

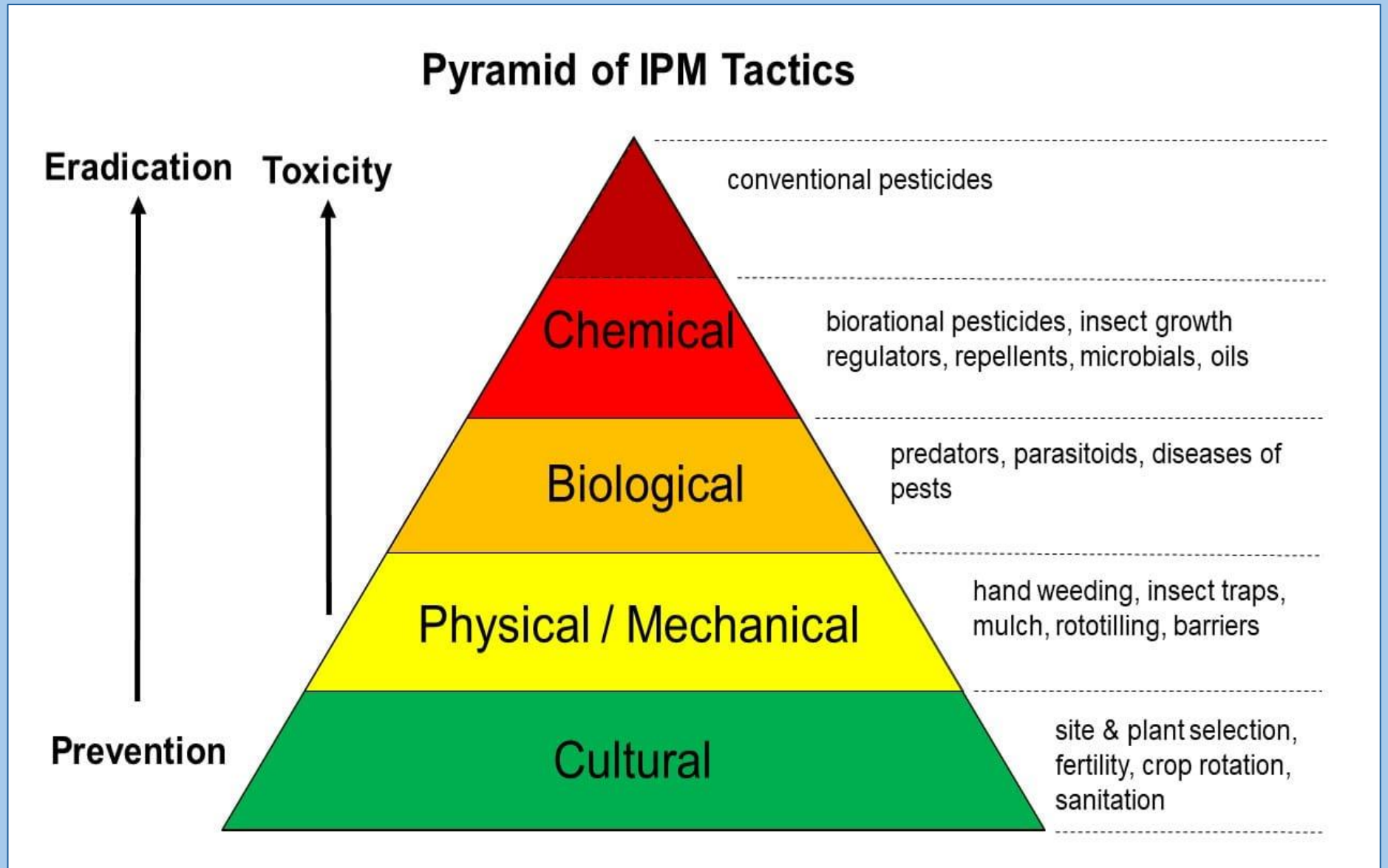
Pest Control in the Tropical Nursery at Kew Gardens

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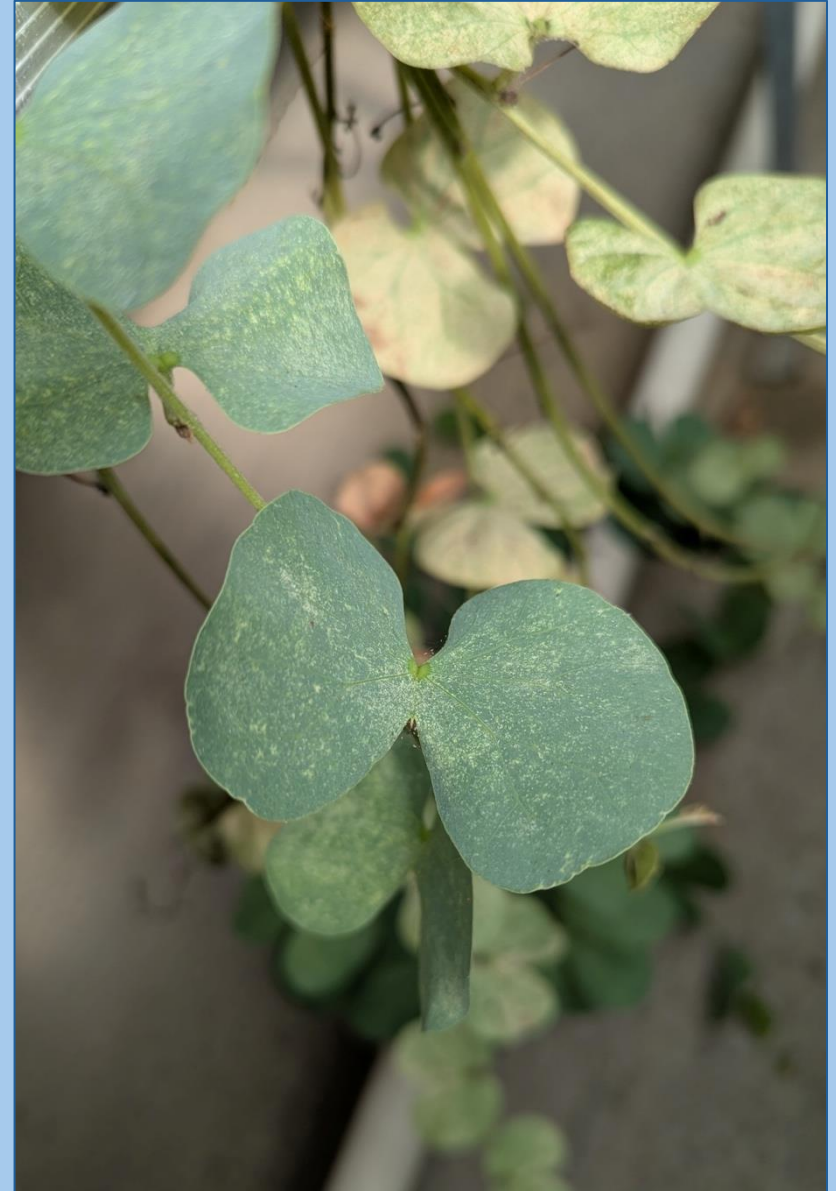
Kew Gardens

Integrated Pest Management



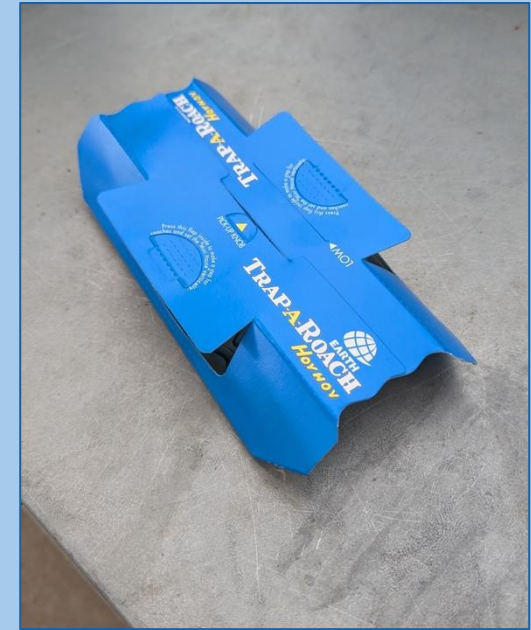
Cultural Controls

- Plant health problems
 - Pests attack weakened or stressed plants
 - Poor root health
 - Incorrect climatic conditions
- Correct irrigation and feeding
 - Avoid waterlogged soils
 - Prevent nutrient deficiency/toxicity
- Good hygiene
 - Clean compost and tools
 - Remove weeds and dead leaves
 - Quarantine new plants



Physical Controls

- Hand removal
 - Paintbrush or toothbrush
 - Pruning and leaf picking
- Water jet
 - High pressure nozzle
 - Useful on woody stems
- Traps and barriers
 - Sticky traps
 - Grease bands



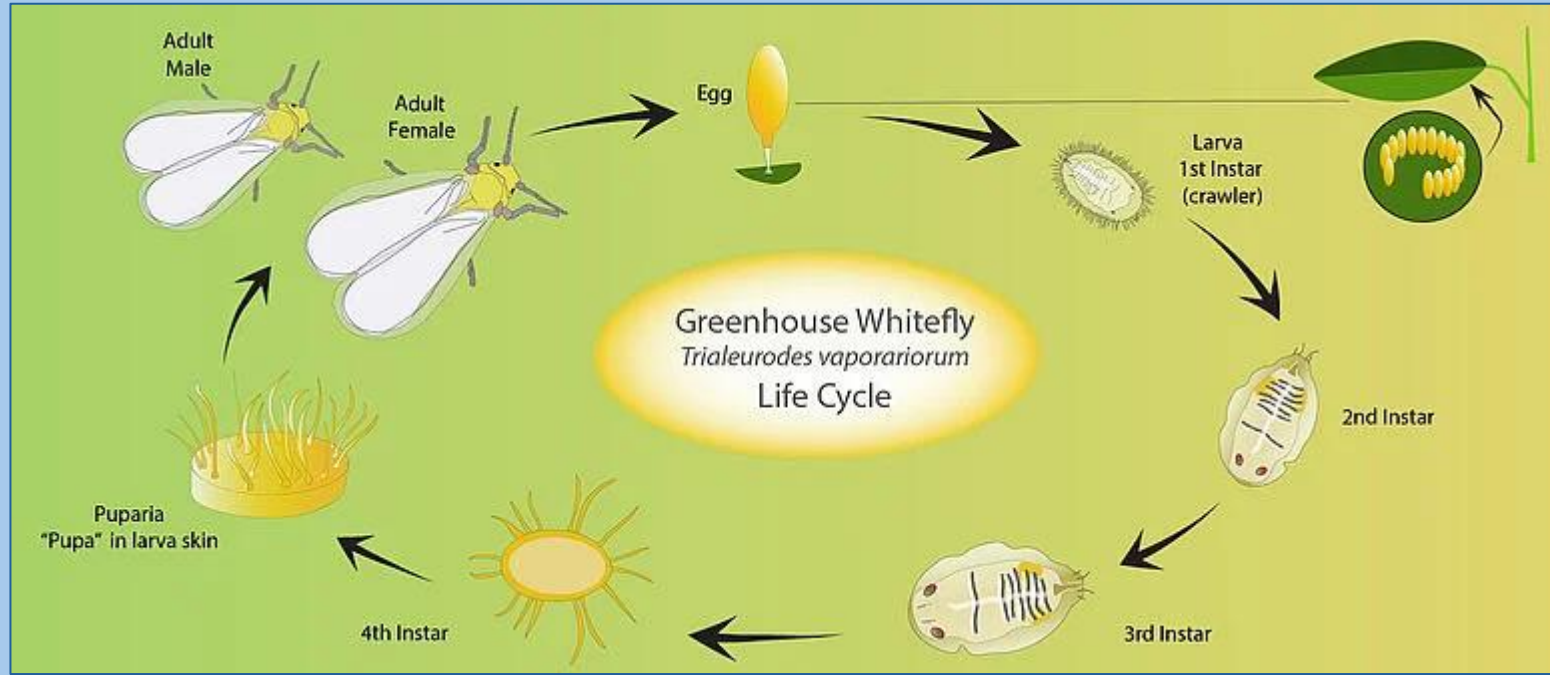
Biological Controls

- Predators
 - *Macrolophus pygmaeus*
 - *Phytoseiulus persimilis*
- Parasitoid wasps
 - *Encarsia formosa*
 - *Aphidius colemani*
- Bacteria
 - *Bacillus thuringiensis*

Aphidius colemani
inserting an egg into
an immature aphid.

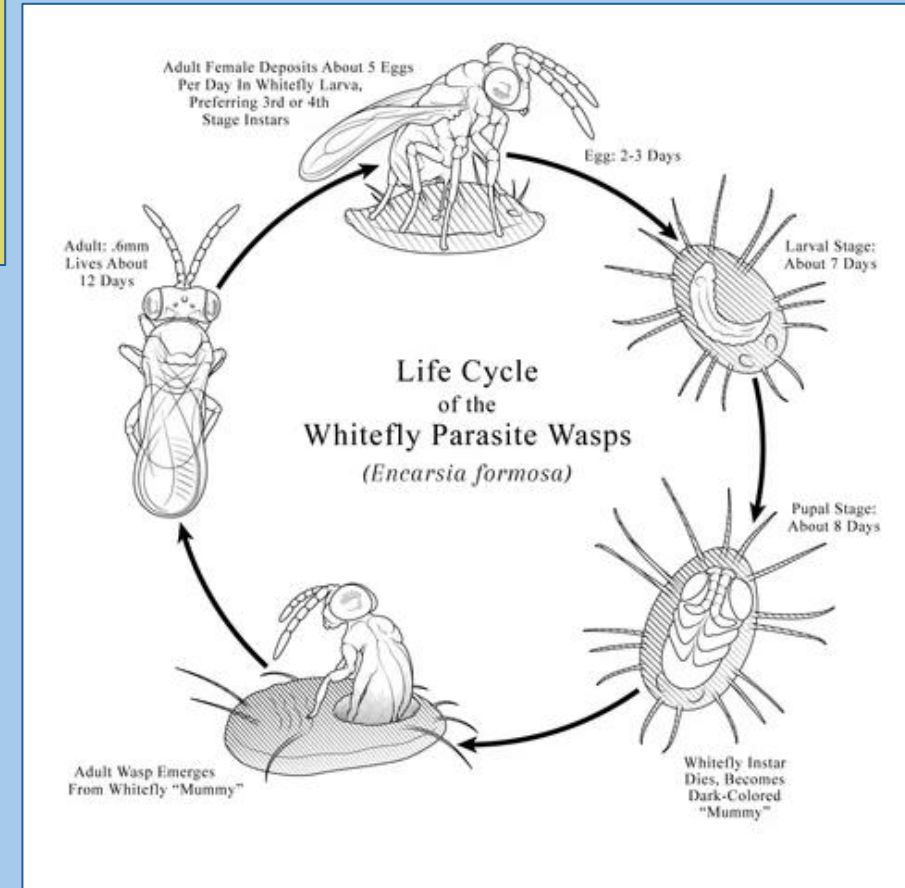


A mummified aphid.



Parasitoid wasps as a biocontrol for greenhouse whitefly

<https://qaqooking.wiki/all/how-to/whitefly-larvae-life-cycle>





Application of
biocontrols
using sachets



Chemical Controls

- Used as a last resort
 - Use increases pesticide resistance
 - Hazardous substances
 - Waste disposal
 - Kills beneficial organisms
- Low toxicity chemicals
 - Pyrethrin
 - Azadirachtin
 - Flipper or SB Plant Invigorator



Pesticide Register

- UK Health & Safety Executive
- MAPP number
 - Ministerially Approved Pesticide Product
- Commercial authorisation
 - Number clearly visible on product label
- Expiry date
 - Hazardous waste disposal

Product	Active Ingredient	Target
Aphox	Pirimcarb	Aphids
Conserve	Spinosad	Thrips
Dynamec	Abamectin	Thrips, spidermites
Effect CS	Pyrethroid	Cockroaches, ants
Flipper	Carboxylic fatty acid	Mealy bugs, scale
Gazelle	Acetamiprid	Scale
Lepinox Plus	Bacillus thuringiensis	Tortrix moths

[Pesticides Register of Authorised Plant Protection Products](#)

Mode of Action

- IRAC number
 - Rotate IRAC numbers
 - Cross resistance prevention
- Typed of MoAs
 - Nerve agent
 - Growth inhibitor
 - Digestive system disruptor
 - Metabolism disruptor

Targeted Physiology:	 Nerve & Muscle	 Growth & Development	 Respiration	 Midgut
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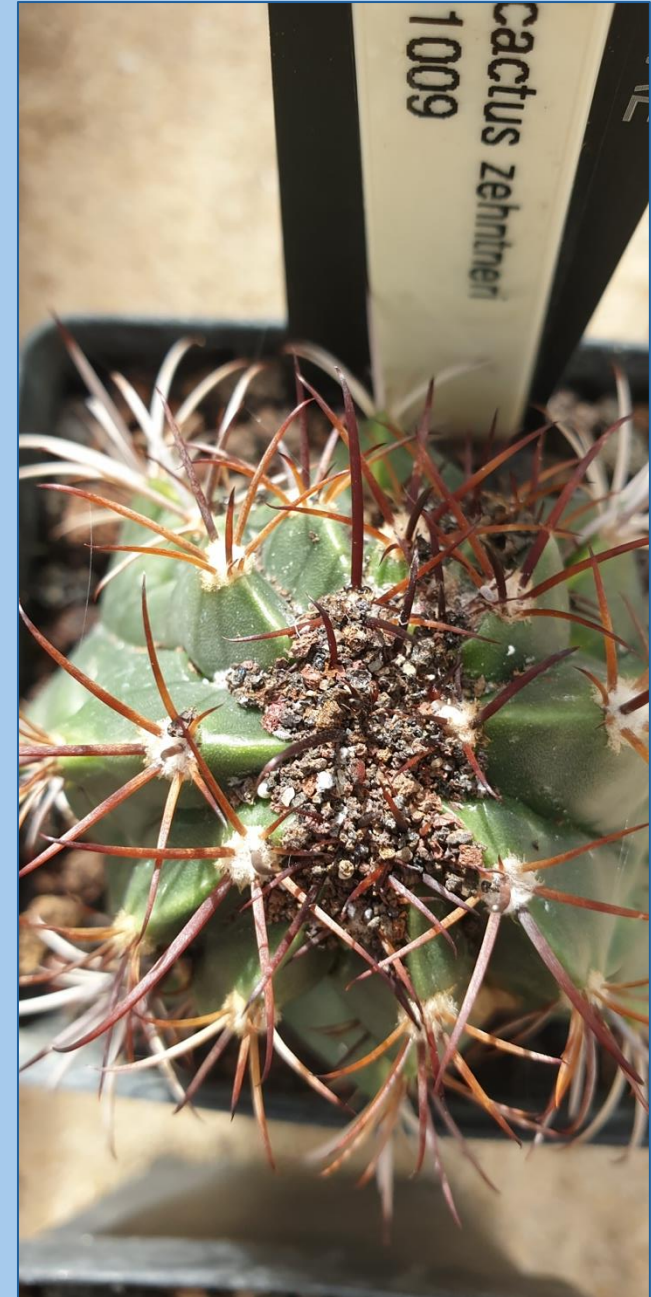
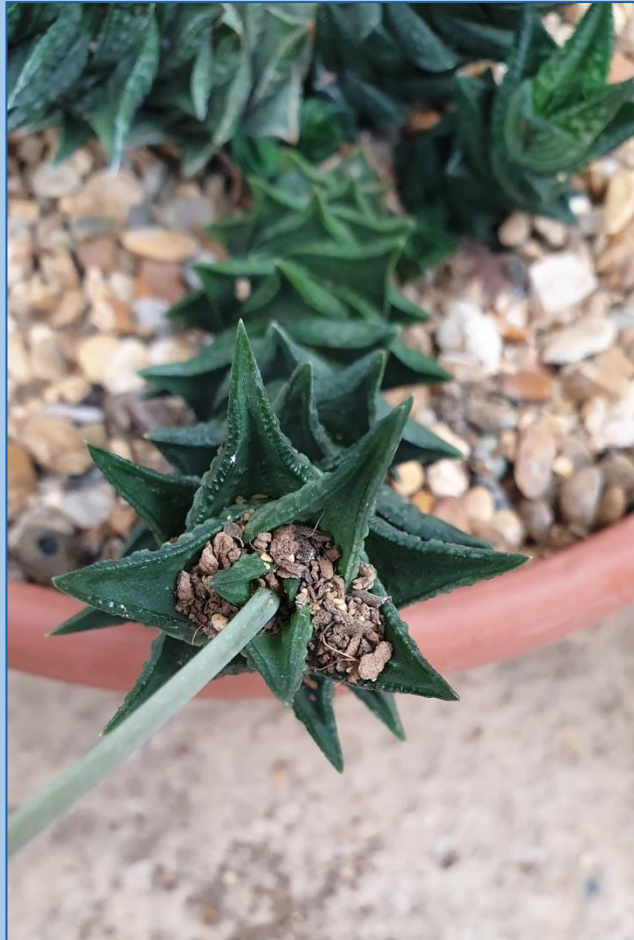
IRAC MoA Classification Version 11.5, February 2026		
See section 7.4 for further information on sub-groups. See section 7.3 for criteria for descriptors of the quality of MoA information.		
Main Group and Primary Site of Action	Sub-group, class or exemplifying Active Ingredient	Active Ingredients
10 Mite growth inhibitors affecting CHS1 Growth regulation {Strong evidence that action at one or more of this class of proteins is responsible for insecticidal effects}	10A Clofentazine Diflovidazin Hexythiazox	Clofentazine, Diflovidazin, Hexythiazox
	10B Etoxazole	Etoxazole
11 Microbial disruptors of insect midgut membranes (Includes transgenic crops expressing <i>Bacillus thuringiensis</i> toxins, however specific guidance for resistance management of transgenic crops is not based on rotation of modes of action)	11A <i>Bacillus thuringiensis</i> and the insecticidal proteins they produce	<i>Bacillus thuringiensis</i> subsp. <i>israelensis</i> <i>Bacillus thuringiensis</i> subsp. <i>aizawai</i> <i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i> <i>Bacillus thuringiensis</i> subsp. <i>tenebrionis</i> <i>B.t.</i> crop proteins: (* Please see footnote) Cry1Ab, Cry1Ac, Cry1Fa, Cry1A.105, Cry2Ab, Vip3A, mCry3A, Cry3Ab, Cry3Bb, Cry34Ab1/Cry35Ab1
	11B <i>Bacillus sphaericus</i>	<i>Bacillus sphaericus</i>
12 Inhibitors of mitochondrial ATP synthase Energy metabolism {Compounds affect the function of this protein, but it is not clear that this is what leads to biological activity}	12A Diafenthion	Diafenthion
	12B Organotin miticides	Azocyclotin, Cyhexatin, Fenbutatin oxide
	12C Propargite	Propargite
	12D Tetradifon	Tetradifon

irac-online.org/documents/moa-classification/

Application

- 120 litre bowser
 - Large growing spaces
 - Better for coating plants
- Backpack sprayer
 - Heavy and fuel-powered
 - Better for coating surfaces
- Fogger
 - Overnight application
 - Reaches high parts of growing space





Ants covering mealybug 'cattle'
with particles of soil

References

Encarsia formosa

<https://doi.org/10.1146/annurev.ento.43.1.645>

Pesticide Register

[Pesticides Register of Authorised Plant Protection Products](https://secure.pesticides.gov.uk/pestreg/) <https://secure.pesticides.gov.uk/pestreg/>

Mode of Action classification

irac-online.org/documents/moa-classification/

Aphidius colemani

[Biological Control of Aphids | Parasitoid Wasp](https://bugsforbugs.com.au/news/biological-control-of-aphids-with-parasitoid-wasps/) <https://bugsforbugs.com.au/news/biological-control-of-aphids-with-parasitoid-wasps/>

[Aphidius colemani \(Parasitic Wasp\): Biological Control of Aphids](https://www.koppert.co.uk/crop-protection/biological-pest-control/parasitoid-wasps/aphidius-colemanii/?utm_term=redirect) https://www.koppert.co.uk/crop-protection/biological-pest-control/parasitoid-wasps/aphidius-colemanii/?utm_term=redirect

IPM pyramid

[invasive species | Gardening in Orange County New York](https://blogs.cornell.edu/master-gardeners-cce-oc/tag/invasive-species/) <https://blogs.cornell.edu/master-gardeners-cce-oc/tag/invasive-species/>