Beneficials Chemical Toxicity Table



A guide to support pest management decisions that consider insecticide impacts on beneficial insects. Developed for Australian vegetable production systems including brassicas, leafy vegetables, root and tuber vegetables, stalk and stem vegetables, fruiting vegetables (incl. cucurbits), and legumes.

Beneficial insects, including predators and parasitoids, play an important role in keeping pests in check. Supporting local populations of beneficials is an important component of pest management and can help to reduce pest pressure in the long term.

Crop protection products, such as insecticides (and miticides), have varying impacts on beneficial insect (and mite) populations, and may disrupt the natural control they provide. Where chemicals are required, consider both their effectiveness against the target pest and their potential impact on beneficials.

The **Beneficials Chemical Toxicity Table for vegetable crops (Table 1)** helps vegetable growers, agronomists and IPM advisers make informed decisions about insecticide use. It summarises the toxicity of foliar insecticides (and miticides) on key beneficials relevant to the Australian vegetable industry.

How to Read the Table

Toxicity ratings are based on protocols for laboratory studies published by the International Organisation for Biological Control (IOBC). Ratings reflect the average percentage mortality of insects within a particular group of beneficials exposed to each chemical.

Low (L)	Moderate (M)	High (H)	Very High (VH)	
< 30% mortality	30-79% mortality	80-99% mortality	> 99% mortality	Variable results

Cells with a diagonal slash indicate highly variable results among beneficial species groups or chemicals within a group. This may occur when different species within a beneficial group respond differently to the same chemical, or when chemicals within a group have varying effects. Consider this variability when interpreting potential impacts.

How to Use the Table

Use this table to support crop protection decisions that help preserve beneficial insect (and mite) populations.

- Start by identifying insecticides registered for use in your crop and suitable for controlling your target pest, based on product labels.
- Compare suitable insecticide options based on their toxicity to beneficials and, where appropriate, choose an option causing the least overall mortality to beneficial insects.
- If you know which beneficial species are present, use the table to identify chemical options with lower toxicity to those species.
- If commercially available beneficial insects (or mites) have been released, use the table to identify insecticides that are most compatible with those beneficials to minimise disruption following release.

Data Sources

Cesar Australia conducted independent laboratory assessments and compiled this data with existing research. These values represent mortality under controlled laboratory conditions – actual impacts may vary in the field, depending on repeated applications, timing, exposure pathways, beneficial life stage, and environmental conditions. Further research is underway to fill remaining data gaps.

For further details about the underlying data, contact Cesar Australia at info@cesaraustralia.com.

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Table 1: Beneficials Chemical Toxicity Table for vegetable crops

Refer to the footnotes on page 3 when using this table.

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Active Ingredient	Mode of Action 1	Rate (g a.i./ha) 2	Aphid parasitoids 3	Egg parasitoids 4	Lepidopteran larval parasitoids 5	Predatory bugs 6	Ladybird beetles 7	Predatory mites 8	Lacewings 9	Rove beetles 10
Nucleopolyhedrovirus 11	31	200	L	L	L	L	L	L	L	L
Bacillus thuringiensis 11	11A	2000	L	L	L	L	L	L	L	L
Beauveria bassiana 11	UNF	500	L	-	L	L	L	L-M	L	L
Chlorantraniliprole	28	30	L	L	M	L	L	L	L	L
Afidopyropen Low 12	9D	10	L-M	L	L	L	L-M	L	L	L
Spirotetramat	23	96	L	-	L	L	L	L-M	L	L
Flonicamid	29	100	L	M	L	L	L-M	L-M	L	L
Pymetrozine	9B	100	L	L-M	L	M	L	L-M	L	L
Afidopyropen High 12	9D	35	M-H	-	M	L	L-M	L-M	L	L
Paraffinic oil	-	1624	L-VH	L	L	M	L	L-VH	L	L
Cyantraniliprole	28	75	L-M	M	M	M	M	L-M	L	M
Indoxacarb	22A	75.75	L-VH	L	VH	L-M	L-H	L-M	L-M	L
Emamectin benzoate Low 12	6	6.6	M-H	VH	VH	M	L	L-M	L	L
Pirimicarb	1A	500	M-VH	VH	M	M	L-M	L-M	L	L
Emamectin benzoate High 12	6	13.2	H-VH	VH	VH	H-VH	L	L-M	L	L-M
Sulfoxaflor Low 12	4C	36	H-VH	VH	VH	H	-	L-H	-	L
Spinetoram Low 12	5	24	H-VH	H	VH	L-H	L-M	L-VH	M	L
Imidacloprid	4A	60	M-H	M	H	M	M	L-M	M-VH	VH
Spinetoram High 12	5	48	H-VH	VH	VH	L-H	M	L-VH	M-H	L
Sulfoxaflor High 12	4C	96	VH	VH	VH	H-VH	H	L-H	H-VH	M
Isocycloseram	30	30	VH	-	VH	H	M	H-VH	M	H
Synthetic Pyrethroids 13	3A	Variable	L-VH	VH	VH	VH	VH	L-VH	VH	M-VH
Methomyl	1A	450	VH	VH	VH	VH	VH	VH	VH	VH
Organophosphates 14	1B	Variable	VH	VH	VH	VH	VH	H-VH	VH	VH

Mortality									
L	<30%	M	30-79%	H	80-99%	VH	>99%	-	No data

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Footnotes

1 The Mode of Action of each active ingredient follows the Insecticide Resistance Action Committee classification (https://irac-online.org/modes-of-action/).

2 Active ingredients were typically tested at their Maximum Registered Field Rates (MRFR) per hectare in Australian vegetable crops. Data from previous research trials were included if those studies tested rates within 35% of the MRFR.

3 Data based on *Aphelinus abdominalis*, *Aphidius colemani* and *Aphidius rapae* (previously *Diaeretiella rapae*).

4 Data based on *Trichogramma pretiosum* and *Telenomus remus.*

5 Data based on *Diadegma semiclausum.*

6 Data based on *Nabis kinbergii* and *Orius tantillus.*

7 Data based on *Adalia bipunctata, Coccinella transversalis, Harmonia conformis,* and *Hippodamia variegata*.

8 Data based on *Gaeolaelaps aculeifer* (previously *Hypoaspis aculeifer*), *Neoseiulus californicus, Neoseiulus cucumeris, Phytoseiulus persimilis, Transeius montdorensis* (previously *Typhlodromips montdorensis*) and *Typhlodromus pyri*.

9 Data based on *Mallada signatus* and *Micromus tasmaniae.*

10 Data based on *Dalotia* spp.

11 Rates listed for biologicals are the amount of product per hectare rather than amount of active ingredient. The listed rate for Nucleopolyhedrovirus is applicable to Vivus Armigen™ (mL), the listed rate for *Bacillus thuringiensis* is applicable to Dipel® (g) and the listed rate for *Beauveria bassiana* is applicable to Velifer® (mL). Rates for other products may vary.

12 Two rates are included for several active ingredients to reflect variation in application rates across Australian vegetable crops and differences in mortality between rates.

13 Synthetic Pyrethroids included here are alpha-cypermethrin, bifenthrin, esfenvalerate and lambda-cyhalothrin.

14 Organophosphates included here are chlorpyrifos and dimethoate.

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Disclaimer: Information provided in the Beneficials Chemical Toxicity Table for vegetable crops (Table 1) is based on the current best information available from research data. The impact of insecticides may vary in the field and between crop types. Users of chemical products should check the label for further details of rate, pest spectrum, safe handling and application. Further information on the products can be obtained from the manufacturer. Cesar Australia and Hort Innovation accept no responsibility whatsoever for any loss occasioned by any person acting or refraining from action as a result of reliance on this data.

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