



Cucumber

Strategic Agrichemical Review Process
(SARP)

September 2020

Hort Innovation
Project – VG18004

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Vg18004 – Vegetable Strategic Agrichemical Review Process (SARP) Report Updates

SARP Service Provider:

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Purpose of the report:

This report was funded by Hort Innovation to investigate the pest problem, agrichemical usage and pest management alternatives for the Cucumber industry across Australia. The information in this report will assist the industry with its agrichemical selection and usage into the future.

Date of report:

September 2020

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**Hort
Innovation**
Strategic levy investment

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1. Summary

The strategic levy investment project Vegetable Industry SARP Report Updates (VG18004) is part of the Hort Innovation Vegetable Fund. A Strategic Agrichemical Review Process (SARP), through the process of a desktop audit and industry liaison;

- (i) Assesses the importance of the diseases, insects and weeds (plant pests) that can affect a horticultural industry;
- (ii) Evaluates the availability and effectiveness of fungicides, insecticides and herbicides (pesticides) to control the plant pests;
- (iii) Determines any gaps in the pest control strategy and
- (iv) Identifies suitable new or alternatives pesticides to address the gaps.

Alternative pesticides should ideally be selected for benefits of:

- Integrated Pest Management (IPM) compatibility
- Improved scope for resistance management
- Sound biological profile
- Residue and trade acceptance domestically and for export

The results of this process will provide the Cucumber industry with sound pesticide usage for the future that the industry can pursue for registration with the manufacturer, or minor-use permits with the Australian Pesticide and Veterinary Medicines Authority (APVMA).

1.1 Diseases

The high priority diseases are:

Common name	Scientific name
Fusarium wilt (Root & Stem Rot)	<i>Fusarium oxysporum</i> f.sp. <i>radices-cucumerinum</i>
Damping-off	<i>Pythium</i> spp., <i>Phytophthora</i> spp., <i>Fusarium</i> spp. & <i>Rhizoctonia</i> spp.
Powdery mildew	<i>Podosphaera xanthii</i> & <i>Golovinomyces cichoracearum</i>
Downy mildew	<i>Pseudoperonospora cubensis</i>

1.2 Insects, Mites and Other Pests

The high priority insect and mite pests are:

Common name	Scientific name
Two-spotted mites	<i>Tetranychus urticae</i>
Western flower thrips	<i>Frankliniella occidentalis</i>
Silverleaf whiteflies	<i>Bemisia tabaci</i>
Greenhouse whiteflies	<i>Trialeurodes vaporariorum</i>

1.3 Weeds

The feedback received from the different States and Territories did not rank any weeds as high priority, but some individual regions identified the following weeds.

Common Name	Scientific name
Blackberry nightshade (QLD)	(<i>Solanum nigrum</i>)
Soursob (SA)	(<i>Oxalis</i>)

2. The Australian Cucumber Industry

Most of the Cucumbers are grown in protected cropping environments, including newer high-tech greenhouses. Production regions include Bowen and Bundaberg in Queensland and the Riverland region in South Australia.

¹For the year ending in June 2019, Australia produced 93,768 tonnes of Cucumbers:

- 95% was sent to fresh market
- 5% was sent for processing
- <1% was sent for fresh export

There are three main Cucumber varieties grown for the Australian market. These include:

- Continental (telegraph) Cucumbers (59% of fresh production)
- Lebanese Cucumbers (31% of fresh production)
- Baby Cucumbers (Qukes™) (9% of fresh production)
- Other varieties including White and Apple Cucumber (1% of fresh production)

Cucumbers are primarily field grown in QLD but grown in protected cropping (PC) systems in NSW, WA, SA & NT. Cucumbers grown in protected cropping systems can be grown directly in the soil, which is normally the case in SA & WA. Hi-tech and low-tech hydroponic systems using different media such as coco peat is practiced in NSW, VIC & NT and in some production sites in SA.

Due to Australia's varying weather conditions and the introduction of different varieties that have varying growth and maturity characteristics, the Australian industry is now able to supply domestic markets with fresh Cucumber throughout the year. Given that most Cucumbers are grown in greenhouse environments, the industry generally has a steady year-round production.

Fresh Cucumber Seasonality by State

State	18/19 t	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
New South Wales (9%)	8,654												
Victoria (1%)	780												
Queensland (35%)	32,819												
Western Australia (10%)	8,848												
South Australia (43%)	40,370												
Tasmania (<1%)	46												
Northern Territory (2%)	2,250												
Availability legend			High		Medium		Low					None	

Australia is a net exporter of fresh Cucumbers, typically exporting 100-150 tonnes per annum. For the year ending in June 2019, Australia exported 93 tonnes. Of this export, 75% was exported to New Zealand for fresh market followed by Malaysia (7%), Hong Kong (5%), PNG (4%) and Singapore 3%). Since 2016, NT has entered the export market.

¹ Hort Innovation (2020). Australian Horticulture Statistics Handbook 2018/19. [online] Available at: <https://www.horticulture.com.au/growers/help-your-business-grow/research-reports-publications-fact-sheets-and-more/australian-horticulture-statistics-handbook/>

3. Introduction

3.1 Background

Growers of some horticultural crops suffer from a lack of legal access to crop protection products (pesticides). The problem may be that whilst a relatively small crop area is valuable in an agricultural sense, it may not be of sufficient size for Agrichemical companies to justify the expense of registering a product use on that crop. Alternately, the disease, pest, or weed problem may be regional or spasmodic, making Agrichemical companies unwilling to bear the initial high cost of registering suitable pesticides.

Growers may face severe losses from diseases, pests and weeds due to a lack of registered or approved (via a permit) chemical control tools.

Environmental concerns, consumer demands, and public opinion are also significant influences in the marketplace related to pest management practices. Industry IPM practitioners must strive to implement best management practices and tools to incorporate a pest management regime where strategies work in harmony with each other to achieve the desired effects while posing the least risks.

In combination with cultural practices, pesticides are important tools in Cucumber production and respective IPM programs. They control the various diseases, insects and weeds that affect the crop and can cause severe economic loss in modern high intensity growing operations. Pesticides are utilised during establishment and development, and to maximise quality and customer appeal.

As a consequence of the issues facing the Cucumber industry regarding pesticide access, Hort Innovation undertook a review of the pesticide requirements via a Strategic Agrichemical Review Process (SARP) in 2014. The current project is to update the SARP with the latest information and progress.

The SARP process identifies diseases, insect pests and weeds of major concern to the Cucumber industry. Against these threats, available registered or permitted pesticides are evaluated for overall suitability in terms of IPM, resistance, efficacy, trade, human safety and environmental issues. Where tools are unavailable or unsuitable the process aims to identify potential future solutions. Potential new risks to the industry are also identified.

The results will provide the Cucumber industry with a clear outlook of gaps in existing pest control options. This report is not a comprehensive assessment of ALL pests and control methods used in Cucumber but attempts to prioritise the major problems.

Exotic plant pests, not present in Australia, are not addressed in this document. A biosecurity plan has been developed for the Vegetable Industry in consultation with industry, government and scientists. The Biosecurity Plan for the Vegetable Industry which covers Cucumber outlines key threats to the industry, risk mitigation plans, identification and categorisation of exotic pests and contingency plans. High priority exotic pests have been assessed based on their potential to enter, establish, and spread in Australia (e.g. environmental factors, host range, vectors) and the cost to industry of control measures. More information is available at the link below.
<https://ausveg.com.au/app/uploads/2018/06/Industry-Biosecurity-Plan-for-the-Vegetable-Industry.pdf>

3.2 Minor use permits and registration

From a pesticide access perspective, the APVMA classifies cucumbers as a minor crop. The crop fits within the APVMA crop group Crop Group 011: Fruiting vegetables, Cucurbits. Therefore, access to minor use permits can be relatively straight forward as long as a reasonable justification is provided in accordance to the APVMA's minor use guidance (<https://apvma.gov.au/node/10931>).

Possible justification for future permit applications could be based on:

- New disease, insect or weed identified as a cropping issue
- No pesticide approved for the problem
- Insufficient options for resistance management
- Current pesticides ineffective due to resistance
- Trade risk - current pesticides unsuitable where crop commodities will be exported
- IPM, environment or OH&S issues
- Loss of pesticides due to removal from market or chemical review restrictions
- Opportunity to extrapolate a use pattern when a new, effective pesticide is registered in another crop
- Alternate pesticide has overseas registration or minor use permit
- Market failure – insufficient return on investment for registrant.

With each of these options, sound, scientific argument is required to justify any new permit applications. Another option for the Cucumber industry is for manufacturers to register new pesticides uses in the crop.

3.3 Methods

The current update of the Cucumber Strategic Agrichemical Review Process (SARP), which was last updated in 2014, was conducted by desktop audit using industry information gathered during 2011-2014 under MT10029 – Managing pesticide access in horticulture and finalised under VG12081 - Review of vegetable SARP reports. The process included gathering, collating and confirming information:

Hort Innovation Project Reference	Process of Review - Activity
VG16060 - Vegetable Agrichemical Pest Management Needs and Priorities (AUSVEG) - Commenced: 2 May 2017	<p>Engagement and consultation with growers and other relevant stakeholders. Including; Online crop specific surveys, workshops and one on one consultation Nationally.</p> <p>Collation of information collected by commodity on applicable pests, diseases and weeds in order of priority.</p>
MT17019 – Regulatory Support & Co-ordination (AKC)	<p>Cucumber Agrichemical Regulatory Risk Assessment Document</p> <p>To assist strategic planning, with respect to future pest management options, this document was developed as part of the Hort Innovation funded project MT17019 to highlight the regulatory threats to agrichemicals currently approved for the management of the pests and diseases in Cucumber as well as current initiatives aimed at addressing identified pest management deficiencies.</p>
VG18004 – Vegetable Strategic Agrichemical Review Process (SARP) Report Updates	<p>SARP updated via a desktop audit:</p> <p>Review list of priorities ranked as high, moderate and low for each plant pest groups (disease, insects and weeds) – provided by VG16060</p> <p>Identify industries pest priority gaps in order of importance</p> <p>Update current pesticides available via label registrations or minor use permits</p> <p>Update available pesticide use patterns, IPM ranking/compatibility, mode of action and chemical group.</p> <p>Identify pesticides at risk (under review and/or limited uses) via MT17019 Regulatory Support & Co-ordination – AKC consulting.</p> <p>Identify any appropriate solutions through the outcomes of the AgChem Forum’s or similar market intelligence and their overall suitability (IPM compatibility, Chemical group to manage resistance, risk profile, existing domestic MRL’s or global MRL’s including any potential trade barriers, efficacy, OH&S, environmental safety and sustainability).</p> <p>Include known pesticide solutions that are currently under development with registrants for new uses in the nominated crops or in current Hort Innovation projects.</p> <p>Update MRL tables to include Australian MRL’s, Codex and any applicable export market MRL’s</p>

3.4 Results and discussions

3.4.1 Detail

Results and discussions are presented in the body of this document.

3.4.2 Appendices

Refer to additional information in the appendices:

Appendix 1. Products available for disease control in cucumber

Appendix 2. Products available for control of insects, mites and other pests in cucumber

Appendix 3. Products available for weed control in cucumber

Appendix 4. Current permits for use in cucumber

Appendix 5. Cucumber Maximum Residue Limits (MRLs)

Appendix 6. Cucumber regulatory risk assessment

4. Diseases, Pests and Weeds of Cucumber

Resistance management: To manage the risk of resistance development, integrated disease/pest/weed management (IDM/IPM/IWM) strategies should be adopted. The general principle is to integrate diverse chemical and non-chemical strategies; maximise efficacy; not rely on singular tools and rotate between different modes of action. It is always essential to follow all the label instructions. Specific resistance management strategies may apply. These can be found, along with other useful information, on the CropLife Australia website. <https://www.croplife.org.au/resources/programs/resistance-management/>

Information on regulatory risk derived from project MT17019 (In Chapter 4) - Regulatory support and coordination (Appendix 6) has been incorporated.

Some of the suggested options have no overseas MRLs (see Appendix 5). If treated fruit is to be exported nil residues at harvest would be needed for these options.

While care has been taken to ensure the accuracy of the information provided in this document the APVMA registered label and where relevant the APVMA approved permit must always be followed.

4.1 Diseases of cucumber

4.1.1 Disease priorities

Common name	Scientific name
High	
Fusarium wilt (Root & Stem Rot)	<i>Fusarium oxysporum</i> f.sp. <i>radices-cucumerinum</i>
Damping-off	<i>Pythium</i> spp., <i>Phytophthora</i> spp., <i>Fusarium</i> spp. & <i>Rhizoctonia</i> spp.
Powdery mildew	<i>Podosphaera xanthii</i> & <i>Golovinomyces cichoracearum</i>
Downy mildew	<i>Pseudoperonospora cubensis</i>
Moderate	
Alternaria leaf spots	<i>Alternaria cucumerina</i> & <i>Alternaria alternata</i>
Grey mould	<i>Botrytis cinerea</i>
Gummy stem blight	<i>Didymella bryoniae</i>
Low	
Angular leaf spot (Bacterial)	<i>Pseudomonas syringae</i>
Anthracnose	<i>Colletotrichum orbiculare</i>
Bacterial leaf spot	<i>Xanthomonas campestris</i>
Botrytis Rots (Grey Mould)	<i>Botrytis cinerea</i>
Phytophthora soil fungus	<i>Phytophthora</i> spp.
Rhizoctonia ground rot	<i>Rhizoctonia solani</i>
Septoria spot	<i>Septoria cucurbitacearum</i>
Scab	<i>Cladosporium</i> spp.
Target spot	<i>Cercospora citrullina</i>
Mosaic Diseases (Virus)	Cucumber Green Mottle Mosaic Virus (CGMMV), Zucchini yellow mosaic virus (ZYMV) Tomato Spotted Wilt Virus
Cucumber Yellows (Virus)	Beet Pseudo-Yellows Virus

Cucumbers are primarily field grown in QLD but are grown in protected cropping (PC) systems in NSW, WA, SA & NT. Cucumbers grown in protected cropping systems can be grown directly in the soil, which is normally the case in SA & WA. Hi-tech and low-tech hydroponic systems using different media such as coco peat is practiced in NSW, VIC & NT and in some production sites in SA.

Fusarium wilt is the most important disease of cucumbers in Australia according to recent industry consultation. In protected culture, *Fusarium oxysporum* f. sp. *radicis-cucumerinum* can colonize artificial growing media (e.g., blocks and/or slabs). Spread of this fungus occurs through root-to-root contact or by aerial dispersal of macroconidia and microconidia. Pruning creates wounds which are ideal entry sites for airborne macroconidia and microconidia. Disease development is favoured by cool air temperatures and soil temperatures ranging from 17–20°C.

There are many different fungal pathogens that can cause cucumber seedlings to wilt and die, known as 'damping-off'. Environmental conditions and crop hygiene play an important role in the incidence and severity of 'damping-off' losses.

In cucumbers, *Pythium*, *Phytophthora*, *Fusarium*, *Rhizoctonia* and fewer common fungi are associated with these losses. They may occur individually or as a combination.

Some of the fungal and bacterial diseases listed in this report have few fungicide options to suppress or control but should be supplemented by management practices that would increase airflow and minimise moisture in the plant canopy. Soil fumigation also helps in preventing some diseases.

There are no chemical cures for viruses that get transmitted by several aphids, thrips & whiteflies species in a non-persistent manner. A key aspect of virus disease management is to accurately identify the virus causing the disease and then implement appropriate management strategies. Keeping weeds that act as hosts and insects that transmit the viruses in check seem to be the best options available to control these viral diseases.

Management methods that promote clean seeds and transplant material, early detection and disposal of infected seedlings would keep most of these diseases in check whilst eliminating alternative hosts, crop rotation, cover crops, bio fumigation and farm hygiene are also important to prevent spread of these between sites. Taking precautions to prevent spread of disease from nursery to field would also help in this effort.

Resistance Management

Powdery mildew and Downy mildew are both considered to have a high risk of resistance development. In Australia there are confirmed cases of Powdery Mildew resistance to Group 8 Bupirimate, Group 11 Strobilurins and Group 3 Triadimenol.

There are several disease strategies that apply to cucumbers on the CropLife website², including Powdery mildew and Downy mildew.

² www.croplife.org.au/resources/programs/resistance-management/

4.1.2 Available and potential products for priority diseases

TABLE KEY: Note that blank fields in the table indicate no information has been provided.

Availability		Regulatory risk (refer to Appendix 6)	
A	Available via either registration or permit approval	R1	Short-term: Critical concern over retaining access
P	Potential - a possible candidate to pursue for registration or permit	R2	Medium-term: Maintaining access of significant concern
P-A	Potential, already approved in the crop for another use	R3	Long-term: Potential issues associated with use - Monitoring required
Withholding Period (WHP) – Number of days from last treatment to harvest (H) or Grazing (G)			
Harvest	H	Not Required when used as directed	NR
Grazing	G	No Grazing Permitted	NG

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Fusarium wilt /Root and stem rot (<i>Fusarium oxysporum</i>)							
Priority: High							
Fusarium wilt was ranked as a high priority in all consulted regions in VIC, QLD, NSW, WA, SA & NT. It is claimed that fusarium wilt is predominantly an issue during spring, summer and autumn months and adding too much Nitrogen (N) can increase the problem. In protected culture, <i>Fusarium oxysporum</i> f. sp. <i>radicis-cucumerinum</i> can colonize artificial growing media (e.g., blocks and/or slabs). Spread of this fungus occurs through root-to-root contact or by aerial dispersal of macroconidia and microconidia. Pruning creates wounds which are ideal entry sites for airborne macroconidia and microconidia. Disease development is favored by cool air temperatures and soil temperatures ranging from 17–20°C. No fungicides are registered for the control of <i>Fusarium</i> wilt in Cucumber, other than the soil fumigants. Crop management techniques, which includes, varietal choice, grafting onto resistant rootstocks, Crop rotations, Good farm and crop hygiene, optimal irrigation scheduling, Disinfection and testing of the water supply and control of fungus gnats which spread the fungus can help in controlling this disease.							
1,3-dichloropropene (Tri-Form)	-	Soil fumigant	NR	A	ALL	Registered for control of plant parasitic Nematodes, Symphylans, Wireworms, and soil borne diseases in field crops.	-
Chloropicrin + 1,3-dichloropropene (Tri-Form)	8B	Soil fumigant	NR	A	ALL (Restricted use TAS, VIC & SA)	Registered in vegetable crops for control of plant parasitic nematodes, symphylans, wireworms, soil borne diseases (including <i>Fusarium</i> and <i>Verticillium</i> wilts, <i>Rhizoctonia</i> , <i>Pythium</i>) and suppression of weeds. Restricted chemical. [Users may require fumigator license]	-
Dazomet (Cerlong)	8F	Soil fumigant	NR	A	ALL	Registered in broadacre seed beds for control of soil fungi (including <i>Fusarium</i> spp.), nematodes (cyst and non-cyst forming), soil insects and germinating seeds of weeds.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Ethanedinitrile (EDN Fumigas)	-	Soil fumigant	NR	A	ALL	Registered in cucurbits for control of soil borne pathogens (including <i>Fusarium oxysporum</i>), nematodes (including <i>Meloidogyne</i> spp.) and weeds (including <i>Amaranthus retroflexus</i> , <i>Cyperus rotundus</i> and <i>Solanum nigrum</i>). [Use by licensed fumigators or approved persons only].	-
Metham sodium (Imtrade)	-	Soil fumigant	NR	A	ALL	Registered for control of nematodes, various weeds & fungal diseases in field crops.	-
Fludioxonil + Sedaxane (Vibrance Premium) Syngenta	7+12	Protective seed treatment		P		Registered in potatoes for control of Black scurf, Silver surf, Black rot, Gangrene and Fusarium and suppression of Scab. Hort innovation is pursuing studies on control of rhizoctonia in beetroot.	R3
Guazatine Acetate (Panocrine) Farnoz	X	Post-harvest disease protectant		P		Registered in Rockmelons for control of various post-harvest fungal infections including Fusarium fruit rot (<i>Fusarium</i> spp.). Dip fruit for 45 seconds within 24 h of harvest.	-
Imazalil (Imzacure) Grochem	3	Post-harvest disease protectant		P		Registered in potatoes for control of storage diseases caused by Silver scurf (<i>Helminthosporium solani</i>), Gangrene (<i>Phoma exigua</i>) & Dry rot (<i>Fusarium</i> spp.)	-
Damping-off (<i>Pythium</i> spp., <i>Phytophthora</i> spp., <i>Fusarium</i> spp., <i>Rhizoctonia</i> spp.)							
Priority: High							
Damping-off was ranked as a high priority in SA, moderate priority in VIC, QLD & NSW & a low priority in WA & NT. There are many different fungal pathogens that can cause cucumber seedlings to wilt and die, known as 'damping-off'. Environmental conditions and crop hygiene play an important role in the incidence and severity of 'damping-off' losses. In cucumbers, Pythium, Phytophthora, Fusarium, Rhizoctonia and fewer common fungi are associated with these losses. They may occur individually or as a combination.							
Chloropicrin + 1,3-dichloropropene (Tri-Form)	8B	Soil fumigant	NR	A	ALL (Restricted use TAS, VIC & SA)	Registered in various crops including vegetables for control of plant parasitic nematodes, symphylans, wireworms, soil borne diseases (including <i>Fusarium</i> and <i>Verticillium</i> wilts, Rhizoctonia , Pythium) and suppression of weeds. Restricted chemical. [Users may require fumigator license]	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Chlorothalonil (Bravo)	M5	Protective	1	A	ALL	Registered in cucurbits including squash for control of Downy mildew, Gummy stem blight, Anthracnose, Alternaria leaf blight, Target leaf spot & Rhizoctonia . [Max. no. of applications not specified; re-treatment interval: 7 - 14 d]	R3
Metalaxyl (Farmalinx)	4	Systemic	7	A	QLD, NSW & WA	Registered in cucurbits for control of Damping off . [Max. 4 applications per crop; re-treatment interval: 7-10 d].	-
<i>Bacillus amyloliquefaciens</i> (Serenade Prime) Bayer	44	Protective Biofungicide		P		Registered as a soil ameliorant for suppression of Rhizoctonia in potatoes. Serenade Prime is also available to use in vegetable crops as a ready-to-use formulation of the highly active QST 713 strain of <i>Bacillus amyloliquefaciens</i> for application to soil to improve bioavailability of soil resources for agricultural and horticultural crops.	
<i>Bacillus amyloliquefaciens</i> (Serifel) strain MBI 600 BASF	44	Protective Biofungicide		P		Registered for control of <i>Botrytis</i> in grapes and strawberries in Australia. Registered in the USA in peppers for the management of <i>Pythium</i> spp., <i>Phytophthora</i> spp., <i>Fusarium</i> spp., Rhizoctonia spp..	-
Fludioxonil + Sedaxane (Vibrance Premium) Syngenta	7+12	Protective seed treatment		P		Registered in potatoes for control of black scurf (Rhizoctonia), Silver surf, Black rot, Gangrene and Fusarium dry rot and suppression of Scab. Hort innovation is pursuing studies to control Rhizoctonia in beetroot.	R3
<i>Streptomyces lydicus</i> WYEC108 (Actinovate) Novozymes Bioag	BM02	Protective Biofungicide		P		Registered in strawberries and tomato for control of Phytophthora and as a seed treatment in vegetables for control of Pythium, Fusarium and Rhizoctonia . Apply prior to onset of disease season. [Max. no. of applications and retreatment interval not specified].	-
Thiophanate-methyl + Etridiazole (Banrot) Everris Aust.	1+14	Systemic		P		Registered in container grown ornamentals and in ground bedding plants as a post plant soil drench for control of Pythium, Phytophthora, Rhizoctonia and <i>Thielaviopsis</i> .	

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Powdery mildew (<i>Podosphaera xanthii</i>)							
Priority: High							
Powdery mildew was ranked as a high priority in QLD, NSW, WA & SA, a moderate priority in VIC, and as a low priority in NT. Various agrochemical options are available to control this disease. Mini cucumber growers require short WHP as they harvest daily.							
*NOTE: There is a high risk of resistance development.							
In Australia there are confirmed cases of Powdery Mildew resistance to Group 8 (Bupirimate), Group 11 (Strobilurins) and Group 3 (Triadimenol).							
Azoxystrobin (Sanonda)	*11	Protective & curative	1	A	ALL	Registered in cucurbits for the control of Powdery mildew , Downy mildew, and Gummy stem blight. Commence soon after transplanting and continue till fruit maturity. Use subject to CropLife disease management strategies. [Max. no. of applications not specified; 2 sequential applications; re-treatment interval: 7 - 14 d].	-
Azoxystrobin + Oxathiapiprolin (Orondis)	*11+49	Protective & curative	3 NG	A	ALL	Registered in cucurbits including cucumber and pumpkin for the control of Downy mildew and suppression of Powdery mildew , Gummy stem blight and Sclerotinia spp. Use subject to CropLife disease management strategies. [Max. 2 applications per crop; re-treatment interval: 7 - 14 d].	-
Boscalid + Kresoxim-Methyl (Colliss)	*7+11	Systemic, protective & curative	7	A	ALL	Registered in cucurbits for control of Powdery mildew . Use subject to CropLife disease management strategies. [Max. 2 applications per crop; re-treatment interval: 7 - 10 d].	-
Bupirimate (Nimrod)	*8	Systemic, protective & curative	1	A	ALL	Registered in cucurbits including pumpkins cucumber and zucchini for control of Powdery mildew in. [Max. 4 applications per crop; re-treatment interval: 7 d].	-
Chlorothalonil (Sabakem) Sabakem	M5	Protective & curative	1	A	ALL	Registered in cucurbits for suppression of Powdery mildew . [Max. no. of applications not specified; re-treatment interval: 7 d].	R3
Copper octanoate (Tricop)	M1	Contact	1	A	ALL	Registered in cucurbits for control of Powdery mildew and Downy mildew. [Max. no. of applications not specified; re-treatment interval: 7-10 d]	-
Cyflufenamid (Cyflamid)	U6	Protective & curative	1	A	ALL	Registered in cucurbits for control of Powdery mildew . Begin application at first sign of disease. Use subject to CropLife disease management strategies. [Max. 2 applications per crop; re-treatment interval: 7 - 10 d].	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Hydrogen peroxide + peroxy acetic acid (Peratec)	M	Contact	1	A	ALL	Registered in cucumber for control of Powdery mildew (<i>Sphaerotheca</i> spp.). Use subject to CropLife disease management strategies. [Max. 4 applications per crop; re-treatment interval: 5-7 d].	-
Mancozeb + Sulphur (Amgrow)	M3+M2	Systemic & contact	7	A	ALL	Registered in cucumbers for control of Downy mildew and Powdery mildew . [max. no. of applications not specified; re-treatment interval 10 d]	R2
Metrafenone (Vivando)	U8	Protectant	7	A	ALL	Registered in cucurbits for control of Powdery mildew . [Max. 4 applications per crop; 2 sequential applications; re-treatment interval: 7-10 d].	-
Penthiopyrad (Fontelis)	7	Systemic	1	A	ALL	Registered in cucumber (field and protected) for control of Botrytis grey mould, Powdery mildew , and Gummy stem blight. [Max. no. of applications not specified; 2 sequential applications; re-treatment interval: 7 – 14 d].	-
Proquinazid (Talendo)	13	Protective	1	A	ALL	Registered in cucurbits (field grown only) for control of Powdery mildew . [Max. 3 applications per crop; 2 sequential applications; re-treatment interval: 10-14 d].	-
Potassium bicarbonate (Eco-Carb) PER13695	M2	Contact	NR	A	ALL (excl. VIC)	Permitted for use in cucumber for control of Powdery mildew . [Max. no. of applications not specified; re-treatment interval: 10-14 d].	-
Potassium silicate + bicarbonate (Eco-Carb)	M2	contact	NR	A	ALL	Registered in cucumbers for control of Powdery mildew . Begin application at first sign of disease. [Max. no. of applications not specified; re-treatment interval: 7 d].	-
Pyriofenone (Kusabi)	U8	Systemic	NR	A	ALL	Registered in cucumbers (protected cropping) for control of Powdery mildew . [max. 3 applications per crop; re-treatment interval not specified]	-
<i>Streptomyces lydicus</i> (Actinovate)	BM02	Biological	NR	A	ALL	Registered in cucurbits for suppression of Powdery mildew . [max no of applications and re-treatment intervals not specified]	-
Tea tree oil (Timorex Gold)	46	Protective	NR	A	ALL	Registered in cucumbers for control of Powdery mildew . [Max. no. of applications not specified; re-treatment interval: 7-10 d].	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Triadimefon (Novoguard)	*3	Systemic, protective & curative	1	A	NSW & WA	Registered in cucurbits for control of Powdery mildew . [Max. no. of applications not specified; re-treatment interval: 5-10 d].	R3
Triadimenol (Surefire)	*3	Protective & curative	1	A	ALL	Registered in cucurbits for control of Powdery mildew . [Max. 4 applications per crop; re-treatment interval: 5-10 d].	R3
Trifloxystrobin (Flint) PER14050	*11	Systemic, protective & curative	3	A	ALL (excl. VIC)	Permitted for use in cucumbers (protected grown) for control of Powdery mildew . Protected situations only. [Max. 2 applications per crop; re-treatment interval: 28 d].	-
BLAD (Banda de <i>Lupinus albus</i> doce) polypeptide (Problad) CEV S.A.	BM01	Contact & translaminar		P		Registered in stone fruit for control of Brown rot and Blossom blight in stone fruit. Pending final registered in USA in several crops for control of a variety of fungal diseases including botrytis and Powdery mildew .	
Fluopyram + Tebuconazole (Luna Experience) Bayer	*3+7	Protective		P		Registered in Australia for control of Yellow sigatoka, Leaf speckle and Cordana leaf spot in bananas. The US label is for use in almond, brassica leafy vegetables, legume vegetables, melons and various fruit crops for control of a variety of diseases including Powdery mildew, Alternaria leaf spot, Gummy stem blight, Septoria, Cladosporium, Cercospora, Sclerotinia, Botrytis leaf blight, Neck rot (<i>Botrytis allii</i> & <i>B. porri</i>), Purple blotch (<i>Alternaria porri</i>), Rusts (<i>Puccinia alli</i> & <i>P. porri</i>) Anthracnose and suppression of Rhizoctonia.	R3
Mefentrifluconazole (Belanty) BASF	*3	Systemic		P		Registered for control of Powdery mildew in grapes. This would be a good replacement for Triadimefon & Triadimenol in the future.	

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Downy mildew (<i>Pseudoperonospora cubensis</i>)							
Priority: High							
Downy Mildew was ranked as a high priority in NSW, and as a moderate priority in QLD, WA & SA and a low priority in VIC & NT. Multiple fungicide options, including Copper based products are available to control this disease.							
*NOTE: There is a high risk of resistance development.							
Azoxystrobin (Sanonda)	*11	Protective & curative	1	A	ALL	Registered in cucurbits for the control of Powdery mildew, Downy mildew , and Gummy stem blight. Commence soon after transplanting and continue till fruit maturity. Use subject to CropLife disease management strategies. [Max. no. of applications not specified; 2 sequential applications; re-treatment interval: 7 - 14 d].	-
Azoxystrobin + Oxathiapiprolin (Orondis)	*11+49		3 NG	A	ALL	Registered in cucurbits including cucumber and pumpkin for the control of Downy mildew and suppression of Powdery mildew, Gummy stem blight and Sclerotinia spp. Use subject to CropLife disease management strategies. [Max. 2 applications per crop; re-treatment interval: 7 - 14 d].	-
Benalaxyl + Mancozeb (Galben)	4+M3	Systemic	7	A	ALL	Registered in cucurbits for the control of Downy mildew , Anthracnose, Gummy stem blight, Alternaria leaf spot, and Septoria spot. [Max. 2 applications per crop; re-treatment interval: 7 - 10 d].	R2
Chlorothalonil (Bravo)	M5	Protective	1	A	ALL	Registered in cucumber for control of Downy mildew , Gummy stem blight, Anthracnose, Alternaria leaf blight and Target leaf spot. [Max. no. of applications not specified; re-treatment interval: 7 - 14 d]	R3
Copper ammonium acetate (Copperguard)	M1	Protective	1	A	ALL	Registered in cucurbits for the control of Downy mildew and Angular leaf spot. [Max. no. of applications not specified; re-treatment interval: 7 - 10 d].	-
Copper Hydroxide + Metalaxyl-M (Ridomil Gold Plus)	M1+4	Contact	1	A	ALL	Registered in cucumber for control of Downy mildew . [Max. 2 applications per crop; re-treatment interval: 7 - 10 d]	-
Copper octanoate (Tricop)	M1	Contact	1	A	ALL	Registered in cucurbits for control of Powdery mildew and Downy mildew . [Max. no. of applications not specified; re-treatment interval: 7-10 d]	-
Copper Oxychloride (Curenox)	M1	Protective	1	A	NSW, ACT, WA & NT	Registered in cucurbits for control of Angular leaf spot, Bacterial leaf spot, Downy mildew , Anthracnose, Gummy stem blight. [Max. no. of applications not specified; re-treatment interval: 7 d].	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Dimethomorph (Eureka)	40	Systemic, Contact	7	A	ALL	Registered in cucurbits for control of Downy mildew , Anthracnose, Gummy stem blight, Alternaria leaf spot, and Septoria spot. [Max. 4 applications per crop; re-treatment interval: 7-10 d].	-
Mancozeb (Agrevo)	M3	Systemic	7	A	ALL	Registered in cucumbers for control of Downy mildew . [Max. no. of applications not specified; re-treatment interval: 7-10 d].	R2
Mancozeb + metalaxyl (Zeemil)	M3+4	Systemic, protective & curative	7	A	ALL	Registered in cucurbits for control of Downy mildew , Anthracnose, Gummy stem blight, and Alternaria leaf spot. Use subject to phenylamide anti-resistant strategy. [max. no. of applications not specified; re-treatment interval 7-10 d]	R2
Mancozeb+ Sulphur (Amgrow)	M3+M2	Systemic & contact	7	A	ALL	Registered in cucumbers for control of Downy mildew and Powdery mildew. [max. no. of applications not specified; re-treatment interval 10 d]	R2
Metiram (Polyram)	M3	Non-systemic & protective	7	A	ALL	Registered in cucumber for the control of Downy mildew and Gummy stem blight. [Max. no. of applications not specified; re-treatment interval: 7 d]	R2
Oxathiapiprolin (Zorvec)	49	Systemic & protective	1	A	ALL	Registered in cucumber for control of Downy mildew . [Max. 3 applications per crop; 2 consecutive; re-treatment interval 7-10 d]	-
Phosphorous acid (Ezycrop)	33	Contact	NR	A	ALL	Registered in cucurbits for the control of Downy mildew . [Max. no. of applications not specified; re-treatment interval 7 d]	-
Propamocarb hydrochloride + fluopicolide (Infinito)	28+43	Protective, translaminar & systemic	1	A	ALL	Registered in cucurbits (field and protected) for the control of Downy mildew . Use subject to CropLife Resistance management strategies. [max 2 applications per crop; re-treatment interval: 7-10 d]	-
Propineb (Antracol)	M3	Contact & protective	3	A	ALL	Registered in cucumber for the control of Downy mildew . [Max. 4 applications per crop; re-treatment interval: 7- d]	R2
Propineb + oxadixyl (Rebound)	4+M3	Systemic & Contact	3	A	ALL	Registered in cucurbits for the control of Downy mildew , Gummy stem blight, and Anthracnose. [Max. no. of applications not specified; 2 sequential applications; re-treatment interval: 7 – 10 d].	R2
Zineb (Barmac)	M3	Protective	7	A	ALL	Registered in cucurbits for the control of Downy mildew and Anthracnose. [Max. no. of applications not specified; re-treatment interval: 7 d]	R2

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Dimethomorph + Amitoctradin (Zampro) AgNova/BASF	45+40	Protective		P		Hort Innovation Data generation project (ST17000) in cucurbits, completed and data submitted via BASF for a label extension for Downy Mildew control in cucurbits in Mid-2020	
Cyazofamid (Ranman) ISK	21	Protective & curative		P		Registered in Brassica leafy vegetable seedlings for the control of Downy mildew .	-
Phosphorous acid (Agri-fos) Liquid Fertiliser	33	Systemic		P		Registered in grapes for control of Downy mildew . Apply as required when conditions favour disease development.	-
Alternaria (<i>Alternaria cucumerina</i>)							
Priority: Moderate							
Alternaria was ranked as a moderate priority in QLD, NSW & WA, and a low priority in VIC, SA & NT.							
Benalaxyl + Mancozeb (Galben)	D+Y	Systemic & Protective	7	A	QLD	Registered in cucurbits for the control of Downy mildew, Anthracnose, Gummy stem blight, Alternaria leaf blight , and Septoria spot. [Max. 2 applications per crop; re-treatment interval: 7 - 10 d].	R2
Chlorothalonil (Bravo)	M5	Protective	1	A	ALL	Registered in cucumber for control of Downy mildew, Gummy stem blight, Anthracnose, Alternaria leaf blight and Target leaf spot. [Max. no. of applications not specified; re-treatment interval: 7 - 14 d]	R3
Dimethomorph (Eureka)	40	Systemic & Contact	7	A	QLD & NT	Registered in cucurbits for control of Downy mildew, Anthracnose, Gummy stem blight, Alternaria leaf spot , and Septoria spot. [Max. 4 applications per crop; re-treatment interval: 7-10 d]	-
Mancozeb + metalaxyl (Zeemil)	M3+4	Systemic, protective & curative	7	A	QLD	Registered in cucurbits for control of downy mildew, Anthracnose, Gummy stem blight, and Alternaria leaf spot . Use subject to phenylamide ant-resistant strategy. [max. no. of applications not specified; re-treatment interval 7-10 d]	R2

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Fluazinam (Surefire) PCT Holdings	29	Protective		P		Registered in brassica vegetables in Australia for Club root. Registered in the US for Sclerotinia and Alternaria control in carrots.	
Fluopyram + Tebuconazole (Luna Experience) Bayer	3+7	Protective		P		Registered in Australia for control of Yellow sigatoka, Leaf speckle and Cordana leaf spot in bananas. The US label is for use in almond, brassica leafy vegetables, legume vegetables, melons and various fruit crops for control of a variety of diseases including Powdery mildew, Alternaria leaf spot, Gummy stem blight, Septoria, Cladosporium, Cercospora, Sclerotinia, Botrytis leaf blight, Neck rot (<i>Botrytis allii</i> & <i>B. porri</i>), Purple blotch (Alternaria porri), Rusts (<i>Puccinia alli</i> & <i>P. porri</i>) Anthracnose and suppression of Rhizoctonia.	R3
Grey mould (<i>Botrytis cinerea</i>)							
Priority: Moderate							
Grey mould was ranked as a moderate priority in QLD, NSW, WA & SA and low priority in VIC & NT.							
Captan (Crop Care) PER14326	M4	Protective & curative	7	A	ALL (excl. VIC)	Permitted for use in cucumber for control of Grey mould . [Max. 3 applications per crop; re-treatment interval: 7 - 14 d]	-
Chloropicrin + 1,3-dichloropropene (Tri-Form)	8B	Soil fumigant	NR	A	ALL (Restricted use TAS, VIC & SA)	Registered in various crops including vegetables for control of plant parasitic nematodes, symphylans, wireworms, soil borne diseases and suppression of weeds. Restricted chemical. [Users may require fumigator license]	-
Chlorothalonil (Bravo) PER82895	M5	Protective	1	A	ALL (excl. VIC)	Permitted for use in cucumber for control of Grey mould . [Max. 4 applications per crop; re-treatment interval: 7 d]	R3
Cyprodinil+ Fludioxonil (Switch)	9+12	Systemic	3	A	ALL	Registered in cucumber for control of Grey mould . [Max. 3 applications per crop; re-treatment interval: 7 - 10 d]	R3
Fenhexamid (Teldor) PER12447	J	Protective	3	A	ALL (excl. VIC)	Permitted for use in cucumber for control of Grey mould . [Max. 2 applications per crop; re-treatment interval: 7 – 10 d].	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Iprodione (Rovral) PER81589	2	Contact & systemic	7 NG	A	ALL (excl. VIC)	Permitted for use in cucumber for control of Grey mould and Sclerotinia rot. [Max. 3 applications per crop; re-treatment interval: 10-14 d].	R2
Mancozeb (Agrevo) PER14046	M3	Systemic	7	A	ALL	Permitted for use in cucumber for control of Grey mould . [Max. 8 applications per crop; re-treatment interval not specified].	R2
Penthiopyrad (Fontelis)	7	Systemic	1	A	ALL	Registered in cucumber (field and protected) for control of botrytis Grey mould , Powdery mildew, and Gummy stem blight. [Max. no. of applications not specified; 2 sequential applications; re-treatment interval: 7 – 14 d].	-
Pyrimethanil (Scala) PER7909	9	Protective & curative	1	A	ALL (excl. VIC)	Permitted for use in cucumber for control of Grey mould . [Max. 2 applications per crop; re-treatment interval: 7 d].	-
<i>Aureobasidium pullulans</i> (Botector) Nufarm	-	Protective Biofungicide		P		Registered in grapes and berries for control of Botrytis and suppression of several other fungal pathogens (Anthracnose, Phomopsis and Rhizopus) in berries.	-
<i>Bacillus amyloliquefaciens</i> (Serenade Opti) Bayer	44	Protective Biofungicide		P		Registered for control of Botrytis in tomato, capsicum, chilli and several fruits. Registered in US for control of various fungal diseases in a range of fruits and vegetables.	
<i>Bacillus amyloliquefaciens</i> (Serifel) strain MBI 600 BASF	44	Protective Biofungicide		P		Registered for control of Botrytis in grapes and strawberries in Australia. Registered in the USA in peppers for the management of <i>Pythium</i> spp., <i>Phytophthora</i> spp., <i>Fusarium</i> spp., <i>Rhizoctonia</i> spp..	-
BLAD (Banda de <i>Lupinus albus</i> doce) polypeptide CEV S.A.	BM01	Contact & translaminar		P		Registered in stone fruit for control of Brown rot and Blossom blight in stone fruit. Pending final registered in USA in several crops for control of a variety of fungal diseases including Botrytis and Powdery mildew.	

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Fluopyram + Tebuconazole (Luna Experience) Bayer	3+7	Protective		P		Registered in Australia for control of Yellow sigatoka, Leaf speckle and Cordana leaf spot in bananas. The US label is for use in almond, brassica leafy vegetables, legume vegetables, melons and various fruit crops for control of a variety of diseases including Powdery mildew, Alternaria leaf spot, Gummy stem blight, Septoria, Cladosporium, Cercospora, Sclerotinia, Botrytis leaf blight, Neck rot (<i>Botrytis allii</i> & <i>B. porri</i>), Purple blotch (<i>Alternaria porri</i>), Rusts (<i>Puccinia alli</i> and <i>P. porri</i>) Anthracnose and suppression of Rhizoctonia.	R3
Gummy stem blight (<i>Didymella bryoniae</i>) Priority: Moderate Gummy stem blight was ranked as a moderate priority in VIC, QLD, NSW & SA, and as a low priority in WA & NT.							
Azoxystrobin (Sanonda)	11	Protective & curative	1	A	ALL	Registered in cucurbits for the control of Powdery mildew, Downy mildew, and Gummy stem blight . Commence soon after transplanting and continue till fruit maturity. Use subject to CropLife disease management strategies. [Max. 2 applications per crop; re-treatment interval: 7 - 14 d].	-
Azoxystrobin + Oxathiapiprolin (Orondis)	11+49		3 NG	A	ALL	Registered in cucurbits including cucumber and pumpkin for the control of Downy mildew and suppression of Powdery mildew, Gummy stem blight and Sclerotinia spp. Use subject to CropLife disease management strategies. [Max. 2 applications per crop; re-treatment interval: 7 - 14 d].	-
Benalaxyl + Mancozeb (Galben)	D+Y	Systemic & Protective	7	A	QLD	Registered in cucurbits for the control of Downy mildew, Anthracnose, Gummy stem blight , Alternaria leaf spot & Septoria spot. [Max. 2 applications per crop; re-treatment interval: 7 - 10 d].	R2
Chlorothalonil (Bravo)	M5	Protective	1	A	ALL	Registered in cucumber for control of Downy mildew, Gummy stem blight , Anthracnose, Alternaria leaf blight and target leaf spot. [Max. no. of applications not specified; re-treatment interval: 7 - 14 d]	R3
Copper Oxychloride (Curenox)	M1	Protective	1	A	NSW, ACT, WA & NT	Registered in cucurbits for control of Angular leaf spot, Bacterial leaf spot, Downy mildew, Anthracnose, Gummy stem blight . [Max. no. of applications not specified; re-treatment interval: 7 d].	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Dimethomorph (Eureka)	40	Systemic & Contact	7	A	QLD & NT	Registered in cucurbits for control of Downy mildew, Anthracnose, Gummy stem blight , Alternaria leaf spot & Septoria spot. [Max. 4 applications per crop; re-treatment interval: 7-10 d].	-
Mancozeb (Agrevo)	M3	Systemic	7	A	ALL	Registered in cucumbers for control of Downy mildew, Anthracnose & Gummy stem blight . [Max. no. of applications not specified; re-treatment interval: 7-10 d].	R2
Mancozeb + metalaxyl (Zeemil)	M3+4	Systemic, protective & curative	7	A	QLD	Registered in cucurbits for control of Downy mildew, Anthracnose, Gummy stem blight & Alternaria leaf spot. Use subject to phenylamide ant-resistant strategy. [max. no. of applications not specified; re-treatment interval 7-10 d]	R2
Penthiopyrad (Fontelis)	7	Systemic	1	A	ALL	Registered in cucumber (field and protected) for control of Botrytis grey mould, Powdery mildew, and Gummy stem blight . [Max. no. of applications not specified; 2 sequential applications; re-treatment interval: 7 – 10 d].	-
Metiram (Polyram)	M3	Non-systemic & protective	2	A	ALL	Registered in cucumber for the control of Downy mildew and Gummy stem blight . [Max. no. of applications not specified; re-treatment interval: 7 d]	R2
Propineb + oxadixyl (Rebound)	4+M3	Systemic & Contact	3	A	ALL	Registered in cucurbits for the control of Downy mildew, Gummy stem blight , and Anthracnose. [Max. no. of applications not specified; 2 sequential applications; re-treatment interval: 7 – 10 d].	R2
Fluopyram + Tebuconazole (Luna Experience) Bayer	3+7	Protective		P		Registered in Australia for control of Yellow sigatoka, Leaf speckle and Cordana leaf spot in bananas. The US label is for use in almond, brassica leafy vegetables, legume vegetables, melons and various fruit crops for control of a variety of diseases including Powdery mildew, Alternaria leaf spot, Gummy stem blight , Septoria, Cladosporium, Cercospora, Sclerotinia, Botrytis leaf blight, Neck rot (<i>Botrytis allii</i> & <i>B. porri</i>), Purple blotch (<i>Alternaria porri</i>), Rusts (<i>Puccinia allii</i> and <i>P. porri</i>) Anthracnose and suppression of Rhizoctonia.	R3

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Angular leaf spot (<i>Pseudomonas syringae</i>)							
Priority: Low							
Angular leaf spot was ranked as a low priority in all States and Territories surveyed (VIC, QLD, NSW, WA, SA & NT).							
Copper ammonium acetate (Copperguard)	M1	Protective	1	A	ALL	Registered in cucurbits for the control of Downy mildew and Angular leaf spot . [Max. no. of applications not specified; re-treatment interval: 7 - 10 d].	-
Copper Oxychloride (Curenox)	M1	Protective	1	A	ALL	Registered in cucumber for control of Angular leaf spot and Bacterial leaf spot. [Max. no. of applications not specified; re-treatment interval: 7 d].	-
Anthracnose (<i>Colletotrichum orbiculare</i>)							
Priority: Low							
Anthracnose was ranked as a low priority in all States and Territories surveyed (VIC, QLD, NSW, WA, SA & NT).							
Benalaxyl + Mancozeb (Galben)	D+Y	Systemic & Protective	7	A	QLD	Registered in cucurbits for the control of Downy mildew, Anthracnose , Gummy stem blight, Alternaria leaf spot & Septoria spot. [Max. 2 applications per crop; re-treatment interval: 7 - 10 d].	R2
Chlorothalonil (Bravo)	M5	Protective	1	A	ALL	Registered in cucumber for control of Downy mildew, Gummy stem blight, Anthracnose , Alternaria leaf blight and target leaf spot. [Max. no. of applications not specified; re-treatment interval: 7 - 14 d]	R3
Copper Oxychloride (Curenox)	M1	Protective	1	A	NSW, ACT, WA & NT	Registered in cucurbits for control of Angular leaf spot, Bacterial leaf spot, Downy mildew, Anthracnose , Gummy stem blight. [Max. no. of applications not specified; re-treatment interval: 7 d].	-
Dimethomorph (Eureka)	40	Systemic & Contact	7	A	QLD & NT	Registered in cucurbits for control of Downy mildew, Anthracnose , Gummy stem blight, Alternaria leaf spot, and Septoria spot. [Max. 4 applications per crop; re-treatment interval: 7-10 d].	-
Mancozeb (Agrevo)	M3	Protective	7	A	ALL	Registered in cucumbers for control of Downy mildew, Anthracnose and Gummy stem blight. [Max. no. of applications not specified; re-treatment interval: 7-10 d].	R2
Mancozeb + metalaxyl (Zeemil)	M3+4	Systemic, protective & curative	7	A	QLD	Registered in cucurbits for control of Downy mildew, Anthracnose , Gummy stem blight, Septoria leaf spot and Alternaria leaf spot. Use subject to phenylamide ant-resistant strategy. [max. no. of applications not specified; re-treatment interval 7-10 d]	R2

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Propineb + oxadixyl (Rebound)	4+M3	Systemic & contact	3	A	ALL	Registered in cucurbits for the control of Downy mildew, Gummy stem blight, and Anthracnose . [Max. no. of applications not specified; 2 sequential applications; re-treatment interval: 7 – 10 d].	R2
Zineb (Barmac)	M3	Protective	7	A	ALL	Registered in cucurbits for the control of Downy mildew and Anthracnose . [Max. no. of applications not specified; re-treatment interval: 7 d]	R2
<i>Aureobasidium pullulans</i> (Botector) Nufarm	-	Protective Biofungicide		P		Registered in grapes and berries for control of Botrytis and suppression of several other fungal pathogens (Anthracnose , Phomopsis and Rhizopus) in berries.	
<i>Bacillus amyloliquefaciens</i> (Serenade Opti) Bayer	44	Protective Biofungicide		P		Registered for control of Anthracnose in avocado and several tropical fruits. Registered in US for control of various fungal diseases in a range of fruits and vegetables.	
Fluopyram + Tebuconazole (Luna Experience) Bayer	3+7	Protective		P		Registered in Australia for control of Yellow sigatoka, Leaf speckle and Cordana leaf spot in bananas. The US label is for use in almond, brassica leafy vegetables, legume vegetables, melons and various fruit crops for control of a variety of diseases including Powdery mildew, Alternaria leaf spot, Gummy stem blight, Septoria, Cladosporium, Cercospora, Sclerotinia, Botrytis leaf blight, Neck rot (<i>Botrytis allii</i> & <i>B. porri</i>), Purple blotch (<i>Alternaria porri</i>), Rusts (<i>Puccinia alli</i> and <i>P. porri</i>) Anthracnose and suppression of Rhizoctonia.	R3
Bacterial spot (<i>Xanthomonas campestris</i>)							
Priority: Low							
Bacterial spot was ranked as a low priority in all States and Territories surveyed (VIC, QLD, NSW, WA, SA & NT).							
Copper ammonium acetate complex (Cop-it)	M1	Protective	1	A	ALL	Registered in cucumber for the control of Downy mildew, Angular leaf spot, and Bacterial leaf spot . Apply at first signs of disease. [Max. no. of applications not specified; re-treatment interval: 7 - 10 d].	-
Copper Oxychloride (Curenox)	M1	Protective	1	A	ALL	Registered in cucurbits for control of Angular leaf spot, bacterial leaf spot , downy mildew, Anthracnose, Gummy stem blight. [Max. no. of applications not specified; re-treatment interval: 7 d].	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
<i>Bacillus amyloliquefaciens</i> (Serenade Opti) Bayer	44	Protective Biofungicide		P	ALL	Registered for control of Xanthomonas in tomato, capsicum, chilli in field and protected cropping systems. Registered in US for control of various fungal diseases in a range of fruits and vegetables.	-
Phytophthora soil fungus (<i>Phytophthora spp.</i>)							
Priority: Low							
Phytophthora soil fungus was ranked as a moderate priority in SA and as a low priority in VIC, QLD, NSW, WA & NT.							
Chloropicrin + 1,3-dichloropropene (Tri-Form)	8B	Soil fumigant	NR	A	ALL (Restricted use TAS, VIC & SA)	Registered in various crops including vegetables for control of plant parasitic nematodes, symphylans, wireworms, soil borne diseases and suppression of weeds. Restricted chemical. [Users may require fumigator license]	-
<i>Bacillus amyloliquefaciens</i> (Serifel) strain MBI 600 BASF	44	Protective Biofungicide		P		Registered for control of <i>Botrytis</i> in grapes and strawberries in Australia. Registered in the USA in peppers for the management of <i>Pythium</i> spp., Phytophthora spp., <i>Fusarium</i> spp., <i>Rhizoctonia</i> spp..	-
Metalaxyl-M (Ridomil Gold) Syngenta	4	Systemic		P		Registered for control of Phytophthora in pineapples.	-
<i>Streptomyces lydicus</i> WYEC108 (Actinovate) Novozymes Bioag	BM02	Protective Biofungicide		P		Registered in strawberries and tomato for control of Phytophthora and as a seed treatment in vegetables for control of Pythium, Fusarium and Rhizoctonia . Apply prior to onset of disease season. [Max. no. of applications and retreatment interval not specified].	-
Rhizoctonia ground rot (<i>Rhizoctonia solani</i>)							
Priority: Low							
Rhizoctonia ground rot was ranked as a low priority in all States and Territories surveyed (VIC, QLD, NSW, WA, SA & NT).							
Chloropicrin + 1,3-dichloropropene (Tri-Form)	8B	Soil fumigant	NR	A	ALL (Restricted use TAS, VIC & SA)	Registered in various crops including vegetables for control of plant parasitic Nematodes, Symphylans, Wireworms, soil borne diseases (including <i>Fusarium</i> and <i>Verticillium</i> wilts, Rhizoctonia , <i>Pythium</i>) and suppression of weeds. Restricted chemical. [Users may require fumigator license]	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Chlorothalonil (Bravo)	M5	Protective	1	A	ALL	Registered in cucurbits including cucumber for control of Downy mildew, Gummy stem blight, Anthracnose, Alternaria leaf blight, Target leaf spot & Rhizoctonia . [Max. no. of applications not specified; re-treatment interval: 7 - 14 d]	R3
<i>Bacillus amyloliquefaciens</i> (Serenade Prime) Bayer	44	Protective Biofungicide		P		Registered as a soil ameliorant for suppression of Rhizoctonia in potatoes.	
<i>Bacillus amyloliquefaciens</i> (Serifel) strain MBI 600 BASF	44	Protective Biofungicide		P		Registered for control of <i>Botrytis</i> in grapes and strawberries in Australia. Registered in the USA in peppers for the management of <i>Pythium</i> spp., <i>Phytophthora</i> spp., <i>Fusarium</i> spp., Rhizoctonia spp..	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	3+7	Protective		P		Registered in Australia for control of Yellow sigatoka, Leaf speckle and Cordana leaf spot in bananas. The US label is for use in almond, brassica leafy vegetables, legume vegetables, melons and various fruit crops for control of a variety of diseases including Powdery mildew, Alternaria leaf spot, Gummy stem blight, Septoria, Cladosporium, Cercospora, Sclerotinia, Botrytis leaf blight, Neck rot (<i>Botrytis allii</i> & <i>B. porri</i>), Purple blotch (<i>Alternaria porri</i>), Rusts (<i>Puccinia alli</i> and <i>P. porri</i>) Anthracnose and suppression of Rhizoctonia.	R3
<i>Streptomyces lydicus</i> WYEC108 (Actinovate) Novozymes Bioag	BM02	Protective Biofungicide		P		Registered in strawberries and tomato for control of Phytophthora and as a seed treatment in vegetables for control of <i>Pythium</i> , <i>Fusarium</i> and Rhizoctonia . Apply prior to onset of disease season. [Max. no. of applications and retreatment interval not specified].	-
Septoria spot (<i>Septoria cucurbitacearum</i>)							
Priority: Low							
Septoria spot was ranked as a low priority in all States and Territories surveyed (VIC, QLD, NSW, WA, SA & NT).							
Benalaxyl + Mancozeb (Galben)	D+Y	Systemic	7	A	QLD	Registered in cucurbits for the control of Downy mildew, Anthracnose, Gummy stem blight, Alternaria leaf spot & Septoria spot . [Max. 2 applications per crop; re-treatment interval: 7 - 10 d].	R2

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Dimethomorph (Eureka)	40	Systemic & Contact	7	A	QLD & NT	Registered in cucurbits for control of Downy mildew, Anthracnose, Gummy stem blight, Alternaria leaf spot, and Septoria spot . [Max. 4 applications per crop; re-treatment interval: 7-10 d].	-
Mancozeb (Agrevo)	M3	Systemic	7	A	QLD	Registered in cucurbits including pumpkin for control of Downy mildew, Anthracnose, Gummy stem blight and Septoria leaf spot (QLD only). [Max. no. of applications not specified; re-treatment interval 7-10 d]	R2
Mancozeb + Metalaxyl (Zeemil)	M3+4	Systemic, protective & curative	7	A	QLD	Registered in cucurbits for control of Downy mildew, Anthracnose, Gummy stem blight, Septoria leaf spot and Alternaria leaf spot. Use subject to phenylamide ant-resistant strategy. [max. no. of applications not specified; re-treatment interval 7-10 d]	R2
Fluopyram + Tebuconazole (Luna Experience) Bayer	3+7	Protective		P		Registered in Australia for control of Yellow sigatoka, Leaf speckle and Cordana leaf spot in bananas. The US label is for use in almond, brassica leafy vegetables, legume vegetables, melons and various fruit crops for control of a variety of diseases including Powdery mildew, Alternaria leaf spot, Gummy stem blight, Septoria, Cladosporium, Cercospora, Sclerotinia, Botrytis leaf blight, Neck rot (<i>Botrytis allii</i> & <i>B. porri</i>), Purple blotch (<i>Alternaria porri</i>), Rusts (<i>Puccinia alli</i> and <i>P. porri</i>) Anthracnose and suppression of Rhizoctonia.	R3
Scab (<i>Cladosporium</i> spp.)							
Priority: Low							
Scab was ranked as a low priority in all States and Territories surveyed (VIC, QLD, NSW, WA, SA & NT).							
Chloropicrin + 1,3-dichloropropene (Tri-Form)	8B	Soil fumigant	NR	A	ALL (Restricted use TAS, VIC & SA)	Registered in various crops including vegetables for control of plant parasitic Nematodes, Symphylans, Wireworms, soil borne diseases (including <i>Fusarium</i> and <i>Verticillium</i> wilts, <i>Rhizoctonia</i> , <i>Pythium</i>) and suppression of weeds. Restricted chemical. [Users may require fumigator license]	-
Azoxystrobin (Sanonda) Sanonda Aust.	11	Protective & curative		P-A		Registered in passion fruit for control of Cladosporium and <i>Alternaria</i> . Currently registered in cucumber for Powdery mildew, Downy mildew, and Gummy stem blight	

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Fludioxonil + Sedaxane (Vibrance Premium) Syngenta	7+12	Protective seed treatment	NR	P		Registered in potatoes for control of Black scurf, Silver surf, Black rot, Gangrene and Fusarium dry rot and suppression of Scab . Hort innovation is pursuing studies to control Rhizoctonia in beetroot.	R3
Fluopyram + Tebuconazole (Luna Experience) Bayer	3+7	Protective		P		Registered in Australia for control of Yellow sigatoka, Leaf speckle and Cordana leaf spot in bananas. The US label is for use in almond, brassica leafy vegetables, legume vegetables, melons and various fruit crops for control of a variety of diseases including Powdery mildew, Alternaria leaf spot, Gummy stem blight, Septoria, Cladosporium, Cercospora, Sclerotinia, Botrytis leaf blight, Neck rot (<i>Botrytis allii</i> & <i>B. porri</i>), Purple blotch (<i>Alternaria porri</i>), Rusts (<i>Puccinia alli</i> and <i>P. porri</i>) Anthracnose and suppression of Rhizoctonia.	R3
<p>Target spot (<i>Cercospora citrullina</i>) Priority: Low Target spot was ranked as a low priority in all States and Territories surveyed (VIC, QLD, NSW, WA, SA & NT).</p>							
Chlorothalonil (Bravo)	M5	Protective	1	A	ALL	Registered in cucumber for control of Downy mildew, Gummy stem blight, Anthracnose, Alternaria leaf blight and Target leaf spot . [Max. no. of applications not specified; re-treatment interval: 7 - 14 d]	R3
Azoxystrobin + Difenconazole (Amistar top) Syngenta	3+11	Protective & curative		P		Registered in carrots for control of Alternaria, Cercospora and Powdery mildew; Alternaria and Phytophthora in potatoes; Alternaria, Phytophthora, Sclerotinia and Powdery mildew in tomatoes.	R3
Fluopyram + Tebuconazole (Luna Experience) Bayer	3+7	Protective		P		Registered in Australia for control of Yellow sigatoka, Leaf speckle and Cordana leaf spot in bananas. The US label is for use in almond, brassica leafy vegetables, legume vegetables, melons and various fruit crops for control of a variety of diseases including Powdery mildew, Alternaria leaf spot, Gummy stem blight, Septoria, Cladosporium, Cercospora, Sclerotinia, Botrytis leaf blight, Neck rot (<i>Botrytis allii</i> & <i>B. porri</i>), Purple blotch (<i>Alternaria porri</i>), Rusts (<i>Puccinia alli</i> and <i>P. porri</i>) Anthracnose and suppression of Rhizoctonia.	R3

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Viruses - Cucumber Green Mottle Mosaic Virus (CGMMV), Zucchini yellow mosaic virus (ZYMV)							
Tomato Spotted Wilt Virus & Beet Pseudo-Yellows Virus							
Priority: Low							
Growers ranked viruses in general as a low priority in VIC, QLD, NSW, WA, SA & NT. Viruses are transmitted by several aphid species in a non-persistent manner. A key aspect of virus disease management is to accurately identify the virus causing the disease and then implement appropriate management strategies. Keeping weeds that act as hosts and insects that transmit the viruses in check seem to be the best options available to control these viral diseases.							

4.2 Insects, mites and other pests of cucumber

4.2.1 Insects, mites and other pest priorities

Common name	Scientific name
High	
Two-spotted mites	<i>Tetranychus urticae</i>
Western flower thrips	<i>Frankliniella occidentalis</i>
Silverleaf whiteflies	<i>Bemisia tabaci</i>
Greenhouse whiteflies	<i>Trialeurodes vaporariorum</i>
Moderate	
Fungus gnats	<i>Bradysia</i> spp., Sciaridae
Green peach aphid	<i>Myzus persicae</i>
Cotton bollworm / Corn earworm	<i>Helicoverpa armigera</i>
Native budworm	<i>Helicoverpa punctigera</i>
Root knot nematode	<i>Meloidogyne</i> spp.
Thrips	<i>Thysanoptera</i>
Onion thrips	<i>Thrips tabaci</i>
Plague thrips	<i>Thrips imagines</i>
Low	
28-spotted potato ladybird	<i>Henosepilachna vigintiseipunctata</i>
Ants	Formicidae
Cucumber fly	<i>Bactrocera cucumis</i>
Cucumber moth	<i>Diaphania indica</i>
Green vegetable bug	<i>Nezara viridula</i>
Jassids / Leafhoppers	Cicadellidae
Mealybugs	<i>Pseudococcidae</i>
Melon thrips	<i>Thrips palmi</i>
Pumpkin beetle	<i>Aulacophora hilaris</i>
Rutherglen Bug	<i>Nysius vinitor</i>
Wingless grasshopper	<i>Phaulacridium vittatum</i>

Non-ranked pests and new incursions of an exotic pest which poses a potential threat.

New Pest to Australia (unknown priority)	
Brown marmorated stink bug & Yellow spotted stink bug	<i>Halyomorpha halys</i> <i>Erthesina fullo</i> & <i>E. accuminata</i>
Fall Armyworm	<i>Spodoptera frugiperda</i>
Tomato potato psyllid	<i>Bactericera cockerelli</i>
Tomato red spider mite	<i>Tetranychus evansi</i>
Vegetable leaf miner	<i>Liriomyza sativae</i>

As part of the recent industry consultation, sucking insects (Silverleaf whitefly Greenhouse whitefly & Thrips) along with mites were reported to be of the highest priority.

Resistance Management

There are several insecticide management strategies that apply to cucumbers on the CropLife website³, including Silverleaf whitefly, Mites, Thrips & Aphids.

Further development and extension of IPM strategies and best management practices that can be implemented in the management of sucking insects and mites in cucumbers may be warranted.

³ www.croplife.org.au/resources/programs/resistance-management/

4.2.2 Available and potential products for priority insects, mites and other pests

TABLE KEY: Note that blank fields in the table indicate no information has been provided.

Availability		Regulatory risk (refer to Appendix 6)	
A	Available via either registration or permit approval	R1	Short-term: Critical concern over retaining access
P	Potential - a possible candidate to pursue for registration or permit	R2	Medium-term: Maintaining access of significant concern
P-A	Potential, already approved in the crop for another use	R3	Long-term: Potential issues associated with use - Monitoring required
Withholding Period (WHP) – Number of days from last treatment to harvest (H) or Grazing (G)			
Harvest	H	Not Required when used as directed	NR
Grazing	G	No Grazing Permitted	NG
IPM – indicative overall impact on beneficials (based on the Cotton Pest Management Guide 2018-19 and cotton use patterns)			
VL – Very low; L – Low; M – Moderate; H – High; VH – Very High; - not specified			

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Two spotted mites (<i>Tetranychus urticae</i>)								
Priority: High								
Mites were ranked as a high priority in VIC, QLD, WA, NT & SA, and as a moderate priority in NSW. It is one of the biggest pest issues in field and protected cucumber productions. This is a new exotic mite and has not advanced into commercial crops but is a high-risk mite.								
1,3-dichloropropene (Tri-Form)	-	Soil fumigant	NR	A	ALL	Registered in vegetables for control of soil borne pests. Leave soil undisturbed for 14 d after treatment.	-	-
Abamectin (Vantal Upgrade)	6	Contact	3	A	ALL	Registered in cucumber for control of Western flower thrips and Two-spotted mite . [Max 2 applications per crop; re-treatment interval 28 d].	M H-Bees	-
<i>Beauveria bassiana</i> (Broadband OD / Velifer)	UNF	Protective biopesticide	NR	A	ALL	Registered in protected vegetables and ornamentals for suppression of various pests including: Western Flower Thrips, Onion thrips, Greenhouse Whitefly, Silverleaf Whitefly, Sweet Potato Whitefly, Green Peach Aphid & Two-spotted Spider Mites . [Max. 3 application per crop; re-treatment interval 3-14 d]	L L-Bees	-
Bifenazate (Acramite)	20D	Contact & oral	1	A	ALL	Registered in cucumber for control of Two-spotted mites and Byrobia mites. [Max. 1 application per season].	L H-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Botanical oils (Eco-Oil)	-	Contact	NR	A	ALL	Registered in vegetables for control of Greenhouse whitefly and in cucumbers for control of Two-spotted mites , and Aphids. [Max. 3 applications per crop; re-treatment interval 27-56 d].	L L-Bees	-
Diafenthiuron + Cyantraniliprole (Minecto Forte) Syngenta	12A+28	Contact stomach & translaminar	1	A	ALL	Registered in fruiting vegetables and cucurbits for control of Helicoverpa, Potato moth, Cucumber moth, Cluster caterpillar, Aphids and Two-spotted mites and for suppression of Western flower thrips, Tomato thrips and Plague thrips. Field use only with ground-based spraying. [Max. 2 application per crop; re-treatment interval 28 d]	M VH-Bees	-
Etoxazole (Paramite) PER82460	10B	Contact & translaminar	7	A	ALL (excl. VIC)	Permitted for use in cucumber for control of Two-spotted mites . [Max. 1 applications per crop].	L VL-Bee	-
Hexythiazox (Calibre) PER14765	10A	Contact & stomach	3	A	ALL (excl. VIC)	Permitted for use in cucumber for control of Two spotted mite , Tomato russet mite and Broad mite. Apply at first appearance and repeat as necessary. [Max 1 application per crop]	-	-
Paraffinic oil (Trump)	UN	Contact	1	A	ALL	Registered in cucurbits for control of Aphids, Mites , Thrips and Leafhopper. [Max. 4 applications per season; re-treatment intervals not specified].	VL L-Bees	-
Petroleum oil (Biocover)	UN	Contact	1	A	ALL	Registered in cucurbits for control of Aphids, Mites , Thrips and Leafhopper. [Max. 4 applications per season; re-treatment intervals not specified].	VL L-Bees	-
Potassium salts of fatty acids (Natrasoap)	3A	Contact	Nil	A	ALL	Registered in vegetables for control of Aphids, Thrips, Mealybug, Two spotted mites , Spider mite, and White fly. Apply when temperatures are cooler. [Max no. of applications not specified; re-treatment interval 5-7 d].	L L-Bees	-
Propargite (Betamite)	12C	Contact	7	A	Variable refer to label	Registered in vegetables for control of Spider mite (QLD and WA only) and Two spotted mites (All States). Apply at first appearance and repeat as necessary. [Max no. of applications per crop and re-treatment interval not specified].	M L-Bees	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Sulphur (Solo)	UN	Contact	NR	A	VIC, TAS, SA & WA	Registered in vegetables for control of Powdery mildew, Rust, Tomato russet mite and Bean spider mite (NSW only) and Two-spotted mite . [Max no. of applications not specified; re-treatment interval 14-21 d].	L L-Bees	-
Tebufenpyrad (Sipcam) Sipcam Pyranica	21A	Contact	14	A	ALL	Registered in cucumber for control of Two-spotted mite and European red mite. [Max. 1 application per crop].	M M-Bees	-
Acequinocyl (Kenemite) Arysta	20B			P		Registration is progressing (Arysta) for use in pome and stone fruit for control of mites. Registered in Canada for control of Two-spotted spider and Spruce spider mites in greenhouse ornamentals, and Two-spotted spider mite in greenhouse tomato, pepper, eggplant and cucumber.	L L-Bees	-
Diafenthiuron + Cyantraniliprole (Minecto Forte) Syngenta	12A+28			P		Registered in fruiting vegetables and cucurbits for control of Helicoverpa, Potato moth, Cucumber moth, Cluster caterpillar, Aphids and Two-spotted Spider Mites and for suppression of Western flower thrips, Tomato thrips and Plague thrips. Field use only with ground-based spraying. [Max. 2 application per crop; re-treatment interval 28 d]	M VH-Bees	-
Spiromesifen (Oberon) Bayer	23	Contact & systemic		P		Australian Registration pending for control of various Mites . Hort Innovation is undertaking data generation projects across multiple commodities for a new label registration in Australia. (ST19020 – Cucurbit crop group label registration)	M VL-Bees	

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Western Flower thrips (<i>Frankiniella occidentalis</i>)								
Priority: High								
Western flower thrips (WFT) was ranked as a high priority in VIC, QLD, NSW, WA, SA & NT. They can attack cucumber fruit at early stages of development, leaving scars and producing bent fruits making them unmarketable.								
Abamectin (Vantal)	6	Contact	3	A	ALL	Registered in cucumber for control of Western flower thrips and Two-spotted mite. [Max 2 applications per crop; re-treatment interval not specified].	M H-Bees	-
<i>Beauveria bassiana</i> (Broadband OD / Velifer)	UNF	Protective biopesticide	NR	A	ALL	Registered in protected vegetables and ornamentals for suppression of various pests including: Western Flower Thrips , Onion thrips, Greenhouse Whitefly, Silverleaf Whitefly, Sweet Potato Whitefly, Green Peach Aphid & Two-spotted Spider Mites. [Max. 3 application per crop; re-treatment interval 3-14 d]	L L-Bees	-
Cyantraniliprole (Benevia)	28	Systemic & stomach	1	A	ALL	Registered in cucurbits for the control of Melon aphid, Silverleaf whitefly, Cotton bollworm, Cucumber moth, Native budworm and suppression of Western flower thrips . Apply sequentially for maximum efficacy. [Max. 2 applications per crop; re-treatment interval 7-10 d].	L-M VH-Bees	-
Diafenthiuron + Cyantraniliprole (Minecto Forte) Syngenta	12A+28	Contact stomach & translaminar	1	A	ALL	Registered in fruiting vegetables and cucurbits for control of Helicoverpa, Potato moth, Cucumber moth, Cluster caterpillar, Aphids and Two-spotted mites and for suppression of Western flower thrips , Tomato thrips & Plague thrips. Field use only with ground-based spraying. [Max. 2 application per crop; re-treatment interval 28 d]	M VH-Bees	-
Diazinon (Accensi)	1B	Contact & systemic	14 G:14	A	ALL (excl. VIC)	Registered in cucurbits for control of Thrips . [Max no. of applications and re-treatment interval not specified]	H VH-Bees	R3
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars, Earwigs, Whitefly, Thrips and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH H-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Methomyl (various) PER82428	1A	Contact	3	A	ALL	Permitted for use in cucumber for control of <i>Helicoverpa</i> spp., Cucumber moth, Cluster caterpillar, Loopers, Webworm, Rutherglen bug, Thrips including Western flower thrips . [max 6 applications per crop; re-treatment interval 7 d].	H H-Bees	R2
Paraffinic oil (Trump)	UN	Contact	1	A	ALL	Registered in cucurbits for control of Aphids, Mites, Thrips and Leafhopper. [Max. 4 applications per season; re-treatment intervals not specified].	VL L-Bees	-
Petroleum oil (Biocover)	UN	Contact	1	A	ALL	Registered in cucurbits for control of Aphids, Mites, Thrips and Leafhopper. [Max. 4 applications per season; re-treatment intervals not specified].	VL L-Bees	-
Potassium salts of fatty acids (Natrasoap)	3A	Contact	Nil	A	ALL	Registered in vegetables for control of Aphids, Thrips , Mealybug, Two spotted mites, Spider mite, and White fly. Apply when temperatures are cooler. [Max no. of applications not specified; re-treatment interval 5-7 d].	L L-Bees	-
Pyrethrins (Amgrow)	3A	Contact	1	A	ALL	Registered in vegetables for control of Aphids, Thrips , Caterpillars, Ants, Earwigs, White flies and Leafhoppers. Spray early in the morning or late evening. [Max. no. of applications and re-treatment intervals not specified].	VH H-Bees	-
Spinetoram (Success Neo)	5	Translaminar	3	A	ALL	Registered in cucumber for the control of <i>Helicoverpa</i> and Western flower thrip . [Max no. of applications not specified; re-treatment interval: 7-14 d]	M H-Bees	-
Spinosad (Entrust Organic)	5	Contact & ingestion	3 G:14	A	ALL	Registered in cucurbits including cucumber for control of Cucumber moth, <i>Helicoverpa</i> & Western flower thrips . [Max. 4 applications per season; re-treatment interval 7-14 d].	L L-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Thiamethoxam + chlorantraniliprole (Durivo) PER87051	4A+28	Systemic	35 NG	A	QLD (within Wide Bay Burnett region)	Permitted for use in cucumber for control of Diamondback moth, Cabbage white butterfly, Corn Earworm, Native budworm, Cabbage centre grub, Cabbage cluster caterpillar, Cluster caterpillar, Cabbage Aphid, Green Peach Aphid, Silverleaf Whitefly – all biotypes, Greenhouse Whitefly, Western Flower Thrips , Green vegetable bug, Potato moth, Tomato thrips, Brown sowthistle aphid, Vegetable leafhopper, Lucerne leafroller, Leafhoppers (Jassids), Onion Thrips and Psyllids and. [Max. 1 application per crop]. PER87051 is held by Bundaberg Fruit & Vegetable Growers Cooperative and applicable only to QLD growers in Wide Bay Burnett region.	L-H H-Bees	R2
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips , Bugs and Caterpillars in several vegetables.		
Silverleaf whitefly (<i>Bemisia tabaci</i>)								
Priority: High								
Silverleaf Whiteflies were ranked as a high priority in QLD, NSW & SA and moderate priority in VIC, WA & NT. They also act as vectors for viruses.								
Afidopyropen (Versys)	9D	Disrupts feeding	1	A	ALL	Registered in cucurbits for the control of Green peach aphid, Cabbage aphid, Currant lettuce aphid and Cotton/Melon aphid; suppression of Silverleaf whitefly . [Max. 2 applications per crop; re-treatment interval 14 d].	L L-Bees	-
Afidopyropen (Versys) PER87852	9D	Disrupts feeding	3	A	ALL	Permitted for use in cucumber, capsicum & eggplant (protected situations) for control of Green peach aphid, Melon aphids and suppression of Silverleaf whitefly . [Max. 4 applications per crop; re-treatment interval 14 d].	L L-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
<i>Beauveria bassiana</i> (Broadband OD / Velifer)	UNF	Protective biopesticide	NR	A	ALL	Registered in protected vegetables and ornamentals for suppression of various pests including: Western Flower Thrips, Onion thrips, Greenhouse Whitefly, Silverleaf Whitefly , Sweet Potato Whitefly, Green Peach Aphid & Two-spotted Spider Mites. [Max. 3 application per crop; re-treatment interval 3-14 d]	L L-Bees	-
Bifenthrin (Genfarm)	3A	Contact & systemic	1	A	QLD, NSW, NT & WA	Registered in cucurbits (field grown only) for Silverleaf whitefly biotype B . Adult insects should be targeted. [Max. 2 applications per crop; re-treatment interval not specified].	VH H-Bees	R3
Buprofezin (Applaud) PER82467	16	Contact & stomach	3	A	ALL (excl. VIC)	Permitted for use in cucumber (field and protected) for control of Greenhouse whitefly, Sweet potato whitefly & Silverleaf whitefly . [Max. 2 applications per crop; re-treatment interval 14 d].	L L-Bees	-
Chlorpyrifos (Arysta)	1B	Systemic & contact	5	A	NSW & WA	Registered in cucurbits for control of Whiteflies . [Max. no. of applications not specified; re-treatment interval 10-14 d].	H H-Bees	R1
Cyantraniliprole (Benevia)	28	Foliar, systemic & stomach	1	A	ALL	Registered in cucurbits for the control of Melon aphid, Silverleaf whitefly , Cotton bollworm, Cucumber moth, Native budworm & suppression of Western flower thrips. Apply sequentially for maximum efficacy. [Max. 2 applications per crop; re-treatment interval 7-10 d].	M VH-Bees	-
Emulsifiable botanical oils (Eco-oil) PER14077	-	Contact	NR	A	ALL (excl. VIC)	Permitted for use in cucumber for control of Silverleaf whitefly . (green house & hydroponically grown). [Max 3 application; re-treatment interval 3-5 d].	L L-Bees	-
Fonicamid (Mainman)	29	Systemic	1	A	ALL	Registered in cucurbits including cucumber for control of Green peach aphid, Melon aphid, and Silverleaf whitefly . [Max. 3 applications per crop; re-treatment interval 14 d].	M L-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars, Earwigs, Whitefly , Thrips and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH H-Bees	-
Imidacloprid (Eureka)	4A	Systemic	1	A	ALL	Registered in cucumbers for control of Green peach aphid and Silverleaf whitefly including biotype B. [Max. no. of applications & re-treatment intervals not specified].	M M-Bees	R2
Petroleum oil (DC Tron)	UN	Contact	1	A	QLD	Registered in cucurbits for control of Silverleaf whitefly . [Max. no. of applications and re-treatment intervals not specified].	VL L-Bees	
Paraffinic oil (D-C-Maxx)	UN	Contact	1	A	QLD	Registered in cucurbits for control of Silverleaf whitefly . Avoid spraying in hot weather. [Max. no. of applications and re-treatment intervals not specified].	VL L-Bees	-
Petroleum oil (various) PER12221	UN	Contact	1	A	ALL (excl. VIC)	Permitted for use in cucumber for control of Greenhouse whitefly & Bemisia tabaci . [Max. no. of applications and re-treatment intervals not specified].	VL L-Bees	-
Potassium salts of fatty acids (Natrasoap)	3A	Contact	Nil	A	ALL	Registered in vegetables for control of Aphids, Thrips, Mealybug, Two spotted mites, Spider mite, and Whiteflies . Apply when temperatures are cooler. [Max no. of applications not specified; re-treatment interval 5-7 d].	L L-Bees	-
Potassium salts of fatty acids (Natrasoap) PER13920	3A	Contact	Nil		ALL (excl. VIC)	Permitted for use in cucumber for control of Greenhouse whitefly & Silverleaf whitefly . (glass house & hydroponically grown). [Max no. of applications not specified; re-treatment interval 5-7 d].	L L-Bees	-
Pymetrozine (Chess)	9B	Systemic & ingestion	3	A	ALL	Registered in cucurbits (field and protected) for control of Melon aphid, Green peach aphid, Potato aphid and Cowpea aphid; and for suppression of Silverleaf whitefly & Greenhouse whitefly. [Max. 2 applications per crop; re-treatment interval 7 d].	L VL-Bees	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Pyrethrins (Amgrow)	3A	Contact	1	A	ALL	Registered in vegetables for control of Aphids, Thrips, Caterpillars, Ants, Earwigs, Whiteflies & Leafhoppers. Spray early in the morning or late evening. [Max. no. of applications and re-treatment intervals not specified].	VH H-Bees	-
Pyriproxyfen (Admiral)	7C	Ingestion & residual, IGR	H:1 NG	A	ALL	Registered in cucurbits for control of Silverleaf whitefly biotype B) & Greenhouse whitefly. [Max. 2 applications per season; re-treatment interval 14 d].	VL L-Bees	-
Spirotetramat (Movento 240 SC)	23	Contact & systemic	7	A	ALL	Registered in cucurbits for the control of Silverleaf whitefly , and Aphids (Green peach & Cotton). Uses subject to CropLife resistance management strategies. [Max 3 applications per crop; re-treatment interval 7 d].	M VL-Bees	-
Thiamethoxam + chlorantraniliprole (Durivo) PER87051	4A+28	Systemic	H:35 NG	A	QLD (within Wide Bay Burnett region)	Permitted for use in cucumber for control of Diamondback moth, Cabbage white butterfly, Corn Earworm, Native budworm, Cabbage centre grub, Cabbage cluster caterpillar, Cluster caterpillar, Cabbage Aphid, Green Peach Aphid, Silverleaf Whitefly – all biotypes, Greenhouse Whitefly, Western Flower Thrips, Green vegetable bug, Potato moth, Tomato thrips, Brown sowthistle aphid, Vegetable leafhopper, Lucerne leafroller, Leafhoppers (Jassids), Onion Thrips and Psyllids and. [Max. 1 application per crop]. PER87051 is held by Bundaberg Fruit & Vegetable Growers Cooperative and applicable only to QLD growers in Wide Bay Burnett region.	L-H H-Bees	R2
Flupyradifurone (Sivanto) Bayer	4D	Systemic, ingestion & contact		P		Registered in macadamia for control of Macadamia lace bug, Banana spotting bug, Fruit spotting bug and suppression of Scirtothrips. Bayer is pursuing registration of product for control of Aphids, Silverleaf whitefly & Greenhouse whitefly in cucurbits, green beans, tomatoes, eggplant & peppers (protected & field). Registration expected by end of 2021.	L VL-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Spiromesifen (Oberon) Bayer	23	Contact & systemic		P		Registered in US for control of Two-spotted spider mite, Whiteflies and Tomato potato psyllid in tuberous and corm vegetables. Australian Registration pending for control of Mites. Hort Innovation is undertaking data generation projects across multiple commodities for a new label registration in Australia.	M VL-Bees	
Greenhouse whitefly (<i>Trialeurodes vaporariorum</i>)								
Priority: High								
Silverleaf Whiteflies were ranked as a high priority in QLD, NSW & SA and moderate priority in VIC, WA & NT. They also act as vectors for viruses.								
<i>Beauveria bassiana</i> (Broadband OD / Velifer)	UNF	Protective biopesticide	NR	A	ALL	Registered in protected vegetables and ornamentals for suppression of various pests including: Western Flower Thrips, Onion thrips, Greenhouse Whitefly , Silverleaf Whitefly, Sweet Potato Whitefly, Green Peach Aphid & Two-spotted Spider Mites. [Max. 3 application per crop; re-treatment interval 3-14 d]	L L-Bees	-
Botanical oils (Eco-Oil)	-	Contact	NR	A	ALL	Registered in vegetables for control of Greenhouse whitefly and in cucumbers for control of Two-spotted mites, and aphids. [Max. 3 applications per crop; re-treatment interval 27-56 d].	VL L-Bees	-
Buprofezin (Applaud) PER82467	16	Contact & stomach	3	A	ALL (excl. VIC)	Permitted for use in cucumber (field and protected) for control of Greenhouse whitefly , Sweet potato whitefly & Silverleaf whitefly. [Max. 2 applications per crop; re-treatment interval 14 d].	L L-Bees	-
Chlorpyrifos (Arysta)	1B	Systemic & contact	5	A	NSW & WA	Registered in cucurbits for control of Whiteflies . [Max. no. of applications not specified; re-treatment interval 10-14 d].	H H-Bees	R1
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars, Earwigs, Whitefly , Thrips and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH H-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Imidacloprid (Confidor) PER12489	4A	Systemic	1	A	ALL (excl. VIC)	Permitted for use in cucumber (field & protected) for control of Greenhouse whitefly . [Max. 2 applications per crop; re-treatment interval not specified].	M M-Bees	R2
Petroleum oil (various) PER12221	UN	Contact	1	A	ALL (excl. VIC)	Permitted for use in cucumber for control of Greenhouse whitefly & <i>Bemisia tabaci</i> . [Max. no. of applications and re-treatment intervals not specified].	VL L-Bees	-
Potassium salts of fatty acids (Natrasoap)	3A	Contact	Nil	A	ALL	Registered in vegetables for control of Aphids, Thrips, Mealybug, Two spotted mites, Spider mite, and Whiteflies . Apply when temperatures are cooler. [Max no. of applications not specified; re-treatment interval 5-7 d].	L L-Bees	-
Potassium salts of fatty acids (Natrasoap) PER13920	3A	Contact	Nil		ALL (excl. VIC)	Permitted for use in cucumber for control of Greenhouse whitefly & Silverleaf whitefly. (glass house & hydroponically grown). [Max no. of applications not specified; re-treatment interval 5-7 d].	L L-Bees	-
Pymetrozine (Chess)	9B	Systemic & ingestion	3	A	ALL	Registered in cucurbits (field and protected) for control of Melon aphid, Green peach aphid, Potato aphid and Cowpea aphid; and for suppression of Silverleaf whitefly & Greenhouse whitefly . [Max. 2 applications per crop; re-treatment interval 7 d].	L VL-Bees	R3
Pyrethrins (Amgrow)	3A	Contact	1	A	ALL	Registered in vegetables for control of Aphids, Thrips, Caterpillars, Ants, Earwigs, Whiteflies & Leafhoppers. Spray early in the morning or late evening. [Max. no. of applications and re-treatment intervals not specified].	VH H-Bees	-
Pyriproxyfen (Admiral)	7C	Ingestion & residual, IGR	H:1 NG	A	ALL	Registered in cucurbits for control of Silverleaf whitefly biotype B) & Greenhouse whitefly . [Max. 2 applications per season; re-treatment interval 14 d].	VL L-Bees	-
Sulfoxaflor (Transform)	4C	Systemic	1	A	ALL	Registered in cucurbits (field grown only) for control of Green peach aphid, Melon (Cotton) aphid, and Greenhouse whitefly . Do not use if honeybees are foraging. [Max. no. of applications not specified; re-treatment interval 7-10 d].	M VH-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Thiamethoxam + chlorantraniliprole (Durivo) PER87051	4A+28	Systemic	H:35 NG	A	QLD (within Wide Bay Burnett region)	Permitted for use in cucumber for control of Diamondback moth, Cabbage white butterfly, Corn Earworm, Native budworm, Cabbage centre grub, Cabbage cluster caterpillar, Cluster caterpillar, Cabbage Aphid, Green Peach Aphid, Silverleaf Whitefly – all biotypes, Greenhouse Whitefly , Western Flower Thrips, Green vegetable bug, Potato moth, Tomato thrips, Brown sowthistle aphid, Vegetable leafhopper, Lucerne leafroller, Leafhoppers (Jassids), Onion Thrips and Psyllids and. [Max. 1 application per crop]. PER87051 is held by Bundaberg Fruit & Vegetable Growers Cooperative and applicable only to QLD growers in Wide Bay Burnett region.	L-H H-Bees	R2
Flupyradifurone (Sivanto) Bayer	4D	Systemic, ingestion & contact		P		Registered in macadamia for control of Macadamia lace bug, Banana spotting bug, Fruit spotting bug and suppression of Scirtothrips. Bayer is pursuing registration of product for control of Aphids, Silverleaf & Greenhouse whitefly in cucurbits, green beans, tomatoes, eggplant & peppers (protected & field). Registration expected by end of 2021.	L VL-Bees	-
Spiromesifen (Oberon) Bayer	23	Contact & systemic		P		Registered in US for control of Two-spotted spider mite, Whiteflies and Tomato potato psyllid in tuberous and corm vegetables. Australian Registration pending for control of Mites. Hort Innovation is undertaking data generation projects across multiple commodities for a new label registration in Australia.	M VL-Bees	

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Fungus gnats (<i>Bradysia</i> spp., Sciaridae)								
Priority: Moderate								
Fungus gnats was ranked as a high priority in VIC, as a moderate priority in QLD, NSW, WA & SA, and as a low priority in NT. Fungus gnats (<i>Bradysia</i> spp., Sciaridae) are small, mosquito-like flies which are a common problem in nurseries and greenhouses where propagation material and seedlings are being grown.								
<i>Bacillus thuringiensis subsp. kurstaki</i> (Vectobac) PER14694	11A	Protective biopesticide	NR	A	ALL (excl. VIC)	Permitted for use in cucumber (protected situations) for control of Fungus gnats . [Max. no. of applications not specified; re-treatment interval 21 d]	VL L-Bees	-
Acetamiprid (Crown) Everris Australia	4A	Systemic		P		Registered for control of Fungus gnats in potting mixes.	M M-Bees	R2
Green peach aphid (<i>Myzus persicae</i>)								
Priority: Moderate								
Aphids including Green peach aphids were ranked as a high priority in VIC, NSW & WA and as a moderate priority in QLD, SA & NT.								
Afidopyropen (Versys)	9D	Disrupts feeding	1	A	ALL	Registered in cucurbits for the control of Green peach aphid , Cabbage aphid , Currant lettuce aphid and Cotton/Melon aphids . [Max. 4 applications per crop; re-treatment interval 14 d]	L L-Bees	-
Afidopyropen (Versys) PER87852	9D	Disrupts feeding	3	A	ALL	Permitted for use in cucumber, capsicum & eggplant (protected situations) for control of Green peach aphid , Melon aphids and suppression of Silverleaf whitefly. [Max. 4 applications per crop; re-treatment interval 14 d].	L L-Bees	-
<i>Beauveria bassiana</i> (Broadband OD / Velifer)	UNF	Protective biopesticide	NR	A	ALL	Registered in protected vegetables and ornamentals for suppression of various pests including: Western Flower Thrips, Onion thrips, Greenhouse Whitefly, Silverleaf Whitefly, Sweet Potato Whitefly, Green Peach Aphid & Two-spotted Spider Mites. [Max. 3 application per crop; re-treatment interval 3-14 d]	L L-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Botanical oils (Eco-Oil)	-	Contact	NR	A	ALL	Registered in vegetables for control of Greenhouse whitefly and in cucumbers for control of Two-spotted mites, and Aphids . [Max. 3 applications per crop; re-treatment interval 27-56 d].	L L-Bees	-
Cyantraniliprole (Benevia)	28	Foliar, systemic & stomach	1	A	ALL	Registered in cucurbits for the control of Melon aphid , Silverleaf whitefly, Cotton bollworm, Cucumber moth, Native budworm & suppression of Western flower thrips. Apply sequentially for maximum efficacy. [Max. 2 applications per crop; re-treatment interval 7-10 d].	M VH-Bees	-
Fonicamid (Mainman)	29	Systemic	1	A	ALL	Registered in cucurbits including cucumber for control of Green peach aphid , Melon aphid, and Silverleaf whitefly. [Max. 3 applications per crop; re-treatment interval 14 d].	M L-Bees	-
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids , Caterpillars, Earwigs, Whitefly, Thrips and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH H-Bees	-
Imidacloprid (Eureka)	4A	Systemic	1	A	ALL	Registered in cucurbits for control of Green peach aphid and Silverleaf whitefly including biotype B. [Max. no. of applications & re-treatment intervals not specified].	M M-Bees	R2
Paraffinic oil (Trump)	UN	Contact	1	A	ALL	Registered in cucurbits for control of Aphids , Mites, Thrips and Leafhopper. [Max. 4 applications per season; re-treatment intervals not specified].	VL L-Bees	-
Pirimicarb (Aphidex)	1A	Contact & systemic	2	A	ALL	Registered in cucurbits for control of Aphids . [Max. no. of applications not specified; re-treatment 5-10 d].	VL VL-Bees	R3
Potassium salts of fatty acids (Natrasoap)	3A	Contact	NR	A	ALL	Registered in vegetables for control of Aphids , Thrips, Mealybug, Two spotted mites, Spider mite, and Whitefly. Apply when temperatures are cooler. [Max no. of applications not specified; re-treatment interval 5-7 d].	L L-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Pymetrozine (Chess)	9B	Systemic & ingestion	3	A	ALL	Registered in cucurbits (field and protected) for control of Melon aphid, Green peach aphid, Potato aphid and Cowpea aphid ; and for suppression of Silverleaf whitefly and Greenhouse whitefly. [Max. 2 applications per crop; re-treatment interval 7 d].	L VL-Bees	R3
Pyrethrins (Amgrow)	3A	Contact	1	A	ALL	Registered in vegetables for control of Aphids , Thrips, Caterpillars, Ants, Earwigs, Whiteflies and Leafhoppers. Spray early in the morning or late evening. [Max. no. of applications and re-treatment intervals not specified].	VH H-Bees	-
Spirotetramat (Movento 240 SC)	23	Contact & systemic	7	A	ALL	Registered in cucurbits for the control of Silverleaf whitefly, and Aphids (Green peach & Cotton). Uses subject to CropLife resistance management strategies. [Max 3 applications per crop; re-treatment interval 7 d].	M VL-Bees	-
Sulfoxaflor (Transform)	4C	Systemic	1	A	ALL	Registered in cucurbits (field grown only) for control of Green peach aphid , Melon (Cotton) aphid , and Greenhouse whitefly. Do not use if honeybees are foraging. [Max. no. of applications not specified; re-treatment interval 7-10 d].	M VH-Bees	-
Thiamethoxam + chlorantraniliprole (Durivo) PER87051	4A+28	Systemic	H:35 NG	A	QLD (within Wide Bay Burnett region)	Permitted for use in cucumber for control of Corn Earworm, Native budworm, Cabbage Aphid, Green Peach Aphid , Silverleaf Whitefly – all biotypes, Greenhouse Whitefly, Western Flower Thrips and Onion Thrips. [Max. 1 application per crop]. PER87051 is held by Bundaberg Fruit & Vegetable Growers Cooperative and applicable only to QLD growers in Wide Bay Burnett region.	L-H H-Bees	R2
Clothianidin + Imidacloprid (Poncho Plus) BASF	4A	Protective		P		Registered in sweet corn, sunflower, canola & forage brassica for control of Wireworms, Cutworms and Aphids . Will provide early protection for 3-4 weeks after sowing.	M VH-Bees	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Fonicamid (Mainman) ISK	9C	Systemic		P		Registered in Cucurbits for control of Aphids and Silverleaf whitefly; Aphids in potatoes; Aphids and Mealybugs in apples and pears; Aphids and Mirids in cotton. US label (Beleaf) approves use on root vegetables on Aphids , Plant bugs and Greenhouse whitefly.	M L-Bees	
Flupyradifurone (Sivanto) Bayer	4D	Systemic, ingestion & contact		P		Registered in macadamia for control of Macadamia lace bug, Banana spotting bug, Fruit spotting bug and suppression of Scirtothrips. Bayer is pursuing registration of product for control of Aphids , Silverleaf & Greenhouse whitefly in cucurbits, green beans, tomatoes, eggplant & peppers (protected & field). Registration expected by end of 2021.	L VL-Bees	-
Helicoverpa spp. (<i>Helicoverpa armigera</i> [Cotton bollworm / Corn earworm] and <i>Helicoverpa punctigera</i> [Native budworm])								
Priority: Moderate								
Helicoverpa was ranked as a high priority in VIC and as a moderate priority in QLD, NSW, WA, SA & NT.								
<i>Bacillus thuringiensis subsp. kurstaki</i> (Dipel)	11A	Protective biopesticide	NR	A	ALL	Registered in vegetables for control of Caterpillars, including Helicoverpa . [Apply a minimum of 2 sprays, 3 d apart: re-treatment interval 3-5 d]	VL L-Bees	-
Bifenthrin (Genfarm)	3A	Contact & ingestion	1	A	ALL	Registered in cucurbits (field grown only) for control of Helicoverpa . Target larvae < 5 mm in length. [Max. 2 applications per crop; re-treatment interval 7-10 d].	VH H-Bees	R3
Carbaryl (David Grays)	1A	Contact & ingestion	3	A	ALL	Registered in cucurbits (prior to flowering) for the control of Helicoverpa , Pumpkin beetle, 28 spotted lady bird, Wingless grasshopper, Green vegetable bug, Leaf eating ladybird, Cutworms, Earwig, Potato moth, Rutherglen bug and Army worm. [Max. no. of applications and re-treatment interval not specified].	H H-Bees	R3
Chlorantraniliprole (Coragen)	28	Systemic	1	A	ALL	Registered in cucumber for the control of Cotton bollworm (Helicoverpa) and Cucumber moth. [Max. no. of applications not specified; re-treatment interval 5 d].	L VL-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Cyantraniliprole (Benevia)	28	Foliar, systemic & stomach	1	A	ALL	Registered in cucurbits for the control of Melon aphid, Silverleaf whitefly, Cotton bollworm (Helicoverpa) , Cucumber moth, Native budworm & suppression of Western flower thrips. Apply sequentially for maximum efficacy. [Max. 2 applications per crop; re-treatment interval 7-10 d].	M VH-Bees	-
Diafenthiuron + Cyantraniliprole (Minecto Forte) Syngenta	12A+28	Contact stomach & translaminar	1	A	ALL	Registered in fruiting vegetables and cucurbits for control of Helicoverpa , Potato moth, Cucumber moth, Cluster caterpillar, Aphids and Two-spotted mites and for suppression of Western flower thrips, Tomato thrips and Plague thrips. Field use only with ground-based spraying. [Max. 2 application per crop; re-treatment interval 28 d]	M VH-Bees	-
Flubendiamide (Belt)	28	Ingested	1	A	ALL	Registered in cucumber for the control of Helicoverpa and cucumber moth . [Max. 3 applications per crop; re-treatment interval 7-14 d].	L-M L-Bees	-
Methomyl (various) PER82428	1A	Contact	3	A	ALL	Permitted for use in cucumber for control of Helicoverpa spp., Cucumber moth, Cluster caterpillar, Loopers, Webworm, Rutherglen bug, Thrips including Western flower thrips . [max 6 applications per crop; re-treatment interval 7 d].	H H-Bees	R2
Nucleopolyhedrovirus of <i>Helicoverpa armigera</i> (Vivus Max)	31	Biological	NR	A	ALL	Registered in cucurbits including cucumber for control of Helicoverpa spp. Effective on larvae of <7 mm. [Max no. of applications not specified; re-treatment interval 2-3 d]	VL L-Bees	-
Pyrethrins (Amgrow)	3A	Contact	1	A	ALL	Registered in vegetables for control of Aphids, Thrips, Caterpillars , Ants, Earwigs, Whiteflies and Leafhoppers. Spray early in the morning or late evening. [Max. no. of applications and re-treatment intervals not specified].	VH H-Bees	-
Spinetoram (Success Neo)	5	Translaminar	3	A	ALL	Registered in cucumber for the control of Helicoverpa . [Max no. of applications not specified; re-treatment interval: 7-14 d]	M H-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Spinosad (Entrust Organic)	5	Contact & ingestion	3 G:14	A	ALL	Registered in cucurbits including cucumber for control of Cucumber moth, Helicoverpa & Western flower thrips. [Max. 4 applications per season; re-treatment interval 7-14 d].	L L-Bees	-
Thiamethoxam + chlorantraniliprole (Durivo) PER87051	4A+28	Systemic	35 NG	A	QLD (within Wide Bay Burnett region)	Permitted for use in cucumber for control of Diamondback moth, Cabbage white butterfly, Corn Earworm, Native budworm , Cabbage centre grub, Cabbage cluster caterpillar, Cluster caterpillar, Cabbage Aphid, Green Peach Aphid, Silverleaf Whitefly – all biotypes, Greenhouse Whitefly, Western Flower Thrips, Green vegetable bug, Potato moth, Tomato thrips, Brown sowthistle aphid, Vegetable leafhopper, Lucerne leafroller, Leafhoppers (Jassids), Onion Thrips and Psyllids. [Max. 1 application per crop]. PER87051 is held by Bundaberg Fruit & Vegetable Growers Cooperative and applicable only to QLD growers in Wide Bay Burnett region.	L-H H-Bees	R2
Indoxacarb + Novaluron (Plemax) Adama	22A+15			P		Registration pending for control of Lepidoptera including Helicoverpa spp. Registered in South Africa on a range of crops for Lepidoptera control.	L H-Bees	R3
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, Bugs and Caterpillars in several vegetables.	-	
Root knot nematode (Meloidogyne sp.)								
Priority: Moderate								
Root knot nematode was consistently ranked as a moderate priority in WA and a low priority in VIC, QLD, NSW, SA and NT. Soil fumigation would help.								
1,3-dichloropropene + Chloropicrin (Tri-Form)	8B	Soil fumigant	NR	A	ALL	Registered in vegetables for control of soil borne pests including Nematodes . Leave soil undisturbed for 14 d after treatment.	-	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Abamectin (Tervigo)	6	Contact	NR	A	ALL	Registered in Cucurbits for control of Nematodes . [Max. 4 applications; re-treatment interval 14 d]	M H-Bees	-
Fluensulfone (Nimitz)	-	Contact & systemic	NR	A	ALL	Registered in cucurbits for control of Nematodes . Apply a minimum of 7 d before transplanting.	L L-Bees	-
Metham (various)	-	Fumigant	NR	A	Variable. Refer to label.	Registered as a soil fumigant for plant parasitic Nematodes , weed seeds, and various fungal diseases as a pre-plant treatment only.	L M-Bees	-
Fluopyram (Velum) Bayer	7			P		Pending registration (Bayer) as a nematicide . Registered in US for control of Nematodes in a range of vegetables.	L L-Bees	
Sulfonamide (Reklemel) Corteva	New MOA			P		Pending registration as a nematicide by Corteva. Previously known product (Velloxine) is to be launched as Rekelemel in North America and Asia Pacific in 2021. Reklemel is a novel sulfonamide nematicide with a unique mode of action against plant-parasitic nematodes.	L L-Bees	
Thrips other than WFT (Thysanoptera) Bean blossom thrips (<i>Megalurothrips usitatis</i>), Onion thrips (<i>Thrips tabaci</i>), Plague thrips (<i>Thrips imagines</i>) & Tomato thrips (<i>Frankliniella schultzei</i>)								
Priority: Moderate								
Thrips - other than WFT were ranked as a moderate priority in VIC, QLD, SA & NT, and as a high priority in NSW & WA.								
<i>Beauveria bassiana</i> (Broadband OD / Velifer) BASF	UNF	Protective biopesticide	NR	A	ALL	Registered in protected vegetables and ornamentals for suppression of various pests including: Western Flower Thrips, Onion thrips , Greenhouse Whitefly, Silverleaf Whitefly, Sweet Potato Whitefly, Green Peach Aphid & Two-spotted Spider Mites. [Max. 3 application per crop; re-treatment interval 3-14 d]	L L-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Diafenthiuron + Cyantraniliprole (Minecto Forte) Syngenta	12A+28	Contact stomach & translaminar	1	A	ALL	Registered in fruiting vegetables and cucurbits for control of Helicoverpa, Potato moth, Cucumber moth , Cluster caterpillar, Aphids and Two-spotted mites and for suppression of Western flower thrips, Tomato thrips & Plague thrips . Field use only with ground-based spraying. [Max. 2 application per crop; re-treatment interval 28 d]	M VH-Bees	-
Diazinon (Accensi)	1B	Contact & systemic	14 G:14	A	ALL (excl. VIC)	Registered in cucurbits for control of Thrips . [Max no. of applications and re-treatment interval not specified]	H VH-Bees	R3
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars, Earwigs, Whitefly, Thrips and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH H-Bees	-
Paraffinic oil (Trump)	UN	Contact	1	A	ALL	Registered in cucurbits for control of Aphids, Mites, Thrips and Leafhopper. [Max. 4 applications per season; re-treatment intervals not specified].	VL L-Bees	-
Petroleum oil (Biocover)	UN	Contact	1	A	ALL	Registered in cucurbits for control of Aphids, Mites, Thrips and Leafhopper. [Max. 4 applications per season; re-treatment intervals not specified].	VL L-Bees	-
Potassium salts of fatty acids (Natrasoap)	3A	Contact	Nil	A	ALL	Registered in vegetables for control of Aphids, Thrips , Mealybug, Two spotted mites, Spider mite, and White fly. Apply when temperatures are cooler. [Max no. of applications not specified; re-treatment interval 5-7 d].	L L-Bees	-
Pyrethrins (Amgrow)	3A	Contact	1	A	ALL	Registered in vegetables for control of Aphids, Thrips , Caterpillars, Ants, Earwigs, White flies & Leafhoppers. Spray early in the morning or late evening. [Max. no. of applications and re-treatment intervals not specified].	VH H-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Thiamethoxam + chlorantraniliprole (Durivo) PER87051	4A+28	Systemic	H:35 NG	A	QLD (within Wide Bay Burnett region)	Permitted for use in cucumber for control of Diamondback moth, Cabbage white butterfly, Corn Earworm, Native budworm, Cabbage centre grub, Cabbage cluster caterpillar, Cluster caterpillar, Cabbage Aphid, Green Peach Aphid, Silverleaf Whitefly – all biotypes, Greenhouse Whitefly, Western Flower Thrips, Green vegetable bug, Potato moth, Tomato thrips , Brown sowthistle aphid, Vegetable leafhopper, Lucerne leafroller, Leafhoppers (Jassids), Onion Thrips and Psyllids. [Max. 1 application per crop]. PER87051 is held by Bundaberg Fruit & Vegetable Growers Cooperative and applicable only to QLD growers in Wide Bay Burnett region.	L-H H-Bees	R2
Spinetoram (Success Neo) Corteva	5	Translaminar		P-A		Registered in cucumber for the control of Helicoverpa and Western flower thrips . [Max no. of applications not specified; re-treatment interval: 7-14 d]	M H-Bees	-
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips , Bugs and Caterpillars.		
28-spotted potato ladybird (<i>Henosepilachna vigintiseppunctata</i>)								
Priority: Low								
28-spotted potato ladybird ranked as a low priority in VIC, QLD, NSW, WA, SA & NT. Thrips normally move in from other crops and weeds.								
Bioallethrin + Bioresmethrin (Amgrow)	3A	Contact	1	A	ALL	Registered in vegetables for control of 28-spotted lady beetle and plain Pumpkin beetle. [Max. no. of applications not specified; re-treatment interval 3-4 d].	VH H-Bees	-
Carbaryl (David Grays)	1A	Contact & ingestion	3	A	ALL	Registered in cucurbits (prior to flowering) for the control of Helicoverpa, Pumpkin beetle, 28 spotted lady bird , Wingless grasshopper, Green vegetable bug, Leaf eating ladybird, Cutworms, Earwig, Potato moth, Rutherglen bug and Army worm. [Max. no. of applications and re-treatment interval not specified].	H H-Bees	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Tetraniliprole (Vayego) Bayer	28	Disrupts feeding		P		Registered in Australia in multiple crops for various insect pests such as Beetles , Weevils & Lepidoptera. Hort Innovation has several projects underway towards assisting registration in minor crops.	M VH-Bees	-
Ants (Various spp.)								
Priority: Low								
Ants were ranked as a low priority in VIC, QLD, NSW, WA, SA & NT.								
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants , Aphids, Caterpillars, Earwigs, Whitefly, Thrips and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH H-Bees	-
Pyrethrins (Amgrow)	3A	Contact	1	A	ALL	Registered in vegetables for control of Aphids, Thrips, Caterpillars, Ants , Earwigs, White flies & Leafhoppers. Spray early in the morning or late evening. [Max. no. of applications and re-treatment intervals not specified].	VH H-Bees	-
Spinosad (Entrust Organic) Corteva	5	Contact and ingestion		P-A		Registered in cucurbits including cucumber for control of Cucumber moth, Helicoverpa & Western flower thrips. [Max. 4 applications per season; re-treatment interval 7-14 d]. Registered in US and Canada for control of a range of insect pests such as Ants , Caterpillars, Colorado Potato Beetle, Corn Earworms, Flea Beetle, Leaf miners, Loopers, Mites and Thrips in various vegetables.	L L-Bees	-
Broflanilide (Vedira) BASF	30			P		Pending registration as an ant bait.	H VH-Bees	
Metaflumizone (Siesta Ant Bait) BASF	22B			P		Pending registration as an ant bait.	M M-Bees	

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Cucumber fly (<i>Bactrocera Cucumis</i>)								
Priority: Low								
Cucumber fly was ranked as a low priority in VIC, QLD, NSW, SA & NT and as a moderate priority in WA.								
Alpha-cypermethrin (Rygel) PER80138	3A	Contact	1	A	ALL (excl. VIC)	Permitted to use for control of Cucumber Fruit Fly in cucurbits. [Max. 3 applications per crop; 2 sequential; re-treatment interval 7 d]	VH H-Bees	-
Clothianidin (Samurai) PER80101	4A	Systemic	7 NG	A	ALL	Permitted to use for control of Cucumber Fruit Fly in cucurbit vegetables (field & protected). [Max. 2 applications per crop; re-treatment interval 7 d]	M VH-Bees	R2
Spinosad (Amgrow)	5	Contact	NR	A	ALL	Registered for control of Fruit fly as a bait in fruit trees, vegetables and ornamentals. [Max. no. of applications not specified; re-treatment interval 7 d].	L L-Bees	
Cucumber moth (<i>Diaphania indica</i>)								
Priority: Low								
Cucumber moth was ranked as a low priority in VIC, QLD, NSW, WA, SA & NT. It is claimed that it can be controlled when managing Helicoverpa.								
<i>Bacillus thuringiensis subsp. kurstaki</i> (Dipel)	11A	Biological control	NR	A	ALL	Registered in vegetables for control of Caterpillars , including Helicoverpa. [Apply a minimum of 2 sprays, 3 d apart; re-treatment interval 3-5 d]	VL L-Bees	-
Chlorantraniliprole (Coragen)	28	Systemic	1	A	ALL	Registered in cucurbits including cucumber for the control of Cotton bollworm (Helicoverpa) and Cucumber moth . [Max. no. of applications not specified; re-treatment interval 5 d].	L VL-Bees	-
Cyantraniliprole (Benevia)	28	Foliar, systemic & stomach	1	A	ALL	Registered in cucurbits for the control of Melon aphid, Silverleaf whitefly, Cotton bollworm (Helicoverpa), Cucumber moth , Native budworm & suppression of Western flower thrips. Apply sequentially for maximum efficacy. [Max. 2 applications per crop; re-treatment interval 7-10 d].	M VH-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Diafenthiuron + Cyantraniliprole (Minecto Forte) Syngenta	12A+28	Contact stomach & translaminar	1	A	ALL	Registered in fruiting vegetables and cucurbits for control of <i>Helicoverpa</i> , Potato moth, Cucumber moth , Cluster caterpillar, Aphids and Two-spotted Spider Mites and for suppression of Western flower thrips, Tomato thrips and Plague thrips. Field use only with ground-based spraying. [Max. 2 application per crop; re-treatment interval 28 d]	M VH-Bees	-
Flubendiamide (Belt)	28	Ingested	1	A	ALL	Registered in cucumber for the control of <i>Helicoverpa</i> and Cucumber moth . [Max. 3 applications per crop; re-treatment interval 7-14 d].	L-M L-Bees	-
Methomyl (various) PER82428	1A	Contact	3	A	ALL	Permitted for use in cucurbits including cucumber for control of <i>Helicoverpa</i> spp., Cucumber moth , Cluster caterpillar, Loopers, Webworm, Rutherglen bug & Thrips including Western flower thrips. [Max. 6 applications per crop; re-treatment interval 7 d].	H H-Bees	R2
Pyrethrins (Amgrow)	3A	Contact	1	A	ALL	Registered in vegetables for control of Aphids, Thrips, Caterpillars , Ants, Earwigs, White flies & Leafhoppers. Spray early in the morning or late evening. [Max. no. of applications and re-treatment intervals not specified].	VH H-Bees	-
Spinosad (Entrust Organic)	5	Contact & ingestion	3 G:14	A	ALL	Registered in cucurbits including cucumber for control of Cucumber moth , <i>Helicoverpa</i> & Western flower thrips. [Max. 4 applications per season; re-treatment interval 7-14 d].	L L-Bees	-
Bifenthrin (various)	3A	Contact & ingestion		P-A		Registered in cucurbits (field grown only) for control of Helicoverpa . Target larvae < 5 mm in length. [Max. 2 applications per crop; re-treatment interval 7-10 d].	VH H-Bees	R3
Nucleopolyhedrovirus of <i>Helicoverpa armigera</i> (Vivus Max)	31	Biological		P-A		Registered in cucurbits including cucumber for control of Helicoverpa spp. Effective on larvae of <7 mm. [Max no. of applications not specified; re-treatment interval 2-3 d]	VL L-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Spinetoram (Success Neo) Corteva	5	Translaminar		P-A		Registered in cucurbits including cucumber for the control of Helicoverpa . [Max no. of applications not specified; re-treatment interval: 7-14 d]	M H-Bees	-
Indoxacarb + Novaluron (Plemax) Adama	22A+15			P		Registration pending (Adama) for control of Lepidoptera including Helicoverpa spp. Registered in South Africa on a range of crops for Lepidoptera control.	L H-Bees	R3
Tetraniliprole (Vayego) Bayer	28	Disrupts feeding		P		Registered in Australia in multiple crops for various insect pests such as Beetles, Weevils & Lepidoptera . Hort Innovation has several projects underway towards assisting registration in minor crops.	M VH-Bees	-
Green Vegetable Bug (<i>Nezara viridula</i>)								
Priority: Low								
Green vegetable bugs were consistently ranked as a low priority in every consulted region and can be easily managed.								
Carbaryl (David Grays)	1A	Contact or ingestion	3	A	ALL	Registered in cucurbits (prior to flowering) for the control of Helicoverpa, Pumpkin beetle, 28 spotted lady bird, Wingless grasshopper, Green vegetable bug , Leaf eating ladybird, Cutworms, Earwig, Potato moth, Rutherglen bug and Army worm. [Max. no. of applications and re-treatment interval not specified].	H H-Bees	R3
Maldison (Fyfanon)	1B	Contact & systemic	1	A	ALL	Registered in vegetables including cucurbits for control of Aphid, Green vegetable bug , Jassids, Leaf hopper, Rutherglen bug. [Apply at first sight of infestation: max no. of applications not specified]	H H-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Thiamethoxam + chlorantraniliprole (Durivo) PER87051	4A+28	Systemic	H:35 NG	A	QLD (within Wide Bay Burnett region)	Permitted for use in cucumber for control of Diamondback moth, Cabbage white butterfly, Corn Earworm, Native budworm, Cabbage centre grub, Cabbage cluster caterpillar, Cluster caterpillar, Cabbage Aphid, Green Peach Aphid, Silverleaf Whitefly – all biotypes, Greenhouse Whitefly, Western Flower Thrips, Green vegetable bug , Potato moth, Tomato thrips, Brown sowthistle aphid, Vegetable leafhopper, Lucerne leafroller, Leafhoppers (Jassids), Onion Thrips and Psyllids. [Max. 1 application per crop]. PER87051 is held by Bundaberg Fruit & Vegetable Growers Cooperative and applicable only to QLD growers in Wide Bay Burnett region.	L-H H-Bees	R2
Trichlorfon (Tyranex)	1B	Contact	2	A	ALL	Registered in vegetables for control of Green vegetable bug , and Rutherglen bug. Apply at first sight of infestation. [Max no. of applications not specified; re-treatment interval 7-10 d].]	H H-Bees	R2
Fonicamid (Mainman) ISK	29	Systemic		P		Registered in cucurbits for control of Aphids and Silverleaf white fly; Aphids in potatoes; Aphids and Mealybugs in apples and pears; aphids and mirids in cotton. US label (Beleaf) approves use on cucurbits (field and green house) on Aphids, Plant bugs and Greenhouse whitefly.	M L-Bees	-
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, Bugs and Caterpillars.		
Jassids/Leafhoppers (Cicadellidae)								
Priority: Low								
Jassids were consistently ranked as a low priority in every consulted region. Soil fumigation can help.								
1,3-dichloropropene (Tri-Form)	-	Soil fumigant	NR	A	ALL	Registered in vegetables for control of soil borne pests. Leave soil undisturbed for 14 d after treatment.	-	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars, Earwigs, Whitefly, Thrips and Leafhoppers . Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH H-Bees	-
Maldison (Fyfanon)	1B	Contact & systemic	1	A	ALL	Registered in vegetables including cucurbits for control of Aphid, Green vegetable bug, Jassids , Leaf hopper & Rutherglen bug. [Apply at first sight of infestation: max no. of applications not specified]	H H-Bees	-
Petroleum oil (Biocover)	UN	Contact		A		Registered in cucurbits for control of Aphids, Mites, Thrips and Leafhopper . [Max. 4 applications per season; re-treatment intervals not specified].	VL L-Bees	-
Thiamethoxam + chlorantraniliprole (Durivo) PER87051	4A+28	Systemic	H:35 NG	A	QLD (within Wide Bay Burnett region)	Permitted for use in cucumber for control of Diamondback moth, Cabbage white butterfly, Corn Earworm, Native budworm, Cabbage centre grub, Cabbage cluster caterpillar, Cluster caterpillar, Cabbage Aphid, Green Peach Aphid, Silverleaf Whitefly – all biotypes, Greenhouse Whitefly, Western Flower Thrips, Green vegetable bug, Potato moth, Tomato thrips, Brown sowthistle aphid, Vegetable leafhopper, Lucerne leafroller, Leafhoppers (Jassids) , Onion Thrips and Psyllids. [Max. 1 application per crop]. PER87051 is held by Bundaberg Fruit & Vegetable Growers Cooperative and applicable only to QLD growers in Wide Bay Burnett region.	L-H H-Bees	R2
Phorate (Thimet) Amvac Netherlands	1B	Contact & systemic		A		Registered in carrots for control of Aphids, Thrips, Jassids & Carrot fly. [Max. no. of applications and re-treatment interval not specified].	H H-Bees	R3
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, Bugs and Caterpillars.		

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Mealybugs (<i>Pseudococcidae</i> - unidentified species)								
Priority: Low								
Mealybugs were consistently ranked as a low priority in every consulted region								
Potassium salts of fatty acids (Natrasoap)	3A	Contact	NR	A	ALL	Registered in vegetables for control of Aphids, Thrips, Mealybug , Two spotted mites, Spider mite, and White fly. Apply when temperatures are cooler. [Max no. of applications not specified; re-treatment interval 5-7 d].	L L-Bees	-
Fonicamid (Mainman) ISK	29	Systemic		P-A		Registered in cucurbits for control of Aphids and Silverleaf white fly; Aphids in potatoes; Aphids and Mealybugs in apples and pears; Aphids and Mirids in cotton. US label (Beleaf) approves use on cucurbits (field and green house) on Aphids, Plant bugs and Greenhouse whitefly.	M L-Bees	
Sulfoxaflor (Transform) Corteva	4C	Systemic		P-A		Registered in cotton for control of Mealybugs . Registered in Cucurbits for control of Aphids, Greenhouse whitefly and Rutherglen bug.	M VH-Bees	
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C			P		Registered for control of Mealy bugs in grapes and macadamia.	M M-Bees	R2
Buprofezin (ACP Pickup) Australian Crop Protection	16	Insect Growth Regulator		P		Registered in custard apple, grapes, citrus, passion fruit, pear and persimmons for control of Mealy bugs .	L L-Bees	
Melon thrips (<i>Thrips palmi</i>)								
Priority: Low								
Thrips were consistently ranked as a low priority in every consulted region.								
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars, Earwigs, Whitefly, Thrips and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH H-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Methomyl (various) PER82428	1A	Contact	3	A	ALL	Permitted for use in cucumber for control of <i>Helicoverpa</i> spp., Cucumber moth, Cluster caterpillar, Loopers, Webworm, Rutherglen bug, Thrips including Western flower thrips. [max 6 applications per crop; re-treatment interval 7 d].	H H-Bees	R2
Paraffinic oil (Trump)	UN	Contact	1	A	ALL	Registered in cucurbits for control of Aphids, Mites, Thrips and Leafhopper. [Max. 4 applications per season; re-treatment intervals not specified].	VL L-Bees	-
Petroleum oil (Biocover)	UN	Contact	1	A	ALL	Registered in cucurbits for control of Aphids, Mites, Thrips and Leafhopper. [Max. 4 applications per season; re-treatment intervals not specified].	VL L-Bees	-
Potassium salts of fatty acids (Natrasoap)	-	Contact	Nil	A	ALL	Registered in vegetables for control of Aphids, Thrips , Mealybug, Two spotted mites, Spider mite, and White fly. Apply when temperatures are cooler. [Max no. of applications not specified; re-treatment interval 5-7 d].	L L-Bees	-
Pyrethrins (Amgrow)	3A	Contact	1	A	ALL	Registered in vegetables for control of Aphids, Thrips , Caterpillars, Ants, Earwigs, White flies & Leafhoppers. Spray early in the morning or late evening. [Max. no. of applications and re-treatment intervals not specified].	VH H-Bees	-
Rotenone (Derris Dust)	21B	-	1	A	ALL	Registered in vegetables for control of Aphids, Cabbage white butterfly, Cabbage moth, Cabbage-centre grub, Caterpillars, Potato moth (Leaf miner) and Thrips . [Max no. of applications not specified; Re-treatment interval: 10-14 d]	VL L-Bees	-
<i>Beauveria bassiana</i> (Broadband OD / Velifer) BASF	UNF	Protective biopesticide		P-A		Registered in protected vegetables and ornamentals for suppression of various pests including: Western Flower Thrips, Onion thrips , Greenhouse Whitefly, Silverleaf Whitefly, Sweet Potato Whitefly, Green Peach Aphid & Two-spotted Spider Mites. [Max. 3 application per crop; re-treatment interval 3-14 d]	L L-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Diafenthiuron + Cyantraniliprole (Minecto Forte) Syngenta	12A+28	Contact stomach & translaminar		P-A		Registered in fruiting vegetables including cucurbits for control of Helicoverpa, Potato moth, Cucumber moth, Cluster caterpillar, Aphids and Two-spotted Spider Mites and for suppression of Western flower thrips, Tomato thrips & Plague thrips . Field use only with ground-based spraying. [Max. 2 application per crop; re-treatment interval 28 d]	M VH-Bees	-
Spinetoram (Success Neo) Corteva	5	Translaminar		P-A		Registered in cucumber for the control of Helicoverpa and Western flower thrip . [Max no. of applications not specified; re-treatment interval: 7-14 d]	M H-Bees	-
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips , Bugs and Caterpillars.		
Pumpkin beetle (<i>Aulacophora hilaris</i>)								
Priority: Low								
Pumpkin beetles were consistently ranked as a low priority in every consulted region								
Bioallethrin + Bioresmethrin (Amgrow)	3A	Contact	1	A	ALL	Registered in vegetables for control of 28-spotted lady beetle and plain Pumpkin beetle . [Max. no. of applications not specified; re-treatment interval 3-4 d].	VH H-Bees	-
Carbaryl (David Grays)	1A	Contact & ingestion	3	A	ALL	Registered in cucurbits (prior to flowering) for the control of Helicoverpa, Pumpkin beetle , 28 spotted lady bird, Wingless grasshopper, Green vegetable bug, Leaf eating ladybird, Cutworms, Earwig, Potato moth, Rutherglen bug and Army worm. [Max. no. of applications and re-treatment interval not specified].	H H-Bees	R3
Cyantraniliprole + Thiamethoxam (Spinner) Syngenta	4A+28			P		Registered in Turf for control of caterpillars including Cutworms and Army worms, African black beetle larvae, Argentinian scarab larvae and stem weevil larvae. US label (Minecto Duo) approves use on Brassica, cucurbits, fruiting vegetables, leafy vegetables & tuberous and corm vegetables on a range of insect pests including Army worm, Leaf hoppers, Leaf miners, Diamond back moth and Potato beetle.	M VH-Bees	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Maldison (Fyfanon) FMC	1B	Contact & systemic		P		Registered in vegetables for control of Aphid, Green vegetable bug, Jassids, Leaf hopper, Red legged earth mite, Rutherglen bug, Twenty-eight spotted ladybirds . [Apply at first sight of infestation: max no. of applications not specified]	H H-Bees	-
Tetraniliprole (Vayego) Bayer	28	Disrupts feeding		P		Registered in Australia in multiple crops for various insect pests such as Beetles , Weevils & Lepidoptera. Hort Innovation has several projects underway towards assisting registration in minor crops.	M VH-Bees	-
Rutherglen Bug (<i>Nysius vinitor</i>) Priority: Low								
Rutherglen Bug was ranked as a moderate priority in QLD.								
Maldison (Fyfanon)	1B	Contact & systemic	1	A	ALL	Registered in vegetables including cucurbits for control of Aphid, Green vegetable bug, Jassids, Leaf hopper & Rutherglen bug . [Apply at first sight of infestation: max no. of applications not specified]	H H-Bees	-
Sulfoxaflor (Transform)	4C	Systemic	1	A	ALL	Registered in cucurbits including cucumber for control of Aphids, Green house whitefly and Rutherglen bug . [Max. no. of applications not specified; re-treatment interval 7-10 d]	M VH-Bees	-
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, Bugs and Caterpillars.		
Wingless grasshopper (<i>Phaulacridium vittatum</i>) Priority: Low								
Wingless grasshopper was consistently ranked as a low priority in every consulted region. Soil fumigation would help.								
1,3-dichloropropene (Tri-Form)	-	Soil fumigant	NR	A	ALL	Registered in vegetables for control of soil borne pests. Leave soil undisturbed for 14 d after treatment.	-	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Carbaryl (David Grays)	1A	Contact & ingestion	3	A	ALL	Registered in cucurbits (prior to flowering) for the control of Helicoverpa, Pumpkin beetle, 28 spotted lady bird, Wingless grasshopper , Green vegetable bug, Leaf eating ladybird, Cutworms, Earwig, Potato moth, Rutherglen bug and Army worm. [Max. no. of applications and re-treatment interval not specified].	H H-Bees	R3
Chlorpyrifos (Sinon)	1B	Contact & systemic	5	A	QLD & WA	Registered in young vegetable plants for the control of field and mole Crickets . Apply as a soil drench or boom spray. [Max no. of applications and re-treatment interval not specified]	H H-Bees	R1
<p>Brown marmorated stink bug (<i>Halyomorpha halys</i>) & Yellow spotted stink bug (<i>Erthesina fullo</i> & <i>E. accuminata</i>) Priority: Unknown</p> <p>An exotic pest that is considered a potential threat that could affect most vegetable crops if allowed to spread. It is important to monitor crops for eggs and larvae of pest species by regular field scouting. Target sprays against mature eggs and newly hatched larvae before pests become entrenched.</p>								
Bifenthrin (Talstar) PER82374	3A	Contact or ingestion	1	A	ALL	Permitted to use for control of Brown marmorated stink bug (<i>Halyomorpha halys</i>) & Yellow spotted stink bug (<i>Erthesina fullo</i> & <i>E. accuminata</i>) in cucurbits (field grown only). To be used in the event of a suspected or confirmed incursion only. [Max. 2 applications per crop; re-treatment interval not specified]	VH H-Bees	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Fall Armyworm (<i>Spodoptera frugiperda</i>)								
New Pest to Australia (unknown priority)								
Fall armyworm was not ranked as a pest in cucumber. It is an exotic pest that is considered a potential threat that could affect most vegetable crops if allowed to spread. If incursions occur, valid permits are in place for its control. It is important to monitor crops for eggs and larvae of pest species by regular field scouting. Target sprays against mature eggs and newly hatched larvae before pests become entrenched.								
Chlorantraniliprole (Coragen) PER89259	28	Systemic	1	A	ALL (excl. VIC)	Permitted to use for control of Fall Armyworm in field peas, faba beans, Brassica vegetables, Brassica leafy vegetables, Stalk and stem vegetables, Leafy vegetables, Fruiting vegetables (including cucurbits), Legume vegetables, Potatoes Sweet corn & Lettuce. [Max. 3 applications per crop; 2 consecutive; re-treatment interval 7 d]	L VL-Bees	-
Emamectin (Proclaim Opti) PER89263	6	Contact & systemic	3 NG	A	ALL (excl. VIC)	Permitted to use for control of Fall Armyworm in Brassica vegetables, Root & tuber vegetables, (except potato) Leafy vegetables, Brassica leafy vegetables, Sweet Corn, Lettuce, Cucurbits, Legume vegetables and Fruiting vegetables (field grown and protected cropping). [Max 4 applications per crop; re-treatment interval: 7 d]	M H-Bees	-
Spinetoram (Delegate & Success Neo) PER89241	5	Contact & ingestion	3	A	ALL (excl. VIC)	Permitted to use for control of Fall Armyworm in Sweet corn, Brassica vegetables, Brassica leafy vegetables, Stalk and stem vegetables, Leafy vegetables, Fruiting vegetables (including cucurbits), Legume vegetables, Stalk and stem vegetables, Culinary herbs, Root and tuber vegetables and several fruits. [Max. 4 applications per crop; re-treatment interval 7-14 d]	M H-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Spinosad (Entrust Organic) PER89870	5	Contact & ingestion	3 G:14	A	ALL (excl. VIC)	Permitted to use for control of Fall Armyworm in Brassica vegetables, Brassica leafy vegetables, Cucurbits, Stalk and stem vegetables, Leafy vegetables, Fruiting vegetables, Legume vegetables (succulent seeds & immature pods only), Stalk and stem vegetables, Culinary herbs, Root and tuber vegetables and several fruits. (field & protected cropping). [Max. 4 applications per season; re-treatment interval 7-14 d]	L L-Bees	-
Broflanilide (Vedira) BASF	30	Contact & ingestion		P		Registration submitted concurrently in Australia, Canada, USA, and Mexico as a soil application and seed treatment against chewing insects such as ants, cockroaches and Spodoptera spp. BASF are seeking registrations in amenity turf initially, then potential horticultural crops thereafter.	H VH-Bees	-
Indoxacarb (Avatar eVo) FMC	22A	Contact		P		Registered in several vegetable groups for control of various Lepidoptera pests. [Max 4 applications per crop: re-treatment interval 7 d]	L H-Bees	R3
Tetraniliprole (Vayego) Bayer	28	Disrupts feeding		P		Not registered in Australia, but Bayer is proceeding with registering it in New Zealand and Australia in multiple crops for several insect pests such as Weevils, Borers, Leafrollers, White grubs, Lepidoptera and Beetles including African black beetle.	M VH-Bees	-
Tomato potato psyllid (<i>Bactericera cockerelli</i>)								
Priority: Unknown								
Tomato potato psyllid was not ranked as a pest in cucumber. It is an exotic pest that is considered a potential threat that could affect most vegetable crops if allowed to spread. As it could be a potential threat, valid permits are in place for its control. It is important to monitor crops for eggs and larvae of pest species by regular field scouting. Target sprays against mature eggs and newly hatched larvae before pests become entrenched.								
Cyantraniliprole (Benevia) PER84805	28	Foliar, systemic & stomach	1	A	ALL (excl. VIC)	Permitted to use for control of Tomato potato psyllid in fruiting vegetables. [Max. 2 application per crop; re-treatment interval 7-10 d].	M VH-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Sulfoxaflor (Transform) PER84743	4C	Systemic	1	A	ALL (excl. VIC)	Permitted to use for control of Tomato potato psyllid in fruiting vegetables. [Max. 4 application per crop; re-treatment interval 7-10 d].	M VH-Bees	-
Spiromesifen (Oberon) Bayer	23	Non-systemic		P		Australian Registration pending for control of Mites. Registered in US for control of Two-spotted spider mite, Whiteflies and Tomato potato psyllid in tuberous and corm vegetables. Hort Innovation is undertaking data generation projects across multiple commodities for a new label registration in Australia.	M VL-Bees	
Tomato red spider mite (<i>Tetranychus evansi</i>) Priority: Unknown Tomato red spider mite was not ranked as a pest in cucumber. Other industry sources indicate that it could be a potential threat and a valid permit is in place for its control. This new species has not been found in commercial production sites to date. It is important to monitor crops for eggs and larvae of pest species by regular field scouting. Target sprays against mature eggs and newly hatched larvae before pests become entrenched.								
Abamectin (Vertimec) PER14722	6	Contact	3	A	ALL (excl. VIC)	Permitted for use in cucumber, squash & zucchini for control of Tomato red spider mite . [Max 2 applications per crop; re-treatment interval 28 d].	M H-Bees	-
Vegetable leaf miner (<i>Liriomyza sativae</i>) Priority: Unknown Liriomyza leafminers are serious horticultural pests, causing severe yield losses and quality downgrades. The Vegetable leafminer (<i>Liriomyza sativae</i>) is currently confined to the northern tip of Cape York Peninsula. Future outbreaks of Vegetable leafminer or other exotic Liriomyza species could potentially occur in any jurisdiction. It is important to monitor crops for eggs and larvae of pest species by regular field scouting. Target sprays against mature eggs and newly hatched larvae before pests become entrenched.								
Abamectin (Vertimec) PER81876	4C	Systemic	1	A	ALL (excl. VIC)	Permitted to use for control of Vegetable leaf miner in fruiting vegetables including cucurbits. [Max. 2 application per crop; re-treatment interval 7-14 d].	M H-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on Beneficials	Regulatory risk
Spinosad (Entrust Organic) Corteva	5	Contact and ingestion		P-A		Registered in cucurbits including cucumber for control of Cucumber moth, Helicoverpa & Western flower thrips. [Max. 4 applications per season; re-treatment interval 7-14 d]. Registered in US and Canada for control of a range of insect pests such as Ants, Caterpillars, Colorado Potato Beetle, Corn Earworms, Flea Beetle, Leaf miners , Loopers, Mites and Thrips in various vegetables.	L L-Bees	-
Cyantraniliprole + Thiamethoxam (Spinner) Syngenta	4A+28	Systemic, contact & stomach		P		Registered in Turf for control of Caterpillars including Cutworms and Army worms, African black beetle larvae, Argentinian scarab larvae & Stem weevil larvae. US label (Minecto Duo) approves use on Brassica, cucurbits, fruiting vegetables, leafy vegetables & tuberous and corm vegetables on a range of insect pests including Army worm, Leaf hoppers, Leaf miners , Diamondback moth and Potato beetle.	M VH-Bees	R2

4.3 Weeds in cucumber

4.3.1 Weed priorities

The feedback received from the different States and Territories did not rank any weeds as high priority, but some individual regions identified the following weeds.

Common Name	Scientific Name
Blackberry nightshade (Qld)	<i>Solanum nigrum</i>
Soursob (SA)	<i>Oxalis</i>

Some of the chemicals available for control of other unranked weeds in cucurbits are listed in Section 4.3.2 below.

Most of the Cucumbers are grown in protected cropping environments, including newer high-tech greenhouses. Hi-tech and low-tech hydroponic systems using different media such as coco peat is practiced in most States. In such protected cropping situations, weeds are not a problem and hence the non-ranking of weeds in the survey.

For field cucumber, various management practices such as soil fumigation, pre-crop spraying, spot spraying, or using mechanical devices can be used for controlling weeds.

In protected situations weed mats are used rather than herbicides.

Resistance management

Of the weeds listed in the table above there are confirmed cases of resistance in Australia for Blackberry nightshade (Group L at 2 sites).

Specific resistance management strategies for high resistance risk (A and B) and moderate resistance risk (C, D, F, G, I, J, K, L, M, N, Q and Z) herbicide modes of action are available on the CropLife Australia webpage.

<https://www.croplife.org.au/resources/programs/resistance-management/herbicide-resistance-management-strategies-2/>

4.3.2 Available and potential products for weed control

TABLE KEY: Note that blank fields in the table indicate no information has been provided.

Availability			
A	Available via either registration or permit approval		
P	Potential – a possible candidate to pursue for registration or permit		
P-A	Potential, already approved in the crop for another use		
Resistance risk		Regulatory risk (refer to Appendix 6)	
		R1	Short-term: Critical concern over retaining access
**	Moderate resistance risk	R2	Medium-term: Maintaining access of significant concern
***	High resistance risk	R3	Long-term: Potential issues associated with use - Monitoring required
Withholding Period (WHP) – Number of days from last treatment to harvest (H) or Grazing (G)			
Harvest	H	Not Required when used as directed	NR
Grazing	G	No Grazing Permitted	NG

Active ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Blackberry nightshade (<i>Solanum nigrum</i>)							
Priority: Low (QLD only)							
The above weed was an issue in a single State. Managing this would be possible using herbicides mentioned in Appendix 3 or by various management practices such as soil fumigation, pre-crop spraying, spot spraying, or using mechanical devices.							
2,4-D Acid (Farmalinx)	I**	Post emergent spot spray / Selective	Registered for spot spraying on all situations for control of a range of weeds. Thorough wetting of weed essential. Do not spray if rain is likely within 6 h. [Max no of applications not specified].	NR	A	ALL	-
Glyphosate (various)	M**	General knockdown. Pre-crop spray	Registered for control of general weeds as a pre-crop spray	NR	A	ALL	R3
Isoxaflutole (Balance) Bayer	H**	Sugarcane & chickpeas / Pre- emergent / Fallow	Registered for use in sugarcane, chickpeas and fallow situations for control of grass and broadleaf weeds including Blackberry nightshade .		P		

Active ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
S-Metolachlor + Prosulfocarb (Boxer Gold) Syngenta	J+K**	Barley, chickpeas, Faba beans, peas, lentils, lupins, potato and wheat / Pre- emergent	Registered for use in several crops for control of grass and broadleaf weeds including Blackberry nightshade . Hort Innovation is pursuing trials on onions and carrots.		P		
Soursob (<i>Oxalis pes-caprae</i>)							
Priority: Low (SA only)							
The above weed was an issue in a single State. Managing this would be possible using herbicides mentioned in Appendix 3 or by various management practices such as soil fumigation, pre-crop spraying, spot spraying, or using mechanical devices.							
2,4-D Acid (Farmalinx)	I**	Post emergent spot spray / Selective	Registered for spot spraying on all situations for control of a range of weeds. Thorough wetting of weed essential. Do not spray if rain is likely within 6 h. [Max no of applications not specified].	NR	A	ALL	-
Glyphosate (various)	M**	General knockdown. Pre-crop spray	Registered for control of general weeds as a pre-crop spray	NR	A	ALL	R3
Dicamba (Hemani) Hemani Industries	I**	Turf / Post-emergent	Registered for use in turf for control of a range of weeds including Oxalis spp. [Max. no. of applications not specified]		P		
Oxyfluorfen (Crossbar) UPL Aust.	G**	Broccoli, cabbage & cauliflower / Pre- emergent	Registered in broccoli, cabbage & cauliflower for pre-emergent control of several broadleaf and grass weeds including Soursob . Apply 4-7 days prior to transplanting. Irrigation or rainfall is essential for activation of this herbicide		P		-
Grass & Broadleaf weeds in Cucurbits							
Priority: Unknown							
Available and potential chemicals for control of other unranked weeds in cucurbits are listed below.							
Clomazone (Farmalinx)	Q**	Cucumber / Post plant / Pre-emergent	Most broadleaf and grass weeds. Only used in field grown crops. Refer to crop tolerance rate on label. [Max no of applications not specified].	NR	A	ALL	-

Active ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Fluazifop-P as butyl (Surefire)	A***	Cucurbits / Post emergent grass selective	Registered in cucurbits for the control of various grass weeds. Only used in field grown crops. Used to spot spray grass weeds such as couch grass. Do not apply before 5 true leaf stage of crop. [Max no of applications not specified].	21	A	ALL	-
Paraquat +/- diquat (Agro-Essence)	L***	Vegetable s/ General seed bed preparation / Post-emergent inter-row weed control	General weeds as a pre-crop spray. Only used in field grown crops. Post-emergence inter-row weed control (shielded spray – do not touch the crop). Add diquat where broadleaf weeds dominate. [Max no of applications not specified]	H:1 G:1	A	ALL	R3
Quizalofop-P-ethyl (Sabakem)	A***	Cucumber / Post emergent grass selective	Registered in cucumber for control of various grass weeds. Apply when weeds are actively growing. [Max no of applications not specified]	14	A	ALL	R3
Sethoxydim (Sertin)	A***	Cucumber / Post-emergent	Registered in cucumber for control of various grass weeds. Do not apply overhead irrigation within 2 h of application. [Max no of applications not specified]	28	A	ALL	-
Carbetamide (Ultro) Adama	E**	Oil seed rape & beans / Pre- & post-emergent	Registration is progressing for use on various crops for control of grass and broadleaf weeds. Registered in the UK for use in winter oil seed rape and winter beans.		P		
Metribuzin (Sencor) Bayer	C**	Barley, asparagus, beans, peas, oats, tomatoes etc. / Post-emergent	Registered for use in several crops for control of grass and broadleaf weeds.		P		
Norflurazon (Zoliar) Agnova Technologies	F**	Asparagus, citrus, grapes, nuts, stone & pome fruits / Pre-emergent	Registered in asparagus, citrus, grapes, nuts, stone & pome fruits for control of grass and broadleaf weeds. [Max. 2 applications per year; re-treatment interval not specified].		P		

5. References

5.1 Information:

AgChem Access Priority Access Forum	https://www.agrifutures.com.au/national-rural-issues/agvet-chemicals/
Australian Pesticide and Veterinary Medicines Authority	www.apvma.gov.au
APVMA Chemical review	https://apvma.gov.au/chemicals-and-products/chemical-review/listing
APVMA MRLs	www.legislation.gov.au/Details/F2020C00713
APVMA Permit search	https://productsearch.apvma.gov.au/permits
APVMA Product search	https://productsearch.apvma.gov.au/products
AUSVEG	https://ausveg.com.au
Codex MRL database	http://www.fao.org/fao-who-codexalimentarius/codex-texts/dbs/pestres/en/
Cotton Pest Management Guide 2018-19	https://www.cottoninfo.com.au/publications/cotton-pest-management-guide
CropLife Australia (resistance management)	https://www.croplife.org.au/resources/programs/resistance-management/
Growcom – Infopest Database	www.infopest.com.au
Hort Innovation	www.horticulture.com.au

5.2 Abbreviations and Definitions:

APVMA	Australian Pesticides and Veterinary Medicines Authority
IPM	Integrated pest management
LOQ	Limit of quantification
MRL	Maximum residue limit (mg/kg or ppm)
Pesticides	Plant protection products (fungicide, insecticide, herbicide, nematicides, rodenticides, etc.).
Plant pests	Diseases, insects, nematodes, rodents, viruses, weeds, etc.
SARP	Strategic Agrichemical Review Process
TBC	To be continued
WHP	Withholding Period

5.3 Acknowledgements:

Thanks go to the many industry people who contributed information and collaborated on the review of this report.

6. Appendices:

Appendix 1. Products available for disease control in cucumber

Appendix 2. Products available for control of insects, mites and other pests in cucumber

Appendix 3. Products available for weed control in cucumber

Appendix 4. Current permits for use in cucumber

Appendix 5. Cucumber Maximum Residue Limits (MRLs)

Appendix 6. Cucumber regulatory risk assessment

Appendix 1. Products available for disease control in cucumber

Active Ingredient (Trade Name)	Chem. group	Crop/Situation	Diseases / Comments	States	WHP Days	Regulatory risk
1,3-dichloropropene (Tri-Form)	-	General pre-plant soil fumigation	Nematodes, fungi & weed seeds. Restricted use.	ALL	NR	-
Azoxystrobin (various)	11	Cucurbits (field)	Powdery mildew, Downy mildew & Gummy stem blight	ALL	1	-
Benalaxyl + Mancozeb (Galben)	4+M3	Cucurbit (field)	Downy mildew (all states), Anthracnose, Gummy stem blight, Alternaria leaf spot & Septoria spot of pumpkins (QLD).	Variable	7	R2
Boscalid + Kresoxim-Methyl (Colliss)	7+11	Cucurbits (field)	Powdery mildew	ALL	7	-
Bupirimate (Nimrod)	8	Cucumber (field & protected)	Powdery mildew (<i>Sphaerotheca fuliginea</i>)	ALL	1	-
Captan (Crop Care) PER14326	M4	Cucumber (protected)	Grey mould	All (excl. VIC)	7	-
Chlorothalonil (Bravo)	M5	Cucurbits (field)	Downy mildew, Gummy stem blight, Anthracnose, Alternaria leaf blight, Target leaf spot & Belly rot	ALL	1	R3
Chlorothalonil (Sabakem)	M5	Cucurbits (field)	Suppression of Powdery mildew	ALL	1	R3
Chlorothalonil (Bravo) PER82895	M5	Cucumber (field & protected)	Grey mould	All (excl. VIC)	1	R3
Copper (various)	M1	Cucurbits (field & protected)	Angular leaf spot, Bacterial leaf spot & Downy mildew	ALL	1	-
Copper octanoate (Tricop)	M1	Cucurbits (field & protected)	Powdery mildew & Downy mildew.	ALL	1	-

Active Ingredient (Trade Name)	Chem. group	Crop/Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Copper oxychloride (Curenox)	M1	Cucurbits (field & protected)	Angular leaf spot, Bacterial leaf spot (all states), anthracnose, Downy mildew and Gummy stem blight (NSW, ACT, WA, NT only); registered in vegetables for control of Rust and Leaf spot diseases (QLD, NSW, VIC, TAS, SA & WA).	Variable	1	-
Cyflufenamid (Cyflamid)	U6	Cucurbits (field & protected)	Powdery mildew	ALL	1	-
Cyprodinil + fludioxonil (Switch)	9+12	Cucumber (field & protected)	Botrytis grey mould	ALL	3	R3
Dimethomorph (Eureka)	40	Cucurbits (field & protected)	Downy mildew (all states), Anthracnose, Gummy stem blight, Alternaria leaf spot (QLD & NT)	Variable	7	-
Ethanedinitrile (EDN Fumigas)	-	Cucurbits	Soil borne pathogens (including <i>Fusarium oxysporum</i>), Nematodes (including) and weeds. Use by licensed fumigators or approved persons.	ALL	NR	-
Fenhexamid (Teldor) PER12447	J	Cucumber (field & protected)	Grey mould.	All (excl. VIC)	3	-
Hydrogen peroxide + peroxy acetic acid (Peratec)	M	Cucurbits (field & protected)	Powdery mildew (<i>Sphaerotheca</i> spp.)	ALL	1	-
Iprodione (Rovral) PER81589	2	Cucumber (field & protected)	Grey mould and Sclerotinia rot	All (excl. VIC)	7 NG	R2
Mancozeb (Agrevo)	M3	Cucurbits (field)	Anthracnose, Downy mildew, Gummy stem blight & Septoria spot	ALL	7	R2
Mancozeb (Agrevo) PER14046	M3	Cucumber (field)	Botrytis grey mould	All (excl. VIC)	7	R2
Mancozeb + metalaxyl (Zeemil)	M3+4	Cucurbits (field)	Downy mildew (all states), Anthracnose, Gummy stem blight & Alternaria leaf spot (QLD)	Variable	7	R2
Metalaxyl	4	Cucurbits	Damping off (Pythium and Phytophthora spp.)	NSW, QLD,	7	-

Active Ingredient (Trade Name)	Chem. group	Crop/Situation	Diseases / Comments	States	WHP Days	Regulatory risk
(Farmalinx)		(field & protected)		WA		
Metham sodium (Imtrade)	-	Field fumigation	Nematodes, germinating weed seeds (including fat hen), Symphylids (not TAS) & fungal diseases (including Fusarium) field application in beds or rows. Field application to total area NSW, QLD, SA, VIC & WA.	ALL	NR	-
Metiram (Polyram)	M3	Cucurbits (field & protected)	Powdery mildew & Gummy stem blight	ALL	7	R2
Metrafenone (Vivando)	U8	Cucurbits (field & protected)	Powdery mildew	ALL	7	-
Oxathiapiprolin (Zorvec)	49	Cucurbits (field & protected)	Downy mildew	ALL	1	-
Penthiopyrad (Fontelis)	7	Cucurbits (field & protected)	Botrytis grey mould, Powdery mildew & Gummy stem blight	ALL	1	-
Phosphorous acid (Ezycrop)	33	Cucurbits (field)	Downy mildew	ALL	NR	-
Potassium bicarbonate (Eco-Carb) PER13695	M2	Cucumber (field & protected)	Powdery mildew	ALL	NR	-
Propamocarb hydrochloride + fluopicolide (Infinito)	28+43	Cucurbits (field & protected)	Downy mildew	ALL	1	-
Propineb (Antracol)	M3	Cucurbits (field & protected)	Downy mildew	ALL	3	R2
Propineb + oxadixyl (Rebound)	4+M3	Cucurbits (field)	Downy mildew, Gummy stem blight & Anthracnose	ALL	3	R2
Proquinazid (Talendo)	13	Cucurbits (field & protected)	Powdery mildew	ALL	1	-
Pyrimethanil (Scala) PER7909	9	Cucumber (field & protected)	Grey mould	All (excl. VIC)	1	-
Pyriofenone (Kusabi)	U8	Cucurbits (protected)	Powdery mildew	ALL	NR	-

Active Ingredient (Trade Name)	Chem. group	Crop/Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Sulphur + Mancozeb (Amgrow)	M2+M3	Cucurbits (field)	Downy mildew & Powdery mildew	ALL	7	R2
Tea tree oil (Timorex Gold)	46	Cucurbits (field & protected)	Powdery mildew	ALL	NR	-
Triadimefon (Novoguard)	3	Cucurbits (field)	Powdery mildew	NSW & WA	1	R3
Triadimenol (Surefire)	3	Cucurbits (field)	Powdery mildew	ALL	1	R3
Trifloxystrobin (Flint) PER14050	11	Cucumber (protected)	Powdery mildew	ALL (excl. VIC)	3	-
Zineb (Barmac)	M3	Cucurbits (field)	Downy mildew & Anthracnose	ALL	7	R2

Appendix 2. Products available for control of insects, mites and other pests in cucumber

Active Ingredient (Trade Name)	Chem. group	Crop/Situation	Pests / Comments	States	WHP	Regulatory risk
Abamectin (Vantal)	6	Cucumber (field)	Western flower thrips & Two-spotted mite	ALL	3	-
Abamectin (Tervigo Nematicide)	6	Cucurbits	Nematodes	ALL	NR	-
Abamectin (Vertimec) PER81876	6	Fruiting vegetables – Cucurbits (field)	Vegetable leaf miner (suppression only)	ALL (excl. VIC)	7 NG	-
Abamectin (Vertimec) PER14722	6	Cucumber (field & protected)	Tomato red spider mite	All (excl. VIC)	3 G:3	-
Afidopyropen (Versys)	9D	Cucurbits (field)	Green peach aphid, Cabbage aphid, Currant lettuce aphid and Cotton/Melon aphid; suppression of Silverleaf whitefly.	ALL	1	-
Afidopyropen (Versys) PER87852	9D	Cucumber, capsicum & eggplant (protected)	Green peach aphid, Melon aphid; suppression of Silverleaf whitefly.	ALL	3	-
Alpha-cypermethrin PER80138	3A	Cucurbit vegetables (field)	Cucumber fruit fly	ALL (excl. VIC)	1	-
Alpha-cypermethrin PER81702	3A	Cucumber (field & protected)	Loopers, Vegetable weevil & Plague thrips	ALL (excl. VIC)	1	-
<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i> (Dipel)	11A	Vegetables (field & protected)	Armyworm, Cotton bollworm, Native budworm, Cabbage moth, Cabbage white butterfly, Green looper, Lightbrown apple moth, Pear looper, Soybean looper, Vine moth & Tobacco looper	ALL	NR	-
<i>Bacillus thuringiensis</i> (Vectobac) PER14694	11A	Cucumber (protected)	Fungus gnats	ALL (excl. VIC)	NR	-

Active Ingredient (Trade Name)	Chem. group	Crop/Situation	Pests / Comments	States	WHP	Regulatory risk
<i>Beauveria bassiana</i> (Broadband OD / Velifer)	UNF	Protected vegetables and ornamentals	Suppression of various pests including: Western Flower Thrips, Onion thrips, Greenhouse Whitefly, Silverleaf Whitefly, Sweet Potato Whitefly, Green Peach Aphid & Two-spotted Spider Mites.	ALL	NR	-
Bifenazate (Acramite)	20D	Cucumber (field)	Two-spotted mite & Byrobia mite	ALL	1	-
Bifenazate (Acramite) PER82341	20D	Cucumber (field & protected)	Red tomato spider mite	ALL (excl. VIC)	1 NG	-
Bifenthrin (Genfarm)	3A	Cucurbits (field grown only)	Native budworm, Corn earworm, Cucumber moth & Silverleaf whitefly biotype B	QLD, NSW, NT & WA	1	R3
Bifenthrin (Talstar) PER82374	3A	Cucurbits (field grown only)	Brown marmorated stink bug & Yellow spotted stink bug	ALL	1	R3
Bioallethrin + bioresmethrin (Amgrow Bug Kill)	3A	Cucurbits (field)	Plain pumpkin beetle & Twenty-eight spotted lady beetles	ALL	1	-
Botanical oils (Eco-Oil)	-	Cucumber	Two-spotted mites, Greenhouse whitefly & Aphids	ALL	NR	-
Buprofezin (Applaud) PER82467	16	Cucumber (field & protected)	Greenhouse whitefly, Sweet potato whitefly & Silverleaf whitefly	All (excl. VIC)	3	-
Carbaryl (David Grays)	1A	Cucurbits (prior to flowering only) (field & protected)	Helicoverpa spp., Pumpkin beetle, Twenty-eight spotted ladybird, Cucurbit stemborer, Wingless grasshopper, Green vegetable bug, Leaf eating ladybird, Cutworms, European earwig, Potato moth, Rutherglen bug & Army worms	Variable refer to label	3	R3
Chlorantraniliprole (Coragen)	28	Cucumber (field & protected)	Cotton bollworm, Native budworm & Cucumber moth	ALL	1	-
Chlorantraniliprole (Coragen) PER89259	28	Fruiting vegetables including cucurbits (field)	Fall armyworm (<i>Spodoptera frugiperda</i>)	ALL (excl. VIC)	1	-
Chlorpyrifos	1B	Cucurbits	Whitefly	NSW & WA	5	R1

Active Ingredient (Trade Name)	Chem. group	Crop/Situation	Pests / Comments	States	WHP	Regulatory risk
(Arysta)		(field & protected)				
Clothianidin (Samurai) PER80101	4A	Cucurbit vegetables (field and protected)	Cucumber fruit fly	ALL	7 NG	R2
Cyantraniliprole (Benevia)	28	Cucurbits (field)	Melon aphid, Silverleaf whitefly, Cotton bollworm, Cucumber moth, Native budworm & Western flower thrips (suppression only)	ALL	1	-
Cyantraniliprole (Benevia) PER84805	28	Fruiting vegetables (field)	Tomato potato psyllid	ALL (excl. VIC)	1 NG	-
Diafenthiuron + Cyantraniliprole (Minecto Forte) Syngenta	12A+28	Fruiting vegetables including cucurbits (field only)	Helicoverpa, Potato moth, Cucumber moth, Cluster caterpillar, Aphids and Two-spotted Spider Mites and for suppression of Western flower thrips, Tomato thrips & Plague thrips	ALL	1	-
Diazinon (various)	1B	Cucumbers (field)	Caterpillars, Cutworms, and Thrips	All (excl. TAS)	14 G:14	R3
Emamectin (Proclaim Opti) PER89263	6	Cucurbits (field & protected)	Fall armyworm (<i>Spodoptera frugiperda</i>)	ALL (excl. VIC)	3	-
Emulsifiable botanical oils (Eco-oil) PER14077	-	Cucumbers (greenhouse and hydroponic)	Silverleaf whitefly biotype B	ALL (excl. VIC)	Nil	-
Etoxazole (Paramite) PER82460	10B	Cucumber (field and protected)	Two-spotted mite & Tomato red spider mite	ALL (excl. VIC)	7	-
Flonicamid (Mainman)	29	Cucumber (field & protected)	Green peach aphid, Melon aphid & Silverleaf whitefly	ALL	1	-
Flubendiamide (Belt)	28	Cucurbits (field & protected)	Helicoverpa spp. & Cucumber moth	ALL	1	-
Fluensulfone (Nimitz Nematicide)	-	Cucurbits (field)	Root-knot nematode	QLD	NR NG	-
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Vegetables (field)	Ants, Aphids, Caterpillars, Earwigs, Whitefly, Thrips & Leafhoppers. Suitable for organic	ALL	1	-

Active Ingredient (Trade Name)	Chem. group	Crop/Situation	Pests / Comments	States	WHP	Regulatory risk
(Richgro)			growers.			
Hexythiazox (Calibre) PER14765	10A	Cucumber (field & protected)	Tomato russet mite, Broad mite, Tomato red mite & Two-spotted mite	ALL	3	-
Imidacloprid (Eureka)	4A	Cucumber (field)	Green peach aphid & Silverleaf whitefly including biotype B	ALL	1	R2
Imidacloprid (Confidor) PER12489	4A	Cucumber (field & protected)	Greenhouse whitefly	All (excl. VIC)	1	R2
Maldison (Fyfanon)	1B	Cucumber (field & protected)	Aphids, Green vegetable bug, Jassids, Leaf hopper, Red legged earth mite (not TAS), Rutherglen bug, Twenty-eight spotted lady bird (not TAS), Pumpkin beetle & Fruit fly	Variable refer to label	1	-
Methomyl (Marlin) PER82428	1A	Cucumber (field)	Helicoverpa spp., Cucumber moth, Cluster caterpillar, Loopers, Webworm, Rutherglen bug & Thrips including Western flower thrips	ALL	3	R2
NPV Helicoverpa (Helicovex)	31	Cucumber (field & protected)	Cotton bollworm, Corn earworm, Tobacco budworm & Native budworm	ALL	Nil	-
Petroleum oil (various)	UN	Cucurbits (field)	Aphids, Mites, Thrips & Leaf hopper	ALL	1	-
Paraffinic oil (D-C-Maxx)	UN	Cucurbits (field)	Silverleaf whitefly	QLD	1	-
Petroleum oil (various) PER12221	UN	Cucumber (field & protected)	Greenhouse whitefly, Sweet potato white fly, Silverleaf whitefly biotype B & whitefly biotype Q	ALL (excl. VIC)	1	-
Pirimicarb (various)	1A	Cucurbits (field)	Aphids	ALL	2	R3
Potassium salts of fatty acids (Natrasoap) PER13920	-	Cucumbers (protected)	Greenhouse whitefly & Silverleaf whitefly	ALL (excl. VIC)	NR	-
Pyrethrins (Amgrow)	3A	Cucurbits (field)	Aphids, Thrips, Caterpillars (including Cabbage white butterfly and Cabbage moth), Whitefly, Ants, Flies, Earwigs, Leafhopper, Two-spotted	ALL	1	-

Active Ingredient (Trade Name)	Chem. group	Crop/Situation	Pests / Comments	States	WHP	Regulatory risk
			mite, Scale, Mealybug & Sooty mould			
Pyriproxyfen (Admiral)	7C	Cucurbits (field & protected)	Silverleaf whitefly biotype B & Greenhouse whitefly	ALL	1 NG	-
Spinetoram (Success NEO)	5	Cucurbits (field & protected)	Cucumber moth, <i>Helicoverpa</i> spp. & Western flower thrips	ALL	3	-
Spinetoram (Success Neo) PER89241	5	Cucurbits (field & protected)	Fall armyworm (<i>Spodoptera frugiperda</i>)	ALL (excl. VIC)	1	
Spinosad (Entrust Organic)	5	Cucurbits (field & protected)	Cucumber moth, <i>Helicoverpa</i> & Western flower thrips.	ALL	3 G:14	-
Spinosad (Entrust Organic) PER89870	5	Cucurbits (field & protected)	Fall armyworm (<i>Spodoptera frugiperda</i>)	ALL (excl. VIC)	3 G:14	-
Spirotetramat (Movento)	23	Cucurbits (field & protected)	Cotton aphid, green peach aphid & silverleaf whitefly biotype B	ALL	1	-
Sulfoxaflor (Transform)	4C	Cucurbits (field grown only)	Green peach aphid, Melon (Cotton) aphid & Greenhouse whitefly	ALL	1	-
Sulfoxaflor (Transform) PER84743	4C	Fruiting vegetables (field)	Tomato potato psyllid	ALL (excl. VIC)	1 NG	-
Tebufenpyrad (Sipcam)	21A	Cucumbers (field & protected)	Two-spotted mite and European red mite	ALL	14	-
Thiamethoxam + chlorantraniliprole (Durivo) PER87051	4A+28	Cucumbers (field & protected)	Diamondback moth, Cabbage white butterfly, Corn Earworm, Native budworm, Cabbage centre grub, Cabbage cluster caterpillar, Cluster	QLD	5 NG	

Active Ingredient (Trade Name)	Chem. group	Crop/Situation	Pests / Comments	States	WHP	Regulatory risk
			caterpillar, Cabbage Aphid, Green Peach Aphid, Silverleaf Whitefly – all biotypes, Greenhouse Whitefly, Western Flower Thrips, Green vegetable bug, Potato moth, Tomato thrips, Brown sowthistle aphid, Vegetable leafhopper, Lucerne leafroller, Leafhoppers (Jassids), Onion Thrips & Psyllids			
Trichlorfon (TyraneX)	1B	Cucurbits (field & protected)	Cutworm	QLD & NT	2	R2
Trichlorfon (TyraneX)	1B	Vegetables (field & protected)	Cabbage white butterfly, Cabbage moth, Green vegetable bug & Rutherglen bug	ALL	2	R2

Appendix 3. Products available for weed control in cucumber

Active ingredient (Trade Name)	Chem. Group	Crop / Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
2,4-D Acid (Farmalinx)	I**	Post emergent spot spray/selective	Registered for spot spraying on all situations for control of a range of weeds. Thorough wetting of weed essential. Do not spray if rain is likely within 6 h. [Max no of applications not specified].	NR	ALL	-
Clomazone (Farmalinx)	Q**	Cucumber / Post plant/pre-emergent	Most broadleaf and grass weeds. Only used in field grown crops. Refer to crop tolerance rate on label. [Max no of applications not specified].	NR	ALL	-
Fluazifop-P as butyl (Surefire)	A***	Cucurbits / Post emergent grass selective	Registered in cucurbits for the control of various grass weeds. Only used in field grown crops. Used to spot spray grass weeds such as couch grass. Do not apply before 5 true leaf stage of crop. [Max no of applications not specified].	21	ALL	-
Glyphosate (various)	M**	General knockdown. Pre-crop spray	Registered for control of general weeds as a pre-crop spray	NR	ALL	R3
Paraquat +/- diquat (Agro-Essence)	L***	Vegetables/General seed bed preparation / Post-emergence inter-row weed control	General weeds as a pre-crop spray. Only used in field grown crops. Post-emergence inter-row weed control (shielded spray – do not touch the crop). Add diquat where broadleaf weeds dominate. [Max no of applications not specified]	NR	ALL	R3
Quizalofop-P-ethyl (Sabakem)	A***	Cucumber / Post emergent grass selective	Registered in cucumber for control of various grass weeds. Apply when weeds are actively growing. [Max no of applications not specified]	14	ALL	R3
Sethoxydim (Sertin)	A***	Cucumber / Post- emergent	Registered in cucumber for control of various grass weeds. Do not apply overhead irrigation within 2 h of application. [Max no of applications not specified]	28	ALL	-

Appendix 4. Current permits for use in cucumber

Permit No.	Description	Issued Date	Expiry Date	Permit Holder
PER81876 Version 3	Abamectin / Fruiting vegetables – cucurbits / Vegetable leaf miner (suppression only) (field)	24-Jun-16	30-Apr-24	Hort Innovation
PER14722 Version 3	Abamectin / Cucumber / Tomato red spider mite (field and protected)	17-Feb-15	31-Jul-25	Hort Innovation
PER87852	Afidopyropen (Versys) / Cucumber, eggplant & capsicum / Green peach aphid, Melon aphid & suppression of Silverleaf whitefly (protected)	29-May-20	31-May-23	Hort Innovation
PER80138 Version 2	Alpha-cypermethrin / Cucurbit vegetables / Cucumber fruit fly (field)	26-Feb-15	31-Mar-25	Hort Innovation
PER81702 Version 2	Alpha-cypermethrin / Cucumber / Loopers, vegetable weevil, and plague thrips Cucumber (field and protected)	24-Mar-16	31-Mar-21	Hort Innovation
PER14694 Version3	<i>Bacillus thuringiensis</i> (Vectobac) / cucumber / Fungus gnats (protected)	01-Jun-14	30-Jun-24	Hort Innovation
PER82341 Version 2	Bifenazate (Acramite) / Cucumber / Red tomato spider mite (field and protected)	29-Mar-16	31-Mar-21	Hort Innovation
PER82374	Bifenthrin / Cucurbits / Stink bugs (field)	14-Feb-18	28-Feb-23	Dept. of Ag. & Water Resources
PER82467 Version 3	Buprofezin (Applaud) / Greenhouse whitefly, sweet potato whitefly, and silverleaf whitefly (field and protected)	07-Jul-17	31-Aug-25	Hort Innovation
PER14326 Version 3	Captan (Crop Care) / Cucumbers / Botrytis grey mould (protected)	19-Dec-13	30-Nov-21	Hort Innovation
PER89259	Chlorantraniliprole (Coragen) / Various Crops / Fall Armyworm (field)	06-Mar-20	31-Mar-23	Hort Innovation
PER82895	Chlorothalonil (Bravo) / Cucumber / Botrytis rot (field & protected)	04-Aug-17	31-Aug-25	Hort Innovation
PER80101 Version 3	Clothianidin (Samurai) / Cucurbit vegetables / Cucumber fruit fly (field & protected)	10-Nov-15	30-Sep-23	Hort Innovation
PER84805	Cyantraniliprole (Benevia) / Fruiting vegetables / Tomato potato psyllid (field)	06-Dec-17	31-Dec-22	Hort Innovation
PER89263	Emamectin (Proclaim Opti) / Various crops / Fall Armyworm (field & protected)	10-Mar-20	31-Mar-23	Hort Innovation
PER14077 Version 2	Emulsifiable botanical oils (Eco-oil) / Cucumbers / Silverleaf whitefly biotype B (protected)	01-Oct-13	30-Sep-23	Hort Innovation
PER82460 Version 2	Etoxazole (Paramite) / Cucumber / Two-spotted mite and tomato red spider mite (field & protected)	26-Jul-17	31-Jul-23	Hort Innovation
PER12447 Version 3	Fenhexamid (Teldor) / Cucumber / Botrytis grey mould (field & protected)	30-Sep-13	31-May-21	Hort Innovation
PER14765 Version 4	Hexythiazox (Calibre) / Cucumber / Tomato russet mite, broad mite, tomato red mite, and two-spotted mite (field & protected)	21-Feb-15	30-Sep-23	Hort Innovation
PER12489	Imidacloprid (Confidor) / Cucumber / Greenhouse	30-Jun-15	31-May-25	Hort

Permit No.	Description	Issued Date	Expiry Date	Permit Holder
Version 2	whitefly (field & protected)			Innovation
PER81589 Version 2	Iprodione (Rovral) / Cucumber / Sclerotinia rot and Botrytis grey mould (field & protected)	21-Sep-16	31-Oct-21	Hort Innovation
PER14046 Version 2	Mancozeb / Cucumber / Botrytis grey mould (field)	01-May-13	31-Mar-23	Hort Innovation
PER82428 Version 4	Methomyl / Cucumber / <i>Helicoverpa</i> spp., cucumber moth, cluster caterpillar, loopers, webworm, Rutherglen bug, thrips including Western flower thrips (field)	22-Apr-16	31-Mar-24	Hort Innovation
PER12221 Version 4	Petroleum oil / Cucumber / Greenhouse whitefly, sweet potato white fly, silverleaf whitefly biotype B, and whitefly biotype Q (field & protected)	29-Jun-12	30-Nov-22	Hort Innovation
PER13695 Version 3	Potassium bicarbonate (Eco-Carb) / Cucumbers / Powdery mildew (field & protected)	31-Oct-12	31-Jul-25	Hort Innovation
PER13920 Version 2	Potassium salts of fatty acids (Natrasoap) / Cucumbers / Greenhouse whitefly and silverleaf whitefly (protected)	01-Mar-13	31-Mar-23	Hort Innovation
PER7909 Version 3	Pyrimethanil (Scala) / Cucumber / Botrytis grey mould (field & protected)	05-Apr-12	30-Sep-22	Hort Innovation
PER89241	Spinetoram (Success Neo and Delegate) / Various Crops / Fall Armyworm (field & protected)	06-Mar-20	31-Mar-23	Hort Innovation
PER89870	Spinosad (Entrust Organic) / Various Crops / Fall Armyworm (field & protected)	21-Jul-20	31-Jul-23	Hort Innovation
PER84743	Sulfoxaflor (Transform) / Fruiting vegetables / Tomato potato psyllid (field)	24-Oct-17	31-Oct-22	Hort Innovation
PER87051	Thiamethoxam + chlorantraniliprole (Durivo) / Various Crops / Various pests (specific regions of SE QLD) (field & protected)	25-Feb-19	28-Feb-24	Bundaberg Fruit & Vegetable Growers Coop Ltd.
PER14050 Version 2	Trifloxystrobin (Flint) / Cucumbers / Powdery mildew (protected)	01-Jun-13	30-Jun-23	Hort Innovation

Appendix 5. Cucumber Maximum Residue Limits (MRLs)

CODEX commodity groupings of fruiting vegetables and subgroups:

VC 0424 Cucumber
 VC 0045 Fruiting vegetables, cucurbits
 - Vegetables

Note: Less than 1% of cucumbers have been exported and out of that 67% was exported to New Zealand. Available information indicates that in the absence specific limits in legislation the most countries defers to Codex, followed by EU MRL standards or applies a 0.01ppm default value. Food exported to New Zealand from Australia may be legally sold if it complies with Australian requirements. MRLs and legislation are subject to change; the values presented should not be relied on.

Chemical	Codex	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Abamectin	VC0424	Cucumber	T0.05	0.03
Acetamiprid	VC0424	Cucumber	T0.2	0.3
Acibenzolar-S-methyl	VC0424	Cucumber	T0.5	-
Afidopyropen	VC0045	Fruiting vegetables, cucurbits	0.7	0.7 ⁴
Aldrin and Dieldrin	VC0045	Fruiting vegetables, cucurbits	E0.1	E0.1
Ametoctradin	VC0424	Cucumber	-	0.4
Amitraz	VC0424	Cucumber	-	0.5
Azoxystrobin	VC0045	Fruiting vegetables, cucurbits	2	1
Benalaxyl	VC0045	Fruiting vegetables, cucurbits	0.2	-
Bensulide	VC0045	Fruiting vegetables, cucurbits	*0.1	-
Bifenazate	VC0045	Fruiting vegetables, cucurbits	-	0.5
Bifenthrin	VC0424	Cucumber	0.5	-
Bitertanol	VC0424	Cucumber	-	0.5
Boscalid	VC0045	Fruiting vegetables, cucurbits	0.5	3
Bromide ion	VC0424	Cucumber	-	100
Bromopropylate	VC0424	Cucumber	-	0.5
Bupirimate	VC0045	Fruiting vegetables, cucurbits	1	-
Buprofezin	VC0045	Fruiting vegetables, cucurbits	T2	0.7
Captan	VC0424	Cucumber	T5	3
Carbaryl	VC0045	Fruiting vegetables, cucurbits	*0.01	-
Carbendazim	VC0424	Cucumber	-	*0.05
Chlorantraniliprole	VC0045	Fruiting vegetables, cucurbits	0.2	0.3
Chlordane	VC0045	Fruiting vegetables, cucurbits	E0.05	-
Chlorothalonil	VC0424	Cucumber	-	3
	VC0045	Fruiting vegetables, cucurbits	5	-
Chlorpyrifos	-	Vegetables	T*0.01	-
Chlorthal-dimethyl	-	Vegetables	5	-
Clofentezine	VC0424	Cucumber	-	0.5
Clomazone	VC0045	Fruiting vegetables, cucurbits	*0.05	-
Clothianidin	VC0045	Fruiting vegetables, cucurbits	T0.5	*0.02
Cyantraniliprole	VC0045	Fruiting vegetables, cucurbits	0.5	0.3
Cyazofamid	VC0045	Fruiting vegetables, cucurbits	-	0.09
Cyflufenamid	VC0045	Fruiting vegetables, cucurbits	0.1	-
Cyhalothrin (includes lambda-cyhalothrin)	VC0045	Fruiting vegetables, cucurbits	-	0.05
	VC0424	Cucumber	T0.05	-

⁴ 2019 JMPR Recommendation

Chemical	Codex	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Cypermethrins (including alpha- and zeta-cypermethrin)	VC0045	Fruiting vegetables, cucurbits	T0.3	0.07
Cyprodinil	VC0045	Fruiting vegetables, cucurbits	-	0.5
	VC0424	Cucumber	0.5	-
Cyromazine	VC0424	Cucumber	-	2
	VC0045	Fruiting vegetables, cucurbits	T0.7	-
Deltamethrin	VC0045	Fruiting vegetables, cucurbits	-	0.2
Diazinon	VC0424	Cucumber	-	0.1
	-	Vegetables	0.7	-
Dichlobenil	VC0045	Fruiting vegetables, cucurbits	-	*0.01
Dicofol	VC0424	Cucumber	2	-
Difenoconazole	VC0424	Cucumber	-	0.2
Dimethomorph	VC0045	Fruiting vegetables, cucurbits	0.5	0.5
Dinocap	VC0045	Fruiting vegetables, cucurbits	-	*0.05
	VC0424	Cucumber	-	0.7
Dinotefuran	VC0045	Fruiting vegetables, cucurbits	-	0.5
2,2 DPA	-	Vegetables	*0.1	-
Diquat	-	Vegetables	*0.05	-
Dithiocarbamates	VC0424	Cucumber	-	2
	VC0045	Fruiting vegetables, cucurbits	2	-
Emamectin benzoate	VC0045	Fruiting vegetables, cucurbits	0.01	0.007
Endrin	VC0045	Fruiting vegetables, cucurbits	-	E0.05
EPTC	-	Vegetables	*0.04	-
Ethoprophos	VC0424	Cucumber	-	0.01
Etoxazole	VC0424	Cucumber	-	0.02
	VC0045	Fruiting vegetables, cucurbits	T0.1	-
Etridiazole	-	Vegetables	0.2	-
Famoxadone	VC0424	Cucumber	-	0.2
Fenamidone	VC0045	Fruiting vegetables, cucurbits	-	0.2
Fenbuconazole	VC0424	Cucumber	-	0.2
Fenbutatin Oxide	VC0424	Cucumber	-	0.5
Fenhexamid	VC0424	Cucumber	T10	1
Fenpyroximate	VC0424	Cucumber	-	0.3
Flonicamid	VC0045	Fruiting vegetables, cucurbits	0.7	0.2
Fluazifop-p-butyl	VC0045	Fruiting vegetables, cucurbits	0.1	-
Flubendiamide	VC0045	Fruiting vegetables, cucurbits	0.2	0.2
Fludioxonil	VC0045	Fruiting vegetables, cucurbits	-	0.5
	VC0424	Cucumber	0.5	-
Fluensulfone	VC0045	Fruiting vegetables, cucurbits	0.5	0.7
Flumioxazin	VC0045	Fruiting vegetables, cucurbits	-	*0.02
Fluopicolide	VC0045	Fruiting vegetables, cucurbits	0.5	0.5
Fluopyram	VC0424	Cucumber	-	0.5
Flutriafol	VC0045	Fruiting vegetables, cucurbits	-	0.3
Fluxapyroxad	VC0045	Fruiting vegetables, cucurbits	-	0.2
Folpet	VC0424	Cucumber	-	1
Glyphosate	VC0045	Fruiting vegetables, cucurbits	*0.1	-
Heptachlor	-	Vegetables	E0.05	-
Hexythiazox	VC0045	Fruiting vegetables, cucurbits	T0.05	0.05
Imazalil	VC0424	Cucumber	-	0.5

Chemical	Codex	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Imidacloprid	VC0424	Cucumber	-	1
	VC 0045	Fruiting vegetables, cucurbits	0.2	-
Indoxacarb	VC 0045	Fruiting vegetables, cucurbits	-	0.5
Inorganic bromide	-	Vegetables	20	-
Iprodione	VC0424	Cucumber	-	2
Kresoxim-Methyl	VC0424	Cucumber	-	*0.05
	VC0045	Fruiting vegetables, cucurbits	0.05	-
Lufenuron	VC0424	Cucumber	-	0.09
Lindane	-	Vegetables	E2	-
Linuron	-	Vegetables	*0.05	-
Malathion	VC0424	Cucumber	-	0.2
Maldison	VC0424	Cucumber	3	-
Mandipropamid	VC0424	Cucumber	-	0.2
Meptyldinocap	VC0424	Cucumber	-	0.07
Metalaxyl	VC0424	Cucumber	-	0.5
	VC0045	Fruiting vegetables, cucurbits	0.2	-
Metaldehyde	-	Vegetables	1	-
Methiocarb	-	Vegetables	0.1	-
Methomyl	VC0045	Fruiting vegetables, cucurbits	0.1	0.1
Methoxyfenozide	VC0045	Fruiting vegetables, cucurbits	3	0.3
	VC0424	Cucumber	T2	-
Methyl bromide	VC0424	Cucumber	*0.05	-
Metrafenone	VC0424	Fruiting vegetables, cucurbits	-	0.5
Metolachlor	VC0045	Fruiting vegetables, cucurbits	*0.05	-
Metrafenone	VC0045	Fruiting vegetables, cucurbits	0.2	-
Myclobutanil	VC0045	Fruiting vegetables, cucurbits	-	0.2
Novaluron	VC0045	Fruiting vegetables, cucurbits	-	0.2
Omethoate	-	Vegetables	2	-
Oxadixyl	VC0045	Fruiting vegetables, cucurbits	0.5	-
Oxamyl	VC0424	Cucumber	-	0.02
Oxathiapiprolin	VC0045	Fruiting vegetables, cucurbits	0.2	-
Paraquat	VC0045	Fruiting vegetables, cucurbits	-	0.02
	-	Vegetables	*0.05	-
Penconazole	VC0424	Cucumber	-	0.06
Penthiopyrad	VC0045	Fruiting vegetables, cucurbits	1	0.5
Permethrin	VC0424	Cucumber	-	0.5
Phosphorous acid	VC0045	Fruiting vegetables, cucurbits	T100	-
Piperonyl Butoxide	VC0045	Fruiting vegetables, cucurbits	-	1
	-	Vegetables	8	-
Pirimicarb	VC0045	Fruiting vegetables, cucurbits	-	1
	-	Vegetables	1	-
Prometryn	-	Vegetables	*0.1	-
Propamocarb	VC0045	Fruiting vegetables, cucurbits	5	5
Propargite	-	Vegetables	3	-
Propazine	-	Vegetables	*0.1	-
Propineb	VC0045	Fruiting vegetables, cucurbits	2	-
Proquinazid	VC0045	Fruiting vegetables, cucurbits	0.2	-
Prothioconazole	VC0045	Fruiting vegetables, cucurbits	-	0.2
Pydiflumetofen	VC0045	Fruiting vegetables, cucurbits	T0.5	-

Chemical	Codex	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Pymetrozine	VC0045	Fruiting vegetables, cucurbits	1	-
Pyraclostrobin	VC0045	Fruiting vegetables, cucurbits		0.5
Pyrethrins	VC0045	Fruiting vegetables, cucurbits	-	*0.05
	-	Vegetables	1	-
Pyrimethanil	VC0424	Cucumber	5	0.7
Pyriofenone	VC0045	Fruiting vegetables, cucurbits	0.7	-
Pyriproxyfen	VC0045	Fruiting vegetables, cucurbits	0.2	0.04
Quisalofop-ethyl	VC0424	Cucumber	*0.02	-
Quisalofop-P-tefuryl	VC0424	Cucumber	*0.02	-
Sethoxydim	VC0045	Fruiting vegetables, cucurbits	*0.1	-
Spinetoram	VC0045	Fruiting vegetables, cucurbits	0.05	-
Spinosad	VC0045	Fruiting vegetables, cucurbits	0.2	0.2
Spirodiclofen	VC0424	Cucumber	-	0.07
Spirotetramat	VC0045	Fruiting vegetables, cucurbits	2	0.2
Sulfoxaflor	VC0045	Fruiting vegetables, cucurbits	0.5	0.5
Tebuconazole	VC0424	Cucumber	-	0.2
Tebufenpyrad	VC0424	Cucumber	*0.02	-
Thiacloprid	VC0424	Cucumber	-	0.3
Thiamethoxam	VC0045	Fruiting vegetables, cucurbits	T1	0.5
Triadimefon	VC0045	Fruiting vegetables, cucurbits	0.2	0.2
Triadimenol	VC0045	Fruiting vegetables, cucurbits	0.5	0.2
Trichlorfon	-	Vegetables	0.1	-
Trifloxystrobin	VC0045	Fruiting vegetables, cucurbits	-	0.3
	VC0424	Cucumber	T*0.1	-
Triflumizole	VC0424	Cucumber	-	0.5
Trifluralin	-	Vegetables	0.05	-
Zoxamide	VC0045	Fruiting vegetables, cucurbits	-	2

NOTE: MRLs are constantly under review and subject to change. Check for current MRLs and do not rely on the values stated above.

* Indicates that an MRL is at the Limit of Quantitation (LOQ)

NR - Uses of substances where MRLs are not necessary / required.

T =Temporary MRL

E = The MRL is based on extraneous residues

Sources: APVMA MRLs: Agricultural and Veterinary Chemicals Code Instrument No. 4 (MRL Standard) 2019. Compilation 4. Prepared 15 January 2020. CODEX MRLs: In addition to the online CODEX database, meeting reports were used to update recent changes (to July 2019).

Appendix 6. Cucumber regulatory risk assessment

Cucumber Agrichemical Regulatory Risk Assessment

June 2020

Regulatory pressures on agrichemicals are increasing globally, with many being either restricted or withdrawn from use. For older agrichemicals these pressures are often the result of reconsiderations involving new or refined risk assessment methodologies that requiring the generation of new data. A consequence of which can be that many of these agrichemicals are not meeting contemporary risk assessment standards as the necessary data is unavailable, or where data is available, the risk posed is considered unacceptable.

The use of agrichemicals can also be impacted through differences in standards between trading partners. The lack of an appropriate pesticide maximum residue limit (MRL) in an importing country can, for practical purposes, effectively prohibit use in the exporting country so as to ensure compliance, as an MRL breach would adversely affect market access.

The effects of the above are greater regulatory pressure placed on the use of individual agrichemicals or chemical groups. As a consequence, it is possible that the number of approved agrichemical options could be adversely impacted.

To assist strategic planning, with respect to future pest management options, the following tables have been developed to highlight the regulatory threats to agrichemicals currently approved for the management of the pests and diseases in cucumbers as well as current initiatives aimed at addressing identified pest management deficiencies.

Cucumber regulatory risk assessment

R1	Short-term: Critical concern over retaining access
R2	Medium-term: Maintaining access of significant concern
R3	Long-term: Potential issues associated with use - Monitoring required

Problem	Active Constituents	Chemical Group	Comment	Activities
Insect and mite pests				
Ants	Pyrethrins	3A		
	Chlorpyrifos	1B	APVMA: Currently under review, outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure. EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
Aphids				
Aphids	Malathion/Maldison	1B	APVMA – Under review – chemistry Codex: Re-evaluation scheduled for 2022/23	
	Petroleum oil	UN		
	Pirimicarb	1A	Codex - JMPR Periodic re-evaluation 2022/23	
	Pyrethrins	3A		
Cabbage aphid	Afidopyropen	9D		
Cotton / melon aphid	Afidopyropen	9D		
	Cyantraniliprole	28		
	Diafenthiuron + cyantraniliprole	12A + 28	Diafenthiuron Codex: No MRLs EU: No authorisation in place	
	Flonicamid	29		
	Pymetrozine	9B	EU- Being phased out Codex – No registrant support	
	Spirotetramat	23		
	Sulfoxaflor	4C	USA – Pollinator concerns	

Problem	Active Constituents	Chemical Group	Comment	Activities
Cowpea aphid	Pymetrozine	9B	EU- Being phased out Codex – No registrant support	
Currant lettuce aphid	Afidopyropen	9D		
Green peach aphid	Afidopyropen	9D		
	Diafenthiuron + cyantraniliprole	12A + 28	Diafenthiuron Codex: No MRLs EU: No authorisation in place	
	Flonicamid	29		
	Imidacloprid	4A	APVMA – Under review Canada – Under review EU – Removal of all field uses USA: Re-registration with new risk mitigation measures	
	Pymetrozine	9B	EU- Being phased out Codex – No registrant support	
	Pyrethrins	3A		
	Spirotetramat	23		
	Sulfoxaflor	4C	USA – Pollinator concerns	
Potato aphid	Pymetrozine	9B	EU- Being phased out Codex – No registrant support	
Rose aphid	Pyrethrins	3A		
Beetles				
Leaf eating ladybirds	Carbaryl	1A	Canada: Review recently completed, retained, but with a large number of uses deleted	
Pumpkin beetle	Carbaryl	1A	Codex: Toxicology review scheduled 2020 Europe: deregistered	
	Malathion/Maldison	1B	APVMA – Under review – chemistry Codex: Re-evaluation scheduled for 2022/23	
28-spotted potato ladybird	Carbaryl	1A	Canada: Review recently completed, retained, but with a large number of uses deleted Codex: Toxicology review scheduled 2020 Europe: deregistered	
	Malathion/Maldison	1B	APVMA – Under review – chemistry Codex: Re-evaluation scheduled for 2022/23	

Problem	Active Constituents	Chemical Group	Comment	Activities
Lepidoptera				
Armyworms	Carbaryl	1A	Canada: Review recently completed, retained but with a large number of uses deleted Codex: Toxicology review scheduled 2020 Europe: deregistered	
Budworm / Bollworm (<i>Helicoverpa punctigera</i>) Corn earworm / Cotton bollworm (<i>Helicoverpa armigera</i>)	Beta-cyfluthrin	3A	EU: No authorisation in place	
	Carbaryl	1A	Canada: Review recently completed, retained but with a large number of uses deleted Codex: Toxicology review scheduled 2020 Europe: deregistered	
	Emamectin benzoate	6		
	Flubendiamide	28		
	Methomyl	1A	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed EU: No authorisations	
	Spinetoram	5		
	Bifenthrin	3A	Canada: Subject to phase-out until 31/12/2020 EU: No authorisation in place	
	Diafenthiuron + cyantraniliprole	12A + 28	Diafenthiuron Codex: No MRLs EU: No authorisation in place	
	Helicoverpa NPV	UN		
	Chlorantraniliprole	28		
	Cyantraniliprole	28		
Cabbage white butterfly	pyrethrins	3A		
Caterpillars	Bifenthrin	3A	Canada: Subject to phase-out until 31/12/2020 EU: No authorisation in place	
	Pyrethrins	3A		
	Diazinon	1B	EU – Deregistered Codex - To be reviewed by 2020/21.	
	Spinetoram	5		

Problem	Active Constituents	Chemical Group	Comment	Activities
Cluster caterpillar	Emamectin benzoate	6		
	Diafenthiuron + cyantraniliprole	12A + 28	Diafenthiuron Codex: No MRLs EU: No authorisation in place	
	Flubendiamide	28		
	Methomyl	1A	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed EU: No authorisations	
Cucumber moth	Beta-cyfluthrin	3A	EU: No authorisation in place	
	Bifenthrin	3A	Canada: Subject to phase-out until 31/12/2020 EU: No authorisation in place	
	Chlorantraniliprole	28		
	Cyantraniliprole	28		
	Diafenthiuron + cyantraniliprole	12A + 28	Diafenthiuron Codex: No MRLs EU: No authorisation in place	
	Emamectin benzoate	6		
	Methomyl	1A	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed EU: No authorisations	
	Spinetoram	5		
Cucurbit stem borer	Carbaryl	1A	Canada: Review recently completed with a large number of uses deleted	
Cutworms	Carbaryl	1A	Codex: Toxicology review scheduled 2020 Europe: deregistered	
	Diazinon	1B	EU – Deregistered Codex - To be reviewed by 2020/21.	
	Trichlorfon	1B	APVMA – nominated for review Codex – No MRLs Europe – deregistered US – No MRLs	
Diamondback (Cabbage) moth	Pyrethrins	3A		

Problem	Active Constituents	Chemical Group	Comment	Activities
Fall armyworm	Chlorantraniliprole (PER89259)	28		
	Emamectin benzoate (PER89263)	6		
	Methomyl (PER89293)	1A	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed EU: No authorisations	
	Spinosad (PER89870)	5		
	Spinetoram (PER89241)	5		
Light brown apple moth	Pyrethrins	3A		
Loopers	Methomyl	1A	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed EU: No authorisations	
Moths	Bifenthrin	3A	Canada: Subject to phase-out until 31/12/2020 EU: No authorisation in place	
Potato moth (Leafminer)	Carbaryl	1A	Canada: Review recently completed, retained but with a large number of uses deleted Codex: Toxicology review scheduled 2020 Europe: deregistered	
Tomato grub	Emamectin benzoate	6		
Webworms	Methomyl	1A	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed EU: No authorisations	

Problem	Active Constituents	Chemical Group	Comment	Activities
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Fruit fly				
Cucumber fly	Alpha-cypermethrin	3A	EU: Proposed restricted authorisation & Candidate for substitution	
	Clothianidin (PER80101)	4A	APVMA – Under review Canada – Proposal to cancel foliar use in orchards strawberries and turf Europe – Outdoor uses deregistered USA: Re-registration with new risk mitigation measures ⁱ	
	Dimethoate	1B	Codex: MRL deletion recommended. EU proposing to set all MRLs to < 0.01 mg/kg	
Flies	Pyrethrins	3A		
Fruit flies	Malathion/Maldison	1B	APVMA – Under review – chemistry Codex: Re-evaluation scheduled for 2022/23	
Grasshoppers/Locusts				
Australian plague locust Migratory locust Spur-throated locust	Chlorpyrifos	1B	APVMA: Currently under review, outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure. EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
	Malathion/Maldison	1B	APVMA – Under review – chemistry Codex: Re-evaluation scheduled for 2022/23	
Field crickets Mole crickets	Chlorpyrifos	1B	APVMA: Currently under review, outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure. EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
Wingless grasshopper	Carbaryl	1A	Canada: Review recently completed, retained but with a large number of uses deleted Codex: Toxicology review scheduled 2020 Europe: deregistered	

Problem	Active Constituents	Chemical Group	Comment	Activities
Jassids/Plant bugs				
Brown marmorated stink bug	Bifenthrin (PER82374)	3A	Canada: Subject to phase-out until 31/12/2020 EU: No authorisation in place	
Green vegetable bug	Carbaryl	1A	Canada: Review recently completed, retained but with a large number of uses deleted Codex: Toxicology review scheduled 2020 Europe: deregistered	
	Malathion/Maldison	1B	APVMA – Under review – chemistry Codex: Re-evaluation scheduled for 2022/23	
Jassids	Malathion/Maldison	1B	APVMA – Under review – chemistry Codex: Re-evaluation scheduled for 2022/23	
Leafhoppers	Pyrethrins	3A		
	Malathion/Maldison	1B	APVMA – Under review – chemistry Codex: Re-evaluation scheduled for 2022/23	
	Petroleum oil	UN		
Rutherglen bug	Carbaryl	1A	Canada: Review recently completed, retained but with a large number of uses deleted Codex: Toxicology review scheduled 2020 Europe: deregistered	
	Malathion/Maldison	1B	APVMA – Under review – chemistry Codex: Re-evaluation scheduled for 2022/23	
	Methomyl	1A	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed EU: No authorisations	
	Pyrethrins	3A		
Yellow spotted stink bug	Bifenthrin	3A	Canada: Subject to phase-out until 31/12/2020 EU: No authorisation in place	

Problem	Active Constituents	Chemical Group	Comment	Activities
Mealybug/Scale				
Mealybugs	Pyrethrins	3A		
	Chlorpyrifos	1B	APVMA: Currently under review, outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure. EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
Mites				
Broad mite	Hexythiazox	10A	Codex – No MRLs	ST19020 Data generation project underway for a new label registration Spiromesifen (Oberon 240SC) Group 23
Bryobia mite	Bifenazate	20D	EU: Proposed non-renewal	
European red mite	Tebufenpyrad (PER80891)	21A		
Mites	Bifenthrin	3A	Canada: Subject to phase-out until 31/12/2020 EU: No authorisation in place	
	Petroleum oil	UN		
Red tomato spider mite	Bifenazate (PER82341)	20D	EU: Proposed non-renewal	
Tomato russet mite	Hexythiazox	10A	Codex – No MRLs	
Two-spotted (Red spider) mite	Abamectin	6		
	Bifenazate	20D	EU: Proposed non-renewal	
	Diafenthiuron + cyantraniliprole	12A + 28	Diafenthiuron Codex: No MRLs EU: No authorisation in place	
	Etoxazole	10B		
	Hexythiazox	10A	Codex – No MRLs	
	Pyrethrins	3A		
	Tebufenpyrad (PER80891)	21A		
Redlegged earth mite	Malathion/Maldison	1B	APVMA – Under review – chemistry Codex: Re-evaluation scheduled for 2022/23	

Problem	Active Constituents	Chemical Group	Comment	Activities
Thrips				
Thrips	Bifenthrin	3A	Canada: Subject to phase-out until 31/12/2020 EU: No authorisation in place	
	Diazinon	1B	EU – Deregistered Codex - To be reviewed by 2020/21.	
	Methomyl	1A	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed EU: No authorisations	
	Petroleum oil	UN		
	Pyrethrins	3A		
	Diafenthiuron + cyantraniliprole	12A + 28	Diafenthiuron Codex: No MRLs EU: No authorisation in place	
Plague thrips	Alpha-cypermethrin	3A	EU: Proposed restricted authorisation & Candidate for substitution	
	Diafenthiuron + cyantraniliprole	12A + 28	Diafenthiuron Codex: No MRLs EU: No authorisation in place	
	Pyrethrins	3A		
Tomato thrips	Diafenthiuron + cyantraniliprole	12A + 28	Diafenthiuron Codex: No MRLs EU: No authorisation in place	
Western flower thrips	Abamectin	6		
	Cyantraniliprole	28		
	Diafenthiuron + cyantraniliprole	12A + 28	Diafenthiuron Codex: No MRLs EU: No authorisation in place	
	Methomyl	1A	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed EU: No authorisations	
	Spinetoram	5		

Problem	Active Constituents	Chemical Group	Comment	Activities
White fly				
Cotton (Sweet Potato) whitefly	Buprofezin	16	Europe – In the process of deleting MRLs	
Greenhouse whitefly	Buprofezin	16	Europe – In the process of deleting MRLs	
	Imidacloprid	4A	APVMA – Under review Canada – Under review EU – Removal of all field uses USA: Re-registration with new risk mitigation measures	
	Petroleum oil	UN		
	Pymetrozine	9B	EU- Being phased out Codex – No registrant support	
	Sulfoxaflor	4C	USA – Pollinator concerns	
Silverleaf whiteflies	Afidopyropen	9D		
	Bifenthrin	3A	Canada: Subject to phase-out until 31/12/2020 EU: No authorisation in place	
	Diafenthiuron + cyantraniliprole	12A + 28	Diafenthiuron Codex: No MRLs EU: No authorisation in place	
	Flonicamid	29		
	Imidacloprid	4A	APVMA – Under review Canada – Under review EU – Removal of all field uses USA: Re-registration with new risk mitigation measures	
	Pyriproxyfen	7C	EU – Authorisation renewal process underway	
	Spirotetramat	23		
	Buprofezin	16	Europe – In the process of deleting MRLs	
	Cyantraniliprole	28		
	Imidacloprid	4A	APVMA – Under review Canada – Under review EU – Removal of all field uses USA: Re-registration with new risk mitigation measures	
Petroleum oil	UN			
Pymetrozine	9B	EU- Being phased out Codex – No registrant support		

Problem	Active Constituents	Chemical Group	Comment	Activities
Whiteflies	Bifenthrin	3A	Canada: Subject to phase-out until 31/12/2020 EU: No authorisation in place	
	Chlorpyrifos	1B	APVMA: Currently under review, outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure. EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
Whitefly	Pyrethrins	3A		
Other				
Earwig	Pyrethrins	3A		
European earwig	Carbaryl	1A	Canada: Review recently completed, retained but with a large number of uses deleted Codex: Toxicology review scheduled 2020 Europe: deregistered	
Vegetable leafminer	Abamectin (PER81876)	6		
Vegetable weevil	Alpha-cypermethrin	3A	EU: Proposed restricted authorisation & Candidate for substitution	
Nematodes				
Root-knot nematodes	Abamectin	6		
	Fluensulfone	-		

Problem	Active Constituents	Chemical Group	Comment	Activities
DISEASES				
Alternaria leaf blight	Benalaxyl	4	EU: Proposed non-renewal of authorisation	
	Chlorothalonil	M5	APVMA – Previously nominated for review Canada – Review recently completed; continued use considered acceptable Europe - Deregistered ⁱⁱ .	
	Dimethomorph	40		
	Mancozeb	M3	APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2022/23 EU: Proposed non-renewal of authorisation	
	Metalaxyl/metalaxyl-M	4		
Angular leaf spot	Copper	M1	EU: Candidate for substitution	
Anthracnose	Benalaxyl	4	EU: Proposed non-renewal of authorisation	
	Chlorothalonil	M5	APVMA – Previously nominated for review Canada – Review recently completed; continued use considered acceptable Europe - Deregistered.	
	Copper	M1	EU: Candidate for substitution	
	Dimethomorph	40		
	Mancozeb	M3	APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2022/23 EU: Proposed non-renewal of authorisation	
	Metalaxyl/metalaxyl-M	4		
	Oxadixyl	4	EU: No authorisation in place	
	Propineb	M3	APVMA - Nominated for review EU: No authorisation in place Codex - To be reviewed 2022/23	
	Sulfur	M2		
Zineb	M3	APVMA - Nominated for review Codex - To be reviewed 2022/23 EU: No authorisation in place		

Problem	Active Constituents	Chemical Group	Comment	Activities
Bacterial spot	Copper	M1	EU: Candidate for substitution	
Bactericide	Iodine	M		
Botrytis	Iprodione	2	Europe – Deregistered Canada – Majority of food crop uses deleted Codex – Review scheduled for 2022/23	
	Pyrimethanil	9		
Damping off	Ethanedinitrile	-	EU: No authorisation in place	
	Metalaxyl/metalaxyl-M	4		
Downy mildew	Azoxystrobin	11		ST17000 Data generation project to support registration of ametoctradin + dimethomorph (Zampro)
	Benalaxyl	4	EU: Proposed non-renewal of authorisation	
	Chlorothalonil	M5	APVMA – Previously nominated for review Canada – Review recently completed; continued use considered acceptable Europe - Deregistered.	
	Copper	M1	EU: Candidate for substitution	
	Dimethomorph	40		
	Fluopicolide	43		
	Mancozeb	M3	APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2022/23 EU: Proposed non-renewal of authorisation	
	Metalaxyl/metalaxyl-M	4		
	Metiram	M3	APVMA - Nominated for review Canada – Proposed cancelling of foliar uses Codex - To be reviewed 2022/23	
	Oxadixyl	4	EU: No authorisation in place	
	Oxathiapiprolin	49		
	Phosphorous acid	33		
	Propamocarb HCl	28		
	Propineb	M3	APVMA - Nominated for review	
Zineb	M3	EU: No authorisation in place Codex - To be reviewed 2022/23		
Sulfur	M2			

Problem	Active Constituents	Chemical Group	Comment	Activities
Fungal diseases - Rhizoctonia	Cyanogen (ethanedinitrile)	-		
Fungi	Iodine	M		
Fungal diseases - Fusarium	Cyanogen (ethanedinitrile)	-		
Fusarium fruit rot	Guazatine acetate	M7	Codex – No MRLs Europe - Deregistered	
	Imazalil	3	Europe – Under review -data gaps identified. Withdrawal of many EU MRLs proposed.	
Fusarium wilt	Cyanogen (ethanedinitrile)	-		
Grey mould	Captan	M4		
	Chlorothalonil	M5	APVMA – Previously nominated for review Canada – Review recently completed; continued use considered acceptable Europe - Deregistered.	
	Cyprodinil	9	Canada – Under review	
	Fenhexamid	17		
	Fludioxonil	12	EU – Under review	
Downy mildew	Mancozeb	M3	APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2022/23 EU: Proposed non-renewal of authorisation	
	Penthiopyrad	7		

Problem	Active Constituents	Chemical Group	Comment	Activities
Gummy stem blight	Azoxystrobin	11		
	Benalaxyl	4	EU: Proposed non-renewal of authorisation	
	Chlorothalonil	M5	APVMA – Previously nominated for review Canada – Continued use considered acceptable Europe - Deregistered.	
	Copper	M1	EU: Candidate for substitution	
	Dimethomorph	40		
	Mancozeb	M3	APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2022/23 EU: Proposed non-renewal of authorisation	
	Metalaxyl/metalaxyl-M	4		
	Metiram	M3	APVMA - Nominated for review	
	Propineb	M3	Canada – Proposed cancelling of foliar uses Codex - To be reviewed 2022/23	
	Oxadixyl	4	EU: No authorisation in place	
Penthiopyrad	7			
Late (Irish) blight	Copper	M1	EU: Candidate for substitution	
Leaf diseases/spots	Copper	M1	EU: Candidate for substitution	
Phytophthora soil fungus (Dieback)	Metalaxyl	4		
Phytophthora trunk/collar rot	Cyanogen (ethanedinitrile)	-		

Problem	Active Constituents	Chemical Group	Comment	Activities
Powdery mildew	Azoxystrobin	11		
	Boscalid	7		
	Bupirimate (PER14840)	8		
	Chlorothalonil	M5	APVMA – Previously nominated for review Canada – Review recently completed; continued use considered acceptable Europe - Deregistered.	
	Copper	M1	EU: Candidate for substitution	
	Cyflufenamid	U6		
	Hydrogen peroxide +peroxyacetic acid	M		
	Kresoxim-methyl	7	Canada – Re-evaluation process underway. Outcome due April 2019 Codex – JMPR re-evaluation completed	
	Mancozeb	M3	APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2022/23 EU: Proposed non-renewal of authorisation	
	Melaleuca oil			
	Metrafenone	U8		
	Penthiopyrad	7		
	Potassium bicarbonate			
	Proquinazid	13		
	Pyriofenone	U8		
	<i>Streptomyces lydicus</i>	BM2		
Triadimefon	3	APVMA - Nominated for review EU: Authorisation expired 31/08/2019		
Triadimenol	3	APVMA - Nominated for review EU: No authorisation in place		
Trifloxystrobin	11			

Problem	Active Constituents	Chemical Group	Comment	Activities
Rhizoctonia ground rot	Chlorothalonil	M5	APVMA – Previously nominated for review Canada – Review recently completed; continued use considered acceptable Europe - Deregistered.	
Rhizoctonia rot	Cyanogen (ethanedinitrile)	-		
Rhizopus rot	Guazatine acetate	M7	Codex – No MRLs Europe - Deregistered	
Root and collar rot	Cyanogen (ethanedinitrile)	-		
Rust	Copper	M1	EU: Candidate for substitution	
	Sulphur	M2		
Sclerotinia rot	Iprodione	2	Europe – Deregistered Canada – Majority of food crop uses deleted Codex – Review scheduled for 2022/23	
Sclerotium crown rot	Cyanogen (ethanedinitrile)	-		
Septoria leaf spot	Copper	M1	EU: Candidate for substitution	
	Dimethomorph	40		
	Mancozeb	M3	APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2022/23 EU: Proposed non-renewal of authorisation	
	Sulfur	M2		
Spot blotch	Cyanogen (ethanedinitrile)	-		
Target leafspot	Chlorothalonil	M5	APVMA – Previously nominated for review Canada – Review recently completed; continued use considered acceptable Europe - Deregistered.	
Target spot (Early blight)	Copper	M1	EU: Candidate for substitution	
	Sulfur	M2		

Problem	Active Constituents	Chemical Group	Comment	Activities
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Problem	Active Constituents	Chemical Group	Comment	Activities
WEEDS				
Broadleaf weeds and grasses	Clomazone	Q		
	Fluazifop-P	A		
	Quizalofop-P	A	Canada – Under re-evaluation - proposed completion June 2019. EU – Candidate for substitution	
	Sethoxydim	A	EU: No authorisation in place	
Plant growth regulators				
	1-methylcyclopropene		EU – Candidate for substitution	
	Paclobutrazol		EU – Candidate for substitution	

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ⁱ Clothianidin: Berry fruit, fruiting vegetables, ornamentals, pome fruit, turf Reduction in yearly total rate

ⁱⁱ Chlorothalonil - Withdrawal authorisations by 20 November 2019. Max period of grace: 20 May 2020. Commission Implementing Regulation (EU) 2019/677 <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32019R0677&from=EN>