



# **Brassica Vegetables**

Strategic Agrichemical Review Process  
(SARP)

October 2020

Hort Innovation  
Project – VG18004

**Hort Innovation Project Number:**

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 Brassica vegetable industry across Australia. The information in this report will assist the industry with its agrichemical selection and usage into the future.

**Date of report:**

October 2020

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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 Brassica vegetable 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:

<b>Common name</b>	<b>Scientific name</b>
White blister	<i>Albugo candida</i>
Bacterial rot - head	<i>Erwinia spp.</i> , <i>Pseudomonas spp.</i>

## **1.2 Insects and mites**

The high priority insect and mite pests are:

<b>Common name</b>	<b>Scientific name</b>
Diamondback moth	<i>Plutella xylostella</i>
Aphids - Green peach aphid Cabbage aphid Turnip aphid	<i>Myzus persicae</i> , <i>Brevicoryne brassicae</i> <i>Lipaphis pseudobrassicae</i>
Cabbage-centre grub	<i>Hellula hydralis</i>

## **1.3 Weeds**

The high priority weeds are:

<b>Common name</b>	<b>Scientific name</b>
<b>High</b>	
Brassica weeds - Wild Radish & Wild Turnips	<i>Raphanus raphanistrum L.</i>
Chickweed	<i>Stellaria media</i>
Fat hen	<i>Chenopodium album</i>
Stinging nettles	<i>Urtica spp.</i>

## **2. The Australian Brassica Vegetable Industry**

The Australian brassica vegetable industry is a mature, innovative and resourceful horticultural industry. Consumption of brassica vegetables has risen in recent years with promotion of health benefits.

Crops included in the brassica vegetable crop group include:

<b>Common Name</b>	<b>Scientific name</b>
Broccoli	<i>Brassica oleracea var. italica</i>
Brussels Sprouts	<i>Brassica oleracea var. gemmifera</i>
Cabbages	<i>Brassica oleracea var. capitata</i>
Cauliflower	<i>Brassica oleracea var. botrytis</i>

Brassica vegetables are grown in most states of Australia, with the majority of production occurring in the Southern states.

<sup>1</sup>2019 Crops statistics for the brassica vegetable group are:

<b>Name</b>	<b>Production</b>	<b>Fresh market</b>	<b>Processing</b>	<b>Export</b>	<b>Value</b>
Broccoli	75,957 t	86%	5%	9%	\$256m (2019)
Brussels Sprouts	5,733 t	76%	18%	6%	\$19.0m (2019)
Cabbages	77,422 t	82%	15%	2%	\$44.1m (2019)
Cauliflower	75,647 t	91%	8%	1%	\$54.1m (2019)

Due to Australia's diverse weather conditions and the introduction of different varieties of brassica vegetable, the Australian industry is now able to supply the domestic market with fresh brassica vegetables throughout the year.

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<sup>1</sup> 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/>

Table 1. Fresh Broccoli Seasonality by State

State	18/19 t	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
New South Wales (4%)	3,046												
Victoria (47%)	35,478												
Queensland (28%)	21,208												
Western Australia (15%)	11,592												
South Australia (2%)	1,337												
Tasmania (4%)	3,295												
Availability legend			High		Medium		Low					None	

Table 2. Fresh Brussels Sprouts Seasonality by State

State	18/19 t	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
New South Wales (<1%)	7												
Victoria (22%)	1,247												
Queensland (4%)	242												
Western Australia (<1%)	0												
South Australia (60%)	3,434												
Tasmania (14%)	803												
Availability legend			High		Medium		Low					None	

Table 3. Fresh Cabbage Seasonality by State

State	18/19 t	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
New South Wales (26%)	20,128												
Victoria (30%)	23,515												
Queensland (32%)	24,400												
Western Australia (9%)	6,817												
South Australia (3%)	2,214												
Tasmania (<1%)	347												
Availability legend			High		Medium		Low					None	

Table 4. Fresh Cauliflower Seasonality by State

State	18/19 t	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
New South Wales (14%)	10,540												
Victoria (44%)	33,080												
Queensland (19%)	14,448												
Western Australia (10%)	7,980												
South Australia (5%)	3,730												
Tasmania (8%)	5,868												
Availability legend			High		Medium		Low					None	

## **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 Brassica vegetable 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 Brassica vegetable 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 Brassica vegetable 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 Brassica vegetable 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 Brassica vegetables but attempts to prioritise the major problems.

Exotic plant pests, not present in Australia, are not addressed in this document.<sup>2</sup>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 Brassica vegetables 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.

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<sup>2</sup> <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 Brassica vegetables as major crops. The crop fits within the APVMA Crop Group 010: Brassica (cole or cabbage) vegetables, Head cabbages, Flowerhead cabbages.

Therefore, access to minor use permits can be difficult and permit requests need to be 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 Brassica vegetable industry is for manufacturers to register new pesticides uses in the crop.

### **3.3 Methods**

The current update of the Brassica vegetables 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:

<b>Hort Innovation Project Reference</b>	<b>Process of Review - Activity</b>
VG16060 - Vegetable Agrichemical Pest Management Needs and Priorities (AUSVEG) - Commenced: 2 May 2017	Engagement and consultation with growers and other relevant stakeholders. Including; Online crop specific surveys, workshops and one on one consultation Nationally.  Collation of information collected by commodity on applicable pests, diseases and weeds in order of priority.
MT17019 – Regulatory Support & Co-ordination (AKC)	<b>Brassica vegetables Agrichemical Regulatory Risk Assessment Document</b> 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 Brassica vegetables as well as current initiatives aimed at addressing identified pest management deficiencies.
VG18004 – Vegetable Strategic Agrichemical Review Process (SARP) Report Updates	<b>SARP updated via a desktop audit:</b> Review list of priorities ranked as high, moderate and low for each plant pest groups (disease, insects and weeds) – provided by VG16060 Identify industries pest priority gaps in order of importance Update current pesticides available via label registrations or minor use permits Update available pesticide use patterns, IPM ranking/compatibility, mode of action and chemical group. Identify pesticides at risk (under review and/or limited uses) via MT17019 Regulatory Support & Co-ordination – AKC consulting. 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). Include known pesticide solutions that are currently under development with registrants for new uses in the nominated crops or in current Hort Innovation projects. Update MRL tables to include Australian MRL’s, Codex and any applicable export market MRL’s

## **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 Brassica vegetables
- Appendix 2. Products available for control of insects and mites in Brassica vegetables
- Appendix 3. Products available for weed control in Brassica vegetables
- Appendix 4. Current permits for use in Brassica vegetables
- Appendix 5. Brassica Vegetables Maximum Residue Limits (MRLs)
- Appendix 6. Brassica Vegetables Regulatory Risk Assessment

## **4. Diseases Pests and Weeds of Brassica vegetables**

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 (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 Brassica vegetables**

### **4.1.1 Disease priorities**

<b>Common name</b>	<b>Scientific name</b>
<b>High</b>	
White blister	<i>Albugo candida</i>
Bacterial rot - head	<i>Erwinia</i> spp., <i>Pseudomonas</i> spp.
<b>Moderate</b>	
Clubroot	<i>Plasmodiophora brassicae</i>
Downy mildew	<i>Peronospora</i> spp.
Wirestem	<i>Rhizoctonia solani</i>
Grey mould	<i>Botrytis cinerea</i>
Peppery leaf spot	<i>Pseudomonas syringae</i> pv. <i>maculicola</i>
Ring spot	<i>Mycosphaerella</i>
<b>Low</b>	
Alternaria leaf spot / Target spot	<i>Alternaria</i> spp.
Anthraxnose	<i>Colletotrichum</i>
Cercospora leaf spot	<i>Cercospora</i> spp.
Damping off	<i>Pythium</i> spp. or <i>Fusarium</i> spp.
Sclerotinia rot / White mould	<i>Sclerotinia</i> spp.
Powdery Mildew	<i>Erysiphe cruciferarum</i>
Black rot / Bacterial leaf spot	<i>Xanthomonas campestris</i> pv. <i>campestris</i>

White blister is a fungal disease caused by *Albugo candida*. It affects many Brassica crops and some Brassica weeds.

Bacterial soft rots are caused by several bacteria, most commonly *Pectobacterium* spp. *Erwinia* spp. and certain species of *Pseudomonas*, *Bacillus* and *Clostridium*. These bacteria can enter plants through wounds caused by tools, insects, severe weather such as hail, or through natural openings. The bacteria can be spread from plant to plant by insects, on contaminated tools, or by movement of infested plant debris, soil, or contaminated water. Bacterial soft rots tend to be more of a problem during wet weather and has shown to be more severe when plants lack sufficient calcium.

Some of the fungal and bacterial diseases that have received moderate to low priority have few 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 low priority diseases such as Club root and Damping off whilst seed treatment helps in the control of some others such as Rhizoctonia rot.

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**

Downy mildew is considered to have a high risk of resistance development.

There are several disease strategies that apply to brassica on the CropLife website<sup>3</sup>, including

<sup>4</sup>Downy mildew.

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<sup>3</sup> [www.croplife.org.au/resources/programs/resistance-management/](http://www.croplife.org.au/resources/programs/resistance-management/)

<sup>4</sup> <https://www.croplife.org.au/resources/programs/resistance-management/broccoli-cauliflower-downy-mildew/>

#### 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
<b>White Blister</b> ( <i>Albugo candida</i> )							
<b>Priority: High</b>							
White blister was ranked as a high priority in VIC, QLD, NSW, WA & SA and as a moderate priority in TAS. White blister is more of an issue for broccoli growers and it is variety dependant. Currently managed with spray programs, however it is an issue for growers every season.							
Azoxystrobin (Amistar)	11	Protective & curative	7	A	ALL	Registered in Brassica vegetables for the control of <b>White blister</b> and Sclerotinia. [Max 2 applications per crop; re-treatment interval 7-14 d]	-
Azoxystrobin + Oxythiapirolin (Orondis)	11+49	Protective & curative	3 NG	A	ALL	Registered in Brassica vegetables for the control of Downy mildew and suppression of Alternaria, <b>White blister</b> and Sclerotinia. Use subject to CropLife resistance management strategy. [Max. 3 applications per crop; re-treatment interval 7-14 d]	-
Amisulbrom + Copper (Amicus Blue)	21+M1	Protective	NR	A	ALL	Registered in brassica vegetables for control of Downy mildew and <b>White blister</b> . [Max 3 sprays per crop; re-treatment interval 7-10 d]	-
Cyazofamid (Ranman)	21	Protective	NR	A	ALL	Registered for control of Late blight and <b>White blister</b> in broccoli. [Resistance management - Max 3 consecutive sprays per crop; re-treatment interval 7-10 d]	-
Hydrogen peroxide + peroxyacetic acid (Peratec Plus)	M	Non-selective surface sterilant	1	A	ALL	Registered in broccoli, cauliflower, cabbage & Brussels sprout for control of Downy mildew and <b>White blister</b> . [Max 4 sprays per crop; max 2 consecutive; re-treatment interval 5-7 d]	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Metalaxyl + copper as hydroxide (Ridomil Gold Plus)	M3+M1	Systemic, protective & curative	14	A	ALL	Registered in all brassica vegetables, including brassica leafy vegetables for control of Downy mildew and <b>White blister</b> . Used in pressure situations. Subject to CropLife resistant management strategy. [Max 2 applications per year; re-treatment interval 7-14 d]	-
Metalaxyl-M + Mancozeb (Ridomil Gold MZ) (PER14045)	4+M3	Systemic, protective & curative	7	A	ALL (excl. VIC)	Permitted for use in broccoli, cauliflower & Brussels sprout only for control of Downy mildew and <b>White blister</b> at higher than label rate.	R2
Propamocarb + Fluopicolide (Infinito)	28+43	Protective, curative & systemic	NR NG	A	ALL	Registered in Brassica vegetables for the control of Downy mildew and <b>White blister</b> . Apply when conditions favour disease development. [Max 3 applications per crop; re-treatment interval 7-10 d]	-
Mancozeb + Dimethomorph (Acrobat) BASF	M3+40	Protective		P		Permitted for use in Brassica leafy vegetables for control of Downy mildew and <b>White blister</b> . [Max 4 applications per crop; 2 sequential; re-treatment interval 7-10 d]	R2
<b>Bacterial soft Rot</b> ( <i>Erwinia</i> spp., <i>Pseudomonas</i> spp.)							
<b>Priority: High</b>							
Bacterial soft rot was ranked as a high priority in QLD, NSW & WA and as a moderate priority in VIC, SA & TAS. Management using clean seeds and transplant material; eliminating alternative hosts; and through early detection and disposal of infected seedlings.							
Copper-oxychloride + hydroxide (Relyon Airone)	M1	Protective	1	A	ALL	Registered in Brassica vegetables for control of <b><i>Pseudomonas syringae</i></b> . [Max. no. of applications not specified; re-treatment interval 10-14 d]	-
Copper products (Cupric hydroxide) (Champ)	M1	Protective		P		Registered in beans for control of Common blight ( <i>Xanthomonas campestris</i> pv. <i>Phaseoli</i> ), Halo blight ( <b><i>Pseudomonas syringae</i></b> pv. <i>Phaseasiolicola</i> ) and Bacterial brown spot ( <b><i>Pseudomonas syringae</i></b> pv. <i>Syringae</i> ). [Max. no. of applications not specified; re-treatment interval 10-14 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		Registered for control Botrytis in strawberries and grapes, suppression of bacterial spot in tomato, chili and capsicum and control of Anthracnose and suppression of Stem end rot in tropical fruits. Registered in US for control of Botrytis, Sclerotinia, Xanthomonas and <b>Erwinia</b> in grapes, strawberries, pome fruits, tree nuts and leafy vegetables. In root and leafy vegetables, it is registered for the suppression of <b>Erwinia carotovora</b> .	
<b>Club root</b> ( <i>Plasmodiophora brassicae</i> )							
<b>Priority: Moderate</b>							
Club root was ranked as a high priority in in VIC, NSW & WA and as a moderate priority in QLD, SA & TAS. Club root is considered a major problem in areas with lower soil pH. Mainly an issue on sandy soils. Use of lime, crop rotation, cover crops, bio fumigation & farm hygiene are also important to prevent spread of club root between sites. Maintain rigorous farm hygiene, avoid summer plantings in high risk situations & check soil pH regularly.							
Fluazinam (Surefire)	29	Brassica vegetables / Fumigant	NR	A	ALL	Registered in Brassica vegetables for control of <b>Club root</b> . To be used as a seedling drench or pre-plant soil application.	-
Metham sodium (Imtrade)	-	Soil fumigant	-	A	ALL (excl. TAS)	Registered for pre-planting soil treatment to control soil borne fungal diseases in food crops.	-
Quintozene (Terraclor)	14	Contact	28 NG	A	ALL	Registered in cabbage, cauliflower & broccoli seed beds for control of <b>Club root</b> , Wirestem & Black rot. Spray in 20-30 cm band over rows and incorporate to depth of 10 cm. [ Max. 1 application per crop]	-
<b>Downy mildew</b> ( <i>Peronospora</i> spp.)							
<b>Priority: Moderate</b>							
Downy mildew was ranked as a moderate priority in all regions consulted, VIC, QLD, NSW, WA, SA & TAS. Frequently attacks seedlings; Management techniques may include cultural practices that increase airflow and minimise moisture in the plant canopy. Resistant and tolerant varieties available.							
Azoxystrobin+ Oxathiapiprolin (Orondis)	11+49	Protective & curative	3 NG	A	ALL	Registered in Brassica vegetables for control of <b>Downy mildew</b> and suppression of Alternaria, White blister and Sclerotinia. Use subject to CropLife resistance management strategy. [Max. 3 applications per crop; re-treatment interval 7-14 d]	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Cupric Hydroxide + Mancozeb (ManKocide)	M1+M3	Protective	7 NG	A	All	Registered in Brassica vegetables for control of Black rot, <b>Downy mildew</b> , Alternaria spot, Anthracnose & Ring spot. Cupric hydroxide predisposes cabbage to frost damage; avoid if frosts are likely. Use subject to CropLife resistant management strategy. [Max 8 applications per season; re-treatment interval 7-10 d;]	R2
Copper + Amisulbrom (Amicus Blue)	21+M1	Protective	NR	A	ALL	Registered in Brassica vegetables for control of <b>Downy mildew</b> . Thorough coverage of crop essential; configuration of sprayer need to be altered as plants grow and change shape. Avoid when frosts are possible. [Max 3 applications per crop; re-treatment interval 7-10 d]	-
Cyazofamid (Ranman)	21	Protective & curative	NR NG	A	ALL	Registered in Brassica vegetable seedlings for control of <b>Downy mildew</b> . Apply when disease is first seen. [Max 6 applications per season; re-treatment interval 7-10 d]	-
Hydrogen peroxide + peroxyacetic acid (Peratec Plus)	M	Non-selective surface sterilant	1	A	ALL	Registered in Brassica vegetables for control of <b>Downy mildew</b> . Should be used in a disease management strategy to maintain low disease pressure. [Max 4 applications per crop; max 2 consecutive; re-treatment interval 5-7 d]	-
Mancozeb + Sulphur (Amgrow)	M3+M2	Seedlings (general)	7	A	ALL	Registered in Brassica vegetables for control of <b>Downy mildew</b> . Spray when disease risk is high and spray every 10 d.	R2
Metalaxyl-M + Mancozeb (Ridomil Gold MZ) (PER14045)	4+M3	Systemic, protective & curative	7	A	ALL (excl. VIC)	Permitted for use in broccoli, cauliflower & Brussels sprout only for control of <b>Downy mildew</b> and White blister at higher than label rate. [Max. 2 applications per crop; re-treatment interval not specified]	R2
Metiram (Polyram)	M3	Protective	7	A	ALL	Registered in Brassica vegetable seedlings for control of <b>Downy mildew</b> . Begin application when disease becomes apparent and repeat at 7-10 d intervals	R2
Oxathiapiprolin (Zorvec Enicade)	49	Protective	NR NG	A	ALL	Registered in Brassica vegetables for control of <b>Downy mildew</b> . Apply when conditions favour disease development but before disease is evident. [Max 2 applications per year; re-treatment interval 7-10 d; subject to CropLife resistant management strategy]	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Phosphorous acid (Various) PER11951	33	Protective & systemic	NR	A	ALL (excl. VIC)	Permitted for use in broccoli, cauliflower & Brussels sprouts only for control of <b>Downy mildew</b> . [Max no. of applications not specified; re-treatment interval 7 d;	-
Propamocarb + Fluopicolide (Infinito)	28+43	Protective, curative & systemic	NR NG	A	ALL	Registered in Brassica vegetables for the control of <b>Downy mildew</b> and White blister. Apply when conditions favour disease development. [Max 3 applications per crop; re-treatment interval 7-10 d]	-
Acibenzolar-S-methyl (Actigard Plant Activator) Syngenta	P01	Protective		P		Registered in the USA for the control of <b>Downy mildew</b> in Brassica vegetables Registered in Australia for use in tomatoes for the suppression of Powdery mildew.	
Cyazofamid (Ranman) ISK	21	Protective		P		Registered for control of Late blight and White blister in potatoes and broccoli. Overseas registration on brassica leafy for White rust ( <i>Albugo occidentalis</i> ), <b>Downy mildew</b> , Pythium damping-off, Club root ( <i>Plasmodiophora brassicae</i> ).	
Dimethomorph + Ametoctradin (Zampro) AgNova/BASF	40+45	Protective		P		Registered in Australia for control of <b>Downy mildew</b> in grape vines. Hort Innovation data generation project ST16006 underway for a label extension in Brassica Leafy Vegetables, Cucurbits, Onions & Beetroot. Label registration anticipated in 2021.	
Mandipropamid (Revus) Syngenta	40	Protective		P		Registered in Aust for <b>Downy mildew</b> control in grapes and brassica leafy crops. Possible option as a different chemical group.	
<b>Base rot - Wirestem (<i>Rhizoctonia solani</i>)</b>							
<b>Priority: Moderate</b>							
Rhizoctonia rot was ranked as moderate priority in all regions consulted, VIC, QLD, NSW, WA, SA & TAS. It is said to be more of an issue in nurseries, but not on the field which can be bad in wet years. The causal organism is a soil borne fungal pathogen with a variety of hosts. Managing farm hygiene and crop rotation would help minimise risk of infection.							
Iprodione (PER14051) (Rovral)	2	Protective & curative	NR	A	ALL	Product registered in potatoes for control of <b>Rhizoctonia rot</b> . Permit approved for Broccoli to treat seeds before planting.	R3

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Quintozene (Terraclor)	14	Contact	28 NG	A	ALL	Registered in cabbage, cauliflower & broccoli seed beds for control of Club root, <b>Wirestem</b> & Black rot. Spray in 20-30 cm band over rows and incorporate to depth of 10 cm. [ Max. 1 application per crop]	-
Penflufen + Trifloxystrobin (Evergol Extend) Bayer	7+11	Protective		P-A		Registered in forage Brassica for the control of <b>Rhizoctonia rot</b> .	
Metalaxyl-M + Fludioxonil (Maxim XL) Syngenta	4+12	Protective Seed Treatment		P		Registered in Australia for the control of <b>Rhizoctonia rot</b> in canola, Spinach & silverbeet seedlings.	R3
<i>Bacillus amyloliquefaciens</i> (Serenade Prime) Bayer	44	Protective Biofungicide		P		Registered in potatoes for control of <b>Rhizoctonia rot</b> .	-
<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., <b>Rhizoctonia</b> spp..	
Fludioxonil + Sedaxane (Vibrance Premium) Syngenta	7+12	Systemic & protective		P		Registered as a seed treatment for control of Black scurf ( <b>Rhizoctonia</b> ), Silver surf, Black dot, Gangrene, Fusarium dry rot and suppression of common scab in potatoes.	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 <b>Rhizoctonia</b> . Apply prior to onset of disease season. [Max. no. of applications and retreatment interval not specified].	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
<b>Grey mould (<i>Botrytis cinerea</i>)</b>							
<b>Priority: Moderate</b>							
Grey mould was ranked as a moderate priority in all regions consulted, VIC, QLD, NSW, WA, SA & TAS. The organism can cause seedling damping-off, leaf spots and rots of vegetative plant parts. Farm hygiene is important and crop residues after harvest need to be destroyed.							
Iprodione (PER80910) (Rovral)	2	Protective & curative	NR	A	ALL	Product registered in grapes boysenberry for control of <b>Grey mould</b> . Permit approved for Brussels sprouts seedlings. Commence spraying at the onset of disease or 3-4 weeks after transplanting. [Re-treatment interval 14 d]	R3
Penthiopyrad (Fontelis) Corteva	7	Systemic		P-A		Registered in Brassica vegetables for control of White mould and for control of <b>Grey mould</b> in Cucurbits and leafy vegetables. [Max 2 sequential treatments; re-treatment interval 7-14 d]	-
<i>Aureobasidium pullulans</i> (Botector) Nufarm	-	Protective Biofungicide		P		Registered for control of Botrytis in grapes and berries. No MRLs required for biological product.	-
<i>Bacillus amyloliquefaciens</i> (Serenade Opti) Bayer	44	Protective Biofungicide		P		Registered for control <b>Botrytis</b> in strawberries and grapes, suppression of bacterial spot in tomato, chili and capsicum and control of Anthracnose and suppression of Stem end rot in tropical fruits. Registered in US for control of <b>Botrytis</b> , Sclerotinia, Xanthomonas and Erwinia in grapes, strawberries, pome fruits, tree nuts, leafy vegetables & potatoes.	-
<i>Bacillus amyloliquefaciens</i> (Serifel) strain MBI 600 BASF	44	Protective Biofungicide		P		Registered for control of <b>Botrytis</b> 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 Lupinus albus doce) (Problad) CEV S.A.	BM01	Protective		P		Registered for control of Brown rot and Blossom blight in stone fruit. The US label is for use in Brassica leafy greens, bulb vegetables and grapes for <b>Botrytis</b> control.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Boscalid (Filan) BASF	7	Protectant		P		Registered in grapevines onions for control of <b>Botrytis</b> .	-
DC-126 Bayer	TBC			P		New product from Bayer with <b>Botrytis</b> activity.	-
Fenpyrazamine (Prolectus) Sumitomo	17	Protectant & Curative		P		Registered for <b>Botrytis</b> control in grapes and has registrations for <b>Botrytis</b> control in the US for various crops. No MRL's for AU or Codex.	-
Florypicoxamid (Adavelt) Corteva	21	Protective & Curative		P		New Mode of Action fungicide being developed in Australia. Corteva claims activity on <b>Botrytis</b> . No MRL's for AU or Codex. Scheduled for JMPR evaluation in 2023.	-
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, <b>Botrytis</b> , Cladosporium, Cercospora, Sclerotinia and Anthracnose. Hort Innovation data generation project ST17000 underway for a label registration in Brassica Leafy Vegetables.	R3
NUL3195 Nufarm	TBC			P		New product from Nufarm with <b>Botrytis</b> activity.	-
SYNCUF29 Syngenta	TBC			P		New product from Syngenta with <b>Botrytis</b> activity.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
<b>Peppery leaf spot</b> ( <i>Pseudomonas syringae</i> pv. <i>maculicola</i> )							
<b>Priority: Moderate</b>							
Peppery leaf spot affects mainly cabbage crops and is ranked moderate by cabbage growers but ranked low across all regions. It mainly affects older leaves and Copper products are mainly used to manage this issue. This bacterial pathogen thrives in wet, cool conditions. Tends to be seed-borne and are dispersed between plants by rain splash. Seed and soil treatment can be options.							
Copper oxychloride and hydroxide (Relyon Airone)	M1	Protective and curative	1	A	ALL	Registered in Brassica vegetables for the control of <b>Peppery leaf spot</b> . Apply at first sign of disease. Avoid spraying cabbages if frosts are likely. [Max no. of applications not specified; re-treatment interval 10-14 d]	-
<b>Ring spot</b> ( <i>Mycosphaerella brassicicola</i> )							
<b>Priority: Moderate</b>							
Ring spot was ranked as a moderate priority in VIC, QLD, WA & TAS and as a low priority in NSW & SA. Ring spot is caused by an organism that thrives under wet and cool conditions. Take precautions to prevent spread of disease from nursery to field. Practice good hygiene and use good quality seed and seedlings. Rotate with non-susceptible crops.							
Chlorothalonil (Trio)	M5	Protective	7	A	ALL	Registered in Brassica vegetables for the control of <b>Ring spot</b> . Apply when conditions favour or at first signs of infection. [Max no. of applications not specified; re-treatment interval 7-14 d]	R3
Copper oxychloride and hydroxide (Relyon Airone)	M1	Protective & curative	1	A	ALL	Registered in Brassica vegetables for the control of black rot, leaf spot, Downy mildew & <b>Ring spot</b> . Apply at first sign of disease. Avoid spraying cabbages if frosts are likely. [Max no. of applications not specified; re-treatment interval 10-14 d]	-
Cupric Hydroxide + Mancozeb (ManKocide)	M1+M3	Protective	7 NG	A	All	Registered in Brassica vegetables for control of Black rot, Downy mildew, Alternaria spot, Anthracnose & <b>Ring spot</b> . Cupric hydroxide predisposes cabbage to frost damage; avoid if frosts are likely. Use subject to CropLife resistant management strategy. [Max 8 applications per season; re-treatment interval 7-10 d;]	R2
Mancozeb (Smart)	M3	Systemic, protective	7	A	ALL	Registered in Brassica vegetables for the control of <b>Ring spot</b> . Apply when at first signs of infection. [Max no. of applications not specified; re-treatment interval 7-10 d]	R2
Metiram (Polyram)	M3	Protective	7	A	QLD, VIC, TAS, SA & WA	Registered in Brassica vegetables for the control of Downy mildew and <b>Ring spot</b> . Begin application when disease becomes apparent and repeat at 7-10 d intervals.	R2

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Penconazole (Vulture)	3	Systemic	7	A	ALL	Registered in Brussels sprouts for the control of <b>Ring spot</b> . Apply at first signs of infection. [Max 6 applications; re-treatment interval 10-14 d]	R3
Triadimenol (Axidime)	3	Systemic, protective & curative	7	A	ALL	Registered in Brassica vegetables for the control of <b>Ring spot</b> . Start application after first two days of rain after transplanting. [Max no. of applications not specified; re-treatment interval 10 d]	R3
Thiram + Thiabendazole (Evershield) Arysta Lifescience	1+M3	Protective & systemic		P		Registered in field & garden peas for control of Black spot ( <i>Mycosphaerella pinodes</i> ) & Seedling root rots ( <i>Fusarium</i> , <i>Pythium</i> & <i>Macrofomina</i> spp.). Use as a liquid seed dressing.	R2
<b>Alternaria leaf spot</b> ( <i>Alternaria brassicicola</i> )							
<b>Priority: Low</b>							
Alternaria leaf spot was ranked as a moderate priority in VIC & WA and as a low priority in QLD, NSW, SA & TAS. It is weather related and is more prevalent in dry, hot conditions leaving shot holes in leaves and marks on baby broccoli stems. Good farm hygiene is crucial as the fungus will over-winter on plant residues and can be spread on tools and water splashes. Seed may also be a source of new infection.							
Azoxystrobin + Oxathiapiprolin (Orondis)	11+49	Protective & curative	3 NG	A	ALL	Registered in Brassica vegetables for the control of Downy mildew and suppression of <b>Alternaria</b> , White blister and Sclerotinia. Use subject to CropLife resistance management strategy. [Max. 3 applications per crop; re-treatment interval 7-14 d]	-
Cupric Hydroxide + Mancozeb (ManKocide)	M1+M3	Protective	7 NG	A	All	Registered in Brassica vegetables for control of Black rot, Downy mildew, <b>Alternaria</b> spot, Anthracnose & Ring spot. Cupric hydroxide predisposes cabbage to frost damage; avoid if frosts are likely. Use subject to CropLife resistant management strategy. [Max 8 applications per season; re-treatment interval 7-10 d;]	R2
Mancozeb (Smart)	M3	Protective	7	A	ALL	Registered in Brassica vegetables for the control of <b>Alternaria leaf spot</b> . Apply when at first signs of infection. [Max no. of applications not specified; re-treatment interval 7-10 d]	R2
Fluazinam (Surefire) PCT Holdings	29	Protective		P-A		Registered in Brassica vegetables in Australia for Club root. Registered in the US for Sclerotinia and <b>Alternaria</b> control in carrots with a GAP of 4 x 0.58 kg ai/ha with a 7-day WHP.	



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		Registered for control Botrytis in strawberries and grapes, suppression of bacterial spot in tomato, chili and capsicum and control of Anthracnose and suppression of stem end rot in tropical fruits. Registered in US for control of <b>Alternaria leaf spot</b> in Brassica vegetables.	-
Florylpicoxamid (Adavelt) Corteva	21	Protective & curative		P		New active in development from Corteva with activity on <b>Alternaria</b> spp. No MRL's for AU or Codex. Scheduled for JMPR evaluation in 2023.	-
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, <b>Alternaria leaf spot</b> , Gummy stem blight, Septoria, <i>Botrytis</i> , <i>Cladosporium</i> , <i>Cercospora</i> , <i>Sclerotinia</i> and Anthracnose. Hort Innovation data generation project ST17000 underway for a label registration in Brassica Leafy Vegetables.	R3
Fluopyram + Trifloxystrobin (Luna Sensation) Bayer	7+11	Protective		P		Registered for control of Powdery mildew, black spot and <b>Alternaria</b> in apples.	
Mefentrifluconazole (Belanty) BASF	3	Protective & Curative		P		Registered in apples for control of Black Spot and grapes for control of Powdery Mildew. BASF claims activity on <b>Alternaria</b> spp. No MRL's for AU or Codex.	-
NUL3446 Nufarm	TBC			P		New active in development from Nufarm with activity on <b>Alternaria</b> spp.	-
Fluxapyroxad + Pyraclostrobin (Merivon) BASF	7+11	Protectant & Curative		P		Registered in almonds for control of <b>Alternaria</b> Leaf Spot. Pyraclostrobin: AU & Codex MRL 1.5 mg/kg. Fluxapyroxad: AU MRL 1.5 mg/kg. Codex MRL 0.6 mg/kg.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
<b>Anthracnose</b> ( <i>Colletotrichum</i> )							
<b>Priority: Low</b>							
Anthracnose was ranked as a low priority in in all regions consulted, VIC, QLD, NSW, WA, SA & TAS. Disease can be associated with seed and infected crop debris. Can be spread by rain/irrigation, workers & machinery. A preventative fungicide spray program, crop rotation, removal of crop debris, good farm hygiene for workers and equipment would help manage spread.							
Cupric Hydroxide + Mancozeb (ManKocide)	M1+M3	Protective	7 NG	A	All	Registered in Brassica vegetables for control of Black rot, Downy mildew, Alternaria spot, <b>Anthracnose</b> & Ring spot. Cupric hydroxide predisposes cabbage to frost damage; avoid if frosts are likely. Use subject to CropLife resistant management strategy. [Max 8 applications per season; re-treatment interval 7-10 d;]	R2
Mancozeb (Smart)	M3	Protective	7	A	ALL	Registered in Brassica vegetables for the control of <b>Anthracnose</b> . Apply when at first signs of infection. [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 includes 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, <i>Botrytis</i> , <i>Cladosporium</i> , <i>Cercospora</i> , <i>Sclerotinia</i> and <b>Anthracnose</b> . Hort Innovation data generation project ST17000 underway for a label registration in Brassica Leafy Vegetables.	R3
<b>Cercospora leaf spot</b> ( <i>Cercospora</i> spp.)							
<b>Priority: Low</b>							
Cercospora leaf spot was ranked as a low priority in in all regions consulted, VIC, QLD, NSW, WA, SA & TAS. The inoculum survives on crop debris and on weeds. Distributed by wind, rain splash and irrigation water. Various cultural practices are important such as crop rotation, removing crop debris and avoiding spread (e.g. via overhead irrigation, equipment, etc).							
Zineb (Barmac)	M3	Protective	7	A	NSW, VIC, SA, WA & TAS (QLD check label)	Registered in Cauliflower and Cabbages for the control of <b>Cercospora leaf spot</b> . Apply when disease threatens. [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
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, <i>Botrytis</i> , <i>Cladosporium</i> , <b><i>Cercospora</i></b> , <i>Sclerotinia</i> and Anthracnose. Hort Innovation data generation project ST17000 underway for a label registration in Brassica Leafy Vegetables.	R3
Hydrogen peroxide + peroxyacetic acid (Peratec Plus)	M	Non-selective surface sterilant		P		Registered in celery for control of <b><i>Cercospora leaf spot</i></b> .	-
Petroleum oil (BioAAid) Australian adjuvants	UN	Contact		P		Registered in bananas for control of <b><i>Cercospora leaf spot</i></b> .	-
<b>Damping off</b> ( <i>Pythium</i> spp., <i>Phytophthora</i> spp., <i>Fusarium</i> spp., <i>Rhizoctonia</i> spp.)							
<b>Priority: Low</b>							
Damping off was ranked as a low priority in all regions consulted, VIC, QLD, NSW, WA, SA & TAS. It is a nursery issue. Damping off is caused by several different pathogens that kill or weaken seeds or seedlings before or after they germinate. It is most prevalent in wet and cool conditions. It is expected that seed treatments will assist, and good on-farm sanitation is recommended.							
Chloropicrin (Tripicrin)	8	General pre-plant soil fumigant	NR	A	ALL	It is registered as a general fumigant to control Nematodes, insects, <b><i>Pythium</i>, <i>Phytophthora</i>, <i>Fusarium</i>, and <i>Verticillium</i></b> . Do not plant for 10 d after soul treatment.	-
Metalaxyl (Barmac)	4	Protective	7	A	NSW, QLD & WA	Registered in Brassica vegetables for the control of <b>Damping off</b> . Apply along furrows and incorporate into soil.	-
Metalaxyl-M + Fludioxonil (Maxim XL) PER14352	4+12	Protective Seed treatment	NR	A	ALL (excl. VIC)	Permitted for use in Broccoli for control of <b>Damping off</b> and Rhizoctonia. Seed treatment 6 months before sowing.	R3
Thiram (Kendon)	M3	Protective & Systemic	7	A	QLD	Registered in Cabbage for the control of <b>Damping off</b> . Drench affected patches or as a preventative drench every 5-7 d.	R2

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
<i>Bacillus amyloliquefaciens</i> (Serenade Prime) Bayer	44	Protective biofungicide		P		Registered as a soil ameliorant for suppression of <b>Rhizoctonia</b> in potatoes. Registered in the USA for the management of <b>Phytophthora infestans</b> and <i>Phytophthora parasitica</i> in peppers.	
<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 <b>Pythium spp., Phytophthora spp., Fusarium spp. &amp; Rhizoctonia spp.</b>	
Fludioxonil + Sedaxane (Vibrance Premium) Syngenta	7+12	Systemic & protective		P		Registered as a seed treatment for control of Black scurf ( <b>Rhizoctonia</b> ), Silver surf, Black dot, Gangrene, Fusarium dry rot and suppression of Common scab in potatoes.	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, Botrytis, Cladosporium, Cercospora, Sclerotinia, Rust and Anthracnose and suppression of <b>Rhizoctonia</b> . Hort Innovation data generation project ST17000 underway for a label registration in Brassica Leafy Vegetables.	R3
Fosetyl-Aluminium (Aliette) Bayer	33	Systemic		P		Registered in apples, peaches, avocados & pineapples for control of <b>Phytophthora spp.</b>	-
NUL3163 Nufarm	TBC			P		New active in development from Nufarm with activity on <b>Fusarium, Pythium &amp; Rhizoctonia.</b>	-
<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, <b>Fusarium</b> and <b>Rhizoctonia</b> . Apply prior to onset of disease season.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Thiram + Thiabendazole (Evershield) Arysta Lifescience	1+M3	Protective & systemic		P		Registered in field & garden peas for control of Black spot ( <i>Mycosphaerella pinodes</i> ) & Seedling root rots ( <i>Fusarium</i> , <i>Pythium</i> & <i>Macrofomina</i> spp.). Use as a liquid seed dressing.	R2
<p><b>Sclerotinia rot</b> (<i>Sclerotinia</i> spp.)</p> <p><b>Priority: Low</b></p> <p>Sclerotinia rot was ranked as a moderate priority in NSW &amp; WA and as a low priority in VIC, QLD, SA &amp; TAS. The plants will wilt and die following infection, with total collapse of the plant occurring as the fungus spreads through the stem. Various cultural practices such as crop rotation, removing crop debris or ploughing in diseased crops immediately after harvest can help prevent spread of disease.</p>							
Azoxystrobin (Amistar)	11	Protective & curative	7	A	ALL	Registered in Brassica vegetables for the suppression of <b>Sclerotinia rot</b> and White blister rust. [Max 2 applications per crop; re-treatment interval 7-14 d]	-
Azoxystrobin + oxathiapiprolin (Orondis)	11+49	Protective & curative	3 NG	A	ALL	Registered in Brassica vegetables for the suppression of <b>Sclerotinia rot</b> , <i>Alternaria</i> , White blister and control of Downy mildew. [Max 3 applications per crop; re-treatment interval 7-14 d; subject to CropLife resistant management strategy]	-
Boscalid (Filan)	7	Systemic	7	A	ALL	Registered in Brassica vegetables for the control of <b>Sclerotinia rot</b> . [Max 4 applications per crop; re-treatment interval 7-14 d; subject to CropLife resistant management strategy]	-
Penthiopyrad (Fontelis)	7	Systemic	NR NG	A	ALL	Registered in Brassica vegetables for control of <b>Sclerotinia rot</b> . [Max 2 sequential treatments; re-treatment interval 7-14 d]	-
Cyprodinil + fludioxonil (Switch) Syngenta	9+12	Protective & systemic		P		Registered in several vegetable crops including leafy vegetables (including, spinach, silverbeet, kale, endive, mustard, cress chard, rocket, Asian leafy greens and Chinese cabbage), peas, beans, leafy vegetables and lettuce for control of <b>Sclerotinia</b> , <i>Botrytis</i> and other diseases.	R3

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, Botrytis, Cladosporium, Cercospora, <b>Sclerotinia</b> , Rust and Anthracnose and suppression of Rhizoctonia. Hort Innovation data generation project ST17000 underway for a label registration in Brassica Leafy Vegetables.	R3
Prothioconazole + Tebuconazole (Prosaro) Bayer	3	Protective		P		Registered in canola and pyrethrum for control of <b>Sclerotinia</b> and other diseases.	R3
<p><b>Powdery mildew</b> (<i>Erysiphe cruciferarum</i>)  <b>Priority: Unknown</b></p> <p>Powdery mildew was not ranked as a priority disease in the recent survey. Other industry sources indicate that it is a disease of some concern. It is a fungus that produces a white powdery mould on the top surface of leaves. The disease can occur through to crop maturity and its development is favoured by warm dry weather.</p>							
Penthiopyrad (Fontelis)	7	Systemic	NR NG	A	ALL	Registered in Chinese cabbage for control of <b>Powdery mildew</b> , Grey mould & Sclerotinia. [Max 2 sequential treatments; re-treatment interval 7-14 d]	-
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 <b>Powdery mildew</b> in tomatoes.	R3
BLAD (Banda de <i>Lupinus albus</i> doce) polypeptide CEV S.A.	BM 01	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 <b>Powdery mildew</b> .	

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. Registered overseas as Luna Experience. 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 <b>Powdery mildew</b> , Alternaria leaf spot, Gummy stem blight, Septoria, Botrytis, Cladosporium, Cercospora, Sclerotinia, Rust and Anthracnose and suppression of Rhizoctonia.	R3
Fluopyram + Trifloxystrobin (Luna Sensation) Bayer	7+11	Protective		P		Registered for control of <b>Powdery mildew</b> , Black spot and Alternaria in apples.	
Mefentrifluconazole (Belanty) BASF	3	Systemic		P		Registered for control of <b>Powdery mildew</b> in grapes.	
<b>Black rot</b> ( <i>Xanthomonas campestris</i> pv. <i>campestris</i> )							
<b>Priority: Moderate</b>							
Black rot was not ranked as a priority disease in Brassica vegetables. However, other industry sources indicate that it is a disease of some concern. This is a bacterial pathogen that can damage plant leaves. Management using clean seeds and transplant material; eliminating alternative hosts; and through early detection and disposal of infected seedlings.							
Copper oxychloride and hydroxide (Relyon Airone)	M1	Protective & curative	1	A	ALL	Registered in Brassica vegetables for the control of <b>Black rot</b> . Apply at first sign of disease. Avoid spraying cabbages if frosts are likely. [Max no. of applications not specified; re-treatment interval 10-14 d]	-
Cupric Hydroxide + Mancozeb (ManKocide)	M1+M3	Protective	7 NG	A	All	Registered in Brassica vegetables for control of <b>Black rot</b> , Downy mildew, Alternaria spot, Anthracnose & Ring spot. Cupric hydroxide predisposes cabbage to frost damage; avoid if frosts are likely. Use subject to CropLife resistant management strategy. [Max 8 applications per season; re-treatment interval 7-10 d;]	R2
Quintozene (Terraclor)	14	Contact	28 NG	A	ALL	Registered in cabbage, cauliflower & broccoli seed beds for control of Club root, Wirestem & <b>Black rot</b> . Spray in 20-30 cm band over rows and incorporate to depth of 10 cm. [ Max. 1 application per crop]	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
<i>Bacillus amyloliquefaciens</i> strain QST 713 (Serenade Opti)	44	Protective biofungicide		P-A		Permitted for use in Brassica leafy vegetables for suppression of Bacterial spot/blight ( <i>Xanthomonas</i> spp.) (PER87630). [Max. no. of applications not specified; re-treatment interval 3-7 d]	-
Acibenzolar-S-methyl (Actigard Plant Activator) Syngenta	P01	Protective		P		Registered in Australia for suppression of Bacterial spot ( <i>Xanthomonas campestris</i> ), Bacterial speck and Bacterial canker in tomatoes. Registered in the USA for the suppression of <b>Black rot</b> ( <i>Xanthomonas campestris</i> ) in Brassica vegetables.	-



## **4.2 Insect and mite pests of Brassica vegetables**

### **4.2.1 Insect and mite pest priorities**

<b>Common name</b>	<b>Scientific name</b>
<b>High</b>	
Diamondback moth	<i>Plutella xylostella</i>
Aphids - Green peach aphid Cabbage aphid Turnip aphid	<i>Myzus persicae</i> , <i>Brevicoryne brassicae</i> <i>Lipaphis pseudobrassicae</i>
Cabbage-centre grub	<i>Hellula hydralis</i>
<b>Moderate</b>	
Cabbage white butterfly	<i>Pieris rapae</i>
Cluster caterpillar	<i>Spodoptera litura</i>
Helicoverpa (Heliothis) Cotton bollworm / Corn earworm Native budworm	<i>Helicoverpa</i> spp. <i>Helicoverpa armigera</i> <i>Helicoverpa punctigera</i>
Thrips - Bean Blossom Thrips Melon thrips Onion thrips Plague thrips	<i>Megalurothrips usitatis</i> <i>Thrips palmi</i> <i>Thrips tabaci</i> <i>Thrips imagines</i>
Crane fly	<i>Trichocera annulata</i>
Redback spider	<i>Latrodectus hasselti</i>
Rutherglen bug	<i>Nysius vinitor</i>
<b>Low</b>	
African black beetle	<i>Heteronychus arator</i>
Cabbage Looper caterpillars	<i>Chrysodeixis</i> spp.
Cabbage Cluster caterpillar	<i>Crociodolomia pavonana</i>
Crickets - Black field & Mole cricket	<i>Teleogryllus commodus</i> , Gryllotalpidae
Earwigs	<i>Forficula</i> spp.
Green vegetable bug	<i>Nezara viridula</i>
Redlegged earth mite	<i>Halotydeus destructor</i>
Snails and slugs	<i>Helix</i> spp.
Staphylinid beetle	Staphylinidae
Vegetable weevil	<i>Listroderes difficilis</i>
Western flower thrips	<i>Frankliniella occidentalis</i>
Silverleaf whitefly	<i>Bemisia tabaci</i>
Brassica Whitefly	<i>Aleyrodes proletella</i>
Root knot nematode	<i>Meloidogyne</i> spp.

New incursions of an exotic pest which poses a potential threat.

<b>New Pest to Australia (unknown priority)</b>	
Fall armyworm	<i>Spodoptera frugiperda</i>
Vegetable leaf miner	<i>Liriomyza sativae</i>

The highest priority insect pests identified by the survey are sap sucking aphids (Hemiptera), Cabbage centre grub and Diamondback moths (Lepidoptera). Available and potential products for all these insects and mites are in Section 4.2.2.

Cabbage white butterfly, Cabbage moth, Cabbage centre grub, Cabbage cluster caterpillar and Cabbage and Turnip aphids feed only on cruciferous plants. Abandoned crops are reservoirs of infestation for subsequent crops, so it is important to plough in old crop residues as soon as harvesting is finished.

Resistance to some insect groups has reduced control options despite a range of actives registered. Additionally, not all actives have broad registrations across Lepidoptera. Growers should not exceed the maximum number of applications permitted on the insecticide label.

Further development and extension of IPM strategies and best management practices that can be implemented in the management of Lepidopteran pests in Brassica may be warranted which would complement current chemical control methods. Biological control involving other insects or fungal organisms in insect pest control is another option that needs to be considered. There are several biological control agents commercially available for pests in Australia.

### **Resistance Management**

Constant use of insecticides from one chemical grouping - Mode of Action (MoA), will increase the risk of rapid build-up of resistance to that chemical group. Alternate use of chemical groups with different MoAs will slow down the process of selection for resistance.

There are several insecticide management strategies that apply to Brassica on the CropLife website<sup>5</sup>, including Diamondback Moth<sup>6</sup>, Aphids<sup>7</sup>, Thrips<sup>8</sup> & Silverleaf whitefly<sup>9</sup>.

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

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<sup>5</sup> [www.croplife.org.au/resources/programs/resistance-management/](http://www.croplife.org.au/resources/programs/resistance-management/)

<sup>6</sup> <https://www.croplife.org.au/resources/programs/resistance-management/brassica-diamondback-moth-3-draft/>

<sup>7</sup> <https://www.croplife.org.au/resources/programs/resistance-management/various-cottonmelon-aphid-and-green-peach-aphid-draft/>

<sup>8</sup> <https://www.croplife.org.au/resources/programs/resistance-management/various-western-flower-thrips/>

<sup>9</sup> <https://www.croplife.org.au/resources/programs/resistance-management/various-silverleaf-whitefly/>

## 4.2.2 Available and potential products for priority insects and mites

**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
<b>Diamondback moth (<i>Plutella xylostella</i>)</b>								
<b>Priority: High</b>								
Diamondback moth was ranked as a high priority in all consulted regions, VIC, QLD, NSW, WA, SA & TAS. Resistance to some insecticide groups has reduced control options despite a range of actives registered.								
Acephate (Titan)	1B	Contact & systemic	3	A	QLD, WA & NT	Registered in Brassica vegetables for control of Cabbage white butterfly, Cabbage aphid, Helicoverpa and <b>Cabbage moth</b> . WHP Broccoli 14 d. [max no. of applications not specified; re-treatment interval 10-14 d]	H H-Bees	R3
Alpha-cypermethrin (Hemani)	3A	Contact & systemic	1	A	ALL	Registered in Brassica vegetables for control of Cabbage white butterfly, Cluster caterpillar, <b>Cabbage moth</b> and Helicoverpa. [Max no. of applications not specified; Re-treatment interval: 7-10 d]	VH H-Bees	-
Amorphous silica (Abrade)	-	Physical cutting & abrading	NR	A	ALL	Registered in Brassica vegetables for control of Helicoverpa and <b>Diamondback moth</b> .	-	-
Beta-Cypermethrin (Banshee)	3A	Contact & systemic	1	A	ALL	Registered in Brassica vegetables for control of <b>Diamondback moth</b> and Helicoverpa. [Max no. of applications and Re-treatment interval not specified]	VH H-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Bioallethrin + Bioresmethrin (Amgrow)	3A	Contact & protective	1	A	ALL	Registered in Brassica vegetables for control of Cabbage aphid and <b>Cabbage moth</b> . [Max no. of applications not specified; re-treatment interval 3-4 d]	VH H-Bees	-
Chlorantraniliprole (Coragen)	28	Contact & systemic	7	A	ALL	Registered in Brassicas for control of Cabbage cluster caterpillar, Cabbage centre grub, Leaf miner, Cabbage white butterfly, Cluster caterpillar, <b>Diamondback moth</b> , Helicoverpa and Soybean looper. [Max of 3 sprays per crop; max 2 consecutive; Re-treatment interval 7 d]	L VL-Bees	-
<i>Clitorea ternatia</i> extract (Sero-X)	UN	Protective biopesticide	NR	A	ALL	Registered in Brassicas for control of <b>Diamondback moth</b> . [Max of 2 sprays per crop; re-treatment interval 7 d]	L L-Bees	-
Thiamethoxam + Chlorantraniliprole (Durivo)	28+4A	Contact & systemic	42	A	ALL	Registered in Brassica vegetables for control of <b>Diamondback moth</b> , Cabbage butterfly, Helicoverpa, Cabbage centre grub, Cabbage cluster caterpillar, Cluster caterpillar, Soya bean looper, Cabbage aphid, Green peach aphid, Silverleaf white fly, Greenhouse white fly, Green vegetable bug, Western flower thrips and Onion thrips. [max 1 application per crop; seedlings should be transplanted within 48 h of application]	L-H H-Bees	R2
Thiamethoxam + chlorantraniliprole (Durivo) PER87051	28+4A	Systemic	35 NG	A	QLD (within Wide Bay Burnett region)	Permitted for use as a single post plant chemigation in Brassica vegetables (field) for control of <b>Diamondback moth</b> , 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

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Chlorfenapyr (Phantom)	13	Contact & systemic	7	A	ALL	Registered in Brassica vegetables for control of <b>Diamondback moth</b> and Cabbage white butterfly. [Max of 2 sprays per crop; Re-treatment interval 7 d; In Brussels sprouts only - a second 2 spray sequence after 28 days]	H H-Bees	-
Emamectin (Proclaim Opti)	6	Contact & systemic	3 NG	A	ALL	Registered in Brassica vegetables for control of Helicoverpa, <b>Diamondback moth</b> , Cabbage white butterfly, Cluster caterpillars and Loopers. Spray at first signs of infestation. [Max 4 applications per crop; re-treatment interval 7 d]	M H-Bees	-
Esfenvalerate (Sumi-Alpha Flex)	3A	Contact	2	A	Variable. Refer to label	Registered in Brassica vegetables for control of Cabbage moth ( <b>Diamondback moth</b> ), Cabbage white butterfly and Cabbage centre grub [Apply at first sight of infestation: max no. of applications not specified; re-treatment interval 7-10 d]	VH H-Bees	-
Fipronil (Emporium)	2B	Contact & systemic	7	A	ALL	Registered in Brassica vegetables for control of <b>Diamondback moth</b> , Cabbage white butterfly and Cabbage cluster caterpillar. [Max 4 applications per year; re-treatment interval 56 d; use subject to CropLife resistant management strategy]	M VH-Bees	R3
Flubendiamide (Belt)	28	Contact & systemic	3 NG	A	ALL	Registered in Brassica vegetables for control of <b>Diamondback moth</b> , Cabbage white butterfly and Cabbage cluster caterpillar and Helicoverpa. [Max 3 applications per crop; re-treatment interval 7-14 d]	L-M L-Bees	-
Gamma-Cyhalothrin (Trojan)	3A	Contact & residual	2	A	ALL	Registered in Brassica vegetables for control of <b>Diamondback moth</b> , Cabbage white butterfly and Cabbage cluster caterpillar. [Apply at first sight of infestation: max no. of applications not specified; re-treatment as needed]	VH H-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, <b>Caterpillars</b> , 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	-
Indoxacarb (Avatar eVo)	22A	Contact	7 NG	A	ALL	Registered in Brassica vegetables for control of Cabbage white butterfly, Helicoverpa, Cluster caterpillar, Cabbage centre grub & <b>Diamondback moth</b> . [Max 4 applications per crop; 3 sequentially; re-treatment interval 7 d]	L H-Bees	R3
Lambda-cyhalothrin (Farmalinx Fizzle)	3A	Contact & residual	2 G 2	A	ALL	Registered in Brassica vegetables for control of <b>Diamondback moth</b> , Cabbage white butterfly and Cabbage cluster caterpillar. [Apply at first sight of infestation: max no. of applications not specified]	VH H-Bees	-
Spinetoram (Success Neo)	5	Contact & ingestion	3	A	ALL	Registered in Brassica vegetables for control of <b>Diamondback moth</b> , Cabbage white butterfly, Cabbage cluster caterpillar, Cabbage centre grub, Loopers, Helicoverpa and Western flower thrips. [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 Brassica vegetables for control of <b>Diamondback moth</b> , Cabbage white butterfly, Cabbage cluster caterpillar, Cabbage centre grub, Loopers, Helicoverpa and Western flower thrips. [Max. 4 applications per season; re-treatment interval 7-14 d].	L L-Bees	-
Spirotetramat (Movento 240 SC)	23	Contact & systemic	3	A	ALL	Registered in Brassica vegetables for control of <b>Diamondback moth</b> . Use subject to CropLife resistant management strategy. [Max 3 sprays per crop; re-treatment interval: 7 d]	M VL-Bees	-
Pyrethrins (Pyganic)	3A	Contact	NR	A	ALL	Registered in Brassica vegetables for control of <b>Diamondback moth</b> . Spray when pests first appear. [Max 3 applications; re-treatment:3 d]	VH H-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Tau-Fluvalinate (Mavrick)	3A	Contact	2	A	ALL	Registered in Cauliflower crops for control of Cabbage moth ( <b>Diamondback moth</b> ), <i>Helicoverpa</i> and Cabbage white butterfly. [Apply at first sight of infestation: max no. of applications not specified]	VH H-Bees	-
Indoxacarb + Novaluron (Plemax) Adama	22A+15	Contact & stomach		P		Registration pending for control of <b>Lepidoptera</b> including <i>Helicoverpa</i> spp. Registered in South Africa on a range of crops for Lepidoptera control.	M M-Bees	R3
Methoxyfenozide (Prodigy) Corteva	18	Insect growth regulator		P		Controls a range of <b>Lepidoptera</b> pests. Registrations and permits to control Lepidoptera pests in various vegetables including fruiting vegetables and lettuce. IPM compatible.	VL VL-Bees	
NUL3445 Nufarm	TBC			P		New active in development. Nufarm claims activity on <b>Lepidoptera</b> .		
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, Bugs and <b>Caterpillars</b> .		
<b>Aphids: Green peach aphid (<i>Myzus persicae</i>), Cabbage aphid (<i>Brevicoryne brassicae</i>), &amp; Turnip aphid (<i>Lipaphis pseudobrassicae</i>)</b>								
<b>Priority: High</b>								
Aphids were ranked as a high priority in VIC, QLD & TAS and as a moderate priority in NSW, WA & SA, Green peach aphid being the main issue. Aphids are considered a major pest across most crops. Many chemical options are available for these pests. All applications are foliar unless specified otherwise. Viruses – vector and weed control is critical to virus management. (Spread by Aphids – Cauliflower mosaic virus, Turnip mosaic virus & Beet Western Yellow Virus)								
<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, <b>Green Peach Aphid</b> & Two-spotted Spider Mites. [Max. 3 application per crop; re-treatment interval 3-14 d]	VL VL-Bees	-
Acephate (Titan)	1B	Contact & systemic	3	A	QLD, WA & NT	Registered in Brassica vegetables for control of Cabbage white butterfly, <b>Cabbage aphid</b> , <i>Helicoverpa</i> and Cabbage moth. WHP Broccoli 14 d. [max no. of applications not specified; re-treatment interval 10-14 d]	H H-Bees	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Afidopyropen (Versys)	9D	Disrupts feeding	1	A	ALL	Registered in Brassica vegetables for control of <b>Cabbage Aphids</b> . [Max 4 applications per crop - only 2 consecutive; re-treatment interval 14 d]	L L-Bees	-
Bioallethrin + Bioresmethrin (Amgrow)	3A	Contact & protectant	1	A	ALL	Registered in Brassica vegetables for control of <b>Cabbage Aphids</b> and Cabbage moths. [Max no. of applications not specified; re-treatment interval 3-4 d]	VH H-Bees	-
Chlorpyrifos (Sinon)	1B	Contact & systemic	5	A	ALL (excl. QLD)	Registered for use in Brassica vegetables for control of <b>Cabbage aphid</b> . [max no. of applications not specified; re-treatment interval: 10-14 d]	H H-Bees	R1
Diazinon (Accensi)	1B	Contact & systemic	14	A	QLD & WA	Registered in Brassica vegetables for control of <b>Cabbage aphid</b> and <b>Green Peach aphid</b> . Insecticide under review by APVMA. [max no. of applications not specified; re-treatment interval: 10-14 d]	H VH-Bees	R3
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, <b>Aphids</b> , 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 (Sindor)	4A	Contact & systemic	7	A	ALL	Registered in Brassica vegetables for control of Grey <b>Cabbage aphid</b> and <b>Turnip aphid</b> . [Apply at first sight of infestation: max no. of applications not specified]	M M-Bees	R2
Maldison (Fyfanon)	1B	Contact & systemic	3	A	ALL	Registered in cabbage and cauliflower for control of <b>Aphids</b> , Green vegetable bug, Jassids, Leaf hopper, Redlegged earth mite (not TAS), Rutherglen bug and Twentyeight-spotted ladybird. [Apply at first sight of infestation: max no. of applications not specified]	H H-Bees	-
Permethrin (Permerid)	3A	Contact & systemic	2	A	Variable. Refer to label.	Registered in Brassica vegetables for control of Cabbage <b>aphid</b> and Green peach <b>aphid</b> . Considered effective, but some level of resistance in some regions. [Apply at first sight of infestation: max no. of applications not specified]	VH H-Bees	-



Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Petroleum oil (various) PER12221	UN	Contact & protective	1	A	ALL (excl. VIC)	Permitted for use Brassica vegetables for control of <b>Aphids</b> , Green mirid, Green vegetable bug, Grey cluster bug, Leafhoppers, Mites, Rutherglen bug & Thrips. [Max. no. of applications and re-treatment interval not specified]	VL L-Bees	-
Phorate (Umet)	1B	Contact & systemic	70	A	ALL	Registered in Brassica vegetables for control of <b>Aphids</b> . [Apply granules on soil surface closer to plants]	H H-Bees	R3
Pirimicarb (Aphidex)	1A	Contact & systemic	2 NG	A	ALL	Registered in Brassica vegetables for control of <b>Cabbage aphid</b> and <b>Green peach aphid</b> . [max no. of applications not specified; field crops only; re-treatment interval: 10-14 d]	VL VL-Bees	R3
Potassium salts of fatty acids (Natrasoap)	3A	Contact	NR	A	ALL	Registered in vegetables for control of <b>Aphids</b> , 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	-
Pymetrozine (Eurochem Metro)	9B	Contact & systemic	14	A	ALL	Registered in Brassica vegetables for control of <b>Cabbage aphid</b> and <b>Green peach aphid</b> . Use subject to CropLife resistant management strategy. [max 2 sprays per crop; re-treatment interval: 14 d]	L VL-Bees	R3
Pyrethrins + Piperonyl butoxide (Crop Culture)	3A	Contact	1	A	ALL	Registered in vegetables for control of <b>Aphids</b> , Thrips, Caterpillars, Ants, Flies, Earwigs, Whitefly and Leafhoppers. [Max no. of applications not specified; Re-treatment interval: 7 d]	VH H-Bees	-
Rotenone (Derris Dust)	21B	Contact	1	A	ALL	Registered in vegetables for control of <b>Aphids</b> . [Repeat at 14-day intervals]	-	-
Spirotetramat (Movento 240 SC)	23	Contact & systemic	3	A	ALL	Registered in Brassica vegetables for control of <b>Green peach aphid</b> , <b>Grey cabbage aphid</b> , Silverleaf whitefly & Diamondback moth. Use subject to CropLife resistant management strategy. [Max 3 sprays per crop; re-treatment interval: 7 d]	M VL-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Sulfoxaflor (Transform)	4C	Systemic	3	A	ALL	Registered in Brassica vegetables for control of Aphids including <b>Cabbage aphid, Green peach aphid and Turnip aphid</b> . (field & protected) Use in in protected systems is permissible when used in conjunction with a proven insect resistance management strategy. [Max no. of applications not specified; re-treatment interval 7-10 d; DO NOT apply consecutive applications of Group 4C insecticides for aphid control]	M VH-Bees	-
Thiamethoxam + Chlorantraniliprole (Durivo)	28+4A	Contact & systemic	42	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, Cabbage white butterfly, Helicoverpa, Cabbage centre grub, Cabbage cluster caterpillar, Cluster caterpillar, Soya bean looper, <b>Cabbage aphid, Green peach aphid</b> , Silverleaf white fly, Greenhouse white fly, Green vegetable bug, Western flower thrips and Onion thrips. [max 1 application per crop; seedlings should be transplanted within 48 h of application]	L-H H-Bees	R2
Thiamethoxam + chlorantraniliprole (Durivo) PER87051	28+4A	Contact & systemic	35 NG	A	QLD (within Wide Bay Burnett region)	Permitted for use as a single post plant chemigation in Brassica vegetables (field) for control of Diamondback moth, Cabbage white butterfly, Corn Earworm, Native budworm, Cabbage centre grub, Cabbage cluster caterpillar, Cluster caterpillar, <b>Cabbage Aphid, Green Peach Aphid</b> , 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

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Flonicamid (Mainman) ISK	29	Systemic		P		Registered in cucurbits for control of <b>Green peach aphid</b> , Melon aphid and Silverleaf whitefly.	M L-Bees	
Flupyradifurone (Sivanto 200 SL) 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. US label (Sivanto) approves use on Brassica vegetables for control of Leafhoppers, <b>Aphids</b> and Whiteflies.	L VL-Bees	-

#### **Cabbage-centre grub (*Hellula hydralis*)**

##### **Priority: High**

Cabbage-centre grub was ranked as a high priority in QLD and as a moderate priority in VIC, NSW, WA, SA & TAS. Resistance to some insect groups has reduced control options despite a range of actives registered. Additionally, not all actives have broad registrations across Lepidoptera. Considered a secondary pest that it is controlled when managing DBM.

<i>Bacillus Thuringiensis</i> var Kurstaki (Btk) (various)	11A	Protective biopesticide	NR	A	ALL	Registered in vegetables for control of all <b>Lepidoptera</b> . Considered highly effective on small caterpillars but needs regular reapplication. UV sensitive.	VL VL-Bees	-
Chlorantraniliprole (Coragen)	28	Contact & systemic	7	A	ALL	Registered in Brassicas for control of Cabbage cluster caterpillar, <b>Cabbage centre grub</b> , Leaf miner, Cabbage white butterfly, Cluster caterpillar, Diamondback moth, Helicoverpa and Soybean looper. [Max of 3 sprays per crop; max 2 consecutive; Re-treatment interval 7 d]	L VL-Bees	-
Deltamethrin (Halley)	3A	Contact & systemic	2	A	ALL (excl. ACT)	Registered in Brassica vegetables for control of <b>Cabbage centre grub</b> . [Max no. of applications not specified; Re-treatment interval: 7-14 d]	VH H-Bees	-
Esfenvalerate (Sumi-Alpha Flex)	3A	Contact	1	A	QLD, NSW & WA	Registered in Brassica vegetables for control of Cabbage moth (diamondback moth), Cabbage white butterfly and <b>Cabbage centre grub</b> [Max no. of applications not specified; Re-treatment interval: 7-10 d]	VH H-Bees	-
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, <b>Caterpillars</b> , 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
Indoxacarb (Farmalinx Spymaster)	22A	Contact	7 NG	A	ALL	Registered in Brassica vegetables for control of Cabbage white butterfly, Cabbage cluster caterpillar, Cabbage moth and Helicoverpa <b>Cabbage centre grub</b> and Helicoverpa. [max 4 application per crop; Re-treatment interval: 7 d]	L H-Bees	R3
Methomyl (various)	1A	Contact & systemic	1	A	ALL (excl. VIC)	Registered in Brassica vegetables for control of Cabbage white butterfly, Cabbage cluster caterpillar, <b>Cabbage centre grub</b> , Cabbage moth and Helicoverpa. Apply when pests first appear. [Max no. of applications not specified; Re-treatment interval: 5-7 d]	H H-Bees	R2
Prothiofos (Tokuthion)	1B	Contact & systemic	7	A	ALL	Registered in Brassica vegetables for control of Cabbage white butterfly, Cabbage cluster caterpillar, <b>Cabbage centre grub</b> , Cabbage moth and Helicoverpa. Apply when pests first appear. [Max no. of applications not specified; Re-treatment interval: 7 d]	H H-Bees	R3
Rotenone (Amgrow Derris Dust)	21B	Contact	1	A	ALL	Registered in vegetables for control of <b>Cabbage centre grub</b> . [Max no. of applications not specified; Re-treatment interval: 10-14 d]	-	-
Spinetoram (Success Neo)	5	Contact & ingestion	3	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, Cabbage white butterfly, Cabbage cluster caterpillar, <b>Cabbage centre grub</b> , Loopers, Helicoverpa and Western flower thrips. [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 Brassica vegetables for control of Diamondback moth, Cabbage white butterfly, Cabbage cluster caterpillar, <b>Cabbage centre grub</b> , Loopers, Helicoverpa and 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)	28+4A	Contact & systemic	42	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, Cabbage white butterfly, Helicoverpa, <b>Cabbage centre grub</b> , Cabbage cluster caterpillar, Cluster caterpillar, Soya bean looper, Cabbage aphid, Green peach aphid, Silverleaf white fly, Greenhouse white fly, Green vegetable bug, Western flower thrips and Onion thrips. [max 1 application per crop; seedlings should be transplanted within 48 h of application]	L-H H-Bees	R2
Thiamethoxam + chlorantraniliprole (Durivo) PER87051	28+4A	Systemic	35 NG	A	QLD (within Wide Bay Burnett region)	Permitted for use as a single post plant chemigation in Brassica vegetables (field) for control of Diamondback moth, Cabbage white butterfly, Corn Earworm, Native budworm, <b>Cabbage centre grub</b> , 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
Chlorfenapyr (Phantom) BASF	13	Contact & systemic		P-A		Registered in Brassica vegetables for control of Diamondback moth and Cabbage white butterfly ( <b>Lepidoptera</b> ). [Max of 2 sprays per crop; Re-treatment interval 7 d; In Brussels sprouts only - a second 2 spray sequence after 28 days]	H H-Bees	-
<i>Clitorea ternatia</i> extract (Sero-X) Innovate Ag	UN	Protective biopesticide		P-A		Registered in Brassicas for control of Diamondback moth ( <b>Lepidoptera</b> ). [Max of 2 sprays per crop; re-treatment interval 7 d]	L L-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Helicoverpa Nucleopolyhedrovirus (NPV) (Helicovex) Andermatt Biocontrol	31	Protective biopesticide		P-A		Registered in Brassica vegetables for control of Helicoverpa ( <b>Lepidoptera</b> ). Effective on larvae of <7 mm. [Max no. of applications not specified; re-treatment interval 2-3 d]	VL VL-Bees	-
Indoxacarb + Novaluron (Plemax) Adama	22A+15			P		Registration pending for control of <b>Lepidoptera</b> including <i>Helicoverpa</i> spp. Registered in South Africa on a range of crops for Lepidoptera control.	M M-Bees	R3
Methoxyfenozide (Prodigy) Corteva	18	Insect growth regulator		P		Controls a range of <b>Lepidopteran</b> pests. Registrations and permits to control Lepidoptera pests in various vegetables including fruiting vegetables and lettuce. IPM compatible.	VL VL-Bees	
NUL3445 Nufarm	TBC			P		New active in development. Nufarm claims activity on <b>Lepidoptera</b> .		
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, Bugs and <b>Caterpillars</b> .		
<b>Cabbage white butterfly (<i>Pieris rapae</i>)</b>								
<b>Priority: Moderate</b>								
Cabbage white butterfly was ranked as a high priority in all consulted regions, VIC, QLD, NSW, WA, SA & TAS. Considered a secondary pest that is controlled when managing DBM.								
Acephate (Titan)	1B	Systemic	3	A	QLD, WA NT & TAS	Registered in Brassica vegetables for control of <b>Cabbage white butterfly</b> , Cabbage aphid, Helicoverpa and Cabbage moth. WHP Broccoli 14 d. [max no. of applications not specified; re-treatment interval 10-14 d]	H H-Bees	R3
Alpha-cypermethrin (Hemani)	3A	Contact & systemic	1	A	ALL	Registered in Brassica vegetables for control of <b>Cabbage white butterfly</b> . [Max no. of applications not specified; Re-treatment interval: 7-10 d]	VH H-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Chlorantraniliprole (Coragen)	28	Contact & systemic	7	A	ALL	Registered in Brassicas for control of Cabbage cluster caterpillar, Cabbage centre grub, Leaf miner, <b>Cabbage white butterfly</b> , Cluster caterpillar, Diamondback moth, Helicoverpa and Soybean looper. Important to plough crop debris immediately after harvest. [Max of 3 sprays per crop; max 2 consecutive; Re-treatment interval 7 d]	L VL-Bees	-
Chlorfenapyr (Secure)	13A	Contact & systemic	7	A	ALL	Registered in Brassica vegetables for control of <b>Cabbage white butterfly</b> and Diamondback moth. [max 2 application per crop; Re-treatment interval: 7 d]	H H-Bees	-
Chlorpyrifos (Sinon)	1B	Contact & systemic	5	A	ALL (excl. QLD)	Registered in Brassica vegetables for control of <b>Cabbage white butterfly</b> . [Max no. of applications not specified; Re-treatment interval: 10-14 d]	H H-Bees	R1
Deltamethrin (Halley)	3A	Contact & systemic	2	A	ALL	Registered in Brassica vegetables for control of <b>Cabbage white butterfly</b> . [Max no. of applications not specified; Re-treatment interval: 7-14 d]	VH H-Bees	-
Diazinon (Accensi)	1B	Contact & systemic	14	A	ALL (excl. TAS)	Registered in Brassica vegetables for control of <b>Cabbage white butterfly</b> . [Max no. of applications not specified; Re-treatment interval: 10-14 d]	H VH-Bees	R3
Emamectin (Proclaim Opti)	6	Contact & systemic	3 NG	A	ALL	Registered in Brassica vegetables for control of Helicoverpa, Diamondback moth, <b>Cabbage white butterfly</b> , Cluster caterpillars and Loopers. Spray at first signs of infestation. Spray at first signs of infestation. [max 4 application per crop; Re-treatment interval: not specified]	M H-Bees	-
Esfenvalerate (Sumi-Alpha Flex)	3A	Contact	1	A	QLD, NSW & WA	Registered in Brassica vegetables for control of Cabbage moth (Diamondback moth), <b>Cabbage white butterfly</b> and Cabbage centre grub. [Max no. of applications not specified; Re-treatment interval: 7-10 d]	VH H-Bees	-
Fipronil (Emporium)	2B	Contact & systemic	7	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, <b>Cabbage white butterfly</b> and Cabbage cluster caterpillar. [max 4 application per year; Re-treatment interval: 56 d]	M VH-Bees	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Flubendiamide (Belt)	28	Contact & systemic	3 NG	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, <b>Cabbage white butterfly</b> and Cabbage cluster caterpillar and Helicoverpa. [max 3 application per year; Re-treatment interval: 7-14 d]	L-M L-Bees	-
Gamma-Cyhalothrin (Trojan)	3A	Contact & residual	2	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, <b>Cabbage white butterfly</b> and Cabbage cluster caterpillar. Apply at first sign of infestation. [max no. of applications not specified; Re-treatment interval: 7 d]	VH H-Bees	-
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, <b>Caterpillars</b> , 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	-
Indoxacarb (Avatar eVo)	22A	Contact	7 NG	A	ALL	Registered in Brassica vegetables for control of <b>Cabbage white butterfly</b> , Helicoverpa, Cluster caterpillar, Cabbage centre grub & Diamondback moth. [Max 4 applications per crop; 3 sequentially; re-treatment interval 7 d]	L H-Bees	R3
Lambda-cyhalothrin (Farmalinx Fizzle)	3A	Contact & residual	2 G2	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, <b>Cabbage white butterfly</b> and Cabbage cluster caterpillar. [max no. of applications not specified; Re-treatment interval: 7 d]	VH H-Bees	-
Methomyl (various)	1A	Contact & systemic	1	A	ALL	Registered in Brassica vegetables for control of <b>Cabbage white butterfly</b> , Cabbage cluster caterpillar, Cabbage centre grub, Cabbage moth and Helicoverpa. Apply when pests first appear. [Max no. of applications not specified; Re-treatment interval: 5-7 d]	H H-Bees	R2
Permethrin (Permerid)	3A	Contact & systemic	2	A	ALL	Registered in Brassica vegetables for control of <b>Cabbage white butterfly</b> . [Apply at first sight of infestation: max no. of applications not specified]	VH H-Bees	-



Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Prothiofos (Tokuthion)	1B	Contact & systemic	7	A	ALL	Registered in Brassica vegetables for control of <b>Cabbage white butterfly</b> , Cabbage cluster caterpillar, Cabbage centre grub, Cabbage moth and Helicoverpa. Apply when pests first appear. [Max no. of applications not specified; Re-treatment interval: 7 d]	H H-Bees	R3
Rotenone (Amgrow Derris Dust)	21B	Contact	1	A	ALL	Registered in vegetables for control of <b>Cabbage white butterfly</b> . [Max no. of applications not specified; Re-treatment interval: 10-14 d]	-	-
Spinetoram (Success Neo)	5	Contact & ingestion	3	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, <b>Cabbage white butterfly</b> , Cabbage cluster caterpillar, Cabbage centre grub, Loopers, Helicoverpa and Western flower thrips. [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 Brassica vegetables for control of Diamondback moth, <b>Cabbage white butterfly</b> , Cabbage cluster caterpillar, Cabbage centre grub, Loopers, Helicoverpa and Western flower thrips. [Max. 4 applications per season; re-treatment interval 7-14 d].	L L-Bees	-
Tau-Fluvalinate (Mavrick Aquaflow)	3A	Contact	2	A	ALL	Registered in Cauliflower crops for control of <b>Cabbage white butterfly</b> . [Max no. of applications not specified; Re-treatment interval: 7-14 d]	VH H-Bees	-
Thiamethoxam + Chlorantraniliprole (Durivo)	28+4A	Contact & systemic	42	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, <b>Cabbage white butterfly</b> , Helicoverpa, Cabbage centre grub, Cabbage cluster caterpillar, Cluster caterpillar, Soya bean looper, Cabbage aphid, Green peach aphid, Silverleaf white fly, Greenhouse white fly, Green vegetable bug, Western flower thrips and Onion thrips. [max 1 application per crop; seedlings should be transplanted within 48 h of application]	L-H H-Bees	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Thiamethoxam + chlorantraniliprole (Durivo) PER87051	28+4A	Systemic	35 NG	A	QLD (within Wide Bay Burnett region)	Permitted for use as a single post plant chemigation in Brassica vegetables (field) for control of Diamondback moth, <b>Cabbage white butterfly</b> , 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
Thiodicarb (Confront)	1A	Contact & ingestion	7 G:21	A	ALL	Registered in Brassica crops for control of <b>Cabbage white butterfly</b> . Time application to coincide with egg hatching. [Max no. of applications and re-treatment interval not specified]	H M-Bees	-
Trichlorfon (Tyranax)	1B	Contact	2	A	ALL	Registered in vegetables for control of <b>Cabbage white butterfly</b> , Cabbage moth, Green vegetable bug, and Rutherglen bug [Apply at first sight of infestation re-treatment interval 7-10 d]	H H-Bees	R2
Zeta-Cypermethrin (Fury)	3A	Contact & systemic	1	A	ALL	Registered in Brassica vegetables for control of <b>Cabbage white butterfly</b> . [Max no. of applications not specified; Re-treatment interval: 7-10 d]	VH H-Bees	-
<i>Clitorea ternatia</i> extract (Sero-X) Innovate Ag	UN	Protective biopesticide		P-A		Registered in Brassicas for control of Diamondback moth ( <b>Lepidoptera</b> ). [Max of 2 sprays per crop; re-treatment interval 7 d]	L L-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Helicoverpa Nucleopolyhedrovirus (NPV) (Helicovex) Andermatt Biocontrol	31	Protective biopesticide		P-A		Registered in Brassica vegetables for control of <b>Helicoverpa</b> . Effective on larvae of <7 mm. [Max no. of applications not specified; re-treatment interval 2-3 d]	VL VL-Bees	-
Indoxacarb + Novaluron (Plemax) Adama	22A+15			P		Registration pending for control of Lepidoptera including <b>Helicoverpa</b> spp. Registered in South Africa on a range of crops for Lepidoptera control.	M M-Bees	R3
NUL3445 Nufarm	TBC			P		New active in development. Nufarm claims activity on <b>Lepidoptera</b> .		
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, Bugs and <b>Caterpillars</b> .		
<b>Cluster caterpillar</b> ( <i>Spodoptera litura</i> )								
<b>Priority: Moderate</b>								
Cluster caterpillar was ranked as a moderate priority in QLD, NSW & WA and as a low priority in SA & TAS. Normally an issue in Autumn, also controlled when managing DBM.								
Alpha-cypermethrin (Hemani)	3A	Contact & systemic	1	A	ALL	Registered in Brassica vegetables for control of <b>Cluster caterpillar</b> . [Max no. of applications not specified; Re-treatment interval: 7-10 d]	VH H-Bees	-
Chlorantraniliprole (Coragen)	28	Contact & systemic	7	A	ALL	Registered in Brassicas for control of Cabbage cluster caterpillar, Cabbage centre grub, Leaf miner, Cabbage white butterfly, <b>Cluster caterpillar</b> , Diamondback moth, Helicoverpa and soybean looper. Important to plough crop debris immediately after harvest. [Max of 3 sprays per crop; max 2 consecutive; Re-treatment interval 7 d]	L VL-Bees	-
Chlorpyrifos (Sinon)	1B	Contact & systemic	5	A	ALL (excl. QLD)	Registered in Brassica vegetables for control of <b>Cluster caterpillar</b> . [Max no. of applications not specified; Re-treatment interval: 10-14 d]	H H-Bees	R1
Diazinon (Accensi)	1B	Contact & systemic	14	A	QLD & WA	Registered in Brassica vegetables for control of <b>Cluster caterpillar</b> . [Max no. of applications not specified; Re-treatment interval: 10-14 d]	H VH-Bees	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Fipronil (Emporium)	2B	Contact & systemic	7	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, Cabbage white butterfly and <b>Cabbage cluster caterpillar</b> . [max 4 application per year; Re-treatment interval: 56 d]	M VH-Bees	-
Flubendiamide (Belt)	28	Contact & systemic	3 NG	A	ALL	Registered in Brassica vegetables for control of <b>Cluster caterpillar</b> . [max 3 application per year; Re-treatment interval: 7-14 d]	L-M L-Bees	-
Gamma-Cyhalothrin (Trojan)	3A	Contact & systemic	2	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, Cabbage white butterfly and <b>Cabbage cluster caterpillar</b> . [Apply at first sight of infestation: max no. of applications not specified; re-treatment as needed]	VH H-Bees	-
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, <b>Caterpillars</b> , 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	-
Indoxacarb (Avatar eVo)	22A	Contact	7 NG	A	ALL	Registered in Brassica vegetables for control of Cabbage white butterfly, Helicoverpa, <b>Cluster caterpillar</b> , Cabbage centre grub & Diamondback moth. [Max 4 applications per crop; 3 sequentially; re-treatment interval 7 d]	L H-Bees	R3
Lambda-cyhalothrin (Farmalinx Fizzle)	3A	Contact & systemic	2 G 2	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, Cabbage white butterfly and <b>Cabbage cluster caterpillar</b> . [Apply at first sight of infestation: max no. of applications not specified]	VH H-Bees	-
Permethrin (Permerid)	3A	Contact & systemic	2	A	Variable. Refer to label.	Registered in Brassica vegetables for control of <b>Cabbage cluster caterpillar</b> . Considered effective, but some level of resistance in some regions. [Apply at first sight of infestation: max no. of applications not specified]	VH H-Bees	-
Zeta-Cypermethrin (Fury)	3A	Contact & systemic	1	A	ALL (excl. QLD)	Registered in Brassica vegetables for control of <b>Cabbage cluster caterpillar</b> . [Max no. of applications not specified; Re-treatment interval: 7-10 d]	VH H-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Chlorfenapyr (Phantom) BASF	13	Contact & systemic		P-A		Registered in Brassica vegetables for control of Diamondback moth and Cabbage white butterfly ( <b>Lepidoptera</b> ). [Max of 2 sprays per crop; Re-treatment interval 7 d; In Brussels sprouts only - a second 2 spray sequence after 28 days]	H H-Bees	-
<i>Clitorea ternatia</i> extract (Sero-X) Innovate Ag	UN	Protective biopesticide		P-A		Registered in Brassicas for control of Diamondback moth ( <b>Lepidoptera</b> ). [Max of 2 sprays per crop; re-treatment interval 7 d]	L L-Bees	-
Helicoverpa Nucleopolyhedrovirus (NPV) (Helicovex) Andermatt Biocontrol	31	Protective biopesticide		P-A		Registered in Brassica vegetables for control of Helicoverpa ( <b>Lepidoptera</b> ). Effective on larvae of <7 mm. [Max no. of applications not specified; re-treatment interval 2-3 d]	VL VL-Bees	-
Spinosad (Entrust Organic) Corteva	5	Contact & ingestion		P-A		Registered in Brassica vegetables for control of Cabbage centre grub, <b>Cabbage cluster caterpillar</b> ( <i>Crocidolomia pavonana</i> ), Cabbage white butterfly, Loopers & Diamondback moth. [Max. 4 applications per season; re-treatment interval 7-14 d].	L L-Bees	-
NUL3445 Nufarm	TBC			P		New active in development. Nufarm claims activity on <b>Lepidoptera</b> .		
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, Bugs and <b>Caterpillars</b> .		
<b>Helicoverpa</b> ( <i>Helicoverpa armigera</i> [ <b>Cotton bollworm / Corn earworm</b> ] and <i>Helicoverpa punctigera</i> [ <b>Native budworm</b> ]) <b>Priority: Moderate</b>								
Helicoverpa was ranked as a moderate priority in VIC, QLD & NSW and as a low priority in WA, SA & TAS. Native budworm is the most likely pest and DBM program would provide control. Corn earworms ( <i>H. armigera</i> ) have developed resistance to broad spectrum pesticides.								
Acephate (Titan)	1B	Systemic	3	A	QLD, WA, NT & TAS	Registered in Brassica vegetables for control of Cabbage white butterfly, Cabbage aphid, <b>Helicoverpa</b> and Cabbage moth. WHP Broccoli 14 d. [max no. of applications not specified; re-treatment interval 10-14 d]	H H-Bees	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Alpha-cypermethrin (various)	3A	Contact &	1	A	ALL	Registered in Brassica vegetables for control of <b>Helicoverpa</b> . Most effective on larvae < 5 mm. [max no. of applications not specified; re-treatment interval 7-10 d]	VH H-Bees	-
Amorphous silica (Abrade)	-	Physical cutting & abrading	NR	A	ALL	Registered in Brassica vegetables for control of <b>Helicoverpa</b> .	-	-
<i>Bacillus thuringiensis subsp. kurstaki</i> (Biocrystal)	11A	Biological	NR	A	ALL	Registered in vegetables for control of <b>Helicoverpa</b> . Most effective on larvae < 8 mm. [Apply a minimum of 2 sprays, 3 d apart; re-treatment interval 3-5 d]	VL VL-Bees	-
Beta-Cypermethrin (Banshee)	3A	Contact & systemic	1	A	ALL	Registered in Brassica vegetables for control of Diamondback moth and <b>Helicoverpa</b> . [Max no. of applications and Re-treatment interval not specified]	VH H-Bees	-
Chlorantraniliprole (Coragen)	28	Contact & systemic	3	A	ALL	Registered in Brassicas for control of Cabbage cluster caterpillar, Cabbage centre grub, Leaf miner, Cabbage white butterfly, Cluster caterpillar, Diamondback moth, <b>Helicoverpa</b> and soybean looper. [Max of 3 sprays per crop; max 2 consecutive; Re-treatment interval 7 d]	L VL-Bees	-
Chlorpyrifos (Sinon)	1B	Contact & systemic	5	A	ALL	Registered in Cole crops including Cabbage and Cauliflower for the control of <b>Helicoverpa</b> . Apply as a soil drench or boom spray. [Max no. of applications and re-treatment interval 10-14 d]	H H-Bees	R1
Etmectin (Proclaim Opti)	6	Contact & systemic	3 NG	A	ALL	Registered in Brassica vegetables for control of <b>Helicoverpa</b> , Diamondback moth, Cabbage white butterfly, Cluster caterpillars and Loopers. Spray at first signs of infestation. [max 4 application per crop; re-treatment interval: 7 d]	M H-Bees	-
Flubendiamide (Belt)	28	Contact & systemic	3 NG	A	ALL	Registered in Brassica vegetables for control of <b>Helicoverpa</b> . [Max 3 applications per crop; re-treatment interval 7-14 d]	L-M L-Bees	-
Helicoverpa Nucleopolyhedrovirus (NPV) (Helicovex)	31	Biological insecticide	NR	A	ALL	Registered in Brassica vegetables for control of <b>Helicoverpa</b> . Effective on larvae of <7 mm. [Max no. of applications not specified; re-treatment interval 2-3 d]	VL VL-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Indoxacarb (Avatar eVo)	22A	Contact	7 NG	A	ALL	Registered in Brassica vegetables for control of Cabbage white butterfly, <b>Helicoverpa</b> , Cluster caterpillar, Cabbage centre grub & Diamondback moth. [Max 4 applications per crop; 3 sequentially; re-treatment interval 7 d]	L H-Bees	R3
Methomyl (Farmalinx)	1A	Contact & systemic	1	A	ALL (excl. VIC)	Registered in Brassica vegetables for control of Cabbage white butterfly, Cabbage cluster caterpillar, Cabbage centre grub, Loopers and <b>Helicoverpa</b> . Apply when pests first appear. [Max no. of applications not specified; Re-treatment interval: 5-7 d]	H H-Bees	R2
Prothiofos (Tokuthion)	1B	Contact & systemic	7	A	ALL	Registered in Brassica vegetables for control of Cabbage white butterfly, Cabbage cluster caterpillar, Cabbage centre grub, Cabbage moth and <b>Helicoverpa</b> . Apply when pests first appear. [Max no. of applications not specified; re-treatment interval: 7 d]	H H-Bees	R3
Spinetoram (Succes Neo)	5	Contact & ingestion	1	A	ALL	Registered in Brassica vegetables for the control of Diamondback moth, Cabbage white butterfly, Cabbage cluster caterpillar, Cabbage centre grub, Loopers and <b>Helicoverpa</b> . [Max no. of applications not specified; re-treatment interval: 7-14 d]	M H-Bees	-
Tau-Fluvalinate (Mavrick)	3A	Contact	2	A	ALL	Registered in Brassica vegetables for the control of <b>Helicoverpa</b> . [Apply at first sight of infestation: max no. of applications not specified]	VH H-Bees	-
Thiamethoxam + Chlorantraniliprole (Durivo)	28+4A	Contact & systemic	42	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, Cabbage white butterfly, <b>Helicoverpa</b> , Cabbage centre grub, Cabbage cluster caterpillar, Cluster caterpillar, soya bean looper, Cabbage aphid, Green peach aphid, Silverleaf white fly, Greenhouse white fly, Green vegetable bug, Western flower thrips and Onion thrips. [max 1 application per crop; seedlings should be transplanted within 48 h of application]	L-H H-Bees	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Thiamethoxam + chlorantraniliprole (Durivo) PER87051	28+4A	Systemic	35 NG	A	QLD (within Wide Bay Burnett region)	Permitted for use as a single post plant chemigation in Brassica vegetables (field) for control of Diamondback moth, Cabbage white butterfly, <b>Corn Earworm, Native budworm</b> , 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
Zeta-Cypermethrin (Fury)	3A	Contact & systemic	1	A	ALL	Registered in Brassica vegetables for control of <b>Helicoverpa</b> . [Max no. of applications not specified; re-treatment interval: 7-10 d]	VH H-Bees	-
Chlorfenapyr (Phantom) BASF	13	Contact & systemic		P-A		Registered in Brassica vegetables for control of Diamondback moth and Cabbage white butterfly ( <b>Lepidoptera</b> ). [Max of 2 sprays per crop; Re-treatment interval 7 d; In Brussels sprouts only - a second 2 spray sequence after 28 days]	H H-Bees	-
<i>Clitorea ternatia</i> extract (Sero-X) Innovate Ag	UN	Protective biopesticide		P-A		Registered in Brassicas for control of Diamondback moth ( <b>Lepidoptera</b> ). [Max of 2 sprays per crop; re-treatment interval 7 d]	L L-Bees	-
Spinosad (Entrust Organic) Corteva	5	Contact & ingestion		P-A		Registered in Brassica vegetables for control of various <b>Lepidoptera</b> including Cabbage centre grub, Cabbage cluster caterpillar, Cabbage white butterfly, Loopers & Diamondback moth. [Max. 4 applications per season; re-treatment interval 7-14 d]. Registered in Brassica leafy vegetables for control of <b>Helicoverpa</b> .	L L-Bees	-



Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Indoxacarb + Novaluron (Plemax) Adama	22A+15	Contact & stomach		P		Registration pending for control of Lepidoptera including <i>Helicoverpa</i> spp. Registered in South Africa on a range of crops for Lepidoptera control.	M M-Bees	R3
NUL3445 Nufarm	TBC			P		New active in development. Nufarm claims activity on <b>Lepidoptera</b> .		
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, Bugs and <b>Caterpillars</b> .		
<p><b>Thrips</b> (<i>Thrips</i> spp.) <b>Bean Blossom Thrips</b> (<i>Megalurothrips usitatis</i>), <b>Melon thrips</b> (<i>Thrips palmi</i>), <b>Onion thrips</b> (<i>Thrips tabaci</i>) &amp; <b>Plague thrips</b> (<i>Thrips imaginis</i>)</p> <p><b>Priority: Moderate</b></p> <p>Thrips were ranked as a moderate priority in VIC, QLD &amp; SA and as a low priority NSW, WA &amp; TAS. However, it is considered a high priority for Brussels sprouts in SA. The pest attack can leave marks on the leaves and thrips can spread viruses. Follow a resistance management strategy for Western Flower Thrips (WFT). Spinosad resistant populations of WFT exist in some production areas.</p>								
<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: <b>Western Flower Thrips, Onion thrips</b> , 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]	VL VL-Bees	-
Chlorantraniliprole + thiamethoxam (Durivo)	28+4A	Contact & systemic	42	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, Cabbage white butterfly, Helicoverpa, Cabbage centre grub, Cabbage cluster caterpillar, Cluster caterpillar, soya bean looper, Cabbage aphid, Green peach aphid, Silverleaf white fly, Greenhouse white fly, Green vegetable bug, Western flower <b>thrips</b> and <b>Onion thrips</b> . [max 1 application per crop; seedlings should be transplanted within 48 h of application]	L-H H-Bees	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Thiamethoxam + chlorantraniliprole (Durivo) PER87051	28+4A	Systemic	35 NG	A	QLD (within Wide Bay Burnett region)	Permitted for use as a single post plant chemigation in Brassica vegetables (field) 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, <b>Tomato thrips</b> , Brown sowthistle aphid, Vegetable leafhopper, Lucerne leafroller, Leafhoppers (Jassids), <b>Onion Thrips</b> 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
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars, Earwigs, Whitefly, <b>Thrips</b> and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH H-Bees	-
Phorate (various)	1B	Contact & systemic	70	A	ALL	Registered in Brassica vegetables for control of <b>Thrips</b> . [Apply granules on soil surface closer to plants]	H H-Bees	R3
Pyrethrins + Piperonyl butoxide (Crop Culture)	3A	Contact	1	A	ALL	Registered in vegetables for control of Aphids, <b>Thrips</b> , Caterpillars, Ants, Flies, Earwigs, Whitefly and Leafhoppers. [Max no. of applications not specified; Re-treatment interval: 7 d]	VH H-Bees	-
Rotenone (Amgrow Derris Dust)	21B	Contact	1	A	ALL	Registered in vegetables for control of <b>Thrips</b> . [Max no. of applications not specified; Re-treatment interval: 10-14 d]	-	-
Spinetoram (Succes Neo)	5	Contact & ingestion	1	A	ALL	Registered in Brassica vegetables for the control of <b>Western flower thrips</b> . [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
Spirotetramat (Movento 240 SC) Bayer	23	Contact & systemic		P-A		Registered in Brassica Leafy Vegetables for control of Green peach aphid, Grey cabbage aphid, Silverleaf whitefly & Diamondback moth. Currently registered in other vegetables for control of <b>Plague Thrips, Western Flower Thrips</b> and <b>Tomato Thrips</b> . IPM compatible.	M VL-Bees	
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for <b>Thrips</b> , Bugs and Caterpillars.		
<b>Crane fly (<i>Trichocera annulata</i>)</b>								
<b>Priority: Moderate</b>								
Crane fly was ranked as moderate priority in TAS only. issue in TAS only and is considered an emerging issue in Tasmania. Very erratic in occurrence but can be devastating.								
Pyrethrins + Piperonyl butoxide (Crop Culture)	3A	Contact	1	A	ALL	Registered in vegetables for control of Aphids, Thrips, Caterpillars, Ants, <b>Flies</b> , Earwigs, Whitefly and Leafhoppers. [Max no. of applications not specified; Re-treatment interval: 7 d]	VH H-Bees	-
<b>Redback spider (<i>Latrodectus hasselti</i>)</b>								
<b>Priority: Moderate</b>								
Redback spiders were ranked as a moderate priority in QLD and is an issue mainly in broccoli. They are not controlled by pesticides. Cultural practices including good farm hygiene is required around sheds and machinery etc. to control them.								
Pyrethrins (Pyganic)	3A	Contact	NR	A	ALL	Registered in Brassica vegetables for control of <b>Spiders</b> . Spray when pests first appear. [Max 3 applications; re-treatment 3 d]	VH H-Bees	-
<b>Rutherglen bug (<i>Nysius vinitor</i>)</b>								
<b>Priority: Moderate</b>								
Rutherglen bug was ranked as a moderate priority in QLD and as a low priority in VIC, NSW, WA, SA & TAS. Considered to be more of an issue in cabbages.								
Maldison (Fyfanon)	1B	Contact & systemic	3	A	ALL (excl. NSW)	Registered in cabbage and cauliflower for control of Aphids, Green vegetable bug, Jassids, Leaf hopper, Redlegged earth mite (not TAS), <b>Rutherglen bug</b> and Twentyeight-spotted ladybird. [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
Petroleum oil (various) PER12221	UN	Contact & protective	1	A	ALL (excl. VIC)	Permitted for use in Brassica vegetables for control of Aphids, Green mirid, Green vegetable bug, Grey cluster bug, Leafhoppers, Mites, <b>Rutherglen bug</b> and Thrips. [Max. no. of applications and re-treatment interval not specified]	VL L-Bees	-
Pyrethrins (Pyganic)	3A	Contact	NR	A	ALL	Registered in Brassica vegetables for control of <b>Rutherglen bug</b> . Spray when pests first appear. [Max 3 applications; re-treatment 3 d]	VH H-Bees	
Sulfoxaflor (Transform)	4C	Systemic	3	A	ALL	Registered in Brassica vegetables for control of <b>Rutherglen bug</b> . Field situations only. [Max no. of applications not specified; re-treatment interval 7-10 d]	M VH-Bees	-
Trichlorfon (Tyranex)	1B	Contact	2	A	ALL	Registered in vegetables for control of Cabbage white butterfly, Cabbage moth, Green vegetable bug, and <b>Rutherglen bug</b> [Apply at first sight of infestation re-treatment interval 7-10 d]	H H-Bees	R2
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, <b>Bugs</b> and Caterpillars.		
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact and Ingestion		P		Registered in macadamia for control of macadamia Lace bug, <b>Banana spotting bug</b> , <b>Fruit spotting bug</b> & suppression of Scirtothrips. US label (Sivanto) approves use on Brassica vegetables for control of Leafhoppers, Aphids and Whiteflies.	L VL-Bees	-
NUL3445 Nufarm	TBC			P		Product in development from Nufarm with activity on <b>Bugs</b> .		

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
<b>African black beetle</b> ( <i>Heteronychus arator</i> )								
<b>Priority: Low</b>								
African black beetle was ranked as a low priority in all consulted regions, VIC, QLD, NSW, WA, SA & TAS. This pest is considered an issue in new ground. Chlorpyrifos is under review by the APVMA, and the vegetable industry requires other Agchem alternatives to control soil insects.								
Chlorpyrifos (Sinon)	1B	Contact & systemic	5	A	NSW & WA	Registered in Cabbage and Cauliflower for control of <b>African black beetle</b> . Apply as a soil drench or boom spray. [Max no. of applications and re-treatment interval not specified]	H H-Bees	R1
Bifenthrin (Ceasefire) Turf Culture	3A	Contact & residual		P		Registered in turf for the control of <b>African Black Beetle</b> .	VH H-Bees	R3
Imidacloprid (Various)	4A	Systemic		P		Registered in Cucurbits, capsicum & eggplant for control of Green peach aphid and in turf for control of <b>African black beetle</b> . Apply at peak egg hatch.	M M-Bees	R2
NUL3145 Nufarm	TBC			P		New product in development. Nufarm claims activity on various <b>Beetles</b> .		-
<b>Cabbage Looper caterpillar</b> ( <i>Chrysodeixis</i> spp.)								
<b>Priority: Low</b>								
Cabbage looper caterpillars were ranked as a low priority in all consulted regions, VIC, QLD, NSW, WA, SA & TAS. It is considered a secondary pest that is controlled when managing DBM.								
Diazinon (Accensi)	1B	Contact & systemic	14 G 14	A	ALL (excl. TAS)	Registered in Brassica vegetables for the control of <b>Australian cabbage looper</b> . [Max no. of applications not specified; re-treatment interval: 10-14 d]	H VH-Bees	R3
Methomyl (Farmalinx)	1A	Contact & systemic	1	A	ALL	Registered in Brassica vegetables for control of <b>Loopers</b> . Apply when pests first appear. [Max no. of applications not specified; Re-treatment interval: 5-7 d]	H H-Bees	R2
<i>Bacillus thuringiensis subsp. kurstaki</i> (Biocrystal)	11A	Protective biopesticide	NR	A	ALL	Registered in vegetables for control of <b>Cabbage looper</b> . [Apply a minimum of 2 sprays, 3 d apart: re-treatment interval 3-5 d]	VL VL-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Emamectin (Proclaim Opti)	6	Contact & systemic	3	A	ALL	Registered in Brassica vegetables for control of Helicoverpa, Diamondback moth, Cabbage white butterfly, Cluster caterpillars and <b>Loopers</b> . Spray at first signs of infestation. [Max 4 applications per crop; re-treatment interval: 7 d]	M H-Bees	-
Spinetoram (Success Neo)	5	Contact & ingestion	3	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, Cabbage white butterfly, Cabbage cluster caterpillar, Cabbage centre grub, <b>Loopers</b> , Helicoverpa and Western flower thrips. [Max 2 applications per crop; re-treatment interval: 7-14 d]	M H-Bees	-
Spinosad (Entrust Organic)	5	Contact & ingestion	3 G:14	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, Cabbage white butterfly, Cabbage cluster caterpillar, Cabbage centre grub, <b>Loopers</b> , Helicoverpa and Western flower thrips. [Max. 4 applications per season; re-treatment interval 7-14 d].	L L-Bees	-
<i>Clitorea ternatia</i> extract (Sero-X) Innovate Ag	UN	Protective biopesticide		P-A		Registered in Brassicas for control of Diamondback moth ( <b>Lepidoptera</b> ). [Max of 2 sprays per crop; re-treatment interval 7 d]	L L-Bees	-
Chlorfenapyr (Phantom) BASF	13	Contact & systemic		P-A		Registered in Brassica vegetables for control of Diamondback moth and Cabbage white butterfly ( <b>Lepidoptera</b> ). [Max of 2 sprays per crop; Re-treatment interval 7 d; In Brussels sprouts only - a second 2 spray sequence after 28 days]	H H-Bees	-
Spirotetramat (Movento 240 SC) Bayer	23	Contact & systemic		P-A		Registered in Brassica vegetables for control of Diamondback moth ( <b>Lepidoptera</b> ). Use subject to CropLife resistant management strategy. [Max 3 sprays per crop; re-treatment interval: 7 d]	M VL-Bees	-
Indoxacarb + Novaluron (Plemax) Adama	22A+15			P		Registration pending for control of <b>Lepidoptera</b> including <i>Helicoverpa</i> spp. Registered in South Africa on a range of crops for Lepidoptera control.	M M-Bees	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
SYNFOI21 Syngenta	TBC	-		P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, Bugs and <b>Caterpillars</b> .	-	■
<b>Cabbage cluster caterpillar</b> ( <i>Crocidolomia pavonana</i> )								
<b>Priority: Low</b>								
Cabbage cluster caterpillar was ranked as a low priority in all consulted regions, VIC, QLD, NSW, WA, SA & TAS. It is considered a secondary pest that it is controlled when managing DBM.								
<i>Bacillus Thuringiensis</i> var Kurstaki (Btk) (various)	11A	Protective biopesticide	NR	A	ALL	Registered in vegetables for control of all <b>Lepidoptera</b> . Considered highly effective on small caterpillars but needs regular reapplication. UV sensitive.	VL VL-Bees	-
Chlorantraniliprole (Coragen)	28	Contact & systemic	7	A	ALL	Registered in Brassicas for control of <b>Cabbage cluster caterpillar</b> , Cabbage centre grub, Leaf miner, Cabbage white butterfly, Cluster caterpillar, Diamondback moth, Helicoverpa and Soybean looper. [Max of 3 sprays per crop; max 2 consecutive; Re-treatment interval 7 d]	L VL-Bees	-
Thiodicarb (Confront)	1A	Contact & ingestion	H:7 G:21	A	ALL	Registered in Brassica crops for control of <b>Cabbage cluster caterpillar</b> . Time application to coincide with egg hatching. [Max no. of applications and re-treatment interval not specified]	H M-Bees	-
Fipronil (Emporium)	2B	Contact & systemic	7	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, Cabbage white butterfly and <b>Cabbage cluster caterpillar</b> . [max 4 application per year; Re-treatment interval: 56 d]	M VH-Bees	-
Gamma-Cyhalothrin (Trojan)	3A	Contact & residual	2	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, Cabbage white butterfly and <b>Cabbage cluster caterpillar</b> . [Apply at first sight of infestation: max no. of applications not specified; re-treatment as needed]	VH H-Bees	-
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, <b>Caterpillars</b> , 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
Lambda-cyhalothrin (Farmalinx Fizzle)	3A	Contact & residual	2 G 2	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, Cabbage white butterfly and <b>Cabbage cluster caterpillar</b> . [Apply at first sight of infestation: max no. of applications not specified]	VH H-Bees	-
Methomyl (Farmalinx)	1A	Contact & systemic	1	A	QLD, WA & NT	Registered in Brassica vegetables for control of <b>Cluster caterpillar</b> . Apply when pests first appear. [Max no. of applications not specified; Re-treatment interval: 5-7 d]	H H-Bees	R2
Permethrin (Permerid)	3A	Contact & systemic	2	A	QLD Variable. Refer to label.	Registered in Brassica vegetables for control of <b>Cabbage cluster caterpillar</b> . [Apply at first sight of infestation: max no. of applications not specified]	VH H-Bees	-
Spinetoram (Success Neo)	5	Contact & ingestion	3	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, Cabbage white butterfly, <b>Cabbage cluster caterpillar</b> , Cabbage centre grub, Loopers, Helicoverpa and Western flower thrips. [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 Brassica vegetables for control of Diamondback moth, Cabbage white butterfly, <b>Cabbage cluster caterpillar</b> , Cabbage centre grub, Loopers, Helicoverpa and Western flower thrips. [Max. 4 applications per season; re-treatment interval 7-14 d].	L L-Bees	-
Thiamethoxam + Chlorantraniliprole (Durivo)	28+4A	Contact & systemic	42	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, Cabbage white butterfly, Helicoverpa, Cabbage centre grub, <b>Cabbage cluster caterpillar</b> , Cluster caterpillar, Soya bean looper, Cabbage aphid, Green peach aphid, Silverleaf white fly, Greenhouse white fly, Green vegetable bug, Western flower thrips and Onion thrips. [max 1 application per crop; seedlings should be transplanted within 48 h of application]	L-H H-Bees	R2



Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Thiamethoxam + chlorantraniliprole (Durivo) PER87051	28+4A	Systemic	35 NG	A	QLD (within Wide Bay Burnett region)	Permitted for use as a single post plant chemigation in Brassica vegetables (field) for control of Diamondback moth, Cabbage white butterfly, Corn Earworm, Native budworm, Cabbage centre grub, <b>Cabbage cluster caterpillar</b> , 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
<i>Clitorea ternatia</i> extract (Sero-X) Innovate Ag	UN	Protective biopesticide		P-A		Registered in Brassicas for control of Diamondback moth ( <b>Lepidoptera</b> ). [Max of 2 sprays per crop; re-treatment interval 7 d]	L L-Bees	-
Chlorfenapyr (Phantom) BASF	13	Contact & systemic		P-A		Registered in Brassica vegetables for control of Diamondback moth and Cabbage white butterfly ( <b>Lepidoptera</b> ). [Max of 2 sprays per crop; Re-treatment interval 7 d; In Brussels sprouts only - a second 2 spray sequence after 28 days]	H H-Bees	-
Spirotetramat (Movento 240 SC) Bayer	23	Contact & systemic		P-A		Registered in Brassica vegetables for control of Diamondback moth ( <b>Lepidoptera</b> ). Use subject to CropLife resistant management strategy. [Max 3 sprays per crop; re-treatment interval: 7 d]	M VL-Bees	-
Indoxacarb + Novaluron (Plemax) Adama	22A+15			P		Registration pending for control of <b>Lepidoptera</b> including <i>Helicoverpa</i> spp. Registered in South Africa on a range of crops for Lepidoptera control.	M M-Bees	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Methoxyfenozide (Prodigy) Corteva	18	Insect growth regulator		P		Controls a range of <b>Lepidopteran</b> pests. Registrations and permits to control Lepidoptera pests in various vegetables including fruiting vegetables and lettuce. IPM compatible.	VL VL-Bees	
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, Bugs and <b>Caterpillars</b> .		
<b>Crickets - Black field and Mole cricket</b> ( <i>Teleogryllus commodus</i> , Gryllotalpidae)								
<b>Priority: Low</b>								
Black field and Mole crickets were ranked as a low priority in all consulted regions, VIC, QLD, NSW, WA, SA & TAS.								
Chlorpyrifos (Sinon)	1B	Contact & systemic	5	A	QLD & WA	Registered in young vegetable plants for the control of Field and <b>Mole crickets</b> . Apply as a soil drench or boom spray. [Max no. of applications and re-treatment interval not specified]	H H-Bees	R1
Fenitrothion (Sumithion ULV) (Sumitomo)	1B	Contact	14	A	Variable – refer to label	Registered in cabbage for the control of a range of <b>grasshoppers and locusts</b> . Apply when pests appear in damaging numbers. [Max no. of applications not specified; re-treatment interval: 14 d]	H H-Bees	-
<b>Earwigs</b> ( <i>Forficula</i> spp.)								
<b>Priority: Low</b>								
Earwigs were ranked as a low priority in all consulted regions, VIC, QLD, NSW, WA, SA & TAS. Considered to be a seasonal issue.								
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars, <b>Earwigs</b> , 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 (Yates)	3A	Contact	1	A	ALL	Registered in vegetables for control of <b>Earwigs</b> . Apply when pests first appear. [Max no. of applications not specified; re-treatment interval 7 d]	VH H-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Pyrethrins + Piperonyl butoxide (Crop Culture)	3A	Contact	1	A	ALL	Registered in vegetables for control of Aphids, Thrips, Caterpillars, Ants, Flies, <b>Earwigs</b> , Whitefly and Leafhoppers. [Max no. of applications not specified; Re-treatment interval: 7 d]	VH H-Bees	-
<b>Green vegetable bug</b> ( <i>Nezara viridula</i> )								
<b>Priority: Low</b>								
Green vegetable bug was ranked as a low priority in all consulted regions, VIC, QLD, NSW, WA, SA & TAS.								
Maldison (Fyfanon)	1B	Contact & systemic	3	A	ALL (excl. QLD)	Registered in cabbage and cauliflower for control of Aphids, <b>Green vegetable bug</b> , Jassid, Leaf hopper, Redlegged earth mite (not TAS), Rutherglen bug and Twentyeight-spotted ladybird. [Apply at first sight of infestation: max no. of applications not specified]	H H-Bees	-
Petroleum oil (various) PER12221	UN	Contact & protective	1	A	ALL (excl. VIC)	Permitted for use in Brassica vegetables for control of Aphids, Green mirid, <b>Green vegetable bug</b> , Grey cluster bug, Leafhoppers, Mites, Rutherglen bug and Thrips. [Max. no. of applications and re-treatment interval not specified]	VL L-Bees	-
Chlorantraniliprole + Thiamethoxam (Durivo)	28+4A	Contact & systemic	42	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, Cabbage white butterfly, Helicoverpa, Cabbage centre grub, Cabbage cluster caterpillar, Cluster caterpillar, soya bean looper, Cabbage aphid, Green peach aphid, Silverleaf white fly, Greenhouse white fly, <b>Green vegetable bug</b> , Western flower thrips and Onion thrips. [max 1 application per crop; seedlings should be transplanted within 48 h of application]	L-H H-Bees	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Thiamethoxam + chlorantraniliprole (Durivo) PER87051	28+4A	Systemic	35 NG	A	QLD (within Wide Bay Burnett region)	Permitted for use as a single post plant chemigation in Brassica vegetables (field) 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, <b>Green vegetable bug</b> , 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 Cabbage white butterfly, Cabbage moth, <b>Green vegetable bug</b> , and Rutherglen bug. [Apply at first sight of infestation re-treatment interval 7-10 d]	H H-Bees	R2
Fonicamid (Mainman) ISK	29	Systemic		P		Registered in cotton for control of Green mirids, in cucurbits against Aphids and in apples and pears against Mealybugs. US label (Beleaf-FMC) approves use on fruiting vegetables against Aphids, plant <b>bugs</b> and tomato psyllids.	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 & suppression of Scirtothrips. US label (Sivanto) approves use on Brassica vegetables for control of Leafhoppers, Aphids and Whiteflies.	L VL-Bees	-
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, <b>Bugs</b> and Caterpillars.		

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
<b>Redlegged earth mite</b> ( <i>Halotydeus destructor</i> )								
<b>Priority: Low</b>								
Redlegged earth mite was ranked as a low priority in all consulted regions, VIC, QLD, NSW, WA, SA & TAS.								
1,3-dichloropropene + Chloropicrin (Tri-Form)	8B	Soil fumigant	NR	A	ALL	Registered in vegetables for control of <b>soil borne pests</b> including Nematodes. Leave soil undisturbed for 14 d after treatment.	-	-
Chlorpyrifos (Lorsban)	1B	Contact & systemic	5	A	NSW	Registered in Brassica vegetables for control of <b>Redlegged earth mite</b> . [Max no. of applications not specified; re-treatment interval 10-14 d]	H H-Bees	R1
Maldison (Fyfanon)	1B	Contact & systemic	3	A	ALL (excl. QLD)	Registered in cabbage and cauliflower for control of Aphids, Green vegetable bug, Jassid, Leaf hopper, <b>Redlegged earth mite</b> (not TAS), Rutherglen bug and Twentyeight-spotted ladybird. [Apply at first sight of infestation: max no. of applications not specified]	H H-Bees	-
<b>Snails and slugs</b>								
<b>Priority: Low</b>								
Snails & Slugs were ranked as a low priority in all consulted regions, VIC, QLD, NSW, WA, SA & TAS.								
Iron EDTA Complex (Eradicate Snail)	-	Contact & ingestion	NR	A	ALL	Registered in all plants for the control of <b>snails and slugs</b> . Spread pellets evenly on ground. [Max no. of applications and re-treatment not specified]	-	-
Metaldehyde (Sabakem)	-	Contact & ingestion	7	A	ALL	Registered in vegetables for the control of <b>snails and slugs</b> . Spread pellets evenly on ground. [Max no. of applications and re-treatment not specified]	-	-
Metaldehyde + Fipronil (Transcend)	2B	Contact & ingestion	7	A	ALL	Registered in Brassica spp. for the control of <b>snails and slugs</b> . Spread pellets in shady places around the base of plant.	M VH-Bees	R3
Methiocarb (Mesurol)	1A	Contact & ingestion	7 G:28	A	ALL	Registered in Brassica vegetables for control of common garden <b>snails, slugs</b> , White snail and Italian white snail.	H M-Bees	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
<b>Staphylinid beetle</b> ( <i>Staphylinidae</i> )								
<b>Priority: Low</b>								
Staphylinid beetles were ranked as a low priority in all consulted regions, VIC, QLD, NSW, WA, SA & TAS.								
Alpha-cypermethrin (Hemani) PER14037	3A	Contact &	1	A	WA	Permitted for use in Cauliflower for control of <b>Staphylinid beetle</b> . Spray when pests first appear. [Max no. of applications and re-treatment interval not specified]	VH H-Bees	-
Chlorpyrifos (Lorsban) PER14596	1B	Systemic & contact	NR	A	WA	Permitted for use in Brassica for control of <b>Vegetable beetles</b> . Apply bait once near crop emergence or transplanting via a fertiliser spreader or similar applicator.	H H-Bees	R1
NUL3445 Nufarm	TBC			P		New active in development. Nufarm claims activity on <b>Beetles</b> .	-	-
<b>Vegetable weevil</b> ( <i>Listroderes difficilis</i> )								
<b>Priority: Low</b>								
Vegetable weevils were ranked as a low priority in all consulted regions, VIC, QLD, NSW, WA, SA & TAS.								
Pyrethrins (Yates)	3A	Contact	1	A	ALL	Registered in vegetables for control of various insect pests. Apply when pests first appear. [Max no. of applications not specified; re-treatment interval 7 d]	VH H-Bees	-
Indoxacarb (Avatar eVo) FMC	22A	Contact & stomach		P		Registered for control of <b>Weevils</b> in pome and stone fruits.	M M-Bees	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
<b>Western flower thrips</b> ( <i>Frankliniella occidentalis</i> )								
<b>Priority: Low</b>								
Western flower thrips were ranked as a low priority in all consulted regions, VIC, QLD, NSW, WA, SA & TAS. It is ranked as a moderate to high issue in QLD for cabbage growers. The pest attack can leave marks on the leaves and thrips can spread viruses. Follow a resistance management strategy for Western Flower Thrips (WFT). Spinosad resistant populations of WFT exist in some production areas.								
<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: <b>Western Flower Thrips</b> , 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]	VL VL-Bees	-
Chlorantraniliprole + thiamethoxam (Durivo)	28+4A	Contact & systemic	42	A	ALL	Registered in Brassica vegetables for control of Diamondback moth, Cabbage white butterfly, Helicoverpa, Cabbage centre grub, Cabbage cluster caterpillar, Cluster caterpillar, soya bean looper, Cabbage aphid, Green peach aphid, Silverleaf white fly, Greenhouse white fly, Green vegetable bug, <b>Western flower thrips</b> and Onion thrips. [max 1 application per crop; seedlings should be transplanted within 48 h of application]	L-H H-Bees	R2
Thiamethoxam + chlorantraniliprole (Durivo) PER87051	28+4A	Systemic	35 NG	A	QLD (within Wide Bay Burnett region)	Permitted for use as a single post plant chemigation in Brassica vegetables (field) 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, <b>Western Flower Thrips</b> , 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

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, <b>Thrips</b> and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH H-Bees	-
Phorate (various)	1B	Contact & systemic	70	A	ALL	Registered in Brassica vegetables for control of <b>Thrips</b> . [Apply granules on soil surface closer to plants]	H H-Bees	R3
Pyrethrins + Piperonyl butoxide (Crop Culture)	3A	Contact	1	A	ALL	Registered in vegetables for control of Aphids, <b>Thrips</b> , Caterpillars, Ants, Flies, Earwigs, Whitefly and Leafhoppers. [Max no. of applications not specified; Re-treatment interval: 7 d]	VH H-Bees	-
Rotenone (Amgrow Derris Dust)	21B	Contact	1	A	ALL	Registered in vegetables for control of <b>Thrips</b> . [Max no. of applications not specified; Re-treatment interval: 10-14 d]	-	-
Spinetoram (Succes Neo)	5	Contact & ingestion	1	A	ALL	Registered in Brassica vegetables for the control of <b>Western flower thrips</b> . [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 Brassica vegetables for control of Diamondback moth, Cabbage white butterfly, Cabbage cluster caterpillar, Cabbage centre grub, Loopers, Helicoverpa & <b>Western flower thrips</b> . [Max. 4 applications per season; re-treatment interval 7-14 d].	L L-Bees	-
NUL3445 Nufarm	TBC			P		New active in development from Nufarm with activity on <b>Thrips</b> .		-
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for <b>Thrips</b> , Bugs and Caterpillars.		



Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
<b>Silverleaf whitefly</b> ( <i>Bemisia tabaci</i> )								
<b>Priority: Low</b>								
Silverleaf whitefly (SLW) was ranked as a moderate priority in QLD & NSW and as a low priority in VIC, WA, SA & TAS. Note Insect growth regulators (IGR) formulations target immature stages only. Significant risk of insecticide resistance.								
Afidopyropen (Versys)	9D	Disrupts feeding	1	A	ALL	Registered in Brassica vegetables for control of Cabbage aphids and suppression of <b>Silverleaf whitefly</b> . [Max 4 applications per crop - only 2 consecutive; re-treatment interval 14 d]	L L-Bees	-
<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, <b>Silverleaf Whitefly</b> , Sweet Potato Whitefly, Green Peach Aphid & Two-spotted Spider Mites. [Max. 3 application per crop; re-treatment interval 3-14 d]	VL VL-Bees	-
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars, Earwigs, <b>Whitefly</b> , 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 (Confidor)	4A	Contact & systemic	NR NG	A	ALL	Registered in Brassica vegetables for control of <b>Silverleaf whitefly</b> . Use as furrow soil drench (prior to 5 d of planting) or plant hole drench (within 2 d of planting). Treated soil to be 100 mm below soil surface.	M M-Bees	R2
Pyriproxyfen (Admiral) PER84261	7C	Ingestion, residual, IGR	7	A	NSW, QLD & NT	Permitted for use in Brassica vegetables for control of <b>Silverleaf whitefly</b> . [Max 2 applications per crop; re-treatment interval 14 d]	VL	-
Pyrethrins + Piperonyl butoxide (Crop Culture)	3A	Contact	1	A	ALL	Registered in vegetables for control of Aphids, Thrips, Caterpillars, Ants, Flies, Earwigs, <b>Whitefly</b> and Leafhoppers. [Max no. of applications not specified; Re-treatment interval: 7 d]	VH H-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Spirotetramat (Movento 240 SC)	23	Contact & systemic	3	A	ALL	Registered in Brassica vegetables for control of <b>Silverleaf whitefly</b> . Use subject to CropLife resistant management strategy. [Max 3 sprays per crop; re-treatment interval 7 d]	M	-
Flonicamid (Mainman) ISK	29	Systemic		P		Registered in cucurbits for control of Aphids and <b>Silverleaf white fly</b> ; Aphids in potatoes; Aphids and Mealybugs in apples and pears; Aphids and mirids in cotton.	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. US label (Sivanto) approves use on Brassica vegetables for control of Leafhoppers, Aphids and <b>Whiteflies</b> .	L VL-Bees	-

**Brassica whitefly** (*Aleyrodes proletella*)

**Priority: Low**

Brassica whitefly was ranked as a low priority in NSW only although it is considered moderate in the Sydney basin area. It is an issue after heavy rain or drought but can be controlled by lime.

Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars, Earwigs, <b>Whitefly</b> , Thrips and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH H-Bees	-
Afidopyropen (Versys)	9D	Disrupts feeding		P-A		Registered in Brassica vegetables for control of Cabbage aphids and suppression of Silverleaf whitefly. [Max 4 applications per crop - only 2 consecutive; re-treatment interval 14 d]	L 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]	VL VL-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
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.	M L-Bees	-
<b>Root knot nematode</b> ( <i>Meloidogyne</i> spp.)								
<b>Priority: Low</b>								
Root knot nematodes were ranked as a moderate priority in VIC only. Managed with soil fumigation and lime.								
1,3-dichloropropene + Chloropicrin (Tri-Form)	8B	Soil fumigant	NR	A	ALL	Registered in vegetables for control of soil borne pests including <b>Nematodes</b> . Leave soil undisturbed for 14 d after treatment.	-	-
Dazomet (Cerlong)	8F	Soil fumigant	NR	A	ALL	Registered in various situations for control of soil fungi, <b>Nematodes</b> , soil insects and weeds. Soil moisture is essential for release of gas and plastic cover brings optimum results. See label for details.	-	-
Abamectin (Tervigo) Syngenta	6	Contact		P		Registered in Cucurbits for control of <b>Nematodes</b> . [Max. 4 applications; re-treatment interval 14 d]	M H-Bees	-
Fluopyram (Velum) Bayer	7	SDHI inhibitor		P		Pending registration (Bayer) as a nematicide. Registered in US for control of <b>Nematodes</b> 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. Rekelemel is a novel sulfonamide nematicide with a unique mode of action against plant-parasitic <b>Nematodes</b> .	L L-Bees	

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
<b>Fall Armyworm (<i>Spodoptera frugiperda</i>)</b>								
<b>New Pest to Australia (unknown priority)</b>								
Fall army worm was not ranked as a pest in Brassica vegetables. 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 for use 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 for control of <b>Fall Armyworm</b> . [Max. 3 applications per crop; 2 consecutive; re-treatment interval 7 d]	L VL-Bees	-
Chlorantraniliprole + Thiamethoxam (Durivo) PER89280	28+4A	Contact & systemic	42	A	ALL (excl. VIC)	Permitted for use in Brassica vegetables, Brassica leafy vegetables, Leafy vegetables (including lettuce, endive, silverbeet & spinach & Fruiting vegetables (excluding cucurbits) for control of <b>Fall Armyworm</b> . Do not transplant seedlings treated by seedling drench into hydroponic production systems. [max 1 application per crop]	L-H H-Bees	R2
Emamectin (Proclaim Opti) PER89263	6	Contact & systemic	3 NG	A	ALL (excl. VIC)	Permitted for use 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) for control of <b>Fall Armyworm</b> . [Max 4 applications per crop; re-treatment interval: 7 d]	M H-Bees	-
Indoxacarb (Avatar evo) PER89278	22A	Contact	7	A	ALL (excl. VIC)	Permitted for use in Broccoli, Brussels sprouts, Cabbage (closed head varieties only), Cauliflower, Celery, Capsicum, Eggplant, Peppers Tomato (field or trellis), Leafy vegetables and Chinese leafy vegetables for control of <b>Fall Armyworm</b> . [Max 4 applications per crop; re-treatment interval: 7 d]	L H-Bees	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Methomyl (Lannate) PER89293	1A	Contact and systemic	14	A	ALL	Permitted for use in Spinach, Fennel, Brassica leafy vegetables, Fruiting vegetables, Root & tuber vegetables, Lettuce, Celery, Bulb onions, Fennel bulb, Leeks & turf for control of <b>Fall Armyworm</b> . Field grown only. [Max. 3 application per crop; re-treatment interval not specified]	H H-Bees	R2
Spinetoram (Success Neo) PER89241	5	Contact & ingestion	3	A	ALL (excl. VIC)	Permitted for use 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 for control of <b>Fall Armyworm</b> . [Max. 4 applications per crop; re-treatment interval 7-14 d]	M H-Bees	-
Spinosad (Entrust Organic) PER89870	5	Contact & ingestion	3 G:14	A	ALL (excl. VIC)	Permitted for use in Brassica vegetables, Brassica leafy vegetables, 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. (Protected cropping) for control of <b>Fall Armyworm</b> . [Max. 4 applications per season; re-treatment interval 7-14 d]	L L-Bees	-
<b>Vegetable leaf miner (<i>Liriomyza sativae</i>)</b>								
<b>Priority: Unknown</b>								
Vegetable leaf miner was not ranked as a pest in Brassica vegetables. 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	6A	Contact	7 NG	A	ALL (excl. VIC)	Permitted for use in Cabbage (head) for suppression of <b>Vegetable leaf miner (<i>Liriomyza</i> spp.)</b> . [Max. 2 sequential 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
Cyromazine (Diptex) PER81867	17	Contact	7 NG	A	QLD	Permitted for use in broccoli (field & protected) for control of <b>Vegetable leaf miner</b> ( <i>Liriomyza</i> spp.). [Max. 6 sequential applications per crop; re-treatment interval: 7 d]	L L-Bees	-
Emamectin (Proclaim Opti) PER87563	6	Contact & systemic	7 NG	A	ALL (excl. VIC)	Permitted for use in Brassica vegetables for control of <b>Vegetable leaf miner</b> ( <i>Liriomyza</i> spp.). [Max. 4 applications per crop; re-treatment interval: 7 d]	M H-Bees	-
Rotenone (Derris Dust)	21B	Contact	1	A	ALL	Registered in vegetables for control of Aphids, Cabbage white butterfly, Cabbage moth, Cabbage-centre grub, Caterpillars, Potato moth ( <b>Leaf miner</b> ) and Thrips. [Max no. of applications not specified; Re-treatment interval: 10-14 d]	-	-
Spinosad (Entrust Organic) Corteva	5	Contact & ingestion		P		Registered in Brassica leafy vegetables for control of Diamondback moth, Cabbage white butterfly, Cabbage cluster caterpillar, Cabbage centre grub, Loopers, 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, <b>Leaf miners</b> , Loopers, Mites & Thrips in various vegetables.	L L-Bees	-
Spirotetramat (Movento 240 SC) Bayer	23	Contact and systemic		P		Permitted for use in Snow Peas, Sugar Snap Peas, Lettuce (Head lettuce and Leafy lettuce), Parsley, Green Beans, Celery, Rhubarb, Eggplant, Capsicums, Chilies & Tomatoes (PER88640) for control of <b>Vegetable leaf miner</b> .	M VL-Bees	-

## **4.3 Weeds in Brassica vegetables**

### **4.3.1 Weed priorities**

<b>Common name</b>	<b>Scientific name</b>
<b>High</b>	
Brassica weeds - Wild Radish & Wild Turnips	<i>Raphanus raphanistrum L.</i>
Chickweed	<i>Stellaria media</i>
Fat hen	<i>Chenopodium album</i>
Stinging nettles	<i>Urtica spp.</i>

Non ranked grass weeds which can be a problem in Brassica vegetables.

<b>Common name</b>	<b>Scientific name</b>
Grass & Broadleaf weeds	Various species

Weed control is an essential component of IPM for a range of pest and diseases issues. In considering pests and diseases thought must be given to host plants for the disease and their vectors (insects that transmit virus) as well as host plants for problem pests.

Weeds identified in Brassica vegetables can be controlled with currently available herbicides. Whilst there are options available for general weed knockdown during ground preparation and pre-emergent control prior to transplanting, post-emergent options in general and options available for direct seeded Brassica crops are extremely rare.

The three high priority weeds identified are Wild radish, Chickweed, Fat hen & Stinging nettles. Although grass weeds have not been identified in the survey, there are several options available for their control as outlined in Section 4.3.2 below.

### **Resistance management**

Growing weed resistance is a problem. For example, wild radish populations have developed resistance to herbicides in the mode-of-action (MOA) Groups B, C, F and I. Group B resistance is the most common, followed by Group F.

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		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) – days from last treatment		Resistance risk	
Harvest	H	**	Moderate resistance risk
Not Required when used as directed	NR	***	High resistance risk

Active ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
<b>Brassica weeds - Wild radish &amp; Wild turnips (<i>Raphanus raphanistrum</i> L.)</b>							
<b>Priority: High</b>							
Brassica weeds were ranked as high priority in all the regions consulted, VIC, QLD, NSW, WA, SA & TAS. It is an issue in all stages of crop development including pre-planting, post-planting and in crop. While there are options available for general weed knockdown during ground preparation and pre-emergent control prior to transplanting, post-emergent options are not available specifically for Brassicas.							
Glyphosate (various)	M**	General knockdown	Registered for control of general weeds as a pre-crop spray.	NR	A	ALL	R3
Oxyfluorfen (Crossbar)	G**	Broccoli, cabbage & cauliflower / Pre-emergent/	Registered in broccoli, cabbage & cauliflower for pre-emergent control of several broadleaf and grass weeds including <b>Wild radish</b> . Apply 4-7 days prior to transplanting. Irrigation or rainfall is essential for activation of this herbicide	NR	A	ALL	-
Pendimethalin (Yastar)	D**	Broccoli, cabbage & cauliflower / Pre-emergent/	Registered in broccoli, cabbage & cauliflower for pre-emergent suppression of several broadleaf and grass weeds including <b>Wild radish &amp; turnip</b> . Apply 2-7 d before transplanting. Irrigation or rainfall is essential for activation of this herbicide. Do not apply after transplanting.	NR	A	ALL	-



Active ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Pendimethalin (Stomp) PER14432	D**	Brussels sprouts / Pre-emergent	Permitted for use in Brussels sprouts for control of broadleaf and grass weeds as listed on product label which includes <b>Wild radish &amp; Turnip</b> . Do not apply after transplanting. [Max. 1 application per crop]	NR	A	ALL (excl. VIC)	-
Pyraflufen-ethyl (Sledge)	G**	General pre-plant fallowing agent/post-emergent	Registered for control of number of broadleaf and grass weeds, including <b>Wild radish</b> . Apply prior to sowing winter crops or starting a winter fallow. Apply to growing weeds at 2-6 leaf stage. Do not sow crops for a minimum of 1 hour after application.	NR	A	ALL	-
Flumetsulam (Smart) Crop Smart	B***	Chickpeas, lentils, peanuts / Post-emergent	Registered in chickpeas for control of several broadleaf weeds including Marshmallow, Shepherds purse and <b>Wild turnip</b> . [Max. no. of applications and re-treatment interval not specified].		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 including Blackberry nightshade, Chickweed, Fat hen Milk thistle, Pigweed, Shepherds purse, <b>Wild radish</b> , Ryegrass and Winter grass. [Max. 2 applications per year; re-treatment interval not specified].		P		-
<p><b>Chickweed (<i>Stellaria media</i>)</b>  <b>Priority: High</b></p> <p>Chickweed was ranked a high priority in VIC &amp; SA, as a moderate priority in TAS and a low priority in QLD, NSW &amp; WA. There are several products available for the control of Chickweed in Brassica vegetables as pre-emergent, but post-emergent options are not available.</p>							
Chlorthal-dimethyl (Lawthal)	D**	Cabbage, broccoli, Brussels sprouts / Pre-plant	Registered in cabbage, broccoli & Brussels sprouts for control of several broadleaf and grass weeds including <b>Chickweed</b> . Spray at time of seeding or transplanting.	NR	A	ALL (excl. NSW)	R3

Active ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
S-Metolachlor (Dual Gold)	K**	Brassicas / Selective pre-emergent	Registered in Brassica vegetables for the <b>suppression of Chickweed</b> . Apply immediately after transplanting. Irrigation to wet 3-4 cm of soil should be applied within 24 h. Crop retardation may occur on soils with low organic matter levels. [max 1 application per year]	NR	A	ALL (excl. SA)	-
Napropamide (Devrinol) PER87773	K**	Brassica vegetables / Pre-emergent	Permitted for use in Brassica vegetables (transplants only) for control of grass and broadleaf weeds including <b>Chickweed</b> (suppression).	NR		ALL (excl. VIC)	-
Paraquat + diquat (various)	L***	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	A	ALL	R3
Pendimethalin (Stomp)	D**	Broccoli, cabbage & cauliflower / Pre-emergent	Registered in broccoli, cabbage & cauliflower for pre-emergent control of several broadleaf and grass weeds including <b>Chickweed</b> . Apply 2-7 d before transplanting. Irrigation or rainfall is essential for activation of this herbicide. Do not apply after transplanting.	NR	A	ALL	-
Pendimethalin (Stomp) PER14432	D**	Brussels sprouts / Pre-emergent /	Permitted for use in Brussels sprouts for control of broadleaf and grass weeds as listed on product label.	NR	A	ALL (excl. VIC)	-
Propachlor (Ramrod)	K**	Brassicas / Selective pre-emergent	Registered in Brassica vegetables for control of several broadleaf and grass weeds including <b>Chickweed</b> . Spray at time of seeding or transplanting.	NR	A	ALL	R3
Oxyfluorfen (Crossbar)	G**	Broccoli, cabbage & cauliflower / Pre-emergent	Registered in broccoli, cabbage & cauliflower for pre-emergent control of several broadleaf and grass weeds including <b>Chickweed</b> . Apply 4-7 days prior to transplanting. Irrigation or rainfall is essential for activation of this herbicide	NR	A	ALL	-

Active ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Metribuzin (Bang) Hemani	C**	Post sowing/pre-emergent / Faba beans	Registered in faba beans, chickpeas & lentils for control of grass and broadleaf weeds including Annual ryegrass, Cape weed, <b>Chickweed</b> , Fat hen, Fumitory, Stinging nettle, Shepherds purse, and Wireweed. Apply post sowing pre-emergence. [Max. 2 applications per year; re-treatment interval not specified].		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 including Annual ryegrass, Cape weed, <b>Chickweed</b> , Fat hen, Milk thistle, Pigweed and Wireweed. [Max. 2 applications per year; re-treatment interval not specified].		P		-
<b>Fat hen</b> ( <i>Chenopodium album</i> )							
<b>Priority: High</b>							
Fat hen was ranked as a high priority in QLD and as a moderate priority in VIC, NSW, WA, SA & TAS. There are no post-emergent products available for controlling them.							
S-Metolachlor (Dual Gold)	K**	Selective pre-emergent/Brassicas	Registered in Brassica vegetables for the control of several broadleaf weeds including <b>Fat hen</b> . Apply immediately after transplanting. Irrigation to wet 3-4 cm of soil should be applied within 24 h. Crop retardation may occur on soils with low organic matter levels. [max 1 application per year]	NR	A	QLD, NSW, VIC, TAS & NT	-
Propachlor (Ramrod)	K**	Brassicas / Selective pre-emergent	Registered in Brassica vegetables for control of several broadleaf and grass weeds including <b>Fat hen</b> . Spray at time of seeding or transplanting.	NR	A	ALL	R3
Oxyfluorfen (Crossbar)	G**	Broccoli, cabbage & cauliflower / Pre-emergent	Registered in broccoli, cabbage & cauliflower for pre-emergent control of several broadleaf and grass weeds including <b>Fat hen</b> . Apply 4-7 days prior to transplanting. Irrigation or rainfall is essential for activation of this herbicide.	NR	A	ALL	-

Active ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Pendimethalin (Stomp)	D**	Broccoli, cabbage & cauliflower / Pre-emergent	Registered in broccoli, cabbage & cauliflower for pre-emergent control of several broadleaf and grass weeds including <b>Fat hen</b> . Apply 2-7 d before transplanting. Irrigation or rainfall is essential for activation of this herbicide. Do not apply after transplanting.	NR	A	ALL	-
Clomazone (Conquest) Conquest Crop Protection	Q**	Green beans / Pre-emergent residual	Registered in beans for control of several broadleaf weeds including <b>Fat hen</b> . [Max 3 applications per crop; re-treatment interval not specified].		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 including Blackberry nightshade, Chickweed, <b>Fat hen</b> , Milk thistle, Pigweed, Shepherds purse, Wild radish, Ryegrass and Winter grass. [Max. 2 applications per year; re-treatment interval not specified].		P		-
<b>Stinging nettles (<i>Urtica spp.</i>)</b>							
<b>Priority: High</b>							
Stinging nettle was ranked as a high priority in VIC only. There are some pre- and post-emergent options available for its control. General weed knockdown options during ground preparation are also available.							
Chlorthal-dimethyl (Lawthal)	D**	Cabbage, broccoli, Brussels sprouts / Pre-plant	Registered in cabbage, broccoli & Brussels sprouts for control of several broadleaf and grass weeds including <b>Stinging nettle</b> . Spray at time of seeding or transplanting.	NR	A	ALL (excl. NSW)	-
S-Metolachlor (Dual Gold)	K**	Brassicas / Selective pre-emergent	Registered in Brassica vegetables for the control several broadleaf weeds including <b>Stinging nettle</b> . Apply immediately after transplanting. Irrigation to wet 3-4 cm of soil should be applied within 24 h. Crop retardation may occur on soils with low organic matter levels. [max 1 application per year]	NR	A	QLD, NSW, VIC, TAS & NT	-

Active ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Oxyfluorfen (Crossbar)	G**	Broccoli, cabbage & cauliflower / Post-emergent	Registered in broccoli, cabbage & cauliflower for post-emergent control of several broadleaf and grass weeds including <b>Stinging nettle</b> . Apply 4-7 days prior to transplanting. Irrigation or rainfall is essential for activation of this herbicide.	NR	A	ALL	-
Pendimethalin (Stomp)	D**	Broccoli, cabbage & cauliflower / Pre-emergent/	Registered in broccoli, cabbage & cauliflower for pre-emergent suppression of several broadleaf and grass weeds including <b>Annual nettles (Utrica spp.)</b> . Apply 2-7 d before transplanting. Irrigation or rainfall is essential for activation of this herbicide. Do not apply after transplanting.	NR	A	ALL	-
Pendimethalin (Stomp) PER14432	D**	Brussels sprouts / Pre-emergent	Permitted for use in Brussels sprouts for control of broadleaf and grass weeds including <b>Annual nettles (Utrica spp.)</b> , Amaranthus, Potato weed, Turnip weed, Wild radish & Winter grass as listed on product label.	NR	A	ALL (excl. VIC)	-
Propachlor (Ramrod)	K**	Brassicas / Selective pre-emergent	Registered in Brassica vegetables for control of several broadleaf and grass weeds including <b>Stinging nettle</b> . Spray at time of seeding or transplanting.	NR	A	ALL	R3
Imazethapyr (Agro-Essence) Agro-Alliance	B**	Faba beans & Field peas / Pre- & Post-emergent	Registered in faba beans & Field peas for control of grass and broadleaf weeds including Annual ryegrass, Cape weed, <b>Stinging nettle</b> , Wild radish & Wireweed. Apply post sowing pre-emergence. [Max. no. of applications per crop & re-treatment interval not specified].		P		-
Metribuzin (Bang) Hemani	C**	Faba beans / Post sowing/pre-emergent	Registered in faba beans, chickpeas & lentils for control of grass and broadleaf weeds including Annual ryegrass, Cape weed, Chickweed, Fat hen, Fumitory, <b>Stinging nettle</b> , Shepherds purse, and Wireweed. Apply post sowing pre-emergence. [Max. 2 applications per year; re-treatment interval not specified].		P		-

Active ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
<b>Grass &amp; Broadleaf weeds</b>							
<b>Priority: Unknown</b>							
Grass weeds were not ranked in the recent survey, but industry sources indicate that they may be an issue in some situations.							
Clethodim (Arysta) PER82459	A***	Broccoli, Brussels sprout and Cauliflower / Post-emergent	Permitted for use in Broccoli, Brussels sprout & Cauliflower for control various <b>grass weeds</b> as per product label. [Max. 1 application per crop].	28	A	ALL	R3
Clopyralid (various) PER13147	D**	Cauliflower / Early post-emergent	Permitted for use in Cauliflower for control of <b>Cape weed</b> and clover. [Max. no. of applications and re-treatment interval not specified]	56	A	WA	-
Fluazifop-P (Surefire)	A***	Brassicas / Post-emergent / Selective herbicide	Registered in Brassica vegetables for control of various <b>grass weeds</b> .		A	ALL	-
Napropamide (Devrinol) PER87773	K**	Brassica vegetables / Pre-emergent	Permitted for use in Brassica vegetables (transplants only) for control of <b>grass and broadleaf weeds</b> including Chickweed (suppression).	NR		ALL (excl. VIC)	-
Pendimethalin (Stomp) PER14432	D**	Brussels sprouts / Pre-emergent	Permitted for use in Brussels sprouts for control of broadleaf and <b>grass weeds</b> including Annual nettles, Amaranthus, Potato weed, Turnip weed, Wild radish & Winter grass as listed on product label.	NR	A	ALL (excl. VIC)	-
Quizalofop-P-ethyl (Opal)	A***	Cauliflower & Cabbage / Selective post-emergent	Registered in cabbage and cauliflower for control of selected <b>grass weeds</b> . Apply when most weeds are actively growing. [Max. no. of applications and re-treatment interval not specified].	14 Cauliflower 63 Cabbage	A	ALL	R3
Sethoxydim (Sertin)	A***	Brassica crops / Directly sown or transplanted / Post-emergent	Registered in Brassica crops for control of various <b>grass weeds</b> . Apply when most weeds are actively growing. [Max. no. of applications and re-treatment interval not specified].	42	A	ALL	-

Active ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Trifluralin (Barmac)	D**	Broccoli, cabbage, cauliflowers / Transplants only	Registered in Broccoli, cabbage, cauliflowers (transplants only) for control of various <b>grass</b> and broadleaf <b>weeds</b> . Spray between 4 weeks and just before sowing.	NR	A	ALL	-
Metolachlor+ Prosulfocarb (Boxer Gold) Syngenta	J***+ K**	Potatoes / Pre-emergent weed control	Registered in potatoes for control of <b>Ryegrass</b> . Apply after planting, but no later than 25% potato shoot emergence. Hort Innovation data generation project ST17000 underway for a label registration in Brassica Leafy Vegetables.		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 <b>grass</b> and broadleaf <b>weeds</b> including Blackberry nightshade, Chickweed, Fat hen, Milk thistle, Pigweed, Shepherds purse, Wild radish & Winter grass. [Max. 2 applications per year; re-treatment interval not specified].		P		
Pendimethalin + Dimethenamid (Podium) BASF	D**+ K**	Ornamental plants & recreational turf / Pre-emergent	Registered in ornamentals & recreational turf for control of <b>grass</b> and broadleaf <b>weeds</b> [Max. no. of applications not specified; re-treatment interval 60 – 90 d]		P		
Phenmedipham (Betanal) Bayer	C**	Silverbeet, beetroot / Post-emergent	Registered in silverbeet for control of a range of weeds, including, Fat hen, Chickweed, Potato weed, Common thorn apple, Groundsel, Milk thistle, Shepherd's purse, Blackberry nightshade, and <b>Winter grass</b> . Apply when weeds are at 2-leaf stage. [Max no of applications and re-treatment interval not specified].		P		R3

## 5. References

### 5.1 Information:

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

### 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 confirmed
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 Brassica vegetables

Appendix 2. Products available for control of insects and mites in Brassica vegetables

Appendix 3. Products available for weed control in Brassica vegetables

Appendix 4. Current permits for use in Brassica vegetables

Appendix 5. Brassica Vegetables Maximum Residue Limits (MRLs)

Appendix 6. Brassica Vegetables Regulatory Risk Assessment

## Appendix 1. Products available for disease control in Brassica vegetables

Active Ingredient (Trade Name)	Chem. group	Crop/Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Amisulbrom + Copper (Amicus Blue)	21+M1	Brassica vegetables / Protective	Downy mildew and White blister	ALL	NR	-
Azoxystrobin (Amistar)	11	Brassica vegetables / Protective and curative	White blister and Sclerotinia rot	ALL	7	-
Azoxystrobin + Oxythiapiprolin (Orondis)	11+49	Brassica vegetables / Protective and curative	Downy mildew and suppression of Alternaria, White blister and Sclerotinia.	ALL	3 NG	-
Boscalid (Filan)	7	Brassica vegetables / Protective	Sclerotinia rot ( <i>Sclerotinia minor</i> , <i>S. sclerotiorum</i> )	ALL	7	-
Chlorothalonil (Trio)	M5	Brassica vegetables / Protectant	Ring spot	ALL	7	R3
Chloropicrin (Tripicrin)	8	General pre-plant soil fumigation	Nematodes, insects, <i>Pythium</i> , <i>Phytophthora</i> , <i>Fusarium</i> , and <i>Verticillium</i>	ALL	NR	-
Copper- oxychloride +hydroxide (Relyon Airone)	M1	Brassica vegetables / Protective	Downy mildew, Black rot, Peppery leaf spot, and Ring spot.	ALL	1	-
Copper + Mancozeb (Mankocide)	M1+M3	Brassica vegetables / Protective	Black rot, Downy mildew, Alternaria spot, Anthracnose & Ring spot. May make cabbages more prone to frost damage	ALL	7	R2
Cyazofamid (Ranman)	21	Broccoli / Protective	Late blight and White blister	ALL	NR	-
Fluazinam (Surefire)	29	Brassica vegetables / Fumigant	Club root. For use in soils where severe Club root has occurred previously	ALL	NR	-
Hydrogen peroxide + peroxyacetic acid (Peratec Plus)	M	Broccoli, cauliflower, cabbage & Brussels sprout / Non- selective surface sterilant	Downy mildew and White blister	ALL	1	-
Iprodione (Rovral) PER80910	2	Brussels Sprouts / Protective	Grey mould	ALL (excl. VIC)	7	R3

Active Ingredient (Trade Name)	Chem. group	Crop/Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Iprodione (Rovral) PER14051	2	Broccoli / seed treatment	Rhizoctonia rot	ALL	NR	R3
Mancozeb (Smart)	M3	Brassica vegetables / Protective	Downy mildew, black rot, Alternaria spot, Anthracnose ring spot	ALL	7	R2
Mancozeb + Sulphur (various)	M3+M2	Seedlings (general)	Downy mildew	ALL	7	R2
Metalaxyl (Barmac)	4	Brassica vegetables / Soil treatment	Damping off	NSW, QLD & WA	7	-
Metalaxyl + copper as hydroxide (Ridomil Gold Plus)	4+M3	Brassica vegetables / Systemic, protective & curative	Downy mildew and White blister	ALL	14	-
Metalaxyl-M + Mancozeb (Ridomil Gold MZ) PER14045	4+M3	Brassica vegetables / Systemic, protective & curative	Downy mildew and White blister/ for application at higher than label rates	ALL (excl. VIC)	7	R2
Metalaxyl-M + Fludioxonil (Maxim XL) PER14352	D+L	Broccoli / Seed treatment	Damping-off and Rhizoctonia	ALL	NR	R3
Metham sodium (Imtrade)	-	General pre-plant soil fumigation	Nematodes, fungi, and weed seeds.	ALL	NR	-
Metiram (Polyram)	M3	Cabbages, cauliflowers, Brussels sprouts & broccoli / Protectant	Downy mildew and ring spot	ALL	7	R2
Oxathiapiprolin (Zorvec)	U15	Brassica vegetables / Protective	Downy mildew	ALL	NR	-
Penconazole (Vulture)	3	Brussels sprouts only / Protective	Ring spot	ALL	7	R3
Penthiopyrad (Fontelis)	7	Brassica vegetables / Protective	White mould (Sclerotinia stem rot) ( <i>Sclerotinia</i> spp.)	ALL	NR	-
Phosphorous acid (various) PER11951	33	Broccoli, cauliflower and Brussels sprout / Protective & systemic	Downy mildew	ALL (excl. VIC)	NR	-

Active Ingredient (Trade Name)	Chem. group	Crop/Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Propamocarb + Fluopicolide (Infinito)	28+43	Brassica vegetables / Protective, curative & systemic	Downy mildew and White blister	ALL	NR NG	-
Quintozene (Terraclor)	14	Cabbage, cauliflower & broccoli seed beds	Club root, Wirestem & Black rot			
Sulphur (Solo)	UN	Vegetables	Powdery mildew, rust, tomato russet mite, Bean spider mite, and Two-spotted mite	Variable refer to label	NR	-
Thiram (Kendon Thiram WP)	M3	Cabbage / Soil treatment	Damping off	QLD	7	-
Triadimenol (Axidime)	3	Brassica vegetables / Protective	Ring spot	ALL	7	R3
Zineb (Barmac)	M3	Cauliflower & cabbages	Cercospora leaf spot	ALL	7	R2

## **Appendix 2. Products available for control of insects and mites in Brassica vegetables**

<b>Active Ingredient (Trade Name)</b>	<b>Chem. group</b>	<b>Crop/Situation</b>	<b>Pests / Comments</b>	<b>States</b>	<b>WHP</b>	<b>Regulatory risk</b>
Acephate (Titan)	1B	Brassica vegetables	Cabbage aphid Cabbage moth, Helicoverpa and Cabbage butterfly.	QLD, WA & NT	3 (broccoli 14)	R3
Afidopyropen (Versys)	9D	Brassica vegetables	Aphids	ALL	1	-
Alpha-cypermethrin (Hemani)	3A	Brassica vegetables	Cabbage moth, Cabbage white butterfly, <i>Helicoverpa (punctigera and armigera)</i> and Cluster caterpillar	ALL	1	-
Alpha-cypermethrin (various) PER14037	3A	Cauliflower	Staphylinid beetle	WA	1	-
Amorphous silica (Abrade)	-	Brassica vegetables	Diamondback moth, Heliothis	ALL	NR	-
<i>Bacillus thuringiensis subsp. kurstaki</i> (Dipel)	11A	Vegetables	Armyworm, cotton bollworm, native budworm, Cabbage moth, Cabbage white butterfly, Green looper, lightbrown apple moth, pear looper, soybean looper, vine moth, and tobacco looper. Highly effective on small grubs, but needs regular application based on pest pressure.	ALL	NR	-
<i>Beauveria bassiana</i> (Broadband OD / Velifer)	UNF	Protected vegetables & 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	-
Beta-Cypermethrin (Banshee)	3A	Brassica vegetables	Diamondback moth, <i>Helicoverpa (punctigera and armigera)</i>	ALL	1	-
Bifenthrin (Talstar) PER82039	3A	Cabbage, Cauliflower	Symphyla	NSW	NR	R3

Active Ingredient (Trade Name)	Chem. group	Crop/Situation	Pests / Comments	States	WHP	Regulatory risk
Bioallethrin + Bioresmethrin (Amgrow Bug Kill)	3A	Brassica vegetables	Cabbage aphid, Cabbage moth	ALL	1	-
Chlorantraniliprole (Coragen)	28	Brassica vegetables	Cabbage centre grub, Diamondback moth & other Lepidoptera.	ALL	7	-
Chlorantraniliprole (Coragen) PER89259	28	Brassica vegetables	Fall armyworm ( <i>Spodoptera frugiperda</i> )	ALL (excl. VIC)	1	-
Chlorantraniliprole + Thiamethoxam (Durivo) PER89280	4A+28	Brassica vegetables	Fall armyworm ( <i>Spodoptera frugiperda</i> )	ALL (excl. VIC)	42	R2
Chlorfenapyr (Phantom)	13	Brassica vegetables	Diamondback moth & Cabbage white butterfly	ALL	7	-
Chlorpyrifos (Sinon)	1B	Brassica vegetables	Cabbage aphid, Cabbage moth, Cabbage white butterfly & Cluster caterpillar	ALL (excl. QLD)	5	R1
Chlorpyrifos (Lorsban) PER14596	1B	Brassica vegetables	Vegetable beetle adults	WA	5	R1
<i>Clitorea ternatia</i> extract (Sero-X)	UN	Brassica vegetables	Diamondback moth	ALL	NR	-
Cyromazine (Diptex) PER81867	17	Broccoli (field & protected)	Leaf miner ( <i>Liriomyza sativa</i> )	QLD	7 NG	-
Dazomet (Cerlong)	8F	Soil preparation for vegetables	Soil fungi, nematodes, soil insects & weeds	ALL	NR	-
Deltamethrin (Halley)	3A	Brassica vegetables	Cabbage white butterfly, Cabbage moth & Cabbage centre grub	Variable. Refer to label.	7	-
Diazinon (Accensi)	1B	Brassica vegetables	Cabbage aphid, Cabbage white butterfly, centre grub, Cluster caterpillar, Green Peach Aphid	QLD & WA	14	R3
Diazinon (Barmac) PER82551	1B	Cauliflower	Onion maggot	ALL (excl. VIC)	14	R3

Active Ingredient (Trade Name)	Chem. group	Crop/Situation	Pests / Comments	States	WHP	Regulatory risk
Emamectin (Proclaim Opti)	6	Brassica vegetables	Diamondback moth & Cabbage white butterfly	ALL	3	-
Emamectin (Proclaim Opti) PER89263	6	Brassica vegetables	Fall armyworm ( <i>Spodoptera frugiperda</i> )	ALL (excl. VIC)	3 NG	-
Emamectin (Proclaim Opti) PER87563	6	Brassica vegetables	Leafminers ( <i>Lyriomyza</i> spp.)	ALL (excl. VIC)	7 NG	-
Esfenvalerate (Sumi-Alpha Flex)	3A	Brassica vegetables	Cabbage moth (Diamondback moth), Cabbage white butterfly & Cabbage centre grub,	Variable. Refer to label.	1	-
Fenitrothion (Sumitomo)	1B	Cabbages	Spur-throated locust & migratory locust	NSW, VIC, SA & WA	14	-
Fipronil (Emporium)	2B	Brassica vegetables	Diamondback moth, Cabbage white butterfly & Cabbage cluster caterpillar	ALL	7	R3
Flubendiamide (Belt)	28	Brassica vegetables	Diamondback moth, Cabbage white butterfly, Cluster caterpillar & <i>Helicoverpa</i> spp.	ALL	1	-
Gamma-Cyhalothrin (Trojan)	3A	Brassica vegetables	Diamondback moth, Cabbage white butterfly & Cluster caterpillar	ALL	2	-
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	3A	Vegetables	Ants, Aphids, Caterpillars, Earwigs, Whitefly, Thrips & Leafhoppers. Suitable for organic growers.	ALL	1	-
Helicoverpa NPV (Helicovex)		Brassica vegetables	<i>Helicoverpa</i> spp.	ALL	-	-
Imidacloprid (Sindor)	4A	Brassica vegetables	Grey cabbage aphid & Turnip aphid	ALL	7	R2
Indoxocarb (Avatar eVo)	22A	Brassica vegetables	Cabbage white butterfly, cotton bollworm, native budworm, Cluster caterpillar, Cabbage centre grub & Diamondback moth	ALL	7	R3
Indoxocarb (Avatar eVo) PER89278	22A	Brassica vegetables	Fall armyworm ( <i>Spodoptera frugiperda</i> )	ALL (excl. VIC)	7	R3

Active Ingredient (Trade Name)	Chem. group	Crop/Situation	Pests / Comments	States	WHP	Regulatory risk
Iron EDTA Complex (Eradicate Snail)	-	Plants generally	Slugs & Snails	ALL	NR	-
Lambda-cyhalothrin (Farmalinx Fizzle)	3A	Broccoli, brussels sprouts, cabbages & cauliflowers	Cabbage cluster caterpillar, Cabbage white butterfly & Diamondback moth.	ALL	2	-
Maldison (Fyfanon, Hy-Mal)	1B	Cabbage and cauliflower	Aphid, Green vegetable bug, Jassids, Leaf hopper, red legged earth mite, Rutherglen bug & Twenty-eight spotted ladybirds	ALL	3	-
Metaldehyde (Sabakem)	-	Vegetables / Baits	Slugs & Snails	ALL	7	-
Metaldehyde + Fipronil (Transcend)	2B	Brassica spp.	Slugs & Snails	ALL	7	R3
Methiocarb (Mesuro)	1A	Brassica vegetables / Baits	Slugs & Snails	ALL	7	-
Methomyl (various)	1A	Brassica vegetables	Cabbage-centre grub	ALL	1	R2
Methomyl (various) PER89293	1A	Brassica vegetables	Fall armyworm ( <i>Spodoptera frugiperda</i> )	ALL	14	R2
Nucleopolyhedrovirus of <i>Helicoverpa armigera</i> (Armigen)	31	Brassica vegetables	Larvae of <i>Helicoverpa armigera</i> & <i>Helicoverpa punctigera</i>	ALL	NR	-
Petroleum oil PER12221	UN	Brassica vegetables	Aphids, Green mirid, Green vegetable bug, Grey cluster bug, Leafhoppers, Mites, Rutherglen bug & Thrips	ALL (excl. VIC)	1	-
Permethrin (Permerid)	3A	Brassica vegetables	Cabbage moth, Cabbage white butterfly, Cabbage cluster caterpillar, Cabbage aphid & Green peach aphid	Variable. Refer to label.	2	-
Phorate (Umet)	1B	Brassica vegetables	Aphids, Thrips, Jassids & Two spotted mites	ALL	70	R3
Pirimicarb (Aphidex)	1A	Brassica vegetables	Cabbage aphid & Green peach aphid. Ineffective against Green Peach Aphid.	ALL	2	R3



Active Ingredient (Trade Name)	Chem. group	Crop/Situation	Pests / Comments	States	WHP	Regulatory risk
Potassium salts of fatty acids (Natrasoap)	3A	Vegetables	Aphids, Thrips, Mealybug, Two spotted mites, Spider mite & Whitefly	ALL	NR	-
Prothiofos (Tukuthion)	1B	Brassica vegetables	Cabbage centre grub, Cabbage moth, Cabbage white butterfly, Cluster caterpillar & <i>Helicoverpa</i> spp.	ALL	7	R3
Propargite (Betamite)	12C	Vegetables	Spider mite (QLD and WA only) & Two-spotted mite	ALL	7	R3
Pymetrozine (Eurochem Metro)	9B	Brassica vegetables	Cabbage aphid & Green peach aphid	ALL	14	R3
Pyrethrins (Pyganic)	3A	Brassica vegetables	Diamondback moth	ALL	NR	-
Pyrethrins + Piperonyl butoxide (Crop Culture)	3A	Vegetables	Aphids, Thrips, Caterpillars, Ants, Flies, Earwigs, Whitefly & Leafhoppers	ALL	1	-
Pyriproxyfen (Admiral) PER84261	7C	Brassica vegetables	Control of Silverleaf whitefly	NSW, QLD & NT	7	-
Rotenone (Derris Dust)	21B	Vegetables	Aphids, Cabbage white butterfly, Cabbage moth, Cabbage-centre grub, Caterpillars, Potato moth (Leafminer) & Thrips	ALL	1	-
Spinetoram (Success Neo)	5	Brassica vegetables	Diamondback moth, Cabbage white butterfly, Cabbage cluster caterpillar, Cabbage centre grub, Loopers, Helicoverpa & Western flower thrips.	ALL	1	-
Spinetoram (Success Neo) PER89241	5	Brassica vegetables	Fall armyworm ( <i>Spodoptera frugiperda</i> )	ALL (excl. VIC)	1	

Active Ingredient (Trade Name)	Chem. group	Crop/Situation	Pests / Comments	States	WHP	Regulatory risk
Spinosad (Entrust Organic)	5	Brassica vegetables	Diamondback moth, Cabbage white butterfly, Cabbage cluster caterpillar, Cabbage centre grub, Loopers, Helicoverpa & Western flower thrips	ALL	3 G:14	-
Spinosad (Entrust Organic) PER89870	5	Brassica vegetables (Protected)	Fall armyworm ( <i>Spodoptera frugiperda</i> )	ALL (excl. VIC)	3 G:14	-
Spirotetramat (Movento 240 SC)	23	Brassica vegetables	Grey cabbage aphid & Green peach aphid	ALL	3	-
Sulfoxaflor (Transform)	4C	Brassica vegetables	Cabbage aphid, Green peach aphid, Turnip aphid & Greenhouse whitefly	ALL	3	-
Sulphur (Reylon Zulfa)	M2	Vegetables	Powdery mildew, bean rust, tomato russet mite & Two spotted mites	Variable. Refer to label.	NR	-
Tau-Fluvalinate (Mavrick)	3A	Brassica crops	Caterpillars, Cabbage moth & Cabbage white butterfly	ALL	2	-
Thiamethoxam + Chlorantraniliprole (Durivo)	28+4A	Brassica and other vegetables	Diamondback moth, Cabbage white butterfly, Helicoverpa, Cabbage centre grub, Cabbage cluster caterpillar, Cluster caterpillar, soya bean looper, Cabbage aphid, Green peach aphid, Silverleaf white fly, Greenhouse white fly, Green vegetable bug, Western flower thrips & Onion thrips.	ALL	42	R2

Active Ingredient (Trade Name)	Chem. group	Crop/Situation	Pests / Comments	States	WHP	Regulatory risk
Thiamethoxam + Chlorantraniliprole (Durivo) PER87051	28+4A	Brassica vegetables (field)	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 & Psyllids	QLD	35 NG	R2
Thiodicarb (Confront)	1A	Brassica crops	Cabbage cluster caterpillar & Cabbage white butterfly	ALL	7 (H) 21 (G)	-
Trichlorfon (Various)	1B	Brassica vegetables	Cutworm	QLD, NT	2	R2
Trichlorfon (Tyranex)	1B	Vegetables	Cabbage white butterfly, Cabbage moth, Green vegetable bug & Rutherglen bug	ALL	2	R2
Zeta-Cypermethrin (Fury)	3A	Brassica vegetables	<i>Helicoverpa</i> spp., Cabbage white butterfly, Cabbage moth & Cluster caterpillar	Variable. Refer to label.	1	-

### **Appendix 3. Products available for weed control in Brassica vegetables**

<b>Active ingredient (Trade Name)</b>	<b>Chem. Group</b>	<b>Crop/Situation</b>	<b>Comment / Use / Weed</b>	<b>WHP (days)</b>	<b>States</b>	<b>Regulatory risk</b>
Chlorthal-dimethyl (Lawthal)	D**	Cabbage, broccoli, Brussels sprouts / Pre- plant /	Number of broadleaf & grass weeds.	NR	ALL	R3
Clethodim (Arysta) PER82459	A***	Brassica vegetables / Post-emergent /	Various grass weeds	28	ALL	R3
Clopyralid (various) PER13147	D**	Cauliflower / Post- emergent	Capeweed and clover	56	WA	-
Fluazifop-P (Surefire)	A***	Brassicas / Post- emergent selective herbicide	Grass weeds	42	ALL	-
Glyphosate (various)	M**	General knockdown	General weeds as a pre-crop spray	NR	ALL	R3
S-Metolachlor (Dual Gold)	K**	Brassica vegetables / Pre-emergent residual	Number of broadleaf and grass weeds. Warning on label that crop retardation may occur on soils with low organic matter levels and in some QLD soils. Not registered in WA due to light soils.	NR G:91	Variable- Refer to label	-
Napropamide (Devrinol PER87773)	K**	Brassica vegetables (transplants) / Pre- emergent	Broadleaf and Grass weeds	NR	ALL (excl. VIC)	-
Oxyfluorfen (various)	G**	Brassica vegetables / Pre- or post-emergent	Number of broadleaf weeds including chickweed and grass weeds. Only used in transplanted broccoli, cabbage & cauliflower.	NR	ALL	-
Paraquat + diquat (various)	L***	General knockdown	General weeds as a pre-crop spray	NR	ALL	R3
Pendimethalin (Stomp)	D**	Broccoli, Cabbage, Cauliflower / Selective post-emergent	Number of broadleaf & grass weeds.	NR	ALL	-

Active ingredient (Trade Name)	Chem. Group	Crop/Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Pendimethalin (Stomp) PER14432	D**	Brussels sprouts / Pre-emergent	Number of broadleaf & grass weeds.	NR	ALL (excl. VIC)	-
Propachlor (Ramrod)	K**	Brassica vegetables / Selective post-emergent	Number of broadleaf weeds including chickweed & grass weeds.	NR	ALL	R3
Pyraflufen-ethyl (Sledge)	G**	General pre-plant fallowing agent	Number of broadleaf weeds including wild radish & grass weeds.	NR	ALL	-
Quizalofop-P-ethyl (various)	A***	Cauliflower, Cabbage / Selective post-emergent herbicide	Selected grass weeds	14 Cauliflower 63 Cabbage	ALL	R3
Sethoxydim (Sertin)	A***	Brassica crops / Directly sown or transplanted	Selected grass weeds	42	ALL	-
Trifluralin (various)	D**	Broccoli, cabbage & cauliflowers / Transplants only	Selected grass weeds	NR	ALL	-

#### **Appendix 4. Current permits for use in Brassica vegetables**

<b>Permit No.</b>	<b>Description</b>	<b>Issued Date</b>	<b>Expiry Date</b>	<b>Permit Holder</b>
PER81876 Version 3	Abamectin / Cabbage (head) / Vegetable Leafminer	24-Jun-16	30-Apr-24	Hort Innovation
PER14037 Version 2	Alpha-cypermethrin / Cauliflower / Staphylinid beetle (WA)	01-May-13	31-Mar-23	Hort Innovation
PER82039 Version 3	Bifenthrin / Cabbage, Cauliflower & Chinese cabbage / Symphyla (NSW)	20-Nov-15	30-Sep-23	Hort Innovation
PER13147 Version 4	Clopyralid (Lontrel) / Cauliflower / Capeweed & Clover (WA)	21-Nov-11	30-Sep-24	Hort Innovation
PER89259	Chlorantraniliprole (Coragen) / Various Crops / Fall Armyworm (field)	06-Mar-20	31-Mar-23	Hort Innovation
PER14596 Version 3	Chlorpyrifos (Lorsban) / Brassica vegetables / Vegetable beetle adults	1-Oct-14	30-Sep-29	Hort Innovation
PER82459	Clethodim / Brassicas & others / Various grass weeds	19-Apr-17	30-Sep-21	Hort Innovation
PER81867	Cyromazine (Diptex) / Broccoli / Leafminer ( <i>Liriomyza sativa</i> ) (field & protected)	02-Dec-19	31-Dec-22	Hort Innovation
PER82551 Version 2	Diazinon / Cauliflower / Onion maggot	20-May-16	31-Mar-21	Hort Innovation
PER87563	Emamectin (Proclaim Opti) / Brassica Vegetables / Liriomyza leafminers	06-Jun-19	30-Jun-24	Hort Innovation
PER89263	Emamectin (Proclaim Opti) / Various crops / Fall Armyworm (field & protected)	10-Mar-20	31-Mar-23	Hort Innovation
PER80910 Version 3	Iprodione (Rovral) / Brussels Sprouts / Grey Mould	1-Aug-15	31-Jul-25	Hort Innovation
PER89278	Indoxacarb (Avatar eVo) / Various Crops / Fall Armyworm (field & protected)	13-Mar-20	31-Mar-23	Hort Innovation
PER14051	Iprodione (Rovral) / Broccoli / Grey mould	1-May-13	31-Mar-23	Hort Innovation
PER14045 Version 3	Mancozeb + Metalaxyl-M (Ridomil Gold) / Broccoli, Cauliflower and Brussels Sprouts/ White blister & Downy mildew	1-Apr-13	31-Mar-22	Hort Innovation
PER14352 Version 3	Metalaxyl-M and Fludioxonil (Maxim XL) / Broccoli (seed treatment) / Damping-off & Rhizoctonia	28-Jan-14	31-Jan-24	Hort Innovation
PER89293	Methomyl (Lannate-L) / Various Crops as per Label / Fall Armyworm (field)	10-Apr-20	30-Apr-23	Hort Innovation
PER87773	Napropamide (Devrinol) Grass & Broadleaf weeds including Chickweed	22-Aug-19	31-Aug-22	Hort Innovation
PER12221 Version 4	Petroleum oil / Brassica & other vegetables / Various insect pests	29-Jun-12	30-Nov-22	Hort Innovation
PER14432 Version 3	Pendimethalin (Stomp) / Brussels sprouts / Various broadleaf & grass weeds	23-May-14	30-Jun-24	Hort Innovation

<b>Permit No.</b>	<b>Description</b>	<b>Issued Date</b>	<b>Expiry Date</b>	<b>Permit Holder</b>
PER11951 Version 5	Phosphorous acid (Agri-fos)/ Brassica and other vegetables / Downy mildew	1-Nov-10	31-Mar-25	Hort Innovation
PER84261	Pyriproxyfen (Admiral) / Brassica vegetables / Silverleaf whitefly	11-Oct-17	31-Aug-25	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
PER89280	Thiamethoxam + Chlorantraniliprole (Durivo) /Brassica, Leafy & Fruiting vegetables / Fall armyworm	12-Mar-20	31-Mar-23	Hort Innovation
PER87051	Thiamethoxam + Chlorantraniliprole (Durivo) / Various vegetables / Various pests (field) (QLD - Wide Bay Burnett Regions only)	25-Feb-19	28-Feb-24	Bundaberg Fruit & Vegetable Growers Cooperative

## **Appendix 5. Brassica Vegetables Maximum Residue Limits (MRLs)**

CODEX commodity groupings of Brassicas and subgroups:

- VB 0040 Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead Brassicas
- VB 0400 Broccoli
- VB 0402 Brussels sprouts
- VB 0041 Cabbages, Head
- VB 0042 Flowerhead Brassicas (including Broccoli and Cauliflower)
- VB 0405 Kohlrabi
  - Vegetables

Note: Major export markets for Brassica vegetables include Singapore, South Korea & Japan. 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.

<b>Chemical</b>	<b>Codex</b>	<b>Description</b>	<b>APVMA MRL mg/kg</b>	<b>Codex MRL mg/kg</b>
2,2-DPA		Vegetables	*0.1	
Abamectin	VB0041	Cabbages, Head	T0.05	-
Acephate	VB0041	Cabbages, Head	-	2
	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas		
Acetamiprid	VB0041	Cabbages, Head	-	2
	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	5	-
Aldicarb	VB0402	Brussels sprouts	-	0.1
Aldrin and Dieldrin	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	E0.1	-
Ametoctradin	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	-	9
Amisulbrom	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	2	-
Azinphos-Methyl	VB0400	Broccoli	-	1
Azoxystrobin	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	1	5
Bifenthrin	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	T1	0.4
Boscalid	VB 0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	2	5
Bromide Ion	VB0041	Cabbages, Head	-	100
	VB0400	Broccoli	-	30
Carbendazim	VB0402	Brussels sprouts	-	0.5
Chlorantraniliprole	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	0.5	2
	-	Vegetables	E0.02	
Chlordane	-	Vegetables	E0.02	-
Chlorfenapyr	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	0.5	-
Chlorothalonil	VB0402	Brussels sprouts	7	6
		Vegetables (Except for Brussels sprouts)	T7	-



<b>Chemical</b>	<b>Codex</b>	<b>Description</b>	<b>APVMA MRL mg/kg</b>	<b>Codex MRL mg/kg</b>
Chlorpyrifos	VB0041	Cabbages, Head	-	1
	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	T0.5	-
	VB0404	Cauliflower	-	0.05
	VB0400	Broccoli	-	2
Chlorthal-dimethyl	-	Vegetables	5	
Clothianidin	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	-	0.2
Clopyralid	VB0404	Cauliflower	T0.2	-
Cyantraniliprole	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	-	2
Cyazofamid	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	-	1.5
	VB0400	Broccoli	2	-
Cycloxydim	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	-	9
Cyfluthrin/beta- cyfluthrin	VB0041	Cabbages, Head	-	0.08
	VB0040	Brassica (Cole or Cabbage) vegetables	0.5	-
	VB0404	Cauliflower	-	2
Cyhalothrin (includes lambda-cyhalothrin)	VB0041	Cabbages, Head	-	0.3
	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	0.1	-
	VB0042	Flowerhead Brassicas (including Broccoli and Cauliflower)	-	0.5
Cypermethrins (including alpha- and zeta- cypermethrin)	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	1	1
Cyprodinil	VB0041	Cabbages, Head	-	0.7
	VB0042	Flowerhead Brassicas (including Broccoli and Cauliflower)	-	2
Cyromazine	VB0400	Broccoli	-	1
Deltamethrin	VB0042	Flowerhead Brassicas (including Broccoli and Cauliflower)	-	0.1
	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	*0.05	-
DDT		Vegetables	E1	
Diazinon	VB0041	Cabbages, Head	-	0.5
		Vegetables	0.7	
	VB0405	Kohlrabi	-	0.2
Dichlobenil	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	-	0.05
Diclofop-methyl	-	Vegetables	5	
Difenoconazole	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	-	2
Dimethoate	VB0402	Brussels sprouts	-	0.2
	VB0041	Cabbages, Head	T0.2	-
	VB0400	Broccoli	T0.3	-
	VB0404	Cauliflower	T0.3	0.2
	VB0403	Cabbage, Savoy	-	0.05
Dimethomorph	VB0041	Cabbages, Head	-	6
	VB0405	Kohlrabi	-	0.02
	VB0400	Broccoli	-	4

<b>Chemical</b>	<b>Codex</b>	<b>Description</b>	<b>APVMA MRL mg/kg</b>	<b>Codex MRL mg/kg</b>
Dinotefuran	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	-	2
Diquat	-	Vegetables	*0.05	-
Dithiocarbamates	VB0041	Cabbages, Head	-	5
	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	2	-
Emamectin	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	0.02	-
EPTC	-	Vegetables	*0.04	
Fenamidone	VB0041	Cabbages, Head	-	0.9
	VB0042	Flowerhead Brassicas (including Broccoli and Cauliflower)	-	4
Fenamiphos	VB0041	Cabbages, Head	-	0.05
	VB0402	Brussels sprouts	-	0.05
Fenitrothion	VB0041	Cabbages, Head	0.5	-
Fenvalerate	VB0401	Broccoli, Chinese	-	3
	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	1	-
Fipronil	VB0041	Cabbages, Head	-	0.02
	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	T0.05	-
	VB0042	Flowerhead Brassicas (including Broccoli and Cauliflower)	-	0.02
Fluazifop-p-butyl	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	1	-
Fluazinam	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	*0.01	-
Flubendiamide	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	5	4
Fludioxonil	VB0041	Cabbages, Head	-	2
	VB0400	Broccoli	T*0.01	0.7
Flumioxazin	VB0041	Cabbages, Head	-	0.02
Fluopicolide	VB0041	Cabbages, Head	-	7
	VB0402	Brussels sprouts	-	0.2
	VB0042	Flowerhead Brassicas (including Broccoli and Cauliflower)	-	2
Fluopyram	VB0041	Cabbages, Head	-	0.15
	VB0404	Cauliflower	-	0.09
	VB0402	Brussels sprouts	-	0.3
	VB0400	Broccoli	-	0.3
Flutolanil	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	-	0.05
Flutriafol	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	-	1.5
Fluvalinate	VB0404	Cauliflower	0.5	-
Fluxapyroxad	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	-	2
Fosetyl	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	T0.1	-
Heptachlor	-	Vegetables	E0.05	

Chemical	Codex	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Imidacloprid	VB0041	Cabbages, Head	-	0.5
	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	0.5	-
	VB0404	Cauliflower	-	0.5
	VB0402	Brussels sprouts	-	0.5
	VB0400	Broccoli	-	0.5
Indoxacarb	VB0041	Cabbages, Head	-	3
	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	2	-
	VB0404	Cauliflower	-	0.2
	VB0400	Broccoli	-	0.2
Inorganic bromide		Vegetables	20	
Iprodione	VB0400	Broccoli	T*0.05	25
	VB0402	Brussels sprouts	0.5	-
	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	15	-
Lindane	-	Vegetables	E2	
Linuron	-	Vegetables	*0.05	
Maldison	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	2	-
	VB0404	Cauliflower	0.5	-
	VB0405	Kohlrabi	0.5	-
Mandipropamid	VB0041	Cabbages, Head	-	3
	VB0400	Broccoli	-	2
Metaldehyde		Vegetables	1	
Metaflumizone	VB0402	Brussels sprouts	-	0.8
Metalaxyl	VB0041	Cabbages, Head	-	0.5
	VB0404	Cauliflower	-	0.5
	VB0402	Brussels sprouts	-	0.2
	VB0400	Broccoli	-	0.5
		Vegetables	T0.1	
Metham sodium	VB0040	Brassica (cole or cabbage) vegetables, Head cabbages, Flowerhead brassica	2	-
Methamidophos	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	1	-
Metiram	VB0040	Brassica (cole or cabbage) vegetables, Head cabbages, Flowerhead brassica	2	-
Methiocarb	VB0041	Cabbages, Head	-	0.1
	VB0404	Cauliflower	-	0.1
	VB0402	Brussels sprouts	-	0.05
	-	Vegetables	0.1	-
Methomyl	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	2	-
Methoxyfenozide	VB0041	Cabbages, Head	-	7
	VB0400	Broccoli	-	3
Metolachlor	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	*0.02	-
Methyl bromide	-	Vegetables	T*0.05	
Mevinphos	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	0.05	-
Myclobutanil	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	-	0.05

Chemical	Codex	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Novaluron	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	-	0.7
Oxathiapiprolin	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	2	-
Oxydemeton-Methyl	VB0405	Kohlrabi	-	0.05
	VB0404	Cauliflower	-	0.01
Oxyfluorfen	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	*0.05	-
Paclobutrazol	VB0400	Broccoli	T*0.01	-
Paraquat	-	Vegetables	*0.05	-
Parathion-Methyl	VB0041	Cabbages, Head		0.05
Penconazole	VB0402	Brussels sprouts	0.05	-
Pendimethalin	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	*0.05	-
Penthiopyrad	VB0041	Cabbages, Head	-	4
	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	7	-
	VB0042	Flowerhead Brassicas (including Broccoli and Cauliflower)	-	5
Permethrin	VB0041	Cabbages, Head	-	5
	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	1	-
	VB0405	Kohlrabi	-	0.1
	VB0404	Cauliflower	-	0.5
	VB0403	Cabbage, Savoy	-	5
	VB0402	Brussels sprouts	2	1
Phorate	VB0400	Broccoli	-	2
	VB0040	Brassica (cole or cabbage) vegetables, Head cabbages, Flowerhead brassicas [except Brussels Sprouts, Broccoli, Head Cabbages, Cauliflowers]	T*0.01	-
	VB0400	Broccoli	0.5	-
	VB0041	Cabbages, Head	0.5	-
Phosphorous acid	VB0404	Cauliflower	0.5	-
	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, [except Flowerhead brassicas]	T1	-
	VB0042	Flowerhead brassicas	50	-
Piperonyl butoxide	-	Vegetables	8	-
Pirimicarb	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	-	0.5
	-	Vegetables (some exceptions)	1	-
Prometryn	-	Vegetables	*0.1	-
Propachlor	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	0.6	-
Propargite	-	Vegetables	3	-
Propazine	-	Vegetables	*0.1	-
Propamocarb	VB0400	Broccoli	-	3
	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	30	-
	VB0404	Cauliflower	-	2
	VB0402	Brussels sprouts	-	2

<b>Chemical</b>	<b>Codex</b>	<b>Description</b>	<b>APVMA MRL mg/kg</b>	<b>Codex MRL mg/kg</b>
Prothiofos	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	0.2	-
Pymetrozine	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	0.5	-
Pyraclostrobin	VB0041	Cabbages, Head	-	0.2
	VB0402	Brussels sprouts	-	0.3
	VB0042	Flowerhead Brassicas (including Broccoli and Cauliflower)	-	0.1
Pyrethrins	-	Vegetables	1	-
Pyriproxyfen	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	T0.7	-
Quintozene	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	0.2	-
	VB0041	Cabbages, Head	-	0.1
	VB0400	Broccoli	-	0.05
Quizalofop-ethyl	VB0041	Cabbages, Head	*0.01	-
	VB0404	Cauliflower	*0.05	-
Sethoxydim	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	0.5	-
Spinetoram	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	0.2	0.3
Spinosad	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	0.5	2
Spirotetramat	VB0041	Cabbages, Head	-	2
	VB0402	Brussels sprouts	1	-
	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	7	-
	VB0042	Flowerhead Brassicas (including Broccoli and Cauliflower)	-	1
Sulfoxaflor	VB0041	Cabbages, Head	-	0.4
	VB0404	Cauliflower	0.1	0.04
	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	3	-
	VB0400	Broccoli	-	3
Tebuconazole	VB0041	Cabbages, Head	-	1
	VB0404	Cauliflower	-	0.05
	VB0402	Brussels sprouts	-	0.3
	VB0400	Broccoli	-	0.2
Tebufenozide	VB0041	Cabbages, Head	-	5
	VB0400	Broccoli	-	0.5
Teflubenzuron	VB0404	Cauliflower	-	0.01
Thiamethoxam	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	3	5
Thiodicarb	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	2	-
Thiram	VB0040	Brassica (cole or cabbage) vegetables, Head cabbages, Flowerhead brassica	2	-
Triadimenol	VB0040	Brassica (Cole or Cabbage) vegetables, Head cabbages, Flowerhead brassicas	1	-
Trichlorfon	VB0402	Brussels sprouts	0.2	-
	VB0404	Cauliflower	0.2	-
		Vegetables (except Brussels sprouts & Cauliflower)	0.1	

<b>Chemical</b>	<b>Codex</b>	<b>Description</b>	<b>APVMA MRL mg/kg</b>	<b>Codex MRL mg/kg</b>
Trifloxystrobin	VB0041	Cabbages, Head	-	1.5
	VB0402	Brussels sprouts	-	0.1
	VB0042	Flowerhead Brassicas (including Broccoli and Cauliflower)	-	0.5
Trifluralin		Vegetables	0.05	
Zineb	VB0040	Brassica (cole or cabbage) vegetables, Head cabbages, Flowerhead brassica	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 (MRL Standard) Instrument 2019. Compilation 4. Prepared 15 January 2020. CODEX MRLs: CODEX Alimentarius International Food Standards database (February 2020), <http://www.fao.org/fao-who-codexalimentarius/codex-texts/dbs/pestres/en/>

## **Appendix 6. Brassica Vegetables Regulatory Risk Assessment**

# **Brassica Vegetable Agrichemical Regulatory Risk Assessment**

**August 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 a 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 Brassica vegetables as well as current initiatives aimed at addressing identified pest management deficiencies.

## Brassica Vegetable Agrichemical Regulatory Risk Assessment

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

Problem	Active Constituents	Chemical Group	Comment	Actions
<b>Insect and mite pests</b>				
Ants	Pyrethrins	<b>3A</b>		
<b>Aphids</b>				
Aphids	Beta-cyfluthrin	<b>3A</b>	EU: Non-renewal of approval	
	Malathion / Maldison (Cabbages & cauliflower)	<b>1B</b>	APVMA – Under review – chemistry Codex: Re-evaluation scheduled for 2022/23	
	Phorate	<b>1B</b>	APVMA – Nominated for review EU: No authorisation in place	
	Sulfoxaflor	<b>4C</b>	USA – Pollinator concerns	
Cabbage aphid	Acephate	<b>1B</b>	APVMA – Nominated for review Canada –Review completed continued use acceptable with risk mitigation <sup>1</sup> Europe - Deregistered	
	Afidopyropen	<b>9D</b>		
	Chlorantraniliprole + thiamethoxam	<b>28 + 4A</b>	Thiamethoxam: APVMA – Under review Canada – Proposal to deregister outdoor uses Europe – Outdoor uses deregistered USA: Re-registration with new risk mitigation measures	
	Chlorpyrifos	<b>1B</b>	APVMA: Currently under review, outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure. Codex: Scheduled for review by JMPR in 2021 EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	



## Brassica Vegetable Agrichemical Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
Cabbage aphid	Diazinon	<b>1B</b>	EU – Deregistered Codex - To be reviewed by 2020/21. JMPR Periodic re-evaluation 2020	
	Imidacloprid (Broccoli)	<b>4A</b>	APVMA – Under review Canada – Under review EU – Removal of all field uses USA: Re-registration with new risk mitigation measures	
	Pirimicarb	<b>1A</b>	Codex - JMPR Periodic re-evaluation 2021/22	
	Pymetrozine	<b>9B</b>	EU- Being phased out Codex – No registrant support	
Cabbage aphid	Spirotetramat	<b>23</b>		
	Sulfoxaflor	<b>4C</b>	USA – Pollinator concerns	
Cotton aphid	Afidopyropen	<b>9D</b>		
Currant lettuce aphid	Afidopyropen	<b>9D</b>		
Green peach aphid	Afidopyropen	<b>9D</b>		
	Chlorantraniliprole + thiamethoxam	<b>28 + 4A</b>	Thiamethoxam: APVMA – Under review Canada – Proposal to deregister outdoor uses Europe – Outdoor uses deregistered USA: Re-registration with new risk mitigation measures	
	Diazinon	<b>1B</b>	EU – Deregistered Codex - To be reviewed by 2020/21. JMPR Periodic re-evaluation 2020	
	Imidacloprid	<b>4A</b>	APVMA – Under review Canada – Under review EU – Removal of all field uses USA: Re-registration with new risk mitigation measures	

## Brassica Vegetable Agrichemical Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
Cotton aphid	Pirimicarb	1A	Codex - JMPR Periodic re-evaluation 2021/22	
	Pymetrozine	9B	EU- Being phased out Codex – No registrant support	
	Spirotetramat	23		
	Sulfoxaflor	4C	USA – Pollinator concerns	
Turnip aphid	Imidacloprid	4A	APVMA – Under review Canada – Under review EU – Removal of all field uses USA: Re-registration with new risk mitigation measures	
	Sulfoxaflor	4C	USA – Pollinator concerns	
<b>Beetles</b>				
African black beetle	Chlorpyrifos	1B	APVMA: Currently under review, outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure.	
False wireworm	Chlorpyrifos	1B	Codex: Scheduled for review by JMPR in 2021	
Spotted vegetable weevil	Chlorpyrifos (PER14596)	1B	EU: Proposed cancellation of use	
Vegetable beetle	Chlorpyrifos (PER14596)	1B	Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
Garden weevil	Beta-cyfluthrin	3A	EU: Non-renewal of approval	
28 spotted ladybird	Malathion / Maldison (Cabbages & cauliflower)	1B	APVMA – Under review – chemistry Codex: Re-evaluation scheduled for 2022/23	
Staphylinid beetles	Alpha-cypermethrin	3A	EU: Proposed restricted authorisation & Candidate for substitution	

## Brassica Vegetable Agrichemical Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
<b>Grasshoppers/Locusts</b>				
Australian plague locust	Alpha-cypermethrin	3A	EU: Proposed restricted authorisation & Candidate for substitution	
	Beta-cyfluthrin	3A	EU: Non-renewal of approval	
	Cypermethrin	3A		
	Fenitrothion	1B		
	Gamma-cyhalothrin	3A		
	Lambda-cyhalothrin	3A		
	Malathion / Maldison	1B	APVMA – Under review – chemistry Codex: Re-evaluation scheduled for 2022/23	
	Chlorpyrifos (Cabbages)	1B	APVMA: Currently under review, outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure. Codex: Scheduled for review by JMPR in 2021	
Black Field crickets/Field Crickets	Chlorpyrifos	1B		
Mole crickets	Chlorpyrifos	1B		
Small plague grasshopper	Chlorpyrifos (Cabbages)	1B		
Spur-throated locust	Chlorpyrifos	1B		
	Alpha-cypermethrin	3A	EU: Proposed restricted authorisation & Candidate for substitution	
	Beta-cyfluthrin	3A	EU: Non-renewal of approval	
	Cypermethrin	3A		
	Fenitrothion (Cabbages)	1B		
	Gamma-cyhalothrin	3A		
	Lambda-cyhalothrin	3A		
	Malathion / Maldison (Cabbages & cauliflower)	1B	APVMA – Under review – chemistry Codex: Re-evaluation scheduled for 2022/23	
Migratory locust	Fenitrothion	1B		
Wingless grasshopper	Chlorpyrifos	1B		
	Fenitrothion	1B		

## Brassica Vegetable Agrichemical Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
<b>Jassids/Plant bugs</b>				
Bugs	Beta-cyfluthrin	<b>3A</b>	EU: Non-renewal of approval	
Green mirid	Petroleum oil	-		
Green vegetable bug	Chlorantraniliprole + thiamethoxam	<b>28 + 4A</b>	Thiamethoxam: APVMA – Under review Canada – Proposal to deregister outdoor uses Europe – Outdoor uses deregistered USA: Re-registration with new risk mitigation measures	
	Malathion / Maldison (Cabbages & cauliflower)	<b>1B</b>	APVMA – Under review – chemistry Codex: Re-evaluation scheduled for 2022/23	
	Methomyl	<b>1A</b>	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed EU: No authorisations	
Jassids	Malathion / Maldison (Cabbages & cauliflower)	<b>1B</b>	APVMA – Under review – chemistry Codex: Re-evaluation scheduled for 2022/23	
	Phorate	<b>1B</b>	APVMA – Nominated for review EU: No authorisation in place	
Lace bugs	Beta-cyfluthrin	<b>3A</b>	EU: Non-renewal of approval	
Leafhoppers	Malathion / Maldison (Cabbages & cauliflower)	<b>1B</b>	APVMA – Under review – chemistry Codex: Re-evaluation scheduled for 2022/23	
	Pyrethrins			
Passionvine hopper	Beta-cyfluthrin	<b>3A</b>	EU: Non-renewal of approval	

## Brassica Vegetable Agrichemical Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
<b>Lepidoptera</b>				
Australian cabbage looper	Methomyl	<b>1B</b>	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed EU: No authorisations	
Budworms - Native ( <i>Helicoverpa punctigera</i> ) Corn earworm/Cotton bollworm ( <i>Helicoverpa armigera</i> )	Acephate	<b>1B</b>	APVMA – Nominated for review Canada –Review completed continued use acceptable with risk mitigation <sup>i</sup> Europe - Deregistered	
	Alpha-cypermethrin	<b>3A</b>	EU: Proposed restricted authorisation & Candidate for substitution	
	Amorphous silica	-		
	Bt	<b>11</b>		
	Chlorantraniliprole	<b>28</b>		
	Chlorantraniliprole + thiamethoxam	<b>28 + 4A</b>	Thiamethoxam: APVMA – Under review Canada – Proposal to deregister outdoor uses Europe – Outdoor uses deregistered USA: Re-registration with new risk mitigation measures	
	Chlorpyrifos	<b>1B</b>	APVMA: Currently under review, outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure. Codex: Scheduled for review by JMPR in 2021 EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
	Cypermethrin	<b>3A</b>		
	Emamectin benzoate	<b>6</b>		
	Flubendiamide	<b>28</b>		
Helicoverpa NPV	-			
Indoxacarb	<b>22A</b>	EU: Proposed non-renewal		

## Brassica Vegetable Agrichemical Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
Budworms - Native ( <i>Helicoverpa punctigera</i> ) Corn earworm/Cotton bollworm ( <i>Helicoverpa armigera</i> )	Methomyl	1A	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed EU: No authorisations	
	Prothiofos	1B	EU: No authorisation in place	
	Spinetoram	5		
	Spinosad	5		
	Tau-fluvalinate	3A		
	Zeta-cypermethrin	3A		
Cabbage cluster caterpillar	Alpha-cypermethrin	3A	EU: Proposed restricted authorisation & Candidate for substitution	
	Bt	11		
	Chlorantraniliprole	28		
	Chlorantraniliprole +thiamethoxam	28 + 4A	Thiamethoxam: APVMA – Under review Canada – Proposal to deregister outdoor uses Europe – Outdoor uses deregistered <sup>ii</sup> USA: Re-registration with new risk mitigation measures	
	Chlorpyrifos	1B	APVMA: Currently under review, outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure. Codex: Scheduled for review by JMPR in 2021 EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
	Cypermethrin	3A		
	Diazinon	1B	EU – Deregistered Codex - To be reviewed by 2020/21. JMPR Periodic re-evaluation 2020	
	Emamectin benzoate	6		

## Brassica Vegetable Agrichemical Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
Cabbage cluster caterpillar	Fipronil	<b>2B</b>	APVMA – Under review Codex: Re-evaluation scheduled for 2021/22 EU: No authorisation in place	
	Flubendiamide	<b>28</b>		
	Gamma-cyhalothrin	<b>3A</b>		
	Indoxacarb	<b>22A</b>	EU: Possible non-renewal	
	Lambda-cyhalothrin	<b>3A</b>		
	Methomyl	<b>1A</b>	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed EU: No authorisations	
	Permethrin	<b>3A</b>		
	Prothiofos	<b>1B</b>	EU: No authorisation in place	
	Spinetoram	<b>5</b>		
	Spinosad	<b>5</b>		
	Thiodicarb	<b>1A</b>		
Zeta-cypermethrin	<b>3A</b>			
Cabbage white butterfly	Acephate	<b>1B</b>	APVMA – Nominated for review Canada –Review completed continued use acceptable with risk mitigation <sup>i</sup> Europe - Deregistered	
	Alpha-cypermethrin	<b>3A</b>	EU: Proposed restricted authorisation & Candidate for substitution	
	Bt	<b>11</b>		
	Chlorantraniliprole	<b>28</b>		
	Chlorantraniliprole + thiamethoxam	<b>28 + 4A</b>	Thiamethoxam: APVMA – Under review Canada – Proposal to deregister outdoor uses Europe – Outdoor uses deregistered USA: Re-registration with new risk mitigation measures	
	Chlorfenapyr	<b>13</b>	EU: No authorisations	

## Brassica Vegetable Agrichemical Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
Cabbage white butterfly	Chlorpyrifos	1B	APVMA: Under review.. Potential issues w.r.t. environmental loading and worker exposure. Codex: Scheduled for review by JMPR in 2021 EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
	Cypermethrin	3A		
	Deltamethrin	3A		
	Diazinon	1B	EU – Deregistered Codex - To be reviewed by 2020/21. JMPR Periodic re-evaluation 2020	
	Emamectin benzoate	6		
	Esfenvalerate	3A		
	Fipronil	2B	APVMA – Under review Codex: Re-evaluation scheduled for 2021/22 EU: No authorisation in place	
	Flubendiamide	28		
	Gamma-cyhalothrin	3A		
	Indoxacarb	22A	EU: Proposed non-renewal	
	Lambda-cyhalothrin	3A		
	Malathion/Maldison (Cabbages)	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	
	Permethrin	3A		
	Prothiofos	1B	EU: No authorisation in place	
	Spinetoram	5		
spinosad	5			
Tau-fluvalinate	3A			
Zeta-cypermethrin	3A			



## Brassica Vegetable Agrichemical Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
Cabbage centre grub	Bt	11		
	Chlorantraniliprole	28		
	Chlorantraniliprole + thiamethoxam	28 + 4A	Thiamethoxam: APVMA – Under review Canada – Proposal to deregister outdoor uses Europe – Outdoor uses deregistered USA: Re-registration with new risk mitigation measures	
	Deltamethrin	3A		
	Diazinon	1B	EU – Deregistered Codex - To be reviewed by 2020/21. JMPR Periodic re-evaluation 2020	
	Esfenvalerate	3A		
	Indoxacarb	22A	EU: Possible non-renewal	
	Methomyl	1A	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed EU: No authorisations	
	Prothiofos	1B	EU: No authorisation in place	
	Spinetoram	5		
	Spinosad	5		
Caterpillars	Beta-cyfluthrin	3A	EU: Non-renewal of approval	
	Pyrethrins	3A		
	Spinetoram	5		

## Brassica Vegetable Agrichemical Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
Cutworms	Chlorpyrifos	1B	APVMA: Currently under review, outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure. Codex: Scheduled for review by JMPR in 2021 EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
	Trichlorfon	1B	APVMA – nominated for review Codex – No MRLs Europe – deregistered US – No MRLs	
Diamondback moth	Acephate	1B	APVMA – Nominated for review Canada – Review completed continued use acceptable with risk mitigation <sup>i</sup> Europe - Deregistered	
	Alpha-cypermethrin	3A	EU: Proposed restricted authorisation & Candidate for substitution	
	Bt	11		
	Beta-cyfluthrin	3A	EU: Non-renewal of approval	
	Chlorantraniliprole	28		
	Chlorantraniliprole + thiamethoxam	28 + 4A	Thiamethoxam: APVMA – Under review Canada – Proposal to deregister outdoor uses Europe – Outdoor uses deregistered USA: Re-registration with new risk mitigation measures	
	Chlorfenapyr	13	EU: No authorisations	

## Brassica Vegetable Agrichemical Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
Diamondback moth	Chlorpyrifos	1B	APVMA: Currently under review, outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure. Codex: Scheduled for review by JMPR in 2021 EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
	Cypermethrin	3A	EU: Proposed restricted authorisation & Candidate for substitution	
	Deltamethrin	3A		
	Diazinon	1B	EU – Deregistered Codex - To be reviewed by 2020/21. JMPR Periodic re-evaluation 2020	
	Emamectin benzoate	6		
	Esfenvalerate	3A		
	Fipronil	2B	APVMA – Under review Codex: Re-evaluation scheduled for 2021/22 EU: No authorisation in place	
	Flubendiamide	2B		
	Gamma-cyhalothrin	3A		
	Indoxacarb	22A	EU: Possible non-renewal	
	Lambda-cyhalothrin	3A		
	Permethrin	3A	EU: No authorisation in place	
	Prothiofos	1B	EU: No authorisation in place	
	Pyrethrins	3A		
	Spinetoram	5		
	Spinosad	5		
Spirotetramat	23			
Tau-fluvalinate	3A			
Zeta-cypermethrin	3A			

## Brassica Vegetable Agrichemical Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
Fall armyworm	Chlorantraniliprole (PER89259)	28		
	Chlorantraniliprole + thiamethoxam (PER89280)	28 + 4A	Thiamethoxam: APVMA – Under review Canada – Proposal to deregister outdoor uses Europe – Outdoor uses deregistered USA: Re-registration with new risk mitigation measures	
	Emamectin benzoate (PER89263)	6		
	Methomyl (PER89293)	1A	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed EU: No authorisations	
	Spinetoram (PER89241)	5		
	Spinosad (PER89870)	5		
Loopers	Bt	11		
	Diazinon	1B	EU – Deregistered Codex - To be reviewed by 2020/21.	
	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		
Soybean looper	Chlorantraniliprole	28		
	Chlorantraniliprole +thiamethoxam	28 + 4A	Thiamethoxam: APVMA – Under review Canada – Proposal to deregister outdoor uses Europe – Outdoor uses deregistered USA: Re-registered with new risk mitigation measures	
	Flubendiamide	28		

## Brassica Vegetable Agrichemical Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
<b>Mites</b>				
Blue oat mite	Chlorpyrifos	<b>1B</b>	APVMA: Currently under review, outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure. Codex: Scheduled for review by JMPR in 2021 EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
Redlegged earth mite	Chlorpyrifos	<b>1B</b>		
	Malathion/Maldison	<b>1B</b>		
Mites	Petroleum oil			
Two spotted mite	Phorate	<b>1B</b>	APVMA – Nominated for review EU: No authorisation in place	
	Pyrethrins	<b>3A</b>		
<b>Scale Insects/Mealybug</b>				
Mealybugs	Beta-cyfluthrin	<b>3A</b>	EU: Non-renewal of approval	
	Pyrethrin	<b>3A</b>		
Scale insects	Pyrethrin	<b>3A</b>		
<b>Other</b>				
Earwig	Pyrethrins	<b>3A</b>		
Leafminers	Abamectin (PER81876)	<b>6</b>		
	Emamectin benzoate (PER87563)	<b>6</b>		
Symphylids	Bifenthrin	<b>3A</b>	Canada: Subject to phase-out until 31/12/2020 EU: No authorisation in place	

## Brassica Vegetable Agrichemical Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
<b>Thrips</b>				
Melon thrips	Spinetoram	<b>5</b>		
Onion thrips	Chlorantraniliprole + thiamethoxam	<b>28 + 4A</b>	Thiamethoxam: APVMA – Under review Canada – Proposal to deregister outdoor uses Europe – Outdoor uses deregistered USA: Re-registration with new risk mitigation measures	
	Imidacloprid	<b>4A</b>	APVMA – Under review Canada – Under review EU – Removal of all field uses USA: Re-registration with new risk mitigation measures	
Thrips	Beta-cyfluthrin	<b>3A</b>	EU: Non-renewal of approval	
	Malathion/Maldison	<b>1B</b>	APVMA – Under review – chemistry Codex: Re-evaluation scheduled for 2022/23	
	Petroleum oil	-		
	Phorate	<b>1B</b>	APVMA – Nominated for review EU: No authorisation in place	
	Pyrethrins	<b>3A</b>		
Western flower thrips	Chlorantraniliprole + thiamethoxam	<b>28 + 4A</b>	Thiamethoxam: APVMA – Under review Canada – Proposal to deregister outdoor uses Europe – Outdoor uses deregistered USA: Re-registration with new risk mitigation measures	
	Spinetoram	<b>5</b>		
	Spinosad			

## Brassica Vegetable Agrichemical Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
<b>Whitefly</b>				
Greenhouse whitefly	Chlorantraniliprole + thiamethoxam	<b>28 + 4A</b>	Thiamethoxam: APVMA – Under review Canada – Proposal to deregister outdoor uses Europe – Outdoor uses deregistered USA: Re-registration with new risk mitigation measures	
	Sulfoxaflor	<b>4C</b>	USA – Pollinator concerns	
Silverleaf (Poinsettia) whitefly	Afidopyropen	<b>9D</b>		
	Bifenthrin	<b>3A</b>	Canada: Subject to phase-out until 31/12/2020 EU: No authorisation in place	
	Chlorantraniliprole + thiamethoxam	<b>28 + 4A</b>	Thiamethoxam: APVMA – Under review Canada – Proposal to deregister outdoor uses Europe – Outdoor uses deregistered USA: Re-registration with new risk mitigation measures	
	Imidacloprid	<b>4A</b>	APVMA – Under review Canada – Under review EU – Removal of all field uses USA: Re-registration with new risk mitigation measures	
Silverleaf (Poinsettia) whitefly	Pymetrozine	<b>9B</b>	EU- Being phased out Codex – No registrant support	
	Pyriproxyfen (PER84261)	<b>7C</b>		
	Spirotetramat	<b>23</b>		
Whiteflies	Beta-cyfluthrin	<b>3A</b>	EU: Non-renewal of approval	
	Pyrethrin	<b>3A</b>		

## Brassica Vegetable Agrichemical Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
<b>DISEASES</b>				
Alternaria leaf spots	Azoxystrobin	<b>11</b>		
	Azoxystrobin + Oxathiapiprolin	<b>11 + 49</b>		
	Copper	<b>M1</b>	EU: Candidate for substitution	
	Mancozeb	<b>M3</b>	APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2022/23 EU: Proposed non-renewal of authorisation	
Black rot	Copper	<b>M1</b>	EU: Candidate for substitution	
Club root	Fluazinam	<b>29</b>		
Damping off	Fludioxonil + Metalaxyl-M (PER14352)	<b>12 + 4</b>	Fludioxonil EU – Under review Candidate for substitution Metalaxyl EU: Candidate for substitution	
	Metalaxyl-M / Metalaxyl	<b>4</b>	Metalaxyl EU: Candidate for substitution Metalaxyl-M EU: Restricted use approval	
Downy mildew	Amisulbrom + Copper	<b>21 + M1</b>	Copper EU: Candidate for substitution	
	Azoxystrobin + Oxathiapiprolin	<b>11 + 49</b>		
	Copper	<b>M1</b>	EU: Candidate for substitution	
	Cyazofamid	<b>21</b>		
	Fluopicolide + Propamocarb HCl	<b>28 + 43</b>		
	Hydrogen peroxide + peroxyacetic acid	<b>M</b>		
	Mancozeb	<b>M3</b>	APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2022/23 EU: Proposed non-renewal of authorisation	



## Brassica Vegetable Agrichemical Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
Downy mildew	Metalaxyl/metalaxyl-M	<b>M3 + 4</b>	Metalaxyl EU: Candidate for substitution Metalaxyl-M EU: Restricted use approval	
	Metiram	<b>M3</b>	APVMA - Nominated for review Canada – Proposed cancelling of foliar uses Codex - To be reviewed 2022/23	
	Oxathiapiprolin	<b>49</b>		
	Phosphorous acid (PER11951)	<b>33</b>		
Grey mould	Penthiopyrad	<b>7</b>		
Papery leaf spot	Copper	<b>M1</b>	EU: Candidate for substitution	
	Mancozeb	<b>M3</b>	APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2022/23 EU: Proposed non-renewal of authorisation	
Phytophthora	Metalaxyl	<b>4</b>	EU: Candidate for substitution	
Powdery mildew	Penthiopyrad	<b>7</b>		
Rhizoctonia	Fludioxonil + Metalaxyl-M	<b>12 + 4</b>	Fludioxonil EU – Under review Candidate for substitution Metalaxyl EU: Candidate for substitution	
	Iprodione (PER14051 – Broccoli)	<b>2</b>	Europe – Deregistered Canada – Majority of food crop uses deleted Codex – Review scheduled for 2022	

## Brassica Vegetable Agrichemical Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
Ring spot	Chlorothalonil	<b>M5</b>	APVMA - Nominated for review Canada – Review recently completed; continued use considered acceptable Europe - Deregistration proposed.	
	Copper	<b>M1</b>	EU: Candidate for substitution	
	Mancozeb	<b>M3</b>	APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2022/23 EU: Proposed non-renewal of authorisation	
	Penconazole	<b>3</b>	APVMA - Nominated for review	
	Triadimenol	<b>3</b>	APVMA - Nominated for review	
Sclerotinia rot (white rot)	Azoxystrobin	<b>11</b>		
	Azoxystrobin + Oxathiapiprolin	<b>11 + 49</b>		
	Boscalid	<b>7</b>		
	Penthiopyrad	<b>7</b>		
White blister	Amisulbrom + Copper	<b>21 + M1</b>	Copper EU: Candidate for substitution	
	Azoxystrobin	<b>11</b>		
	Azoxystrobin + Oxathiapiprolin	<b>11 + 49</b>		
	Copper	<b>M1</b>	EU: Candidate for substitution	
	Cyazofamid	<b>21</b>		
	Fluopicolide + Propamocarb HCl	<b>28 + 43</b>		
	Hydrogen peroxide + peroxyacetic acid	<b>M</b>		
	Mancozeb + Metalaxyl-M (PER14045)	<b>M3 + 4</b>	Mancozeb APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2022/23 EU: Proposed non-renewal of authorisation Metalaxyl-M EU: Restricted use approval	

## Brassica Vegetable Agrichemical Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
<b>WEEDS</b>				
Broadleaf weeds and grasses	Chlorthal-dimethyl	D	EU: No authorisation in place	
	Clethodim (PER82459)	A	Codex: MRLs proposed for deletion	
	Fluazifop-P	A		
	Metolachlor/S-metolachlor	K		
	Napropamide (PER87773)	K		
	Oxyfluorfen	G	EU: Candidate for substitution	
	Pendimethalin	D	EU: Review outcome not positive	
	Propachlor	K	EU: No authorisation in place	
	Quizalofop P (Cabbages)	A	Canada – Under re-evaluation - proposed completion June 2019. EU – Candidate for substitution	
	Sethoxydim	A	EU: No authorisation in place	
Trifluralin	D	EU: No authorisation in place		
<b>Plant growth regulators</b>				
Storage	1-methylcyclopropene (Po) (Broccoli & Cabbages)		EU: Candidate for substitution	

*MT17019 – Regulatory support and coordination. This multi-industry project has been funded by Hort Innovation using industry research and development levies and contributions from the Australian Government. Hort Innovation is the grower-owned, not-for-profit research and development corporation for Australian horticulture.*

<sup>i</sup> Acephate: SP formulations cancelled; handheld mistblowers prohibited; use in public areas prohibited; reduction in application rate, max number of applications; increased re-entry periods and re-treatment intervals and use on potatoes cancelled

<sup>ii</sup> Use of thiamethoxam limited to permanent greenhouses and that the resulting crop stays its entire life cycle within a permanent greenhouse, so that it is not replanted outside