to determine the duration of pesticide effects on predatory mites. *IOBC/WPRS Bull.* 24(4): 61-66.
- Van de Veire, M., Viñuela, E., Bernardo, U., Tirry, L., Adan, A. & Viggiani, G. 2004: Duration of the toxicity of abamectin and spinosad on the parasitic wasp *Encarsia formosa* Gahan in Northern and Southern Europe. *IOBC/WPRS Bull.* 27(6): 21-30.
- Viggiani, G. & Bernardo, U. 2001: Side effects of some pesticides on predatory mites (Phytoseiidae) in citrus orchards. *IOBC/WPRS Bull.* 24(4): 97-102.
- Viñuela, E., Medina, M<sup>a</sup>.P., Schneider, M., González, M., Budia, F., Adán, A. & Del Estal, P. 2001: Comparison of side-effects of spinosad, tebufenozide and azadirachtin on the predators *Chrysoperla carnea* and *Podisus maculiventris* and the parasitoids *Opius concolor* and *Hyposoter didymator* under laboratory conditions. *IOBC/WPRS Bull.* 24(4): 25-34.

Active(s) ingredient(s)	Test species	Category of test	Dose tested (a.i./ha)	IOBC Toxicity class	References	Remarks
abamectine	I Amblyseius californicus	Extended lab	15 g	4	Van de Veire & Tirry, 2003	
abamectine	I Encarsia formosa	Initial toxicity	15 g	4	Van de Veire & Tirry, 2003	
abamectine	I Encarsia formosa	Extended lab	15 g	4-2	Van de Veire & Tirry, 2003	spring 4 5-30DAT, summer 4 5-15DAT, 2 30DAT, no fertility assessment
abamectine	I Encarsia formosa	Semi-field, (3 sites)	4 g	4-1	Van de veire et al., 2004	spring 4 5-15DAT, 3 30DAT (Belgium, Spain), 4 5DAT, 1 15-30DAT (Italy); summer 2 5DAT, 1 15-30DAT (Belgium), 4 5DAT, 1 15-30DAT (Spain), 1 5-30DAT (Italy)
abamectine	I Macrolophus caliginosus	Initial toxicity	LR50	1	Tedeschi et al., 2002	HQ<1
abamectine	I Orius laevigatus	Initial toxicity	15 g	4	Van de Veire & Tirry, 2003	
abamectine	I Orius laevigatus	Extended lab	15 g	4	Van de Veire & Tirry, 2003	4 5-30DAT
abamectine	I Phytoseiulus persimilis	Extended lab	13.5 g	4	Blumel & Hausdorf, 2002	0-10DAT
abamectine	I Phytoseiulus plumifer	Ext lab adults	1.8 g	4	Noii et al., 2008	4 0-3DAT
acetamiprid	I Amblyseius californicus	Extended lab	75 g	2	Van de Veire & Tirry, 2003	no fertility assessment
acetamiprid	I Amblyseius californicus	Field aged	32 g	1	Van de veire et al., 2001	5DAT
acetamiprid	I Encarsia formosa	Initial toxicity	75 g	4	Van de Veire & Tirry, 2003	
acetamiprid	I Encarsia formosa	Extended lab	75 g	4-1	Van de Veire & Tirry, 2003	4 5-15DAT, 1 30DAT, no fertility assessment
acetamiprid	I Euseius finlandicus	Extended lab	20 g	2	Broufas et al., 2008	
acetamiprid	I Euseius finlandicus	Field aged	20 g	2-1	Broufas et al., 2008	2 0-15DAT, 1 20DAT
acetamiprid	I Orius laevigatus	Initial toxicity	75 g	4	Van de Veire & Tirry, 2003	
acetamiprid	I Orius laevigatus	Extended lab	75 g	4	Van de Veire & Tirry, 2003	4 5-30DAT
alphacypermethrin	I Adalia bipunctata	Extended lab	12.5 g	4	Hautier et al., 2006	
alphacypermethrin	I Aphidius rhopalosiphii	Extended lab	12.5 g	2	Hautier et al., 2006	no fertility assessment
alphacypermethrin	I Episyrrhus balteatus	Initial toxicity	12.5 g	1	Hautier et al., 2006	no fertility assessment
amitraz	I Amblyseius californicus	Field aged	160 g	4-3	Van de veire et al., 2001	4 5-15DAT, 3 30DAT

Active(s) ingredient(s)	Test species	Category of test	Dose tested (a.i./ha)	IOBC Toxicity class	References	Remarks
avermectin	I Amblyseius californicus	Field aged	2 g	3-1	Van de veire et al., 2001	3 5DAT, 1 15DAT
avermectin	I Amblyseius californicus	Field aged	4 g	3-1	Van de veire et al., 2001	3 5-15DAT, 1 30DAT
azadirachtin	I Hyposoter didymator	Initial toxicity	9.6 g	1	Schneider et al., 2003	no fertility assessment
azadirachtin	I Opius concolor	Initial toxicity	9.6 g	2	Vinuela et al., 2001	
azadirachtin	I Phytoseiulus persimilis	Extended lab	12 g	3-1	Blumel & Hausdorf, 2002	4 0DAT, 2 3DAT, 1 10DAT
azadirachtin	I Phytoseiulus persimilis	Extended lab	30 g	4-1	Blumel & Hausdorf, 2002	4 0DAT, 2 3DAT, 1 10DAT
azadirachtin	I Phytoseiidae	Field (citrus), 3 sites	19 g	1	Viggiani & Bernardo, 2001	
azadirachtin	I Trichogramma cacoeciae	Initial toxicity	12 g	4	Abdelgarder & Hassan, 2002	
azadirachtin	I Trichogramma cacoeciae	Ini tox pupae	12 g	1	Abdelgarder & Hassan, 2002	
azoxystrobin	F Adalia bipunctata	Initial toxicity	250 g	1	Jansen et al., 2008	no fertility assessment
azoxystrobin	F Aleochara bilineata	Initial toxicity	250 g	1	Jansen et al., 2008	
azoxystrobin	F Aphidius rhopalosiphi	Extended lab	250 g	1	Jansen et al., 2008	no fertility assessment
azoxystrobin	F Bembidion lampros	Initial toxicity	250 g	1	Jansen et al., 2008	
azoxystrobin	F Episyrrhus balteatus	Initial toxicity	250 g	1	Jansen et al., 2008	no fertility assessment
azoxystrobin	F Phytoseiulus persimilis	Extended lab	160 g	2-1	Blumel & Hausdorf, 2002	2 0DAT, 1 3-10DAT
azoxystrobin	F Phytoseiulus persimilis	Extended lab	400 g	2-1	Blumel & Hausdorf, 2002	2 0DAT, 1 3-10DAT
azoxystrobin	F Trichogramma cacoeciae	Initial toxicity	160 g	2	Abdelgarder & Hassan, 2002	
Bacillus thuringiensis kurstaki	I Euseius finlandicus	Extended lab	7.2 g	1	Brouffas et al., 2008	
Bacillus thuringiensis kurstaki	I Euseius finlandicus	Field aged	7.2 g	1	Brouffas et al., 2008	
Bacillus thuringiensis kurstaki	I Phytoseiidae	Field (apple)	240 g	1	Rodrigues et al., 2002	1 0-28DAT
Bacillus thuringiensis kurstaki	I Phytoseiidae	Field (vine), 2 sites	32 g	1	Rodrigues et al., 2004	1 0-35DAT
benalaxyl + mancozeb	F Adalia bipunctata	Initial toxicity	300 + 2438g	1	Hautier et al., 2006	no fertility assessment
benalaxyl + mancozeb	F Aphidius rhopalosiphi	Initial toxicity	300 + 2438g	1	Hautier et al., 2006	no fertility assessment
benalaxyl + mancozeb	F Episyrrhus balteatus	Initial toxicity	300 + 2438g	1	Hautier et al., 2006	no fertility assessment



Active(s) ingredient(s)	Test species	Category of test	Dose tested (a.i./ha)	IOBC Toxicity class	References	Remarks
bentazone	H Aleochara bilineata	Initial toxicity	380 g	1	Jansen et al., 2008	
bentazone	H Bembidion lampros	Initial toxicity	380 g	1	Jansen et al., 2008	
bifenazate	I Amblyseius californicus	Extended lab	225 g	1	Van de Veire & Tirry, 2003	no fertility assessment
bifenazate	I Encarsia formosa	Initial toxicity	225 g	1	Van de Veire & Tirry, 2003	no fertility assessment
bifenazate	I Orius laevigatus	Initial toxicity	225 g	1	Van de Veire & Tirry, 2003	no fertility assessment
bifenthrin	I Adalia bipunctata	Extended lab	40 g	4	Jansen et al., 2008	
bifenthrin	I Aphidius rhopalosiphi	Extended lab	40 g	4	Jansen et al., 2008	
bifenthrin	I Aphidius rhopalosiphi	Field aged	7.5 g	2-1	Jansen 2001	2 0-1DAT, 1 3DAT
bifenthrin	I Episyrrhus balteatus	Extended lab b	40 g	1	Jansen et al., 2008	no fertility assessment
bifenthrin + amitraz	I Chrysoperla carnea	Initial toxicity	75 + 600 g	4	Guven & Goven, 2003	
boscalid + pyraclostrobine	F Adalia bipunctata	Initial toxicity	200 + 50 g	3	Jansen et al., 2008	no fertility assessment
boscalid + pyraclostrobine	F Aleochara bilineata	Initial toxicity	200 + 50 g	1	Jansen et al., 2008	
boscalid + pyraclostrobine	F Aphidius rhopalosiphi	Initial toxicity	200 + 50 g	1	Jansen et al., 2008	no fertility assessment
boscalid + pyraclostrobine	F Bembidion lampros	Initial toxicity	200 + 50 g	1	Jansen et al., 2008	
boscalid + pyraclostrobine	F Episyrrhus balteatus	Initial toxicity	200 + 50 g	1	Jansen et al., 2008	no fertility assessment
carbaryl	I Adalia bipunctata	Extended lab	768 g	4	Hautier et al., 2006	
carbaryl	I Aphidius rhopalosiphi	Extended lab	768 g	3	Hautier et al., 2006	no fertility assessment
carbaryl	I Chrysoperla carnea	Initial toxicity	1700 g	4	Guven & Goven, 2003	
carbaryl	I Chrysoperla carnea	Semi-field	1750 g	4	Guven & Golven, 2006	
carbaryl	I Episyrrhus balteatus	Extended lab	768 g	1	Hautier et al., 2006	no fertility assessment
carbaryl	I Euseius finlandicus	Extended lab	256 g	4	Broufas et al., 2008	
carbaryl	I Euseius finlandicus	Field aged	256 g	4-1	Broufas et al., 2008	4 0-7DAT, 3 10DAT, 2 15DAT, 1 20DAT
carbaryl	I Phytoseiidae	Field (apple)	1000 g	4-1	Rodrigues et al., 2002	4 0-7DAT, 3 14DAT, 1 28DAT
carbaryl	I Typhlodromus peribibus	Initial toxicity	1020 g	1	Gröven & Güven, 2008	possible OP resistant strain

Active(s) ingredient(s)	Test species	Category of test	Dose tested (a.i./ha)	IOBC Toxicity class	References	Remarks
carbendazim	F Phytoseiulus persimilis	Extended lab	1000 g	4-2	Blumel & Hausdorf, 2002	4 0DAT, 3 3DAT, 2 10DAT
carbosulfan	I Aleochara bilineata	Extended lab	0.0625 g*	4	Jansen et al., 2008	* = g a.i./m sowing line
carbosulfan	I Bembidion lampros	Extended lab	0.0625 g*	4	Jansen et al., 2008	* = g a.i./m sowing line
carbosulfan	I Poecilus cupreus	Ext lab larvae	42.7 g	1	Heise et al. 2004	mortality based on 60.000 seeds/ha (oilseed rape)x
chlorfenapyr	I Amblyseius californicus	Field aged	96 g	1	Van de veire et al., 2001	5DAT
chlorothalonil	F Adalia bipunctata	Initial toxicity	2250 g	1	Hautier et al., 2006	no fertility assessment
chlorothalonil	F Aphidius rhopalosiphi	Initial toxicity	2250 g	1	Hautier et al., 2006	no fertility assessment
chlorothalonil	F Episyrrhus balteatus	Initial toxicity	2250 g	1	Hautier et al., 2006	no fertility assessment
chlorothalonil + propamocarb	F Adalia bipunctata	Initial toxicity	1500 + 1500g	1	Hautier et al., 2006	no fertility assessment
chlorothalonil + propamocarb	F Aphidius rhopalosiphi	Extended lab	1500 + 1500g	1	Hautier et al., 2006	no fertility assessment
chlorothalonil + propamocarb	F Episyrrhus balteatus	Initial toxicity	1500 + 1500g	1	Hautier et al., 2006	no fertility assessment
chlorproham	H Aleochara bilineata	Extended lab	2400 g	1	Jansen et al., 2008	
chlorproham	H Bembidion lampros	Extended lab	2400 g	1	Jansen et al., 2008	
clofentezin	I Amblyseius californicus	Field aged	80 g	1	Van de veire et al., 2001	5DAT
clomazone	H Aleochara bilineata	Initial toxicity	90 g	1	Jansen et al., 2008	
clomazone	H Bembidion lampros	Initial toxicity	90 g	1	Jansen et al., 2008	
copper hydroxide	F Adalia bipunctata	Initial toxicity	2400 g	1	Hautier et al., 2006	no fertility assessment
copper hydroxide	F Aphidius rhopalosiphi	Initial toxicity	2400 g	1	Hautier et al., 2006	no fertility assessment
copper hydroxide	F Episyrrhus balteatus	Initial toxicity	2400 g	1	Hautier et al., 2006	no fertility assessment

Active(s) ingredient(s)	Test species	Category of test	Dose tested (a.i./ha)	IOBC Toxicity class	References	Remarks
copper oxychlorid	F Adalia bipunctata	Initial toxicity	3750 g	1	Hautier et al., 2006	no fertility assessment
copper oxychlorid	F Aphidius rhopalosiphi	Initial toxicity	3750 g	1	Hautier et al., 2006	no fertility assessment
copper oxychlorid	F Episyrrhus balteatus	Initial toxicity	3750 g	1	Hautier et al., 2006	no fertility assessment
copper sulfat	F Adalia bipunctata	Initial toxicity	3750 g	1	Hautier et al., 2006	no fertility assessment
copper sulfat	F Aphidius rhopalosiphi	Initial toxicity	3750 g	1	Hautier et al., 2006	no fertility assessment
copper sulfat	F Episyrrhus balteatus	Initial toxicity	3750 g	1	Hautier et al., 2006	no fertility assessment
cyazofamid	F Adalia bipunctata	Initial toxicity	120 g	1	Hautier et al., 2006	no fertility assessment
cyazofamid	F Aphidius rhopalosiphi	Initial toxicity	120 g	1	Hautier et al., 2006	no fertility assessment
cyazofamid	F Episyrrhus balteatus	Initial toxicity	120 g	1	Hautier et al., 2006	no fertility assessment
cycloxydim	H Bembidion lampros	Initial toxicity	600 g	1	Jansen et al., 2008	
cyfluthrin	I Aphidius rhopalosiphi	Field aged	10 g	1	Jansen 2001	
cymoxanil + famoxadone	F Adalia bipunctata	Initial toxicity	225 + 225 g	1	Hautier et al., 2006	no fertility assessment
cymoxanil + famoxadone	F Aphidius rhopalosiphi	Initial toxicity	225 + 225 g	1	Hautier et al., 2006	no fertility assessment
cymoxanil + famoxadone	F Episyrrhus balteatus	Initial toxicity	225 + 225 g	1	Hautier et al., 2006	no fertility assessment
cymoxanil + mancozeb	F Adalia bipunctata	Initial toxicity	135 + 1950g	1	Hautier et al., 2006	no fertility assessment
cymoxanil + mancozeb	F Aphidius rhopalosiphi	Initial toxicity	135 + 1950g	1	Hautier et al., 2006	no fertility assessment
cymoxanil + mancozeb	F Episyrrhus balteatus	Initial toxicity	135 + 1950g	1	Hautier et al., 2006	no fertility assessment
cymoxanil + metiram	F Adalia bipunctata	Initial toxicity	216 + 2880g	1	Hautier et al., 2006	no fertility assessment
cymoxanil + metiram	F Aphidius rhopalosiphi	Initial toxicity	216 + 2880g	1	Hautier et al., 2006	no fertility assessment
cymoxanil + metiram	F Episyrrhus balteatus	Initial toxicity	216 + 2880g	1	Hautier et al., 2006	no fertility assessment
cypermethrin	I Adalia bipunctata	Extended lab	25 g	4	Hautier et al., 2006	
cypermethrin	I Aphidius rhopalosiphi	Extended lab	25 g	1	Hautier et al., 2006	no fertility assessment
cypermethrin	I Aphidius rhopalosiphi	Field aged	15 g	1	Jansen 2001	
cypermethrin	I Episyrrhus balteatus	Extended lab	25 g	4	Hautier et al., 2006	

Active(s) ingredient(s)	Test species	Category of test	Dose tested (a.i./ha)	IOBC Toxicity class	References	Remarks
cypermethrin	I Euseius finlandicus	Extended lab	16 g	4	Broufas et al., 2008	
		Field aged	16 g	4-1	Broufas et al., 2008	4 0-10DAT, 3 15DAT, 2 20-25DAT, 1 30DAT
cypermethrin + profenofos	I Chrysoperla carnea	Initial toxicity	100 + 100 g	4	Güven & Goven, 2003	
		Semi-field	100 + 100 g	4	Güven & Gölven, 2006	
deltamethrin	I Adalia bipunctata	Extended lab	7.5 g	4	Hautier et al., 2006	
deltamethrin	I Aleochara bilineata	Extended lab	12.5 g	2	Jansen et al., 2008	
deltamethrin	I Aphidius rhopalosiphi	Extended lab	7.5 g	4	Hautier et al., 2006	
deltamethrin	I Aphidius rhopalosiphi	Field aged	5 g	2-1	Jansen 2001	2 0DAT, 1 1DAT
deltamethrin	I Bembidion lampros	Extended lab	12.5 g	1	Jansen et al., 2008	
deltamethrin	I Episyrrhus balteatus	Extended lab	7.5 g	3	Hautier et al., 2006	no fertility assessment
deltamethrin	I Euseius finlandicus	Extended lab	3 g	4	Broufas et al., 2008	
deltamethrin	I Euseius finlandicus	Field aged	3 g	4-1	Broufas et al., 2008	4 0-15DAT, 2 20-25DAT, 1 30DAT
deltamethrin	I Phytoseiidae	Field (apple)	7.5 g	4-3	Rodrigues et al., 2002	4 0-14DAT, 3 28DAT DAT
deltamethrin	I Phytoseiidae	Field (vine), 2 sites	7.5 g	4	Rodrigues et al., 2004	4 0-35DAT
diafenthiuron	I Phytoseiulus persimilis	Extended lab	500 g	4	Blumel & Hausdorf, 2002	4 0-10DAT
diazinon	I Euseius finlandicus	Extended lab	240 g	2	Broufas et al., 2008	
diazinon	I Euseius finlandicus	Field aged	240 g	2-1	Broufas et al., 2008	2 0-10DAT, 1 15DAT
diazinon	I Phytoseiidae	Field (apple)	510 g	3-2	Rodrigues et al., 2002	3 0-4DAT, 2 7-28DAT
dichlorvos	I Euseius finlandicus	Extended lab	400 g	4	Broufas et al., 2008	
dichlorvos	I Euseius finlandicus	Field aged	400 g	4-1	Broufas et al., 2008	4 0DAT, 3 3DAT, 2 7-15DAT, 1 20DAT
dichlorvos	I Phytoseiidae	Field (apple)	1000 g	3-1	Rodrigues et al., 2002	3 0-7DAT, 2 14DAT, 1 28DAT

Active(s) ingredient(s)	Test species	Category of test	Dose tested (a.i./ha)	IOBC Toxicity class	References	Remarks
difenoconazole	F Adalia bipunctata	Initial toxicity	125 g	1	Jansen et al., 2008	no fertility assessment
difenoconazole	F Aleochara bilineata	Initial toxicity	125 g	1	Jansen et al., 2008	
difenoconazole	F Aphidius rhopalosiphi	Initial toxicity	125 g	1	Jansen et al., 2008	no fertility assessment
difenoconazole	F Bembidion lampros	Initial toxicity	125 g	1	Jansen et al., 2008	
difenoconazole	F Episyrrhus balteatus	Initial toxicity	125 g	1	Jansen et al., 2008	no fertility assessment
diflubenzuron	I Anthrenus nemoralis	Initial toxicity	400 g	1-3	Caroli & Pasqualini, 2004	1 1 <sup>st</sup> instar, 3 3 <sup>rd</sup> instar
diflubenzuron	I Euseius finlandicus	Extended lab	150 g	2	Broufas et al., 2008	
diflubenzuron	I Euseius finlandicus	Field aged	150 g	2	Broufas et al., 2008	2 0 DAT, 1 3DAT
diflubenzuron	I Hyposoter diymator	Initial toxicity	20 g	1	Schneider et al., 2003	no fertility assessment
diflubenzuron	I Phytoseiidae	Field (apple)	100 g	3-1	Rodrigues et al., 2002	3 0-4DAT, 1 7-28DAT
dimethoate	I Adalia bipunctata	Extended lab	200 g	4	Hautier et al., 2006	
dimethoate	I Aphidius rhopalosiphi	Extended lab	200 g	4	Hautier et al., 2006	
dimethoate	Chrysoperla carnea	Initial toxicity	400 g	4	Guyen & Goven, 2003	
dimethoate	I Episyrrhus balteatus	Extended lab	200 g	4	Hautier et al., 2006	
dimethoate	I Phytoseiidae	Field (apple)	400 g	4	Rodrigues et al., 2002	4 0-28DAT
dimethoate	I Phytoseiidae	Field (apple), 2 sites	400 g	4	Cavaco et al., 2003	4 4-35DAT
dimetomorphe + mancozebe	F Adalia bipunctata	Initial toxicity	225 + 2513g	1	Hautier et al., 2006	no fertility assessment
dimetomorphe + mancozebe	F Aphidius rhopalosiphi	Initial toxicity	225 + 2513g	1	Hautier et al., 2006	no fertility assessment
dimetomorphe + mancozebe	F Episyrrhus balteatus	Initial toxicity	225 + 2513g	1	Hautier et al., 2006	no fertility assessment
diquat + paraquat	H Aleochara bilineata	Initial toxicity	350 + 500 g	1	Jansen et al., 2008	
diquat + paraquat	H Bembidion lampros	Initial toxicity	350 + 500 g	1	Jansen et al., 2008	
dithianon	F Adalia bipunctata	Initial toxicity	1260 g	1	Jansen et al., 2008	no fertility assessment
dithianon	F Aleochara bilineata	Initial toxicity	1260 g	1	Jansen et al., 2008	
dithianon	F Aphidius rhopalosiphi	Extended lab	1260 g	1	Jansen et al., 2008	no fertility assessment
dithianon	F Bembidion lampros	Initial toxicity	1260 g	1	Jansen et al., 2008	
dithianon	F Episyrrhus balteatus	Initial toxicity	1260 g	1	Jansen et al., 2008	no fertility assessment

Active(s) ingredient(s)	Test species	Category of test	Dose tested (a.i./ha)	IOBC Toxicity class	References	Remarks
emamectin	I Encarsia formosa	Initial toxicity	25 g	4	Van de Veire & Tirry, 2003	3DAT (delayed effect)
endosulfan	I Amblyseius californicus	Field aged	200 g	2	Van de veire et al., 2001	5DAT
endosulfan	I Phytoseiidae	Field (apple)	1900 g	4-3	Rodrigues et al., 2002	4 0-14DAT, 3 28DAT
endosulfan	I Phytoseiidae	Field (apple), 2 sites	500 g	1-3	Cavaco et al., 2003	1 4-7DAT, 2 14-24DAT, 3 35DAT (mean of 2 sites)
esfenvalerate	I Adalia bipunctata	Extended lab	7.5 g	4	Hautier et al., 2006	
esfenvalerate	I Aphidius rhopalosiphi	Extended lab	7.5 g	1	Hautier et al., 2006	no fertility assessment
esfenvalerate	I Aphidius rhopalosiphi	Field aged	5 g	3-1	Jansen 2001	3 0DAT, 1 1DAT
esfenvalerate	I Episyrrhus balteatus	Initial toxicity	7.5 g	1	Hautier et al., 2006	no fertility assessment
fenarimol	F Chrysoperla carnea	Initial toxicity	3.6 g	2	Guven & Goven, 2003	
fenazaquin	I Phytoseiidae	Field (citrus), 2 sites	25 g	4-1	Viggiani & Bernardo, 2001	3-4 in one site 0-34DAT, 1-2 in another site 0-27DAT
fenitrothion + mineral oil	I Phytoseiidae	Field (citrus), 2 sites	290 g + 4 l	4-1	Viggiani & Bernardo, 2001	4 0DAT, 3 6DAT, 2 13DAT, 1 20DATs
fenoxycarb	I Phytoseiidae	Field (apple)	150 g	3-1	Rodrigues et al., 2002	3-0-7DAT, 1 14-28DAT
fenpyroximate	I Amblyseius californicus	Field aged	16 g	1	Van de veire et al., 2001	5DAT
fenpyroximate	I Chrysoperla carnea	Initial toxicity	7.5 g	1	Guven & Goven, 2003	
fenpyroximate	I Phytoseiulus persimilis	Extended lab	50 g	4	Blumel & Hausdorf, 2002	4 0DAT, 3 3DAT, 2 10DAT
fenpyroximate	I Phytoseiulus persimilis	Extended lab	20 g	4	Blumel & Hausdorf, 2002	4 0DAT, 3 3-10DAT
fenpyroximate	I Trichogramma cacoeciae	Initial toxicity	20 g	2	Abdelgarder & Hassan, 2002	

Active(s) ingredient(s)	Test species	Category of test	Dose tested (a.i./ha)	IOBC Toxicity class	References	Remarks
fipronil	I Chelonus inanitius	Initial toxicity	4.5 g	3	Medina et al., 2008	
fipronil	I Chelonus inanitius	Ini tox pupae	4.5 g	2	Medina et al., 2008	
fipronil	I Hyposoter didymator	Initial toxicity	4.5 g	3	Medina et al., 2008	
fipronil	I Hyposoter didymator	Ini tox pupae	4.5 g	3	Medina et al., 2008	
fluazinam	F Adalia bipunctata	Extended lab	300 g	1	Hautier et al., 2006	no fertility assessment
fluazinam	F Aphidius rhopalosiphi	Initial toxicity	300 g	1	Hautier et al., 2006	no fertility assessment
fluazinam	F Episyrrhus balteatus	Initial toxicity	300 g	1	Hautier et al., 2006	no fertility assessment
flufenoxuron	I Amblyseius californicus	Field aged	4.4 g	2	Van de veire et al., 2001	2 5-15DAT
flufenoxuron	I Anthocoris nemoralis	Initial toxicity	150 g	3-4	Caroli & Pasqualini, 2004	3 1 <sup>st</sup> instar, 4 3 <sup>rd</sup> instar
flufenoxuron	I Chrysoperla carnea	Initial toxicity	10 g	3	Guven & Goven, 2003	
flufenoxuron	I Chrysoperla carnea	Semi-field	100 g	3	Guven & Golven, 2006	
flufenoxuron	I Phytoseidae	Field (vine), 2 sites	50 g	2	Rodrigues et al., 2004	2 0-35 DAT
fluvalinate	I Aphidius rhopalosiphi	Field aged	36 g	1	Jansen 2001	
formetanate	I Phytoseiulus persimilis	Extended lab	500 g	4	Blumel & Hausdorf, 2002	4 0-10DAT
formetanate	I Phytoseiulus persimilis	Extended lab	200 g	4	Blumel & Hausdorf, 2002	4 0-10DAT
formetanate	I Trichogramma cacoecciae	Initial toxicity	200 g	4	Abdelgarder & Hassan, 2002	
formetanate	I Trichogramma cacoecciae	Ini tox pupae	200 g	1	Abdelgarder & Hassan, 2002	
furathiocarb	I Chrysoperla carnea	Initial toxicity	300 g	4	Guven & Goven, 2003	
furathiocarb	I Chrysoperla carnea	Semi-field	300 g	4	Guven & Golven, 2006	
glufosinate-ammonium	H Bembidion lampros	Initial toxicity	450 g	1	Jansen et al., 2008	
halofenozide	I Amblyseius californicus	Extended lab	300 g	1	Van de Veire & Tirry, 2003	no fertility assessment
halofenozide	I Encarsia formosa	Initial toxicity	300 g	1	Van de Veire & Tirry, 2003	no fertility assessment
halofenozide	I Orius laevigatus	Initial toxicity	300 g	1	Van de Veire & Tirry, 2003	no fertility assessment

Active(s) ingredient(s)	Test species	Category of test	Dose tested (a.i./ha)	IOBC Toxicity class	References	Remarks
imidacloprid	I Amblyseius californicus	Field aged	40 g	3-1	Van de veire et al., 2001	3 5DAT, 1 15DAT
imidacloprid	I Chelonus inanitus	Initial toxicity	22.5 g	3	Medina et al., 2008	
imidacloprid	I Chelonus inanitus	Ini tox pupae	22.5 g	1	Medina et al., 2008	
imidacloprid	I Encarsia formosa	Initial toxicity	450 g	3	Van de Veire & Tirry, 2003	
imidacloprid	I Encarsia formosa	Extended lab	450 g	4-2	Van de Veire & Tirry, 2003	4 5DAT, 3 15DAT, 2 30DAT, no fertility assessment
imidacloprid	I Hyposoter didymator	Initial toxicity	22.5 g	3	Medina et al., 2008	
imidacloprid	I Hyposoter didymator	Ini tox pupae	22.5 g	1	Medina et al., 2008	
imidacloprid	I Orius laevigatus	Initial toxicity	450 g	4	Van de Veire & Tirry, 2003	
imidacloprid	I Orius laevigatus	Extended lab	450 g	4	Van de Veire & Tirry, 2003	4 5-30DAT
imidacloprid	I Phytoseiidae	Field (apple)	100 g	4-1	Rodrigues et al., 2002	4 0-4DAT, 3 7-14DAT, 1 28DAT
imidacloprid	I Phytoseiidae	Field (apple), 2 sites	100 g	1	Cavaco et al., 2003	1 4-35DAT (mean of 2 sites)
imidacloprid	I Phytoseiulus persimilis	Extended lab	70 g	4-1	Blumel & Hausdorf, 2002	4 0-3DAT, 1 10DAT
imidacloprid	I Phytoseiulus persimilis	Extended lab	28 g	4-1	Blumel & Hausdorf, 2002	4 0DAT, 2 3DAT, 1 10DAT
imidacloprid	I Trichogramma cacoeciae	Ini tox pupae	28 g	2	Abdelgarder & Hassan, 2002	
imidacloprid	I Trichogramma cacoeciae	Initial toxicity	28 g	4	Abdelgarder & Hassan, 2002	
indoxacarb	I Amblyseius californicus	Extended lab	150 g	1	Van de Veire & Tirry, 2003	no fertility assessment
indoxacarb	I Encarsia formosa	Initial toxicity	150 g	4	Van de Veire & Tirry, 2003	
indoxacarb	I Encarsia formosa	Extended lab	150 g	4-2	Van de Veire & Tirry, 2003	4 5DAT, 3 15DAT, 2 30DAT, no fertility assessment
indoxacarb	I Orius laevigatus	Initial toxicity	150 g	4	Van de Veire & Tirry, 2003	
indoxacarb	I Orius laevigatus	Extended lab	150 g	2-3	Van de Veire & Tirry, 2003	2 5-15DAT, 3 30DAT, no fertility assessment



Active(s) ingredient(s)	Test species	Category of test	Dose tested (a.i./ha)	IOBC Toxicity class	References	Remarks
iprodisone	F Adalia bipunctata	Initial toxicity	500 g	1	Jansen et al., 2008	no fertility assessment
iprodisone	F Aleochara bilineata	Initial toxicity	500 g	1	Jansen et al., 2008	
iprodisone	F Aphidius rhopalosiphii	Initial toxicity	500 g	1	Jansen et al., 2008	no fertility assessment
iprodisone	F Bembidion lampros	Initial toxicity	500 g	1	Jansen et al., 2008	
iprodisone	F Episyrrhus balteatus	Initial toxicity	500 g	1	Jansen et al., 2008	no fertility assessment
isoxaben	H Aleochara bilineata	Initial toxicity	100 g	1	Jansen et al., 2008	
isoxaben	H Bembidion lampros	Initial toxicity	100 g	1	Jansen et al., 2008	
lambda-cyhalothrin	I Adalia bipunctata	Extended lab	7.5 g	4	Hautier et al., 2006	
lambda-cyhalothrin	I Aleochara bilineata	Extended lab	10 g	4	Jansen et al., 2008	
lambda-cyhalothrin	I Aphidius rhopalosiphii	Extended lab	7.5 g	1	Hautier et al., 2006	no fertility assessment
lambda-cyhalothrin	I Aphidius rhopalosiphii	Field aged	5 g	1	Jansen 2001	
lambda-cyhalothrin	I Bembidion lampros	Extended lab	10 g	1	Jansen et al., 2008	
lambda-cyhalothrin	I Chrysoperla carnea	Initial toxicity	75 g	2	Guyen & Goven, 2003	
lambda-cyhalothrin	I Episyrrhus balteatus	Initial toxicity	7.5 g	1	Hautier et al., 2006	no fertility assessment
lambda-cyhalothrin	I Typhlodromus pyri	Extended lab	0.08 g	4	Baier & Moll, 2002	
lambda-cyhalothrin + pirimicarb	I Adalia bipunctata	Extended lab	7.5 + 150 g	4	Hautier et al., 2006	
lambda-cyhalothrin + pirimicarb	I Aphidius rhopalosiphii	Extended lab	7.5 + 150 g	1	Hautier et al., 2006	no fertility assessment
lambda-cyhalothrin + pirimicarb	I Episyrrhus balteatus	Extended lab	7.5 + 150 g	4	Hautier et al., 2006	
linuron	H Aleochara bilineata	Initial toxicity	500 g	1	Jansen et al., 2008	
linuron	H Bembidion lampros	Initial toxicity	500 g	1	Jansen et al., 2008	
malathion	I Phytoseiulus plumifer	Ext lab adults	570 g	4	Noii et al., 2008	4 0-3DAT
mancozeb	F Adalia bipunctata	Initial toxicity	4800 g	1	Hautier et al., 2006	no fertility assessment
mancozeb	F Aphidius rhopalosiphii	Initial toxicity	4800 g	1	Hautier et al., 2006	no fertility assessment
mancozeb	F Episyrrhus balteatus	Initial toxicity	4800 g	1	Hautier et al., 2006	no fertility assessment
mancozeb	F Phytoseiulus persimilis	Extended lab	3200 g	4	Blumel & Hausdorf, 2002	4 0-10DAT

Active(s) ingredient(s)	Test species	Category of test	Dose tested (a.i./ha)	IOBC Toxicity class	References	Remarks
mancozeb + zoxamide	F Adalia bipunctata	Initial toxicity	1801 + 224g	1	Hautier et al., 2006	no fertility assessment
mancozeb + zoxamide	F Aphidius rhopalosiphi	Initial toxicity	1801 + 224g	1	Hautier et al., 2006	no fertility assessment
mancozeb + zoxamide	F Episyrrhus balteatus	Initial toxicity	1801 + 224g	1	Hautier et al., 2006	no fertility assessment
maneb	F Adalia bipunctata	Initial toxicity	4800 g	1	Hautier et al., 2006	no fertility assessment
maneb	F Aphidius rhopalosiphi	Initial toxicity	4800 g	1	Hautier et al., 2006	no fertility assessment
maneb	F Episyrrhus balteatus	Initial toxicity	4800 g	1	Hautier et al., 2006	no fertility assessment
metalaxy M + fluazinam	F Adalia bipunctata	Extended lab	150 + 300 g	2	Hautier et al., 2006	no fertility assessment
metalaxy M + fluazinam	F Aphidius rhopalosiphi	Initial toxicity	150 + 300 g	1	Hautier et al., 2006	no fertility assessment
metalaxy M + fluazinam	F Episyrrhus balteatus	Initial toxicity	150 + 300 g	1	Hautier et al., 2006	no fertility assessment
metalaxy M + mancozeb	F Adalia bipunctata	Initial toxicity	150 + 2400g	1	Hautier et al., 2006	no fertility assessment
metalaxy M + mancozeb	F Aphidius rhopalosiphi	Initial toxicity	150 + 2400g	1	Hautier et al., 2006	no fertility assessment
metalaxy M + mancozeb	F Chrysoperla carnea	Initial toxicity	320 + 40 g	1	Guyen & Goven, 2003	
metalaxy M + mancozeb	F Episyrrhus balteatus	Initial toxicity	150 + 2400g	1	Hautier et al., 2006	no fertility assessment
methiocarb	I Adalia bipunctata	Extended lab	750 g	4	Jansen et al., 2008	
methiocarb	I Aleochara bilineata	Extended lab	750 g	4	Jansen et al., 2008	
methiocarb	I Aphidius rhopalosiphi	Extended lab	750 g	4	Jansen et al., 2008	
methiocarb	I Bembidion lampros	Extended lab	750 g	4	Jansen et al., 2008	
methiocarb	I Episyrrhus balteatus	Extended lab	750 g	4	Jansen et al., 2008	
methomy1	I Chrysoperla carnea	Initial toxicity	160 g	4	Guyen & Goven, 2003	
methomy1	I Euseius finlandicus	Extended lab	144 g	4	Broufas et al., 2008	
methomy1	I Euseius finlandicus	Field aged	144 g	4-1	Broufas et al., 2008	4 0-3DAT, 3 7-10DAT, 2 15-20DAT, 1 25DAT
methoxyfenozide	I Amblyseius californicus	Extended lab	300 g	1	Van de Veire & Tirry, 2003	no fertility assessment
methoxyfenozide	I Encarsia formosa	Initial toxicity	300 g	1	Van de Veire & Tirry, 2003	no fertility assessment
methoxyfenozide	I Hyposoter diymator	Initial toxicity	28.8 g	1	Schneider et al., 2003	no fertility assessment
methoxyfenozide	I Orius laevigatus	Initial toxicity	300 g	1	Van de Veire & Tirry, 2003	no fertility assessment

Active(s) ingredient(s)	Test species	Category of test	Dose tested (a.i./ha)	IOBC Toxicity class	References	Remarks
metidathion	I Phytoseiidae	Field (apple)	400g	4-3	Rodrigues et al., 2002	4 0-14DAT, 3 28DAT
metoxuron	H Aleochara bilineata	Initial toxicity	3600 g	1	Jansen et al., 2008	
metoxuron	H Bembidion lampros	Initial toxicity	3600 g	1	Jansen et al., 2008	
mevinphos	I Phytoseiulus persimilis	Extended lab	500 g	4-2	Blumel & Hausdorf, 2002	4 0DAT, 2 3DAT
mevinphos	I Phytoseiulus persimilis	Extended lab	200 g	4-1	Blumel & Hausdorf, 2002	4 0DAT, 1 3DAT
mevinphos	I Trichogramma cacoeciae	Ini tox pupae	200 g	4	Abdelgarder & Hassan, 2002	
mineral oil	I Phytoseiidae	Field (citrus), 1 site	4 l	1	Viggiani & Bernardo, 2001	
myclobutanil	F Adalia bipunctata	Initial toxicity	60 g	1	Jansen et al., 2008	no fertility assessment
myclobutanil	F Aleochara bilineata	Initial toxicity	60 g	1	Jansen et al., 2008	
myclobutanil	F Aphidius rhopalosiphi	Initial toxicity	60 g	1	Jansen et al., 2008	no fertility assessment
myclobutanil	F Bembidion lampros	Initial toxicity	60 g	1	Jansen et al., 2008	
myclobutanil	F Episyrrhus balteatus	Initial toxicity	60 g	1	Jansen et al., 2008	no fertility assessment
novaluron	I Amblyseius californicus	Field aged	20 g	2	Van de veire et al., 2001	5DAT
paraquat	H Aleochara bilineata	Initial toxicity	1000 g	1	Jansen et al., 2008	
paraquat	H Bembidion lampros	Initial toxicity	1000 g	1	Jansen et al., 2008	
parathion-methyl	I Typhlodromus peribibus	Initial toxicity	360 g	1	Göven & Güven, 2008	possible OP resistant strain
pendimethalin	H Aleochara bilineata	Initial toxicity	1000 g	1	Jansen et al., 2008	
pendimethalin	H Bembidion lampros	Initial toxicity	1000 g	1	Jansen et al., 2008	

Active(s) ingredient(s)	Test species	Category of test	Dose tested (a.i./ha)	IOBC Toxicity class	References	Remarks
phosalone	I Adalia bipunctata	Extended lab	750 g	4	Hautier et al., 2006	
phosalone	I Aphidius rhopalosiphi	Extended lab	750 g	2	Hautier et al., 2006	no fertility assessment
phosalone	I Episyrrphus balteatus	Extended lab	750 g	3	Hautier et al., 2006	no fertility assessment
phosalone	I Phytoseiidae	Field (apple)	600 g	4-2	Rodrigues et al., 2002	4 0-14DAT, 2 28DAT
phosalone	I Phytoseiidae	Field (vine), 2 sites	600 g	4	Rodrigues et al., 2004	4 0-35DAT
phosalone	I Phytoseiulus plumifer	Ext lab adults	263 g	4	Noii et al., 2008	4 0-3DAT
pirimicarb	I Adalia bipunctata	Initial toxicity	200 g	1	Hautier et al., 2006	no fertility assessment
pirimicarb	I Aphidius rhopalosiphi	Extended lab	200 g	1	Hautier et al., 2006	no fertility assessment
pirimicarb	I Aphidius rhopalosiphi	Field aged	125 g	1	Jansen 2001	
pirimicarb	I Episyrrphus balteatus	Ext labt	200 g	4	Hautier et al., 2006	
pirimicarb	I Phytoseiidae	Field (apple)	250 g	4-1	Rodrigues et al., 2002	4 0-7DAT, 3 14DAT, 1 28DAT
pirimicarb	I Phytoseiidae	Field (apple), 2 sites	250 g	1-3	Cavaco et al., 2003	1 4-35DAT (field 1); 1 4-7DAT, 2 14DAT, 3 21-35DAT (field 2)
procymidone	F Adalia bipunctata	Extended lab	500 g	1	Jansen et al., 2008	no fertility assessment
procymidone	F Aphidius rhopalosiphi	Initial toxicity	500 g	1	Jansen et al., 2008	no fertility assessment
procymidone	F Episyrrphus balteatus	Initial toxicity	500 g	1	Jansen et al., 2008	no fertility assessment
prometryn	H Trichogramma cacoeciae	Initial toxicity	5.0 g	2	Abdelgarder & Hassan, 2002	
propachlore	H Aleochara bilineata	Initial toxicity	4800 g	1	Jansen et al., 2008	
propachlore	H Bembidion lampros	Initial toxicity	4800 g	1	Jansen et al., 2008	
propineb	F Adalia bipunctata	Initial toxicity	3150 g	1	Hautier et al., 2006	no fertility assessment
propineb	F Aphidius rhopalosiphi	Initial toxicity	3150 g	1	Hautier et al., 2006	no fertility assessment
propineb	F Episyrrphus balteatus	Initial toxicity	3150 g	1	Hautier et al., 2006	no fertility assessment
propineb	I Typhlodromus peribubis	Initial toxicity	700 g	1	Göven & Güven, 2008	

Active(s) ingredient(s)	Test species	Category of test	Dose tested (a.i./ha)	IOBC Toxicity class	References	Remarks
propineb + copper oxychlorid	F Adalia bipunctata	Initial toxicity	2775 + 1313g	1	Hautier et al., 2006	no fertility assessment
propineb + copper oxychlorid	F Aphidius rhopalosiphi	Initial toxicity	2775 + 1313g	1	Hautier et al., 2006	no fertility assessment
propineb + copper oxychlorid	F Episyrrhus balteatus	Initial toxicity	2775 + 1313g	1	Hautier et al., 2006	no fertility assessment
pymetrozin	I Adalia bipunctata	Initial toxicity	150 g	1	Hautier et al., 2006	no fertility assessment
pymetrozin	I Amblyseius californicus	Extended lab	300 g	1	Van de Veire & Tirry, 2003	no fertility assessment
pymetrozin	I Aphidius rhopalosiphi	Initial toxicity	150 g	1	Hautier et al., 2006	no fertility assessment
pymetrozin	I Encarsia formosa	Initial toxicity	300 g	1	Van de Veire & Tirry, 2003	no fertility assessment
pymetrozin	I Episyrrhus balteatus	Initial toxicity	150 g	1	Hautier et al., 2006	no fertility assessment
pymetrozin	I Macrolophus caliginosus	Initial toxicity	LR50	1	Tedeschi et al., 2002	HQ<1
pymetrozin	I Orius laevigatus	Initial toxicity	300 g	3	Van de Veire & Tirry, 2003	
pymetrozin	I Orius laevigatus	Extended lab	300 g	1	Van de Veire & Tirry, 2003	1 5-15DAT, no fertility assessment
pymetrozin	I Trichogramma cacoeciae	Initial toxicity	12 g	3	Abdelgarder & Hassan, 2002	
pymetrozin	I Trichogramma cacoeciae	Ini tox pupae	12 g	1	Abdelgarder & Hassan, 2002	
pyrazophos	I Amblyseius californicus	Field aged	88 g	2	Van de veire et al., 2001	5DAT
pyrethrins + piperonyl-butoxide	I Adalia bipunctata	Extended lab	40 + 440 g	4	Jansen et al., 2008	
pyrethrins + piperonyl-butoxide	I Aleochara bilineata	Extended lab	40 + 440 g	1	Jansen et al., 2008	
pyrethrins + piperonyl-butoxide	I Aphidius rhopalosiphi	Extended lab	40 + 440 g	4	Jansen et al., 2008	
pyrethrins + piperonyl-butoxide	I Bembidion lampros	Extended lab	40 + 440 g	3	Jansen et al., 2008	
pyrethrins + piperonyl-butoxide	I Chelonus inanitus	Initial toxicity	12 + 48 g	3	Medina et al., 2008	
pyrethrins + piperonyl-butoxide	I Chelonus inanitus	Ini tox pupae	12 + 48 g	1	Medina et al., 2008	
pyrethrins + piperonyl-butoxide	I Episyrrhus balteatus	Extended lab	40 + 440 g	3	Jansen et al., 2008	
pyrethrins + piperonyl-butoxide	I Hyposoter didymator	Initial toxicity	12 + 48 g	3	Medina et al., 2008	
pyrethrins + piperonyl-butoxide	I Hyposoter didymator	Ini tox pupae	12 + 48 g	1	Medina et al., 2008	
pyridaben	I Amblyseius californicus	Field aged	300 g	3-1	Van de veire et al., 2001	3 5DAT, 1 15DAT
pyriproxifen	I Hyposoter didymator	Initial toxicity	15 g	1	Schneider et al., 2003	no fertility assessment
pyriproxifen	I Phytoseiulus persimilis	Extended lab	50 g	2-1	Blumel & Hausdorf, 2002	2 0DAT, 1 3DAT

Active(s) ingredient(s)	Test species	Category of test	Dose tested (a.i./ha)	IOBC Toxicity class	References	Remarks
quinalphos	I Chrysoperla carnea	Initial toxicity	312.5 g	4	Güven & Göven, 2003	
quinalphos	I Chrysoperla carnea	Semi-field	300 g	4	Güven & Göven, 2006	
quinalphos	I Typhlodromus peribius	Initial toxicity	300 g	1	Göven & Güven, 2008	possible OP resistant strain
quinalofop-ethyl D	H Aleochara bilineata	Initial toxicity	75 g	1	Jansen et al., 2008	
quinalofop-ethyl D	H Bembidion lampros	Initial toxicity	75 g	1	Jansen et al., 2008	
rape seed oil	I Phytoseiulus persimilis	Extended lab	20 l	3-1	Blumel & Hausdorf, 2002	3 0-3DAT, 1 10DAT
spinosad	I Amblyseius californicus	Extended lab	225 g	1	Van de Veire & Tirry, 2003	no fertility assessment
spinosad	I Amblyseius californicus	Field aged	100 g	1	Van de veire et al., 2001	5DAT
spinosad	I Encarsia formosa	Initial toxicity	225 g	4	Van de Veire & Tirry, 2003	
spinosad	I Encarsia formosa	Extended lab	225 g	4-2	Van de Veire & Tirry, 2003	4 5-15DAT, 2 30DAT, no fertility assessment
spinosad	I Encarsia formosa	Semi-field, (3 sites)	50 g	4-1	Van de veire et al., 2004	spring 4 5-30DAT (Spain, Belgium), 4 5DAT, 3 15DAT, 1 30DAT (Italy); summer 4 5-30DAT (Spain, Belgium), 4 5DAT, 2 15DAT, 1 30DAT (Italy)
spinosad	I Hyposoter diymator	Initial toxicity	24 g	4-1	Schneider et al., 2003	4 0DAT, 2 5DAT, 1 10DAT, no fertility assessment
spinosad	I Opius concolor	Initial toxicity	24 g	4	Vinuela et al., 2001	
spinosad	I Orius laevigatus	Initial toxicity	225 g	4	Van de Veire & Tirry, 2003	
spinosad	I Orius laevigatus	Extended lab	225 g	1-3	Van de Veire & Tirry, 2003	summer 1 5DAT, spring 3 5-30DAT, no fertility assessment

Active(s) ingredient(s)	Test species	Category of test	Dose tested (a.i./ha)	IOBC Toxicity class	References	Remarks
spiroxamin	F Phytoseiulus persimilis	Extended lab	300 g	3-1	Blumel & Hausdorf, 2002	3 0DAT, 1 3-10DAT
spiroxamin	F Phytoseiulus persimilis	Extended lab	750 g	3	Blumel & Hausdorf, 2002	
spiroxamin	F Trichogramma cacoecciae	Initial toxicity	300 g	4	Abdelgarder & Hassan, 2002	
spiroxamin	F Trichogramma cacoecciae	Ini tox pupae	300 g	1	Abdelgarder & Hassan, 2002	
sulfur	F Adalia bipunctata	Ext. lab	4000 g	1	Jansen et al., 2008	no fertility assessment
sulfur	F Aleochara bilineata	Initial toxicity	4000 g	1	Jansen et al., 2008	
sulfur	I Amblyseius californicus	Field aged	2000 g	1	Van de veire et al., 2001	5DAT
sulfur	F Aphidius rhopalosiphi	Initial toxicity	4000 g	1	Jansen et al., 2008	no fertility assessment
sulfur	F Bembidion lampros	Initial toxicity	4000 g	1	Jansen et al., 2008	
sulfur	F Chrysoperla carnea	Initial toxicity	640 g	1	Güven & Goven, 2003	
sulfur	F Episyrrhus balteatus	Initial toxicity	4000 g	1	Jansen et al., 2008	no fertility assessment
sulfur	F Macrolophus caliginosus	Initial toxicity	LR50	1	Tedeschi et al., 2002	HQ<1
sulfur	F Phytoseiulus persimilis	Extended lab	8000 g	4-3	Blumel & Hausdorf, 2002	4 0DAT, 3-10DAT
sulfur	F Typhlodromus peribibus	Initial toxicity	3200 g	2	Göven & Güven, 2008	
tebuconazole	F Adalia bipunctata	Extended lab	250 g	2	Jansen et al., 2008	no fertility assessment
tebuconazole	F Aleochara bilineata	Initial toxicity	250 g	1	Jansen et al., 2008	
tebuconazole	F Aphidius rhopalosiphi	Ext. lab	250 g	1	Jansen et al., 2008	no fertility assessment
tebuconazole	F Bembidion lampros	Initial toxicity	250 g	1	Jansen et al., 2008	
tebuconazole	F Episyrrhus balteatus	Initial toxicity	250 g	1	Jansen et al., 2008	no fertility assessment
tebufenozide	I Anthocoris nemoralis	Initial toxicity	384 g	2-1	Caroli & Pasqualini, 2004	2 1 <sup>st</sup> instar, 1 3 <sup>rd</sup> instar
tebufenozide	I Hyposoter diymator	Initial toxicity	28.8 g	1	Schneider et al., 2003	no fertility assessment
tebufenozide	I Opilus concolor	Initial toxicity	36 g	1	Vinuela et al., 2001	
tebufenozide	I Phytoseiidae	Field (vine), 2 sites	72 g	2-1	Rodrigues et al., 2004	2 0-21DAT, 1 35DAT
tebufenozide	I Trichogramma cacoecciae	Initial toxicity	58 g	1	Abdelgarder & Hassan, 2002	

Active(s) ingredient(s)	Test species	Category of test	Dose tested (a.i./ha)	IOBC Toxicity class	References	Remarks
tebufenpyrad	I Amblyseius californicus	Field aged	12 g	1	Van de veire et al., 2001	5DAT
tebufenpyrad	I Phytoseiulus persimilis	Extended lab	100 g	4	Blumel & Hausdorf, 2002	4 0-10DAT
tebufenpyrad	I Phytoseiulus persimilis	Extended lab	40 g	4	Blumel & Hausdorf, 2002	4 0-10DAT
tebufenpyrad	I Trichogramma cacoeciae	Initial toxicity	40 g	4	Abdelgarder & Hassan, 2002	
tebufenpyrad	I Trichogramma cacoeciae	Ini tox pupae	40 g	2	Abdelgarder & Hassan, 2002	
teflubenzuron	I Phytoseiidae	Field (apple)	480 g	3-1	Rodrigues et al., 2002	3 0-4DAT, 2 7DAT, 1 14-28DAT
tepraloxym	H Aleochara bilineata	Initial toxicity	100 g	1	Jansen et al., 2008	
tepraloxym	H Bembidion lampros	Initial toxicity	100 g	1	Jansen et al., 2008	
thiacloprid	I Amblyseius californicus	Extended lab	150 g	1	Van de Veire & Tirry, 2003	no fertility assessment
thiacloprid	I Encarsia formosa	Initial toxicity	150 g	4	Van de Veire & Tirry, 2003	
thiacloprid	I Encarsia formosa	Extended lab	150 g	4-1	Van de Veire & Tirry, 2003	4 5DAT, 2 15DAT, 1 30DAT, no fertility assessment
thiacloprid	I Orius laevigatus	Extended lab	150 g	4	Van de Veire & Tirry, 2003	4 0-30DAT
thiacloprid	I Orius laevigatus	Initial toxicity	150 g	4	Van de Veire & Tirry, 2003	
thiamethoxam	I Amblyseius californicus	Extended lab	150 g	2	Van de Veire & Tirry, 2003	no fertility assessment
thiamethoxam	I Encarsia formosa	Initial toxicity	150 g	4	Van de Veire & Tirry, 2003	
thiamethoxam	I Encarsia formosa	Extended lab	150 g	4	Van de Veire & Tirry, 2003	4 5-30DAT
thiamethoxam	I Orius laevigatus	Initial toxicity	150 g	4	Van de Veire & Tirry, 2003	
thiamethoxam	I Orius laevigatus	Extended lab	150 g	4	Van de Veire & Tirry, 2003	4 0-30DAT
thiophanate-methyl	F Phytoseiulus persimilis	Extended lab	400 g	4	Blumel & Hausdorf, 2002	4 0-10DAT
thiram	F Adalia bipunctata	Ext. lab	2000 g	1	Jansen et al., 2008	no fertility assessment
thiram	F Aleochara bilineata	Initial toxicity	2000 g	1	Jansen et al., 2008	
thiram	F Aphidius rhopalosiphi	Ext. lab	2000 g	1	Jansen et al., 2008	no fertility assessment
thiram	F Episyrrhus balteatus	Initial toxicity	2000 g	1	Jansen et al., 2008	no fertility assessment



Active(s) ingredient(s)	Test species	Category of test	Dose tested (a.i./ha)	IOBC Toxicity class	References	Remarks
tolylfluand	Phytoseiulus persimilis	Extended lab	1560 g	4-3	Blumel & Hausdorf, 2002	4 0DAT, 3 3-10DAT
triasulfuron	Trichogramma cacoeciae	Initial toxicity	7.5 g	1	Abdelgarder & Hassan, 2002	
triazamate	Amblyseius californicus	Extended lab	270 g	1	Van de Veire & Tirry, 2003	no fertility assessment
triazamate	Encarsia formosa	Initial toxicity	270 g	4	Van de Veire & Tirry, 2003	
triazamate	Encarsia formosa	Extended lab	270 g	1	Van de Veire & Tirry, 2003	1 5 DAT, no fertility assessment
triazamate	Orius laevigatus	Initial toxicity	270 g	3	Van de Veire & Tirry, 2003	no fertility assessment
triazamate	Orius laevigatus	Extended lab	270 g	4-2	Van de Veire & Tirry, 2003	4 5 DAT, 2 15DAT, no fertility assessment
triazamate	Phytoseiulus persimilis	Extended lab	70 g	3-1	Blumel & Hausdorf, 2002	3 0DAT, 1 3DAT
triazamate	Phytoseiulus persimilis	Extended lab	28 g	3-1	Blumel & Hausdorf, 2002	3 0DAT, 1 3DAT
triazamate	Trichogramma cacoeciae	Initial toxicity	28 g	4	Abdelgarder & Hassan, 2002	
triazamate	Trichogramma cacoeciae	Ini tox pupae	28 g	1	Abdelgarder & Hassan, 2002	
vamidothion	Phytoseiidae	Field (apple)	500 g	3	Rodrigues et al., 2002	4 0-7DAT, 3 14DAT, 1 28DAT
vamidothion	Phytoseiidae	Field (apple), 2 sites	500 g	1-4	Cavaco et al., 2003	1 4-35DAT (field 1); 4 4-35DAT (field 2)
vinclozolin	Adalia bipunctata	Initial toxicity	750 g	1	Jansen et al., 2008	no fertility assessment
vinclozolin	Aleochara bilineata	Initial toxicity	750 g	1	Jansen et al., 2008	
vinclozolin	Aphidius rhopalosiphi	Initial toxicity	750 g	1	Jansen et al., 2008	no fertility assessment
vinclozolin	Bembidion lampros	Initial toxicity	750 g	1	Jansen et al., 2008	
vinclozolin	Episyrphus balteatus	Initial toxicity	750 g	1	Jansen et al., 2008	no fertility assessment
zetacypermethrin	Adalia bipunctata	Extended lab	10 g	4	Hautier et al., 2006	
zetacypermethrin	Aphidius rhopalosiphi	Extended lab	10 g	1	Hautier et al., 2006	no fertility assessment
zetacypermethrin	Episyrphus balteatus	Extended lab	10 g	1	Hautier et al., 2006	no fertility assessment

