Parsley

Strategic Agrichemical Review Process (SARP)

April 2021

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

Date of report:
April 2021

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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 Parsley industry with sound pesticide usage for the future that the industry can pursue for registration with the manufacturer, or minor-use permits with the Australian Pesticide and Veterinary Medicines Authority (APVMA).

1.1 Diseases

The high priority diseases are:

Common name	Scientific name
Alternaria Leaf Blight	*Alternaria petroselini*
Cercospora Leaf Spot	*Cercospora* spp.
Septoria Leaf Spot	*Septoria petroselini*
Sclerotinia Rot	*Sclerotinia sclerotiorum*

1.2 Insects, mites and other pests

The high priority insects are:

Common name	Scientific name
Vegetable Leaf Hoppers	*Austroasca viridigrisea*

1.3 Weeds

The moderate priority weeds are:

Common Name	Scientific Name
Blackberry Nightshade	*Solanum nigrum*
Chickweed	*Stellaria media*
Fat Hen	*Chenopodium album*
Marshmallow	*Malva parviflora*
Nutgrass	*Cyperus rotundus*
Potato Weed	*Galinsoga* spp.
Wild Turnip	*Brassica* spp.
Amaranthus	*Amaranthus* spp.
Groundsel	*Senecio* spp.
Milk Thistle	*Sonchus* spp.
Grass Weeds	Various species

2. The Australian Parsley Industry

The Australian Parsley industry is a small horticultural industry.

The Parsley species referred to in this report is *Petroselinum crispum*. The most commonly grown commercial Parsley variety is 'flat leaf', 'Italian' or 'continental' Parsley with dark green flat leaves. 'Curly-leaf' Parsley is popular as a garnish with dark green curled leaves, which are easier to chop chiffonade-style. Both varieties are covered under the same permits and registrations.

Parsley is grouped with other fresh herbs for production and trade data purposes. Therefore, it can be difficult to determine accurate supply chain and production data.

For the year ending June 2020[1]:

- Production was 11,995 tonnes (Parsley accounted for 26%) with a value of $229 m.
- 96% for the fresh market, 4% was used for processing and no exports recorded.

Production of fresh herbs occurs in most states of Australia. Typically, production is focussed near the major capitals to ensure fresh supply to demand. Increasingly volumes are being grown year-round in high-tech greenhouses in the New South Wales regions of the Sydney Basin and Northern New South Wales.

Due to Australia's varying weather conditions and the development of controlled temperature greenhouses, the Australian industry is now able to supply domestic markets with fresh herbs throughout the year.

Fresh Parsley and other Fresh Herbs Seasonality by State

State	19/20 t	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
New South Wales (19%)	2,279												
Victoria (30%)	3,598												
Queensland (46%)	5,518												
Western Australia (2%)	228												
South Australia (2%)	252												
Tasmania (<1%)	120												
Availability legend			High			Medium			Low			None	

[1] Hort Innovation (2020). Australian Horticulture Statistics Handbook 2019/20. [online] Available at: https://www.horticulture.com.au/globalassets/hort-innovation/resource-assets/ha18002-australian-horticulture-statistics-handbook-2019-20-vegetables.pdf

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 Parsley 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 Parsley 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 Parsley 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 Parsley 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 Parsleys but attempts to prioritise the major problems.

Exotic plant pests that are not present in Australia, are not addressed in this document. A biosecurity plan has been developed for the Vegetable Industry in consultation with industry, government and scientists. The Biosecurity Plan for the Vegetable Industry which covers Parsley outlines key threats to the industry, risk mitigation plans, identification and categorisation of exotic pests and contingency plans[2].

[2] 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 Parsley as a minor crop. The crop fits within the APVMA crop group 027: Herbs. Therefore, access to minor use permits can be relatively straight forward as long as a reasonable justification is provided in accordance to the APVMA's minor use guidance[3].

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 Parsley industry is for manufacturers to register new pesticides uses in the crop.

[3] https://apvma.gov.au/node/10931

3.3 Methods

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

Hort Innovation Project Reference	Process of Review - Activity
VG16060 - Vegetable Agrichemical Pest Management Needs and Priorities (AUSVEG) - Commenced: 2 May 2017	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)	**Parsley Agrichemical Regulatory Risk Assessment Document** 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 Parsley as well as current initiatives aimed at addressing identified pest management deficiencies.
VG18004 – Vegetable Strategic Agrichemical Review Process (SARP) Report Updates	**SARP updated via a desktop audit:** • 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 parsley
Appendix 2. Products available for control of insects, mites and other pests in parsley
Appendix 3. Products available for weed control in parsley
Appendix 4. Current permits for use in parsley
Appendix 5. Parsley Maximum Residue Limits (MRLs)
Appendix 6. Parsley Agrichemical Regulatory Risk Assessment

4. Diseases, Pests and Weeds of Parsley

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/

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

Some of the suggested options have no overseas MRLs (see Appendix 5).

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 parsley

4.1.1 Disease priorities

Common name	Scientific name
High	
Alternaria Leaf Blight	*Alternaria petroselini*
Cercospora Leaf Spot	*Cercospora* spp.
Septoria Leaf Spot	*Septoria petroselini*
Sclerotinia Rot	*Sclerotinia sclerotiorum*
Moderate	
Damping Off	*Pythium* spp., *Phytophthora* spp, *Fusarium* spp., *Rhizoctonia* spp.
Downy Mildew	*Plasmopara petroselini*
Anthracnose	*Colletotrichum* spp.
Bacterial Leaf Blight	*Xanthomonas* spp.
Bacterial Leaf Spot	*Pseudomonas syringae* pv. *apii*
Low	
Rust	*Puccinia menthae*
Powdery Mildew	*Erysiphe heraclei*
Grey Mould	*Botrytis cinerea*

The most important disease issues across all parsley production regions, based on industry consultation, are Alternaria leaf blight, Cercospora leaf spot and Sclerotinia rot. Available and potential products for all these diseases are in Section 4.1.2.

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 diseases.

4.1.2 Available and potential products for high 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
Alternaria Leaf Blight (*Alternaria petroselini*) **Priority: High**							
Alternaria Leaf Blight was ranked as a high priority in QLD, WA & TAS and as a moderate priority in VIC, NSW & SA. Use of resistant varieties & disease-free or treated seed are recommended. Adequate nitrogen fertiliser generally reduces the rate of infection by *Alternaria*. Crop rotation, removal of plant debris if infected, and eradication of weed hosts help reduce the inoculum for subsequent plantings of susceptible crops.							
Chlorothalonil (Bravo) PER82895	M5	Protective	14 NG	A	ALL	Permitted for use in parsley (field) for control of Downy Mildew, *Botrytis*, ***Alternaria*** & Cercospora. [Max. no. of applications not specified; re-treatment interval 7-14 d]	R3
Difenoconazole (Score) Syngenta PER87973	3	Protective	7 NG	A	ALL (excl. VIC)	Permitted for use in parsley (field & protected) for control of Cercospora Leaf Spot & **Alternaria Leaf Spot**. [Max 3 applications; 2 consecutive; re-treatment interval 7 d]	R3
Iodine Granules	-	Post-Harvest	NR	A	ALL	Registered in vegetables as a post-harvest sanitiser to control **post-harvest decay and diseases**. Dip fruit for a minimum of 1 minute.	-
Mancozeb and Dimethomorph (Mancozeb + Acrobat) PER14958	M3+40	Protective	14 NG	A	ALL (excl. VIC)	Permitted for use in parsley (field & protected) for control of Downy Mildew and **Alternaria Leaf Spot**. [Max. 2 applications per crop; re-treatment interval 7-10 d]	R2

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Azoxystrobin + Difenoconazole (Amistar Top) Syngenta	3+11	Protective & Curative		P		Hort Innovation Project ST17000 - Azoxystrobin + difenconazole (Amistar Top) Groups 3+11 in parsley for Alternaria Leaf Blight. Completed and data provided in October 2020 to Syngenta for a label extension. Registered in carrots for control of ***Alternaria***, *Cercospora* & Powdery Mildew; *Alternaria* and *Phytophthora* in potatoes; *Alternaria, Phytophthora, Sclerotinia* and Powdery Mildew in tomatoes.	R3
Florylpicoxamid (Adavelt) Corteva	21	Protective & Curative		P		New active in development by Corteva with activity on ***Alternaria*** spp. Scheduled for JMPR evaluation in 2023.	-
Fluazinam (Gem)	29	Protective		P		Registered for control of Club Root in brassica vegetables. US registration for control of ***Alternaria*** in carrots.	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protective		P		Registered for control of Yellow Sigatoka, Leaf Speckle and Cordana Leaf Spot in bananas. US registration for control of ***Alternaria*** in almonds, brassica vegetables, pistachios, sunflowers and cucurbits.	R3
Fluopyram + Trifloxystrobin (Luna Sensation) Bayer	7+11	Protective		P		Registered for control of ***Alternaria*** in apples.	-
NUL3446 Nufarm	TBC			P		New product in development from Nufarm with activity on ***Alternaria*** spp.	-
Cercospora Leaf Spot (*Cercospora* spp.) **Priority: High**							
Cercospora Leaf Spot was ranked as a high priority in VIC, QLD & TAS and as a moderate priority in WA, NSW & TAS. This disease is seed borne and can survive in crop trash. Disease free seeds and seedlings are essential for preventing the spread of this disease.							
Chlorothalonil (Bravo) PER82895	M5	Protective	14 NG	A	ALL	Permitted for use in parsley (field) for control of Downy Mildew, *Botrytis*, *Alternaria* & **Cercospora**. [Max. no. of applications not specified; re-treatment interval 7-14 d]	R3
Propiconazole PER80977	3	Protective	14 NG	A	ALL (excl. VIC)	Permitted for use in parsley (field & protected) for control of Septoria Spot, ***Cercospora* spp.**, Rusts, Powdery Mildew. [Max. 2 applications per crop; re-treatment interval 14 d]	R3

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Difenoconazole (Score) Syngenta PER87973	3	Protective	7 NG	A	ALL (excl. VIC)	Permitted for use in parsley (field & protected) for control of **Cercospora Leaf Spot** & Alternaria Leaf Spot. [Max 3 applications; 2 consecutive; re-treatment interval 7 d]	R3
Petroleum Oil	UN	Contact		P-A		Permitted for use in parsley (field & protected) for control of Aphids, Green Mirid, Green Vegetable Bug, Grey Cluster Bug, Leafhopper, Mites, Rutherglen Bug & Thrips. Registered in bananas for control of **Cercospora Leaf Spot.**	-
Azoxystrobin + Difenoconazole (Amistar Top) Syngenta	11+3	Protective & Curative		P		Registered in carrots for control of *Alternaria,* ***Cercospora*** and Powdery Mildew; *Alternaria* and *Phytophthora* in potatoes; *Alternaria, Phytophthora, Sclerotinia* and Powdery Mildew in tomatoes. Hort Innovation Project ST17000 - Azoxystrobin + difenconazole (Amistar Top) Groups 3+11 in parsley for Alternaria leaf blight. Completed and data provided in October 2020 to Syngenta for a label extension.	R3
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protective		P		Registered for control of Yellow Sigatoka, Leaf Speckle and Cordana Leaf Spot in bananas. US registration for control of ***Cercospora*** in brassica leafy greens and okra.	R3
Hydrogen Peroxide + Peroxyacetic Acid (Peratec Plus)	M	Contact		P		Registered for control of **Cercospora Leaf Spot** in celery**.**	-
Metiram (Polyram) BASF	M3	Protective		P		Registered for control of **Cercospora Leaf Spot** in beans, fruiting vegetables and carrots.	R2
Pydiflumetofen + Fludioxonil (Miravis Prime) Syngenta	7+12	Protective & Curative		P		Registration pending for control of *Botrytis*, *Alternaria*, Powdery Mildew & Anthracnose in berries. US registration for control of **Cercospora** in brassicas, carrots, cucurbits, stalk vegetables and root and tuber vegetables.	R3
Zineb	M3	Protectant		P		Registered for control of **Cercospora Leaf Spot** in cauliflower and cabbages**.**	R2

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Septoria Leaf Spot (*Septoria petroselini*) **Priority: High**							
Septoria Spot was ranked as a high priority in QLD, NSW & TAS and as a moderate priority in VIC, WA & SA. Septoria spot is weather dependent, and it is an issue when cool and wet conditions set in. It is considered more of an autumn and winter issue. The fungus survives in several ways: it can survive on the old leaves removed at harvest, on weeds, and as spores on seed. The use of drip irrigation is recommended rather than sprinklers.							
Mancozeb PER80538	M3	Protective	14	A	ALL (excl. VIC)	Permitted for use in parsley (field) for control of Anthracnose and ***Septoria***. [Max 8 sequential treatments; re-treatment interval 7 d]	R2
Propiconazole PER80977	3	Protective	14 NG	A	ALL (excl. VIC)	Permitted for use in parsley (field & protected) for control of **Septoria Spot**, *Cercospora* spp., Rusts, Powdery Mildew. [Max. 2 applications per crop; re-treatment interval 14 d]	R3
Copper	M1	Protective		P		Registered for control of **Septoria Leaf Spot** in celery, parsnip and tomato.	-
Dimethomorph (Acrobat) BASF	40	Curative & Protective		P		Registered for the control of **Septoria Leaf Spot** in head varieties of lettuce.	-
Florylpicoxamid (Adavelt) Corteva	21	Curative & Protective		P		New Mode of Action fungicide being developed in AU. Corteva claim activity on ***Septoria***. Scheduled for JMPR evaluation in 2023.	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protective		P		Registered for control of Yellow Sigatoka, Leaf Speckle and Cordana Leaf Spot in bananas. US registration for control of ***Septoria*** in dry and succulent beans and pistachio.	R3
Metiram (Polyram) BASF	M3	Protective		P		Registered for the control of **Septoria Leaf Spot** in lettuce.	R2

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Sclerotinia Rot (*Sclerotinia sclerotiorum*) **Priority: High**							
Sclerotinia Rot was ranked as a high priority in QLD and as a moderate priority in VIC, WA, NSW, SA & TAS. Sclerotinia tends to be a problem at canopy closure, particularly if plants have sustained mechanical injuries. Managing this issue would include general farm hygiene, crop rotation, planting space (to allow air movement) and the use of protectant and curative fungicide spray applications when conditions favour disease outbreaks. Correct timing and good penetration of foliage are essential for effective control.							
Dazomet (Basamid, Cerlong)	8F	Fumigant	NR	A	ALL	Registered as a pre-plant fumigant in seed beds for control of soil fungi including *Pythium*, *Phytophthora*, ***Sclerotinia***, *Sclerotium*, *Rhizoctonia*, *Verticillium*, *Plasmodiophora*, *Armillaria* and *Fusarium* spp. Apply granules to the soil surface and incorporate and seal the soil surface immediately. Do not plant into soil until a positive germination test has been conducted.	-
Iprodione (Rovral) PER81589	2	Curative & Protective	7 NG	A	ALL	Permitted for use in parsley (field) for control of **Sclerotinia Rot** and Grey Mould (*Botrytis* spp.) [Max. 3 applications per crop; re-treatment interval not specified]	R2
Metham Sodium	-	Fumigant	NR	A	ALL	Registered in food crops as a pre-plant fumigant for control of fungus diseases including *Rhizoctonia*, *Pythium*, *Fusarium*, *Phytophthora*, *Verticillium*, ***Sclerotinia*** and Club Root of crucifers. Applied as a soil injection, soil surface spray in front of a rotary tiller or through approved trickle irrigation systems.	-
Boscalid (Filan) BASF	7	Systemic		P		Registered for the control of **Sclerotinia Rot** in brassica vegetables.	-
Cyprodinil + Fludioxonil (Switch) Syngenta	9+12	Curative & Protective		P		Registered for control of ***Sclerotinia*** in several vegetable crops including leafy vegetables, peas, beans and lettuce.	R3
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protective		P		Registered for control of Yellow Sigatoka, Leaf Speckle and Cordana Leaf Spot in bananas. US registration for control of ***Sclerotinia*** in brassica leafy greens and sunflower.	R3
NUL3446	TBC			P		In development from Nufarm with activity on ***Sclerotinia* spp.**	**-**

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Aureobasidium pullulans (Botector) Nufarm	-	Biological		P		Botector Fungicide (*Aureobasidium pullulans*) has recently been registered for uses in fruiting vegetables for Botrytis and suppression of Sclerotinia.	
Damping Off (*Pythium* spp.*, Phytophthora* spp.*, Fusarium* spp.*, Rhizoctonia* spp.) **Priority: Moderate**							
Damping Off was ranked as a high priority in VIC and as a moderate priority in QLD, WA, NSW, SA & TAS. The disease attacks seedlings at the 1-2 leaf stage, causing water-soaked lesions on the stem and roots. Severe infections can cause stunting and yellowing in older crops. Registered fungicide treatments are limited for control although it is expected that seed treatments will assist, and good on-farm sanitation is recommended.							
1,3-Dichloropropene + Chloropicrin (Telone C-35)	8B	General pre-plant soil fumigation	NR	A	ALL	Registered in vegetables for control of soil borne diseases. Leave soil undisturbed for 14 d after treatment. ***For use by professional and registered fumigators only.***	-
Chloropicrin (Agrocelhone NE Soil Fumigant)	8	General pre-plant soil fumigation	NR	A	ALL	It is registered as a general fumigant to control Nematodes, insects***, Pythium, Phytophthora, Fusarium,*** and ***Verticillium***. Do not plant for 10 d after soul treatment. ***For use by professional and registered fumigators only.***	-
Cyazofamid (Ranman) UPL PER89216	21	Protectant	3	A	ALL (excl. VIC)	Permitted for use in parsley (field) for control of Phytophthora Root Rot. Apply the first treatment at the base of the plant at transplanting and then as foliar after 7 d. [Max. 6 applications per crop; re-treatment interval 7 d]	-
Dazomet (Basamid, Cerlong)	8F	Fumigant	NR	A	ALL	Registered as a pre-plant fumigant in seed beds for control of soil fungi including ***Pythium, Phytophthora***, *Sclerotinia*, *Sclerotium*, ***Rhizoctonia,*** *Verticillium*, *Plasmodiophora*, *Armillaria* and ***Fusarium*** spp. Apply granules to the soil surface and incorporate and seal the soil surface immediately. Do not plant into soil until a positive germination test has been conducted.	-
Metalaxyl-M (Ridomil Gold 480 SL & 480EC) Syngenta PER83797	4	Protective	NR	A	ALL (excl. VIC)	Permitted for use in parsley (field) for control of ***Pythium*** Root Rot and ***Phytophthora*** Root Rot. [Max. 1 applications per crop]	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Metham Sodium	-	Fumigant	NR	A	ALL	Registered in food crops as a pre-plant fumigant for control of fungus diseases including ***Rhizoctonia***, ***Pythium***, *Fusarium*, ***Phytophthora***, *Verticillium*, *Sclerotinia* and Club Root of crucifers. Applied as a soil injection, soil surface spray in front of a rotary tiller or through approved trickle irrigation systems.	-
Phosphorous Acid PER13698	33	Curative	1	A	ALL (excl. VIC)	Permitted for use in parsley (field) for control of **Pythium Root Rot** & **Phytophthora Root Rot**. [Max. no. of applications and re-treatment interval not specified]	-
Sulphur + Mancozeb	M2+M3	Protective	7	A	ALL	Registered in seedlings (general) for the control **Damping Off**. [Max no. of applications not specified; re-treatment interval 10 d]	R2
Bacillus amyloliquefaciens Strain QST 713 (Serenade Prime Soil Ameliorant and Biofungicide) Bayer	BM 02	Biological	NR	P-A	ALL	Registered in vegetables for application to soil to improve bioavailability of soil resources to horticultural crops.	-
Azoxystrobin + Difenoconazole (Amistar Top) Syngenta	11+3	Protective & Curative		P		Registered for control of *Alternaria*, *Cercospora* and Powdery Mildew in carrots; *Alternaria* and ***Phytophthora*** in potatoes; *Alternaria*, ***Phytophthora***, *Sclerotinia* and Powdery Mildew in tomatoes. Hort Innovation Project ST17000 data generation in parsley for control of Alternaria Leaf Blight. Completed and data provided in October 2020 to Syngenta for a label extension.	R3
Bacillus amyloliquefaciens strain MBI 600 (Serifel) BASF	BM 02	Biological		P		Registered for control of *Botrytis* in grapes and strawberries. US registration for control of *Pythium* spp., ***Phytophthora* spp., *Fusarium* spp., *Rhizoctonia* spp.** in peppers.	-
Fludioxonil + Sedaxane (Vibrance Premium) Syngenta	7+12	Protective		P		Registered for control of Black Scurf (***Rhizoctonia***) in potatoes. Hort Innovation is pursuing studies to control ***Rhizoctonia*** in beetroot.	R3

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protective		P		Registered for control of Yellow Sigatoka, Leaf Speckle and Cordana Leaf Spot in bananas. US registration for suppression of ***Rhizoctonia*** in brassica leafy greens and control of ***Rhizoctonia*** in cucurbits.	R3
Fosetyl-Aluminium (Aliette) Bayer	33	Curative		P		Registered in apples, peaches, avocados & pineapples for control of ***Phytophthora*** **spp.**	-
Metalaxyl-M (Ridomil Gold 25G) Syngenta	4	Protective & Curative		P		Registered for control of **Damping Off** in broccoli, brussel sprouts, cabbage, capsicum or pepper, carrot, cauliflower, cucurbit and tomato. MT18018 is generating data to support a new minor use permit for control of **Damping Off** in beetroot.	-
NUL3163 Nufarm	TBC			P		New active in development from Nufarm with activity on ***Fusarium, Pythium*** *&* ***Rhizoctonia*****.**	-
Amisulbrom Amishield 500WG Fungicide Nufarm	21			P		Nufarm Amishield 500WG Fungicide (amisulbrom) is now registered for use in brassica vegetables against Club root and damping off (Pythium spp. & Phytophthora spp.) (suppression) and potatoes (pink rot and powdery scab).	
Streptomyces lydicus WYEC108 (Actinovate) Novozymes Bioag	BM02	Biological		P		Registered for control of ***Phytophthora*** in strawberries and tomato and as a seed treatment for control of **Pythium, *Fusarium*** and ***Rhizoctonia*** in vegetables.	-
Thiophanate-Methyl + Etridiazole (Banrot)	1+14	Protective & Curative		P		Registered in container grown ornamentals and in ground bedding plants as a post plant soil drench for control of ***Pythium*****, *Phytophthora*****, *Rhizoctonia*** and *Thielaviopsis*.	-
Thiram + Thiabendazole (P-Pickel T)	1+M3	Protective & Curative		P		Registered as a seed dressing in field & garden peas for control of Black Spot (*Mycosphaerella pinodes*) & Seedling Root Rots (***Fusarium, Pythium*** & *Macrophomina* spp.)	R2

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Downy Mildew (*Plasmopara petroselini*) **Priority: Moderate**							
Downy Mildew was ranked as a moderate priority in QLD, WA, SA & TAS and as a low priority in VIC & NSW. Characterised by a white downy fungal growth that develops on the underside of the leaf, Downy mildew comes up every season. Warm, moist weather favours the spread of the disease. Managing this issue would include general farm hygiene, crop rotation, planting space (to allow air movement) and the use of protectant and curative fungicide spray applications when conditions favour disease outbreaks.							
Chlorothalonil (Bravo) PER82895	M5	Protective	14 NG	A	ALL	Permitted for use in parsley (field) for control of **Downy Mildew**, *Botrytis*, *Alternaria* & Cercospora. [Max. no. of applications not specified; re-treatment interval 7-14 d]	R3
Mancozeb + Dimethomorph (Mancozeb+ Acrobat) PER14958	M3+40	Protective	14 NG	A	ALL (excl. VIC)	Permitted for use in parsley (field & protected) for control of **Downy Mildew** and Alternaria Leaf Spot. [Max. 2 applications per crop; re-treatment interval 7-10 d]	R2
Phosphorous Acid (Agri-Fos)	33	Curative		P-A		Permitted for use in parsley (field) for control of Pythium Root Rot & Phytophthora Root Rot. Registered in grapes for control of **Downy Mildew**.	-
Cyazofamid (Ranman) UPL PER89216	21	Protectant	3	P-A	ALL (excl. VIC)	Permitted for use in parsley (field) for control of Phytophthora Root Rot. Apply the first treatment at the base of the plant at transplanting and then as foliar after 7 d. [Max. 6 applications per crop; re-treatment interval 7 d]. Ranman registered for control of Downy Mildew in Basil, Nursery stock, Brassica and Brassica leafy seedlings.	-
Acibenzolar-S-Methyl (Actigard Plant Activator) Syngenta	P01	Protective		P		Registered for suppression of Powdery Mildew in tomatoes. Registered in the USA for the control of **Downy Mildew** in brassica vegetables.	-
Azoxystrobin + Oxathiapiprolin (Orondis Flexi) Syngenta	11+49	Protective & Curative		P		Registered for control of **Downy Mildew** in onions.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Dimethomorph + Ametoctradin (Zampro) AgNova	45+40	Protective		P		Registered for control of **Downy Mildew** in grape vines. US registration for control of **Downy Mildew** in various vegetables including parsley (Leafy Vegetable Group). Hort Innovation projects ST16006 and ST17000 generated data for a label registration for Bulb Onions, Spring onions, Leafy vegetables including head lettuce and brassica leafy vegetables, Beetroot & Cucurbits. Label extension due by the end of 2021.	-
Fluopicolide + Propamocarb (Infinito) Bayer	28+43	Protective & Curative		P		Registered for control of **Downy Mildew** in various vegetable crops and poppies.	-
Hydrogen Peroxide + Peroxyacetic Acid (Peratec Plus)	M	Contact		P		Registered for control of **Downy Mildew** in brassica vegetables, bulb vegetables and grapes**.**	-
Mandipropamid (Revus) Syngenta	40	Protective		P		Registered for control of **Downy Mildew** in grapes, lettuce, leafy vegetables and oilseed poppies.	-
Metalaxyl-M + Mancozeb (Ridomil Gold MZ) Syngenta	4+M3	Protective & Curative		P		Registered for control of **Downy Mildew** in cucurbits, grapes, lettuce, onions, ornamentals, poppies and rhubarb.	-
Oxathiapiprolin (Zorvec Enicade) Corteva	49	Protective & Curative		P		Registered for control of **Downy Mildew** in bulb vegetables, brassicas, cucurbits, leafy vegetables and poppies.	-
Fluoxapiprolin Bayer	TBC			P		Bayer has sought registration of fluoxapiprolin for Downy mildew control in grapes.	

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Anthracnose (*Colletotrichum* spp.) **Priority: Moderate**							
Anthracnose was ranked as a moderate priority in QLD, WA & SA and as a low priority in VIC, NSW & TAS. It requires both pre- and post-harvest treatments. This fungus can be seed-borne and carry over on crop residue in the soil. It is spread in water droplets and worse in warm, humid weather. It is thought that protectants that target Downy Mildew and Botrytis will have some effect and post-harvest treatments would afford protection as well. Regular spraying and orchard hygiene are important to prevent crop damage.							
Mancozeb PER80538	M3	Protective	14	A	ALL (excl. VIC)	Permitted for use in parsley (field) for control of **Anthracnose** & Septoria. [Max 8 sequential treatments; re-treatment interval 7 d]	R2
Aureobasidium pullulans (Botector) Nufarm	-	Biological		P		Registered for suppression of **Anthracnose** in grapes and berries. Botector Fungicide (*Aureobasidium pullulans*) has recently been registered for uses in fruiting vegetables for Botrytis and suppression of Sclerotinia.	-
Bacillus amyloliquefaciens (Serenade Opti) Bayer	BM 02	Biological		P		Registered for control of **Anthracnose** in avocado and several tropical fruits. US registration for control of **Anthracnose**, *Alternaria* and *Botrytis* in herbs/spices and *Sclerotinia* spp. in Parsley and other leafy vegetables.	-
Dimethomorph + Mancozeb (Acrobat WDG) BASF	40+M3	Protective		P		Registered for the control of Downy Mildew, **Anthracnose** and Septoria Leaf Spot in head varieties of lettuce.	R2
Florylpicoxamid (Adavelt) Corteva	21	Protective & Curative		P		New Mode of Action fungicide being developed in AU. Corteva claim activity on **Anthracnose**. Scheduled for JMPR evaluation in 2023.	-
Fludioxonil + Cyprodinil (Switch) Syngenta	12+9	Protective & Curative		P		Registered for control of **Anthracnose** in lettuce, nursery stocks, ornamentals and strawberries.	R3
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protective		P		Registered for control of Yellow Sigatoka, Leaf Speckle and Cordana Leaf Spot in bananas. US registration for control of **Anthracnose** in almonds and tree nuts.	R3

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Fluopyram + Trifloxystrobin (Luna Sensation) Bayer	7+11	Protective & Curative		P		Registered for the control of **Anthracnose** in tropical and sub-tropical fruit.	-
Fluxapyroxad + Pyraclostrobin (Merivon) BASF	7+11	Protective & Curative		P		Registered in almonds for control of ***Colletotrichum* spp.** US registration for control of **Anthracnose** in parsley.	**-**
Prochloraz (Octave) FMC	3	Protective & Curative		P		Registered for control of **Anthracnose** in leafy/open head lettuce (field only) prior to transplantation.	-
Pydiflumetofen + Fludioxonil (Miravis Prime) Syngenta	7+12	Protective & Curative		P		Registration pending for control of *Botrytis, Alternaria*, Powdery Mildew & **Anthracnose** in berries.	R3
Bacterial Leaf Blight (*Xanthomonas* spp.) **Priority: Moderate**							
Bacterial Leaf Blight was ranked as a high priority in VIC. The bacterium may be introduced in seed or in surviving undecomposed crop residue or other host plants. Bacteria spread in water splash during wet, windy weather or by overhead irrigation. It can also disperse on insects, or on people or equipment moving through the crop. Applications of copper may reduce disease spread.							
Acibenzolar-S-Methyl (Actigard Plant Activator) Syngenta	P01	Protective	3	P	ALL	Registered for suppression of Bacterial Spot ***(Xanthamonas campestris)***, Bacterial Speck and Bacterial Canker in tomatoes. US registration for the suppression of **Black Rot** *(Xanthamonas campestris)* in brassica vegetables.	-
Bacillus amyloliquefaciens (Serenade Opti) Bayer	BM 02	Biological	NR	P	ALL	Registered for control of ***Xanthomonas*** in tomato, capsicum, chilli. US registration for control of *Sclerotinia* spp. in parsley and other leafy vegetables.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Copper	M1	Protective		P		Registered in beans for control of Common blight (***Xanthomonas*** *campestris pv. Phaseoli)*, Halo blight (*Pseudomonas syringae pv. Phaseasiolicola*) and Bacterial brown spot (*Pseudomonas syringae pv. Syringae*).	-
Bacterial Leaf Spot (*Pseudomonas syringae* pv*. apii*) **Priority: Moderate**							
Bacterial Leaf Spot was ranked as a moderate priority in QLD. *P. syringae* can be moved by wind, rain, and transportation via nursery material. Mechanical equipment and pruning tools may be a frequently overlooked means of dispersal. Cultural management, host resistance, biological control with microbial antagonists would help in controlling this disease.							
Bacillus amyloliquefaciens (Serenade Opti) Bayer	BM 02	Biological		P		Registered for suppression of **Bacterial Spot** in capsicum, chilli and tomato. US registration for control of Anthracnose, *Alternaria* and *Botrytis* in herbs/spices and *Sclerotinia* spp. in Parsley and other leafy vegetables.	-
Copper	M1	Protective		P		Registered for control of Angular Leaf Spot and **Bacterial Leaf Spot** in cucumber.	-
Rust (*Puccinia menthae*) **Priority: Low**							
Rust was ranked as a moderate priority in VIC and as a low priority in QLD, WA, NSW, SA & TAS. Rusts are plant diseases caused by pathogenic fungi which are essentially parasitic in their behaviour. Although not fatal, they can severely limit growth & fruiting ability.							
Propiconazole (Tilt) PER80977	3	Protective	14 NG	A	ALL (excl. VIC)	Permitted for use in parsley (field & protected) for control of Septoria Spot, *Cercospora* spp., **Rusts**, Powdery Mildew. [Max. 2 applications per crop; re-treatment interval 14 d]	R3
Sulphur	UN	Protective	NR	A	VIC, TAS, SA & WA	Registered in vegetables for control of Powdery Mildew, **Rust**, Tomato Russet Mite and Bean Spider Mite (NSW only) and Two-Spotted Mite. [Max no. of applications not specified; re-treatment interval 14-21 d]	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protective		P		Registered for control of Yellow Sigatoka, Leaf Speckle and Cordana Leaf Spot in bananas. US registration for control of **Rust** in bulb vegetables and dry and succulent beans.	R3

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Powdery Mildew (*Erysiphe heraclei*) **Priority: Low**							
Powdery Mildew was ranked as a moderate priority in QLD and as a low priority in VIC, WA, NSW, SA & TAS. The characteristic white, powdery growth occurs on plants infected by this fungus. Photosynthetic efficiency is reduced in affected leaves and fruit can be scarred and damaged, causing produce to be downgraded. Severe outbreaks can cause defoliation, exposing fruit to sunburn and predisposing them to secondary rots.							
Potassium Bicarbonate (Eco-Carb) PER13695	M2	Protective	NR	A	ALL (excl. VIC)	Permitted for use in herbs (field & protected) for control of **Powdery Mildew.** [Max. no. of applications not specified; re-treatment interval: 10-14 d]	-
Propiconazole (Tilt) PER80977	3	Protective	14 NG	A	ALL (excl. VIC)	Permitted for use in parsley (field & protected) for control of Septoria Spot, *Cercospora* spp., Rusts, **Powdery Mildew**. [Max. 2 applications per crop; re-treatment interval 14 d]	R3
Sulphur	UN	Protective	NR	A	VIC, TAS, SA & WA	Registered in vegetables for control of **Powdery Mildew**, Rust, Tomato Russet Mite and Bean Spider Mite (NSW only) and Two-Spotted Mite. [Max no. of applications not specified; re-treatment interval 14-21 d]	-
ADM1700F Adama	TBC			P		Fungicide in development from Adama with **Powdery Mildew** activity.	-
Azoxystrobin + Difenoconazole (Amistar top) Syngenta	3+11	Protective & curative		P		Registered in carrots for control of *Alternaria*, *Cercospora* and Powdery mildew; *Alternaria* and *Phytophthora* in potatoes; *Alternaria*, *Phytophthora*, *Sclerotinia* and **Powdery Mildew** in tomatoes. Hort Innovation Project ST17000 data generation in parsley for control of Alternaria Leaf Blight. Completed and data provided in October 2020 to Syngenta for a label extension.	R3
BLAD (Problad Plus)	BM 01	Biological		P		Registered in stone fruit for control of Brown Rot and Blossom Blight. US registration pending in several crops for control of a variety of fungal diseases including *Botrytis* and **Powdery Mildew**.	-
Bupirimate (Nimrod)	8	Protective & Curative		P		Registered in eggplant for control of **Powdery Mildew**.	-
Cyflufenamid (Flute) AgNova	U6	Protective & Curative		P		Registered in strawberries and strawberry runners for control of **Powdery Mildew**.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Florylpicoxamid (Adavelt) Corteva	21	Protective & Curative		P		New Mode of Action fungicide being developed in AU. Corteva claim activity on **Powdery Mildew**. Scheduled for JMPR evaluation in 2023.	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protective		P		Registered for control of Yellow Sigatoka, Leaf Speckle and Cordana Leaf Spot in bananas. US registration for control of **Powdery Mildew** in almonds, cucurbits, grapes, hops, dry and succulent beans, stone fruit and sunflowers.	R3
Fluopyram + Trifloxystrobin (Luna Sensation) Bayer	7+11	Protective		P		Registered for control of **Powdery Mildew** in apples.	-
Hydrogen Peroxide + Peroxyacetic Acid (Peratec Plus)	M	Contact		P		Registered for control of **Powdery Mildew** in fruiting vegetables and cucurbits.	-
Isofetamid (Kenja) ISK / AgNova	7	Protective & Curative		P		Registered for control of Botrytis Grey Mould in berries. US registration for control of Grey Mould, **Powdery Mildew** and Anthracnose in low-growing berries.	-
Isopyrazam (Seguris) Syngenta	7	Protective		P		Registered for control of **Powdery Mildew** in apples.	-
NUL3195 Nufarm	TBC			P		Fungicide in development from Nufarm with activity on **Powdery Mildew** and *Botrytis*.	-
Penthiopyrad (Fontelis) Corteva	7	Protective & Curative		P		Registered for control of **Powdery Mildew**, Grey Mould & Early Blight in fruiting vegetables.	-
Pydiflumetofen + Fludioxonil (Miravis Prime) Syngenta	7+12	Protective & Curative		P		Registration pending for control of *Botrytis, Alternaria*, **Powdery Mildew** & Anthracnose in berries. US registration for suppression of Grey Mould in fruiting vegetables.	R3
Pyriofenone (Kusabi) ISK	50	Protective		P		Registered for control of **Powdery Mildew** in cucurbits and grapes.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Grey Mould (*Botrytis cinerea*) **Priority: Low**							
Grey Mould was ranked as a low priority in VIC, QLD, WA, NSW, SA & TAS. *Botrytis* spp. which causes Grey mould can affect plants at most stages of production. Affected parts get rapidly covered with a thick grey mould. *Botrytis* also causes secondary rots on fruit and vegetables in storage or transit and in the marketplace.							
Chlorothalonil (Bravo) PER82895	M5	Protective	14 NG	A	ALL	Permitted for use in parsley (field) for control of Downy Mildew, ***Botrytis*****,** *Alternaria* & Cercospora. [Max. no. of applications not specified; re-treatment interval 7-14 d]	R3
Iprodione (Rovral) PER81589	2	Curative & Protective	7 NG	A	ALL	Permitted for use in parsley (field) for control of Sclerotinia Rot and **Grey Mould** (*Botrytis* spp.) [Max. 3 applications per crop; re-treatment interval not specified]	R2
Aureobasidium pullulans (Botector) Nufarm	-	Biological		P		Registered for control of ***Botrytis*** in grapes and berries and suppression of several other fungal pathogens (Anthracnose, *Phomopsis* and *Rhizopus*) in berries. Botector Fungicide (*Aureobasidium pullulans*) has recently been registered for uses in fruiting vegetables for Botrytis and suppression of Sclerotinia.	-
Bacillus amyloliquefaciens (Serifel) BASF	BM 02	Biological		P		Registered for control of ***Botrytis*** in grapes and strawberries.	-
Bacillus amyloliquefaciens (Serenade Opti) Bayer	BM 02	Biological		P		Registered for control of ***Botrytis*** in tomato, capsicum, chilli & several fruits. Registered in US for control of various fungal diseases in a range of fruits and vegetables.	-
BLAD (Problad Plus)	BM 01	Biological		P		Registered in stone fruit for control of Brown Rot and Blossom Blight. US registration pending in several crops for control of a variety of fungal diseases including ***Botrytis*** and Powdery Mildew.	-
Boscalid (Filan) BASF	7	Protective		P		Registered in grapevines and onions for control of ***Botrytis***.	-
DC-126 Bayer	TBC			P		New product from Bayer with **Botrytis** activity.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Fenpyrazamine (Prolectus) Sumitomo	17	Protectant & Curative		P		Registered for control of ***Botrytis*** in grapes.	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protective		P		Registered for control of Yellow Sigatoka, Leaf Speckle and Cordana Leaf Spot in bananas. US registration for control of ***Botrytis*** in almonds, brassica leafy greens, bulb vegetables, grapes, hops, pistachio and stone fruit.	R3
Fluopyram + Trifloxystrobin (Luna Sensation) Bayer	7+11	Protective & Curative		P		Registered for the control of ***Botrytis*** in almonds and stone fruit.	-
Fenpyrazamine (Prolectus) Sumitomo	17	Protective & Curative		P		Registered for ***Botrytis*** control in grapes.	-
Florylpicoxamid (Adavelt) Corteva	21	Protective & Curative		P		New Mode of Action fungicide being developed in Australia. Corteva claims activity on ***Botrytis***. Scheduled for JMPR evaluation in 2023.	-
NUL3195 Nufarm	TBC			P		New product from Nufarm with ***Botrytis*** activity.	-
Penthiopyrad (Fontelis) Corteva	7	Protective		P		Registered for control of **Grey Mould** in cucurbits and leafy vegetables.	-
Pydiflumetofen + Fludioxonil (Miravis Prime) Syngenta	7+12	Protective & Curative		P		Registration pending in Australia for control of ***Botrytis****, Alternaria*, Powdery Mildew & Anthracnose in berries. US registration for suppression of **Grey Mould** in fruiting vegetables.	R3
SYNCUF29 Syngenta	TBC			P		New product from Syngenta with **Botrytis** activity.	-

4.2 Insects, mites and other pests of parsley

4.2.1 Insects, mites and other pest priorities

Common name	Scientific name
High	
Vegetable Leaf Hoppers	*Austroasca viridigrisea*
Moderate	
Rutherglen Bug	*Nysius vinitor*
Jassids	Cicadellidae
Green Peach Aphid	*Myzus persicae*
Cluster Caterpillar	*Spodoptera litura*
Cotton Bollworm / Corn Earworm	*Helicoverpa armigera*
Native Budworm	*Helicoverpa punctigera*
Plague Thrips	*Thrips imaginis*
Melon Thrips	*Thrips palmi*
Western Flower Thrips	*Frankliniella occidentalis*
Silverleaf Whitefly	*Bemisia tabaci*
Greenhouse Whitefly	*Trialeurodes vaporariorum*
Root Knot Nematode	*Meloidogyne* spp.
Low	
Snails and Slugs	*Helix* spp.
Redlegged Earth Mite	*Halotydeus destructor*
African Black Beetle	*Heteronychus arator*
Grasshoppers	Orthoptera
Light Brown Apple Moth	*Epiphyas postvittana*
Mealybugs	Pseudococcidae
Onion Maggot	*Delia antiqua*
Vegetable Weevil	*Listroderes difficilis*
Wireworm / False Wireworm	*Elaterinae* spp. / *Tenebrionidae* spp.

Exotic pests and new incursions which could be potential threats are listed below:

Common Name	Scientific name
Fall Armyworm	*Spodoptera frugiperda*
Vegetable Leafminer	*Liriomyza sativae*
Serpentine Leafminer	*Liriomyza huidobrensis*
American serpentine leaf miner	*Liriomyza trifolii*

Resistance Management

There are several insecticide management strategies that apply to vegetables on the CropLife website[4].

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

[4] www.croplife.org.au/resources/programs/resistance-management/

4.2.2 Available and potential products for high 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
Vegetable Leaf Hoppers (*Austroasca viridigrisea*) **Priority: High**								
Vegetable Leaf Hoppers were ranked as a high priority in QLD, as a moderate priority in VIC & NSW as a low priority in WA, SA & TAS. Adult and nymph leafhoppers suck sap and inject toxins. Some leafhopper species transmit diseases such as viruses and phytoplasmas. Perimeter sprays may be an option to minimise vector transmission.								
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars, Earwigs, Whitefly, Thrips and **Leafhoppers**. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH Bee:H	-
Petroleum Oil PER12221	UN	Contact	1	A	ALL (excl. VIC)	Permitted for use in parsley (field & protected) for control of Aphids, Green Mirid, Green Vegetable Bug, Grey Cluster Bug, **Leafhopper**, Mites, Rutherglen Bug & Thrips. [Max. no. of applications and re-treatment interval not specified]	VL Bee:L	-
Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Thrips, Caterpillars, **Leafhoppers**, and Whitefly. [Max no. of applications not specified; re-treatment interval: 7 d]	VH Bee:H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C	Ingestion / IGR		P		Registered for control of various bugs, fruit fly and scale in avocado, citrus, grapes, macadamia and mango. Hort Innovation project ST16006 generating data to enable registration in Tropical and Sub-Tropical Fruits (inedible peel) for control of Spotting Bugs, **Hoppers**, Scale and Mealybug.	M Bee:M	R2
Buprofezin (Applaud) Corteva	16	Ingestion / IGR		P		Registered for control of **Leafhoppers** in citrus.	M Bee:L	-
Flupyradifurone (Sivanto) Bayer	4D	Contact & Ingestion		P		US registration for control of **Leafhoppers** in brassica vegetables. Bayer label extension submitted in October 2020 to include whitefly in cucurbits, eggplant, peppers, green beans, potatoes, sweet potatoes, and aphids in cucurbits, potatoes.	L Bee:VL	-
NUL3445 Nufarm	TBC			P		New product in development from Nufarm with activity on Lepidoptera, Bugs, Beetles/Weevils, Fruit Fly and Thrips.		-
Sulfoxaflor (Transform) Corteva	4C	Contact & Ingestion		P		Registered in various crops for control of Aphids, Bugs, Mealybug, Greenhouse Whitefly and Scale. US registration for control of **Leafhoppers** in berries, pome fruit and root and tuber vegetables.	M Bee:VH	-
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2023 for Thrips, Bugs, Mites and Caterpillars.	-	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Rutherglen Bug (*Nysius vinitor*) **Priority: Moderate**								
Rutherglen Bug was ranked as a moderate priority in VIC, QLD, WA, NSW, SA & TAS. In cropping areas RGB breed on weeds, moving to available crops or weeds when hosts die off. It is important to monitor crops for eggs and nymphs by regular field scouting. Repeated influxes of migrating adults can make repeat insecticide applications necessary. Large numbers can cause significant feeding damage to foliage by sucking the sap and depleting the crop of nutrients. Nymph movement around the plant may also limit pesticide contact, so insecticides with higher residual values may be more effective in these situations.								
Lambda-Cyhalothrin (Karate Zeon) PER80975	3A	Contact	7	A	ALL (excl. VIC)	Permitted for use in parsley (field and protected) for control of Redlegged Earth Mite, **Rutherglen Bug**, Grey Cluster Bug, Looper, Plague Thrips and Onion Thrips. [Max 2 applications per crop; re-treatment interval not specified]	VH Bee:H	-
Methomyl (Lannate) PER82428	1A	Contact	3	A	ALL	Permitted for use in parsley (field) for control of *Helicoverpa* spp., Cabbage Moth, Cucumber Moth, Cluster Caterpillar, Looper, Webworm, **Rutherglen Bug** & Thrips including Western Flower Thrips. [Max 3 applications per crop; Re-treatment interval not specified]	H Bee:H	R2
Petroleum Oil PER12221	UN	Contact	1	A	ALL (excl. VIC)	Permitted for use in parsley (field & protected) for control of Aphids, Green Mirid, Green Vegetable Bug, Grey Cluster Bug, Leafhopper, Mites, **Rutherglen Bug** & Thrips. [Max. no. of applications and re-treatment interval not specified]	VL Bee:L	-
Trichlorfon (Lepidex)	1B	Contact	2	A	ALL	Registered in vegetables for control Of Cabbage White Butterfly, Cabbage Moth, Green Vegetable Bug and **Rutherglen Bug.** [Apply at first sight of infestation re-treatment interval: 7-10 d]	H Bee:VH	R2
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C	Ingestion / IGR		P		Registered for control of various bugs, fruit fly and scale in avocado, citrus, grapes, macadamia and mango.	M Bee:M	R2
Flonicamid (Mainman) ISK/UPL	29	Ingestion		P		Registered for control of Aphids and Silverleaf Whitefly in cucurbits. US registration for control of Aphids, **Plant Bugs**, Tomato Psyllids and Greenhouse Whitefly in fruiting vegetables.	M Bee:L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Flupyradifurone (Sivanto) Bayer	4D	Contact & Ingestion		P		Registered in macadamia for control Of Macadamia Lace Bug, Banana Spotting Bug, Fruit Spotting Bug & suppression of Scirtothrips. Bayer label extension submitted in October 2020 to include whitefly in cucurbits, eggplant, peppers, green beans, potatoes, sweet potatoes, and aphids in cucurbits, potatoes.	L Bee:VL	-
NUL3445 Nufarm	TBC			P		Product in development from Nufarm with activity on Caterpillars, Fruit Flies, **Bugs,** Beetles and Thrips.	-	-
Sulfoxaflor (Transform) Corteva	4C	Contact & Ingestion		P		Registered for control of Rutherglen Bug in brassica vegetables, cotton, cucurbits, fruiting vegetables, leafy vegetables and tuber vegetables.	M Bee:VH	-
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2023 for Thrips, **Bugs**, Mites and Caterpillars.	-	-
Jassids (Cicadellidae) **Priority: Moderate**								
Jassids were ranked as a moderate priority in VIC, QLD & NSW and as a low priority in WA, SA & TAS. Adult and nymph leafhoppers suck sap and inject toxins. Some leafhopper species transmit diseases such as viruses and phytoplasmas. Perimeter sprays may be an option to minimise vector transmission.								
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars, Earwigs, Whitefly, Thrips and **Leafhoppers**. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH Bee:H	-
Petroleum Oil PER12221	UN	Contact	1	A	ALL (excl. VIC)	Permitted for use in parsley (field & protected) for control of Aphids, Green Mirid, Green Vegetable Bug, Grey Cluster Bug, **Leafhopper**, Mites, Rutherglen Bug & Thrips. [Max. no. of applications and re-treatment interval not specified]	VL Bee:L	-
Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Thrips, Caterpillars, **Leafhoppers**, and Whitefly. [Max no. of applications not specified; re-treatment interval: 7 d]	VH Bee:H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C	Ingestion / IGR		P		Registered for control of various bugs, fruit fly and scale in avocado, citrus, grapes, macadamia and mango. Hort Innovation project ST16006 generating data to enable registration in Tropical and Sub-Tropical Fruits (inedible peel) for control of Spotting Bugs, **Hoppers**, Scale and Mealybug.	M Bee:M	R2
Buprofezin (Applaud) Corteva	16	Ingestion / IGR		P		Registered for control of **Leafhoppers** in citrus.	M Bee:L	-
Flupyradifurone (Sivanto) Bayer	4D	Contact & Ingestion		P		US registration for control of **Leafhoppers** in brassica vegetables. Bayer label extension submitted in October 2020 to include whitefly in cucurbits, eggplant, peppers, green beans, potatoes, sweet potatoes, and aphids in cucurbits, potatoes.	L Bee:VL	-
NUL3445 Nufarm	TBC			P		New product in development from Nufarm with activity on Lepidoptera, Bugs, Beetles/Weevils, Fruit Fly and Thrips.		-
Sulfoxaflor (Transform) Corteva	4C	Contact & Ingestion		P		Registered in various crops for control of Aphids, Bugs, Mealybug, Greenhouse Whitefly and Scale. US registration for control of **Leafhoppers** in berries, pome fruit and root and tuber vegetables.	M Bee:VH	-
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2023 for Thrips, Bugs, Mites and Caterpillars.	-	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Green Peach Aphid (*Myzus persicae*) **Priority: Moderate**								
Green Peach Aphid were ranked as a moderate priority in QLD, WA, NSW, SA & TAS and as a low priority in VIC. Green Peach Aphid suck on sap, causing loss of vigour, and in some cases yellowing, stunting or distortion of plant parts. Honeydew secreted by the insects can cause sooty mould to develop on leaves. Aphids can also be vectors for viruses.								
Afidopyropen (Versys) BASF	9D	Ingestion	1	A	ALL	Registered in parsley for suppression of Silverleaf Whitefly (*Bemisia tabaci* Biotype B) and control of **Green Peach Aphid**. [Max 4 applications per crop; re-treatment interval not specified]	L Bee:L	-
Beauveria bassiana (Velifer) BASF	UN	Biological	NR	A	ALL	Registered in protected vegetables and ornamentals for suppression of various pests including: Western Flower Thrips, Onion Thrips, Greenhouse Whitefly, Silverleaf Whitefly, Sweet Potato Whitefly, **Green Peach Aphid** & Two-Spotted Spider Mites. [Max. 3 application per crop; re-treatment interval 3-14 d]	L Bee:L	-
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, **Aphids**, Caterpillars, Earwigs, Whitefly, Thrips and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH Bee:H	-
Petroleum Oil PER12221	UN	Contact	1	A	ALL (excl. VIC)	Permitted for use in parsley (field & protected) for control of **Aphids**, Green Mirid, Green Vegetable Bug, Grey Cluster Bug, Leafhopper, Mites, Rutherglen Bug & Thrips. [Max. no. of applications and re-treatment interval not specified]	VL Bee:L	-
Potassium Salts of Fatty Acids (Natrasoap)	-	Contact	NR	A	ALL	Registered in vegetables for control of **Aphids**, Thrips, Mealybug, Two Spotted Mites, Spider Mite, and Whitefly. Apply when temperatures are cooler. [Max no. of applications not specified; re-treatment interval 5-7 d]	L Bee:L	-
Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, **Aphids**, Thrips, Caterpillars, Leaf hoppers, and Whitefly. [Repeat spray weekly, if required]	VH Bee:H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Spirotetramat (Movento) Bayer	23	Ingestion	3	A	ALL	Registered in herbs (field and protected) for control of **Green Peach Aphid**, Cotton Aphid, Western Flower Thrips, Tomato Thrips and Plague Thrips. [Max 3 applications per crop; re-treatment interval 7 d]	M Bee:VL	-
Cyantraniliprole (Benevia) FMC	28	Ingestion		P		Registered for control of **Green Peach Aphid** in potatoes and strawberries and suppression of **Green Peach Aphid** in fruiting vegetables.	M Bee:VH	-
Flonicamid (Mainman) ISK/UPL	29	Ingestion		P		Registered for control of **Green Peach Aphid** in cucurbits and potato.	M Bee:L	-
Flupyradifurone (Sivanto) Bayer	4D	Contact & Ingestion		P		US registration for control of **Aphids** in brassica vegetables, berries, cereal grains, citrus, cotton, cucurbits, fruiting vegetables, hops, leafy vegetables, legume vegetables, peanuts, pome fruit, root vegetables, tree nuts and tuberous and corm vegetables. Bayer label extension submitted in October 2020 to include whitefly in cucurbits, eggplant, peppers, green beans, potatoes, sweet potatoes, and aphids in cucurbits, potatoes.	L Bee:VL	-
Novaluron + Acetamiprid (Cormoran) Adama	15+4A	Ingestion / IGR		P		Registered for control of **Green Peach Aphid** in stone fruit.	M Bee:M	R2
Pymetrozine (Chess) Syngenta	9B	Contact & Ingestion		P		Registered for control of **Green Peach Aphid** in almonds, tuber vegetables, brassica vegetables, fruiting vegetables, leafy vegetables, pistachio, potato and stone fruit.	L Bee:VL	R3
Sulfoxaflor (Transform) Corteva	4C	Contact & Ingestion		P		Registered for control of **Green Peach Aphid** in various crops.	M Bee:VH	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Dimpropyridaz (Axalion™ Insecticide) BASF	TBC			P		BASF applied in January 2021 to register a new insecticide Axalion™ Insecticide (dimpropyridaz), a pyrazole carboxamide with a novel mode of action, for the control of whitefly, aphid, and thrips in leafy vegetables, brassica vegetables, fruiting vegetables, including cucurbits. Pending regulatory approvals, BASF expects first market introductions in Australia of Axalion-based products by late 2022 or early 2023.		
Cluster Caterpillar (*Spodoptera litura*) **Priority: Moderate**								
Cluster Caterpillar was ranked as a moderate priority in QLD, WA, NSW & SA and as a low priority in VIC & TAS. Young larvae feed on the leaf surface. Cluster Caterpillars are controlled by most conventional pesticides targeting Helicoverpa.								
Bacillus thuringiensis subsp. kurstaki (DiPel)	11A	Biological	NR	A	ALL	Registered in vegetables for control of **Caterpillars**. [Apply a minimum of 2 sprays, 3 d apart; re-treatment interval 3-5 d]	VL Bee:L	-
Flubendiamide (Belt) Bayer	28	Ingestion	3 NG	A	ALL	Registered in herbs (field and protected) for control of Diamondback Moth, Cabbage White Butterfly, **Cluster Caterpillar** and *Helicoverpa***.** [Max 3 applications per crop; re-treatment interval 7-14 d]	L-M Bee:L	-
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, **Caterpillars**, Earwigs, Whitefly, Thrips and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH Bee:H	-
Spinetoram (Success Neo) Corteva	5	Ingestion		P-A		Registered in culinary herbs including parsley for control of Diamondback Moth, Loopers, Light Brown Apple Moth and *Helicoverpa*.	M Bee:H	-
Spinosad (Entrust Organic) Corteva	5	Ingestion		P-A		Registered in culinary herbs for control of Diamondback Moth, Loopers, Light Brown Apple Moth & *Helicoverpa*.	L Bee:L	-
Chlorfenapyr (Phantom) BASF	13	Contact & Ingestion		P		Registered for control of Diamondback Moth and Cabbage White Butterfly **(Lepidoptera)** in brassica vegetables.	H Bee:H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Clitorea ternatia extract (Sero-X) Innovate Ag	UN	Biological		P		Registered for control of *Helicoverpa* spp., Green Mirids and Silverleaf Whitefly in cotton and Diamondback moth in Brassicas. Innovate Ag applied in January 2021 to the APVMA seeking to add new uses against Silverleaf whitefly and thrips in brassicas and cucurbits to its Sero-X Insecticide label.	L Bee:L	-
Emamectin (Proclaim) Syngenta	6	Ingestion		P		Registered for control of **Cluster Caterpillar** and Heliothis in fruiting vegetables.	M Bee:H	-
Indoxacarb + Novaluron (Plemax) Adama	22A+15	Contact & Ingestion		P		Registered for control of *Helicoverpa* spp. and Tomato Leaf Miner (**Lepidoptera**) in fruiting vegetables.	M Bee:M	R3
Methoxyfenozide (Prodigy) Corteva	18	Insect Growth Regulator		P		Registered for control of **Native Budworm**, Tomato Grub and **Cluster Caterpillar** in fruiting vegetables.	VL Bee:VL	-
NUL3445 Nufarm	TBC			P		Product in development from Nufarm with activity on **Caterpillars**, Fruit Flies, Bugs, Beetles and Thrips.	-	-
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2023 for Thrips, Bugs, Mites and Caterpillars.	-	-
Cotton Bollworm / Corn Earworm (*Helicoverpa armigera*) **Native Budworm** (*Helicoverpa punctigera*) **Priority: Moderate**								
Helicoverpa was ranked as a moderate priority in QLD, NSW & SA and as a low priority in VIC, WA & TAS. *Helicoverpa armigera* is generally regarded as the more serious pest because of its greater capacity to develop resistance to insecticides, broader host range, and persistence in cropping areas from year to year. Larvae feed on leaves but are most damaging when feeding on growing terminals, buds, flowers & fruit. Damage also occurs through bud/fruit shedding and reduced quality.								
Flubendiamide (Belt) Bayer	28	Ingestion	3 NG	A	ALL	Registered in herbs (field and protected) for control of Diamondback Moth, Cabbage White Butterfly, Cluster Caterpillar and ***Helicoverpa*.** [Max 3 applications per crop; re-treatment interval 7-14 d]	L-M Bee:L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Bacillus thuringiensis subsp. kurstaki (DiPel)	11A	Biological	NR	A	ALL	Registered in vegetables for control of Armyworm, Cabbage Moth, Cabbage White Butterfly, Green Looper, Lightbrown Apple Moth, Pear Looper, Soybean Looper, Vine Moth, and Tobacco Looper & ***Helicoverpa* spp.** Most effective on larvae < 8 mm. [Apply a minimum of 2 sprays, 3 d apart; re-treatment interval 3-5 d]	VL Bee:L	-
Methomyl (Lannate) PER82428	1A	Contact	3	A	ALL	Permitted for use in parsley (field) for control of ***Helicoverpa* spp.**, Cabbage Moth, Cucumber Moth, Cluster Caterpillar, Looper, Webworm, Rutherglen Bug & Thrips including Western Flower Thrips. [Max 3 applications per crop; Re-treatment interval not specified]	H Bee:H	R2
Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Aphids, Thrips, **Caterpillars**, Ants, Flies, Earwigs, Whitefly and Leafhoppers. [Max no. of applications not specified; Re-treatment interval: 7 d]	VH Bee:H	-
Spinetoram (Success Neo) Corteva	5	Ingestion	1	A	ALL	Registered in culinary herbs including parsley for control of Diamondback Moth, Loopers, Light Brown Apple Moth and ***Helicoverpa*.** [Max 4 applications per crop; re-treatment interval: 7-14 d]	M Bee:H	-
Spinosad (Entrust Organic)	5	Ingestion	3 G:14	A	ALL	Registered in culinary herbs including parsley for control of Diamondback Moth, Loopers, Light Brown Apple Moth & ***Helicoverpa***. [Max. 4 applications per crop; re-treatment interval 7-14 d]	L Bee:L	-
Chlorfenapyr (Phantom) BASF	13	Contact & Ingestion		P		Registered for control of Diamondback Moth and Cabbage White Butterfly **(Lepidoptera)** in brassica vegetables.	H Bee:H	-
Clitorea ternatia extract (Sero-X) Innovate Ag	UN	Biological		P		Registered for control of *Helicoverpa* spp., Green Mirids and Silverleaf Whitefly in cotton and Diamondback moth in Brassicas. Innovate Ag applied in January 2021 to the APVMA seeking to add new uses against Silverleaf whitefly and thrips in brassicas and cucurbits to its Sero-X Insecticide label.	L Bee:L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Emamectin (Proclaim) Syngenta	6	Ingestion		P		Registered for control of Cluster Caterpillar and **Heliothis** in fruiting vegetables.	M Bee:H	-
Indoxacarb + Novaluron (Plemax) Adama	22A+15	Contact & Ingestion		P		Registration pending for control of Lepidoptera including ***Helicoverpa* spp.** in various crops.	M Bee:M	R3
Methoxyfenozide (Prodigy) Corteva	18	Insect Growth Regulator		P		Registered for control of **Native Budworm**, Tomato Grub and Cluster Caterpillar in fruiting vegetables.	VL Bee:VL	-
NUL3445 Nufarm	TBC			P		Product in development from Nufarm with activity on **Caterpillars**, Fruit Flies, Bugs**,** Beetles and Thrips.	-	-
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2023 for Thrips, Bugs, Mites and Caterpillars.	-	-
Melon Thrips *(Thrips palmi)* **Plague Thrips** *(Thrips imaginis)* **Priority: Moderate**								
Thrips were ranked as a moderate priority in QLD, NSW & TAS and as a low priority in VIC, WA & SA. It can be difficult to distinguish between thrips species in the field. It is important to use different insecticide modes of action to prevent the development of resistance. MT16009 IPM Project Recommends: The use of predatory thrips, mites & bug releases, control flowering weeds, mulch and use of certified seed.								
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars, Earwigs, Whitefly, **Thrips** and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH Bee:H	-
Lambda-Cyhalothrin (Karate Zeon) PER80975	3A	Contact	7	A	ALL (excl. VIC)	Permitted for use in parsley (field and protected) for control of Redlegged Earth Mite, Rutherglen Bug, Grey Cluster Bug, Looper, **Plague Thrips** and Onion Thrips. [Max 2 applications per crop; re-treatment interval not specified]	VH Bee:H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Methomyl (Lannate) PER82428	1A	Contact	3	A	ALL	Permitted for use in parsley (field) for control of *Helicoverpa* spp., Cabbage Moth, Cucumber Moth, Cluster Caterpillar, Looper, Webworm, Rutherglen Bug & **Thrips** including Western Flower Thrips. [Max 3 applications per crop; Re-treatment interval not specified]	H Bee:H	R2
Petroleum Oil PER12221	UN	Contact	1	A	ALL (excl. VIC)	Permitted for use in parsley (field & protected) for control of Aphids, Green Mirid, Green Vegetable Bug, Grey Cluster Bug, Leafhopper, Mites, Rutherglen Bug & **Thrips**. [Max. no. of applications and re-treatment interval not specified]	VL Bee:L	-
Potassium Salts of Fatty Acids (Natrasoap)	-	Contact	NR	A	ALL	Registered in vegetables for control of Aphids, **Thrips**, Mealybug, Two Spotted Mites, Spider Mite, and Whitefly. Apply when temperatures are cooler. [Max no. of applications not specified; re-treatment interval 5-7 d]	L Bee:L	-
Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Aphids, **Thrips**, Caterpillars, Ants, Flies, Earwigs, Whitefly and Leafhoppers. [Max no. of applications not specified; Re-treatment interval: 7 d]	VH Bee:H	-
Spirotetramat (Movento) Bayer	23	Ingestion	3	A	ALL	Registered in herbs (field and protected) for control of Green Peach Aphid, Cotton Aphid, Western Flower Thrips, Tomato Thrips and **Plague Thrips**. [Max 3 applications per crop; re-treatment interval 7 d]	M Bee:VL	-
Beauveria bassiana (Velifer) BASF	UN	Biological	NR	P-A	ALL	Registered in protected vegetables and ornamentals for suppression of various pests including: Western Flower Thrips, Onion Thrips, Greenhouse Whitefly, Silverleaf Whitefly, Sweet Potato Whitefly, Green Peach Aphid & Two-Spotted Spider Mites.	L Bee:L	-
Spinetoram (Success Neo) Corteva	5	Ingestion	1	P-A	ALL	Registered in culinary herbs including parsley for control of Diamondback Moth, Loopers, Light Brown Apple Moth and *Helicoverpa*. Registered for control of Western Flower Thrips in beans, berries, brassica vegetables, cotton, cucurbits, fruiting vegetables, leafy vegetables, legume vegetables, pome fruit, stone fruit and sweet corn.	M Bee:H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Spinosad (Entrust Organic) Corteva	5	Ingestion		P-A		Registered in culinary herbs for control of Diamondback Moth, Loopers, Light Brown Apple Moth & *Helicoverpa*. Registered in fruiting vegetables for control of Western Flower Thrips.	L Bee:L	-
Cyantraniliprole (Benevia) FMC	28	Ingestion		P		Registered for suppression of **Plague Thrips** in potatoes and strawberries, and for suppression of various thrips species including Onion Thrips, Tomato Thrips and Western Flower Thrips in bulb vegetables, fruiting vegetables and cucurbits.	M Bee:VH	-
Flupyradifurone (Sivanto) Bayer	4D	Contact & Ingestion		P		Registered in macadamia for control of Macadamia Lace Bug, Banana Spotting Bug, Fruit Spotting Bug and suppression of Scirtothrips. Label extension submitted in October 2020 to include whitefly in cucurbits, eggplant, peppers, green beans, potatoes, sweet potatoes, and aphids in cucurbits, potatoes.	L Bee:VL	-
Imidacloprid (Confidor) Bayer	4A	Ingestion		P		Registered in eggplant for control of **Melon Thrips** and Green Peach Aphid.	M Bee:M	R2
NUL3445 Nufarm	TBC			P		Product in development from Nufarm with activity on Caterpillars, Fruit Flies, Bugs, Beetles and **Thrips**.	-	-
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2023 for Thrips, Bugs, Mites and Caterpillars.	-	-
Dimpropyridaz (Axalion™ Insecticide) BASF	TBC			P		BASF applied in January 2021 to register a new insecticide Axalion™ Insecticide (dimpropyridaz), a pyrazole carboxamide with a novel mode of action, for the control of whitefly, aphid, and thrips in leafy vegetables, brassica vegetables, fruiting vegetables, including cucurbits. Pending regulatory approvals, BASF expects first market introductions in Australia of Axalion-based products by late 2022 or early 2023.		

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Western Flower Thrips (*Frankliniella occidentalis*) **Priority: Moderate**								
Western Flower Thrips were ranked as a moderate priority in QLD, WA & NSW and as a low priority in VIC, SA & TAS. WFT develop resistance more easily than other thrips species. It is a vector for many viruses including TSWV. (Tomato spotted wilt virus). Identification of the correct species is important prior to treatment. Resistance is an ongoing issue and virus transmission with thrip infestations are a concern for industry. IPM Recommendations include: The use of predatory thrips, mites & bug releases, control flowering weeds, mulch and use of certified seed.								
Beauveria bassiana (Velifer) BASF	UN	Biological	NR	A	ALL	Registered in protected vegetables and ornamentals for suppression of various pests including: **Western Flower Thrips,** Onion Thrips, Greenhouse Whitefly, Silverleaf Whitefly, Sweet Potato Whitefly, Green Peach Aphid & Two-Spotted Spider Mites. [Max. 3 application per crop; re-treatment interval 3-14 d]	L Bee:L	-
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars, Earwigs, Whitefly, **Thrips** and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH Bee:H	-
Methomyl (Lannate) PER82428	1A	Contact	3	A	ALL	Permitted for use in parsley (field) for control of *Helicoverpa* spp., Cabbage Moth, Cucumber Moth, Cluster Caterpillar, Looper, Webworm, Rutherglen Bug & Thrips including **Western Flower Thrips**. [Max 3 applications per crop; Re-treatment interval not specified]	H Bee:H	R2
Petroleum Oil PER12221	UN	Contact	1	A	ALL (excl. VIC)	Permitted for use in parsley (field & protected) for control of Aphids, Green Mirid, Green Vegetable Bug, Grey Cluster Bug, Leafhopper, Mites, Rutherglen Bug & **Thrips**. [Max. no. of applications and re-treatment interval not specified]	VL Bee:L	-
Potassium Salts of Fatty Acids (Natrasoap)	-	Contact	NR	A	ALL	Registered in vegetables for control of Aphids, **Thrips**, Mealybug, Two Spotted Mites, Spider Mite, and Whitefly. Apply when temperatures are cooler. [Max no. of applications not specified; re-treatment interval 5-7 d]	L Bee:L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Aphids, **Thrips**, Caterpillars, Ants, Flies, Earwigs, Whitefly and Leafhoppers. [Max no. of applications not specified; Re-treatment interval: 7 d]	VH Bee:H	-
Spirotetramat (Movento) Bayer	23	Ingestion	3	A	ALL	Registered in herbs (field and protected) for control of Green Peach Aphid, Cotton Aphid, **Western Flower Thrips**, Tomato Thrips and Plague Thrips. [Max 3 applications per crop; re-treatment interval 7 d]	M Bee:VL	-
Spinetoram (Success Neo) Corteva	5	Ingestion	1	P-A	ALL	Registered in culinary herbs including parsley for control of Diamondback Moth, Loopers, Light Brown Apple Moth and *Helicoverpa*. Registered for control of **Western Flower Thrips** in beans, berries, brassica vegetables, cotton, cucurbits, fruiting vegetables, leafy vegetables, legume vegetables, pome fruit, stone fruit and sweet corn.	M Bee:H	-
Spinosad (Entrust Organic) Corteva	5	Ingestion		P-A		Registered in culinary herbs for control of Diamondback Moth, Loopers, Light Brown Apple Moth & *Helicoverpa*. Registered for control of **Western Flower Thrips** in fruiting vegetables.	L Bee:L	-
Abamectin	6	Contact & systemic		P		Registered in eggplant for control of Two-Spotted Mite and **Western Flower Thrips**. [Max. 2 consecutive applications per crop; re-treatment interval 28 d]	M Bee:H	-
Cyantraniliprole (Benevia) FMC	28	Ingestion		P		Registered for suppression of **Western Flower Thrips** in fruiting vegetables, cucurbits and strawberries.	M Bee:VH	-
Flonicamid (Mainman) ISK/UPL	29	Ingestion		P		Registered for control of Aphids and Silverleaf Whitefly in cucurbits; Aphids in potatoes; Aphids and Mealybugs in apples and pears; Aphids and Mirids in Cotton. ST17000 is generating data to support a minor use permit for **Thrips** control in bulb vegetables.	M Bee:L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact & Ingestion		P		Registered in macadamia for control of Macadamia Lace Bug, Banana Spotting Bug, Fruit Spotting Bug and suppression of Scirtothrips. Label extension submitted in October 2020 to include whitefly in cucurbits, eggplant, peppers, green beans, potatoes, sweet potatoes, and aphids in cucurbits, potatoes.	L Bee:L	-
NUL3445 Nufarm	TBC			P		Product in development from Nufarm with activity on Caterpillars, Fruit Flies, Bugs, Beetles and **Thrips**.	-	-
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2023 for Thrips, Bugs, Mites and Caterpillars.	-	-
Dimpropyridaz (Axalion™ Insecticide) BASF	TBC			P		BASF applied in January 2021 to register a new insecticide Axalion™ Insecticide (dimpropyridaz), a pyrazole carboxamide with a novel mode of action, for the control of whitefly, aphid, and thrips in leafy vegetables, brassica vegetables, fruiting vegetables, including cucurbits. Pending regulatory approvals, BASF expects first market introductions in Australia of Axalion-based products by late 2022 or early 2023.		
Silverleaf Whitefly *(Bemisia tabaci)* **Greenhouse Whitefly** *(Trialeurodes vaporariorum)* **Priority: Moderate**								
Whitefly was ranked as a moderate priority in QLD & WA and as a low priority in VIC, NSW, SA & TAS. High reproduction rate and short generation time result in large numbers that can retard plants simply through feeding.								
Afidopyropen (Versys) BASF	9D	Ingestion	1	A	ALL	Registered in parsley for suppression of **Silverleaf Whitefly** (*Bemisia tabaci* Biotype B) and control of Green Peach Aphid. [Max 4 applications per crop; re-treatment interval not specified].	L Bee:L	-
Emulsifiable Botanical Oil (Eco-Oil)	-	Contact	NR	A	ALL	Registered in vegetables for control of **Greenhouse Whitefly**. [max 3 application per crop; re-treatment interval 3-5 d]	L Bee:L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Beauveria bassiana (Velifer) BASF	UN	Biological	NR	A	ALL	Registered in protected vegetables and ornamentals for suppression of various pests including: Western Flower Thrips, Onion Thrips, **Greenhouse Whitefly, Silverleaf Whitefly**, Sweet Potato Whitefly, Green Peach Aphid & Two-Spotted Spider Mites. [Max. 3 application per crop; re-treatment interval 3-14 d]	L Bee:L	-
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars, Earwigs, **Whitefly**, Thrips and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH Bee:H	-
Potassium Salts of Fatty Acids (Natrasoap)	-	Contact	NR	A	ALL	Registered in vegetables for control of Aphids, Thrips, Mealybug, Two Spotted Mites, Spider Mite, and **Whitefly**. Apply when temperatures are cooler. [Max no. of applications not specified; re-treatment interval 5-7 d]	L Bee:L	-
Spirotetramat (Movento) Bayer	23	Ingestion	3	P-A	ALL	Registered in herbs (field and protected) for control of Green Peach Aphid, Cotton Aphid, Western Flower Thrips, Tomato Thrips and Plague Thrips. Registered for control of **Silverleaf Whitefly** in brassica vegetables, fruiting vegetables, cotton, cucurbits, peas, potatoes and seet potato.	M Bee:VL	-
Buprofezin (Applaud) Corteva	16	Ingestion / IGR		P		Registered for control of **Silverleaf Whitefly** in cotton and **Silverleaf Whitefly** and **Greenhouse Whitefly** in tomato.	M Bee:L	-
Clitoria ternatea Extract (Sero-X) Growth Agriculture	-	Biological		P		Registered for control of *Helicoverpa* spp., Green Mirids and Silverleaf Whitefly in cotton and Diamondback moth in Brassicas. Innovate Ag applied in January 2021 to the APVMA seeking to add new uses against **Silverleaf whitefly** and thrips in brassicas and cucurbits to its Sero-X Insecticide label.	L Bee:VL	-
Cyantraniliprole (Benevia) FMC	28	Ingestion		P		Registered for control of **Silverleaf Whitefly** in fruiting vegetables, cucurbits and potatoes.	M Bee:VH	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Flonicamid (Mainman) ISK/UPL	29	Ingestion		P		Registered for control of **Silverleaf Whitefly** in cucurbits.	M Bee:L	-
Flupyradifurone (Sivanto) Bayer	4D	Contact & Ingestion		P		Registered in macadamia for control of Macadamia Lace Bug, Banana Spotting Bug, Fruit Spotting Bug and suppression of Scirtothrips. Label extension submitted in October 2020 to include whitefly in cucurbits, eggplant, peppers, green beans, potatoes, sweet potatoes, and aphids in cucurbits, potatoes.	L Bee:VL	-
NUL3145 Nufarm	TBC			P		New product in development from Nufarm with activity on Scale, Nematodes, Mealybug and **Whitefly**.	-	-
Pymetrozine (Chess) Syngenta	9B	Contact & Ingestion		P		Registered for suppression of **Silverleaf Whitefly** in brassica vegetables, fruiting vegetables and leafy vegetables.	L Bee:VL	R3
Pyriproxyfen (Admiral) Sumitomo	7C	Ingestion / IGR		P		Registered for control of **Silverleaf Whitefly** and **Greenhouse Whitefly** in fruiting vegetables.	VL Bee:L	-
Sulfoxaflor (Transform) Corteva	4C	Contact & Ingestion		P		Registered for control of **Greenhouse Whitefly** in various crops.	M Bee:VH	-
Dimpropyridaz (Axalion™ Insecticide) BASF	TBC			P		BASF applied in January 2021 to register a new insecticide Axalion™ Insecticide (dimpropyridaz), a pyrazole carboxamide with a novel mode of action, for the control of whitefly, aphid, and thrips in leafy vegetables, brassica vegetables, fruiting vegetables, including cucurbits. Pending regulatory approvals, BASF expects first market introductions in Australia of Axalion-based products by late 2022 or early 2023.		

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Redlegged Earth Mite (*Halotydeus destructor*) **Priority: Moderate**								
Redlegged Earth Mite was ranked as a moderate priority in TAS and as a low priority in VIC, QLD, WA, NSW & SA. REM Can cause minor leaf feeding damage to newly emerged crops. MT16009 IPM Project Recommends: Control broadleaf weed hosts (e.g. capeweed) in the season prior to planting.								
1,3-Dichloropropene + Chloropicrin (Telone C-35)	8B	Soil fumigant	NR	A	ALL	Registered in vegetables for control of **soil borne pests** including Nematodes. Leave soil undisturbed for 14 d after treatment. ***For use by professional and registered fumigators only.***	-	-
Lambda-Cyhalothrin (Karate Zeon) PER80975	3A	Contact	7	A	ALL (excl. VIC)	Permitted for use in parsley (field and protected) for control of **Redlegged Earth Mite**, Rutherglen Bug, Grey Cluster Bug, Looper, Plague Thrips and Onion Thrips. [Max 2 applications per crop; re-treatment interval not specified]	VH Bee:H	-
Root Knot Nematode (*Meloidogyne* spp.) **Priority: Moderate**								
Root Knot Nematodes were ranked as a moderate priority in VIC and as a low priority in QLD & WA. Root-Knot Nematodes (*Meloidogyne* spp.) are minute, worm-like animals that are quite common in soil. The juveniles hatch from eggs, move through the soil and invade roots near the root tip. Affected plants have an unthrifty appearance and often show symptoms of stunting, wilting or chlorosis (yellowing). Fumigation of soil and use of nematode free transplants would keep them in check.								
1,3-Dichloropropene + Chloropicrin (Telone C-35)	8B	Soil fumigant	NR	A	ALL (Restricted use TAS, VIC & SA)	Registered in vegetable crops for control of plant **parasitic nematodes**, symphylans, wireworms, soil borne diseases (including *Fusarium* and *Verticillium* wilts, *Rhizoctonia, Pythium*) and suppression of weeds. ***For use by professional and registered fumigators only.***	-	-
Dazomet (Basamid, Cerlong)	8F	Soil fumigant	NR	A	ALL	Registered in broadacre seed beds for control of soil fungi (including *Fusarium* spp.), **nematodes** (cyst and non-cyst forming), soil insects and germinating seeds of weeds.	-	-
Metham Sodium	-	Soil fumigant	NR	A	ALL	Registered for control of **nematodes**, various weeds & fungal diseases in field crops.	-	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Abamectin (Tervigo) Syngenta	6	Contact		P		Registered for control of **nematodes** in cucurbits and fruiting vegetables.	M Bee:H	-
Fluazaindolizine (Reklemel, Salibro) Corteva	New			P		Development underway in AU, to be launched globally in 2021. New MOA nematicide from Corteva.	-	-
Fluensulfone (Nimitz) Adama	-	Contact		P		Registered for control of **nematodes** in cucurbits and fruiting vegetables.	L Bee:L	-
Fluopyram (Velum) Bayer	7			P		Registration pending for control of **nematodes** in various crops. US registration for control of **nematodes** in a range of vegetables.	L Bee:L	-
NUL3145 Nufarm	TBC			P		New product in development from Nufarm with activity on Scale, **Nematodes**, Mealybug and Whitefly.		-
SYNSTN1 Syngenta	TBC			P		Nematicide in development from Syngenta.	-	-
Snails and Slugs (*Helix* spp.) **Priority: Low**								
Slugs and Snails were ranked as moderate in VIC, WA & TAS and as a low priority in QLD, NSW & SA. They are active after dusk when chemical treatments can be effective.								
Iron EDTA Complex	-	Contact & ingestion	NR	A	ALL	Registered in all plants for the control of **Snails and Slugs**. Spread pellets evenly on ground. [Max no. of applications and re-treatment not specified]	-	-
Metaldehyde	-	Contact & ingestion	7	A	ALL	Registered in vegetables for the control of **Snails and Slugs**. Spread pellets evenly on ground. [Max no. of applications and re-treatment not specified]	-	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
African Black Beetle (*Heteronychus arator*) **Priority: Low**								
African Black Beetle was ranked as a low priority in VIC, QLD, WA, NSW, SA & TAS. Larvae are soil dwelling and adults chew plants at or just beneath ground level and may chew right through the stem. There is a commercially available nematode (*Heterorhabditis zealandica*) for the biological control of African Black Beetle in turf and other high value crops. A new and promising biopesticide based on the naturally occurring bacterium *Yersinia entomophaga*, is being evaluated in New Zealand.								
Dazomet (Basamid, Cerlong)	8F	Soil fumigant	NR	A	ALL	Registered in various situations for control of soil fungi, Nematodes, **soil insects** and weeds. Soil moisture is essential for release of gas and plastic cover brings optimum results. See label for details.	-	-
NUL3445 Nufarm	TBC			P		Product in development from Nufarm with activity on Caterpillars, Fruit Flies, Bugs, **Beetles** and Thrips.	-	-
Tetraniliprole (Vayego) Bayer	28	Ingestion		P		Registered in Australia in Almonds, Macadamias, Pomefruit, and Stonefruit for various insect pests such as Fruit fly suppression, Carpophillus Beetles, Weevils & Lepidoptera. Hort Innovation has several projects underway towards assisting registration in vegetables including Root & Tuber and Stalk & Stem. Canadian registration for control of Cabbageworm, Diamondback Moth, Cutworms, Armyworms, Flea Beetles and suppression of Aphids and Cabbage Looper in leafy vegetables, including parsley.	M Bee:VH	
Grasshoppers (Orthoptera) **Priority: Low**								
Grasshoppers was ranked as a low priority in VIC, QLD, WA, NSW, SA & TAS. They have a voracious appetite and can cause severe damage to foliage if the numbers get high. Damage is limited to feeding on newly established plants and reducing plant populations.								
Chlorpyrifos (Lorsban)	1B	Contact		P-A		Permitted for use in parsley (field) for control of Vegetable Weevil. Registered in capsicum for control of Cutworms, Wingless **Grasshopper**, Field and Mole Crickets and Vegetable Weevils.	H Bee:H	R1

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Light Brown Apple Moth (*Epiphyas postvittana*) **Priority: Low**								
Light Brown Apple Moth was ranked as a low priority in VIC, QLD, WA, NSW, SA & TAS. They have a wide host range which includes many broadleaf weeds. It can be found infesting seedlings in cool seasons. Young larvae feed by tying terminal leaves together with webbing. Weed control will keep this pest in check.								
Bacillus thuringiensis subsp. kurstaki (DiPel)	11A	Biological	NR	A	ALL	Registered in vegetables for control of Caterpillars, including **Light Brown Apple Moth.** [Apply a minimum of 2 sprays, 3 d apart; re-treatment interval 3-5 d]	VL Bee:L	-
Spinetoram (Success Neo) Corteva	5	Ingestion	1	A	ALL	Registered in culinary herbs including parsley for control of Diamondback Moth, Loopers, **Light Brown Apple Moth** and *Helicoverpa*. [Max 4 applications per crop; re-treatment interval: 7-14 d]	M Bee:H	-
Spinosad (Entrust Organic)	5	Ingestion	3 G:14	A	ALL	Registered in culinary herbs including parsley for control of Diamondback moth, Loopers, **Light Brown Apple Moth** & *Helicoverpa*. [Max. 4 applications per crop; re-treatment interval 7-14 d]	L Bee:L	-
Flubendiamide (Belt) Bayer	28	Ingestion	3 NG	P-A	ALL	Registered in herbs (field and protected) for control of Diamondback Moth, Cabbage White Butterfly, Cluster Caterpillar and *Helicoverpa*.	L-M Bee:L	-
Emamectin (Proclaim) Syngenta	6	Ingestion		P		Registered for control of **Light Brown Apple Moth** in grapes and strawberries.	M Bee:H	-
NUL3445 Nufarm	TBC			P		Product in development from Nufarm with activity on **Caterpillars**, Fruit Flies, Bugs, Beetles and Thrips.	-	-
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2023 for Thrips, Bugs, Mites and Caterpillars.	-	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Mealybugs (Pseudococcidae) **Priority: Low**								
Mealybugs were ranked as a low priority in VIC, QLD, WA, NSW, SA & TAS. Mealybugs are small insects covered with a white mealy coating. The bugs feed by sucking on plant sap. Mealybugs excrete a sticky substance called honey dew which ants like to feed on. The honeydew also provides a perfect medium for sooty mould growth. If left uncontrolled, it can downgrade the quality of the produce.								
Potassium Salts of Fatty Acids (Natrasoap)	-	Contact	NR	A	ALL	Registered in vegetables for control of Aphids, Thrips, **Mealybug**, Two Spotted Mites, Spider Mite, and Whitefly. Apply when temperatures are cooler. [Max no. of applications not specified; re-treatment interval 5-7 d]	L Bee:L	-
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C			P		Registered for control of **Mealybugs** in grapes and macadamia.	M Bee:M	R2
Buprofezin (Applaud) Corteva	16	Insect Growth Regulator		P		Registered for control of **Mealybugs** in custard apple, grapes, citrus, passion fruit, pear & persimmons.	L Bee:L	-
Flonicamid (Mainman) ISK/UPL	29	Ingestion		P		Registered for control of **Mealybugs** in pome fruit.	M Bee:L	-
Flupyradifurone (Sivanto) Bayer	4D	Contact & Ingestion		P		US registration for control of **Mealybugs** in citrus and small fruit vine climbing (except fuzzy kiwifruit). Bayer label extension submitted in October 2020 to include whitefly in cucurbits, eggplant, peppers, green beans, potatoes, sweet potatoes, and aphids in cucurbits, potatoes.	L Bee:VL	-
NUL3145 Nufarm	TBC			P		Product in development from Nufarm with activity on Scale, Nematodes, **Mealybug** and Whitefly.	-	-
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2023 for Thrips, Bugs, Mites and Caterpillars.	-	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Onion Maggot (*Delia antiqua*) **Priority: Low**								
Onion Maggot was ranked as a low priority in VIC, QLD, WA, NSW & TAS. The larvae live beneath the soil and burrow into germinating seeds or the stems of young seedlings. Direct feeding damage results in reduced plant vigour and the wounds can become entry points for diseases.								
Diazinon PER82551	1B	Contact	21	A	ALL (excl. VIC)	Permitted for use in parsley & coriander (field) for control of **Onion Maggot**. [Max 1 application per crop]	H Bee:H	R3
Vegetable Weevil (*Listroderes difficilis*) **Priority: Low**								
Vegetable Weevil was ranked as a low priority in VIC, QLD, WA, NSW, SA & TAS. Can cause damage by tunnelling into leaves and reducing plant vigour. MT16009 IPM Project Recommends: Control broadleaf weed hosts (e.g. marshmallow) in the season prior to planting.								
Chlorpyrifos (Lorsban) PER14583	1B	Contact	70 NG	A	ALL (excl. VIC)	Permitted for use in parsley (field) for control of **Vegetable Weevil**. Apply within 2 d of transplanting. [Max. 1 application per crop]	H Bee:H	R1
Indoxacarb (Avatar eVo) FMC	22A	Contact & stomach		P		Registered for control of **Weevils** in pome and stone fruits.	M Bee:M	R3
NUL3445 Nufarm	TBC			P		Product in development from Nufarm with activity on Caterpillars, Fruit Flies, Bugs, **Beetles** and Thrips.	-	-
Tetraniliprole (Vayego) Bayer	28	Ingestion		P		Registered in Australia in Almonds, Macadamias, Pomefruit, and Stonefruit for various insect pests such as Fruit fly suppression, Carpophillus Beetles, Weevils & **Lepidoptera**. Hort Innovation has several projects underway towards assisting registration in vegetables including Root & Tuber and Stalk & Stem. Canadian registration for control of Cabbageworm, Diamondback Moth, Cutworms, Armyworms, Flea Beetles and suppression of Aphids and Cabbage Looper in leafy vegetables, including parsley.	M Bee:VH	

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Wireworm / False Wireworm (*Elateridea* spp*. / Tenebrionidae* spp.) **Priority: Low**								
Wireworms were ranked as a low priority in VIC, QLD, WA, NSW, SA & TAS. The larvae are soil-dwelling and will attack newly germinated seedlings by chewing the leaves and stems. This can lead to destruction of the whole plant.								
1,3-Dichloropropene + Chloropicrin (Telone C-35)	8B	Soil fumigant	NR	A	ALL	Registered in vegetables for control of soil borne pests. Leave soil undisturbed for 14 d after treatment. ***For use by professional and registered fumigators only.***	-	-
NUL3445 Nufarm	TBC			P		Product in development from Nufarm with activity on Caterpillars, Fruit Flies, Bugs, **Beetles** and Thrips.	-	-
Tetraniliprole (Vayego) Bayer	28	Ingestion		P		Registered in Australia in Almonds, Macadamias, Pomefruit, and Stonefruit for various insect pests such as Fruit fly suppression, Carpophillus Beetles, Weevils & **Lepidoptera**. Hort Innovation has several projects underway towards assisting registration in vegetables including Root & Tuber and Stalk & Stem. Canadian registration for control of Cabbageworm, Diamondback Moth, Cutworms, Armyworms, Flea Beetles and suppression of Aphids and Cabbage Looper in leafy vegetables, including parsley.	M Bee:VH	
Fall Armyworm (*Spodoptera frugiperda*) **New Pest to Australia (unknown priority)**								
Fall Armyworm was not ranked as a pest in parsley. 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 by regular field scouting. Target sprays against mature eggs and newly hatched larvae before pests become entrenched.								
Chlorantraniliprole (Coragen) FMC PER89353	28	Ingestion	3 NG	A	ALL (excl. VIC)	Permitted for use in parsley (field & protected) for control of **Fall Armyworm.** [Max. 3 applications per crop; 2 consecutive; re-treatment interval 7 d]	L Bee:VL	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Spinetoram (Delegate & Success Neo) Corteva PER89241	5	Contact & ingestion	3	A	ALL (excl. VIC)	Permitted for use in culinary herbs (field & protected) for control of **Fall Armyworm.** [Max. 4 applications per crop; re-treatment interval 7-14 d]	M Bee:H	-
Spinosad (Entrust Organic) Corteva PER89870	5	Contact & ingestion	3 G:14	A	ALL (excl. VIC)	Permitted for use in culinary herbs (protected cropping) for control of **Fall Armyworm**. [Max. 4 applications per season; re-treatment interval 7-14 d]	L Bee:L	-
Amorphous Silica (Abrade) Grow Choice	-	Contact		P		Registered for control of *Spodoptera* in fruiting vegetables and permitted for control of **Fall Armyworm** in sweet corn.	L Bee:L	-
Broflanilide (Vedira) BASF	30	Contact & ingestion		P		Registration submitted concurrently in Australia, Canada, USA, and Mexico as a soil application and seed treatment against chewing insects such as Ants, Cockroaches and ***Spodoptera*** spp. BASF are seeking registrations in amenity turf initially, then potential horticultural crops thereafter.	H Bee:VH	-
Emamectin (Proclaim) Syngenta	6	Ingestion		P			M Bee:H	-
NUL3445 Nufarm	TBC			P		Product in development from Nufarm with activity on Caterpillars, Fruit Flies, Bugs, Beetles and Thrips.	-	-
Spodoptera frugiperda Multiple Nucleopolyhedrovirus (Fawligen) AgBiTech	31	Biological		P		Permitted for control of **Fall Armyworm** in cereal grains, oilseed, pulses, fodder and forage crops, cotton, sweet corn, root and tuber vegetables, legume vegetables and ornamentals.	VL Bee:L	-
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2023 for Thrips, Bugs, Mites and Caterpillars.	-	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Leaf Miners (*Liriomyza* spp.) **Priority: Unknown**								
Leafminer was not ranked as a pest in celery. Dipteran leaf miners (*Liriomyza* spp.) are exotic pests that have recently been detected and become problematic in Australia. For example, the Serpentine leaf miner was first detected in the Sydney area in October 2020 and has since been found in crops in SE Qld. As a group they are destructive pests and can cause significant economic loss through reduced yields and quality when uncontrolled.								
Spinosad (Entrust Organic) PER90928	5	Ingestion	3 G:14	A	ALL (excl. VIC)	Permitted for use in culinary herbs, including parsley for control of **Liriomyza Leafminers**. [Max. 4 applications per crop; min. re-treatment interval 5 d]	L Bee:L	-
Spirotetramat (Movento) PER88640	23	Ingestion	1	A	ALL (excl. VIC)	Permitted for use in parsley (field & protected) for control of **Liriomyza Leafminers (*Liriomyza* spp.)** [Max. 3 applications per crop; re-treatment interval 7 d]	M Bee:VL	-
Chlorantraniliprole (Coragen) PER89353	28	Ingestion	3 NG	P-A	ALL (excl. VIC)	Permitted for use in parsley (field & protected) for control of Fall Armyworm. Permitted for control of **Liriomyza Leafminers** in spinach and silverbeet.	L Bee:VL	-
Spinetoram (Success Neo) Corteva	5	Ingestion	1	P-A	ALL	Registered in culinary herbs including parsley for control of Diamondback Moth, Loopers, Light Brown Apple Moth and *Helicoverpa*. Permitted for control of **Liriomyza Leafminers** in snow peas, sugar snap peas and green beans.	M Bee:H	-
Abamectin	6	Contact & Ingestion		P		Permitted for control of **Liriomyza Leafminers** in fruiting vegetables, cucurbits, leafy vegetables (except lettuce), legume vegetables, root and tuber vegetables, bulb onions, cabbage (head), celery and rhubarb and bulb vegetables.	M Bee:H	-
Cyromazine (Diptex 150 WP)	17	Insect Growth Regulator		P		Permitted for control of **Liriomyza Leafminers** in broccoli, fruiting vegetables, cucurbits, head lettuce, legume vegetables, root and tuber vegetables and stalk and stem vegetables.	L Bee:H	-
Cyantraniliprole (Benevia) FMC	28	Ingestion		P		Permitted for control of **Liriomyza Leafminers** in bulb vegetables, fruiting vegetables and potatoes.	M Bee:VH	-

4.3 Weeds in parsley

4.3.1 Weed priorities

Moderate priority weeds are:

Common Name	Scientific Name
Blackberry Nightshade	*Solanum nigrum*
Chickweed	*Stellaria media*
Fat Hen	*Chenopodium album*
Marshmallow	*Malva parviflora*
Nutgrass	*Cyperus rotundus*
Potato Weed	*Galinsoga* spp.
Wild Turnip	*Brassica* spp.
Amaranthus	*Amaranthus* spp.
Groundsel	*Senecio* spp.
Milk Thistle	*Sonchus* spp.
Grass Weeds	Various species

There were no weeds ranked as high priority in the most recent survey (2019), but several weeds were identified by a few regions as being of moderate priority. Management options include use of herbicides mentioned in Appendix 3 or by various management practices such as soil fumigation, pre-crop spraying, spot spraying, or using mechanical devices.

There are confirmed cases of resistance in Australia for Awnless Barnyard Grass (Group M at more than 200 sites), Feather Top Rhodes Grass (Group M at 4 sites) and Blackberry Nightshade (Group L at 2 sites).

Specific resistance management strategies for high resistance risk (A and B) and moderate resistance risk (C, D, F, G, I, J, K, L, M, N, Q and Z) herbicide modes of action are available on the CropLife Australia webpage[5].

[5] https://www.croplife.org.au/resources/programs/resistance-management/herbicide-resistance-management-strategies-2/

4.3.2 Available and potential products for weed control

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

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

Active ingredient (Trade Name)	Chem. Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Blackberry Nightshade (*Solanum nigrum*) **Priority: Moderate**							
Blackberry Nightshade was ranked as moderate priority in VIC, QLD & NSW. Prolific weed that is widely adapted and difficult to eradicate, mainly due to its long-term seed viability.							
Chlorthal-Dimethyl (Dacthal) PER14032	D**	Parsley / Pre-emergent	Permitted for use in parsley for control of various grass and broadleaf weeds including Amaranth, **Blackberry Nightshade**, Chickweed, Fat Hen, Pigweed, Ryegrass, Milk Thistle, Stinging Nettle & Winter Grass. Spray at times of transplanting. [Max. 1 application per crop]	NR G:85	A	ALL (excl. VIC)	-
Glyphosate (Roundup)	M**	General knockdown / Pre-crop spray	Registered for control of grass and broadleaf weeds as a pre-crop spray.	NR	A	ALL	R3

Active ingredient (Trade Name)	Chem. Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
S-Metolachlor (Dual Gold) Syngenta	K**	Parsley / Pre-emergent	Registered for use in parsley for control of various grass and broadleaf weeds including Amaranth, Common Sowthistle, **Blackberry Nightshade**, Chickweed, Fat Hen, Pigweed, Potato Weed, Annual Ryegrass, Italian Ryegrass, Winter Grass, Stinging Nettle & Wireweed. Spray at transplanting. [Max. 1 application per season]	56	A	ALL (excl. VIC)	-
Paraquat + Diquat (SpraySeed)	L***	General seed bed preparation / Post-emergent inter-row weed control	Registered for control of grass and broadleaf weeds as a pre-crop spray.	NR	A	ALL	R3
Isoxaflutole (Balance) Bayer	H**		Registered for control of grass and broadleaf weeds including **Blackberry Nightshade** in sugarcane, chickpeas & fallow situations.		P		
Oxyfluorfen (Goal)	G**		Registered for pre-emergent control of several broadleaf and grass weeds including **Blackberry Nightshade**.		P		-
Chickweed (*Stellaria media*) **Priority: Moderate**							
Chickweed was ranked as moderate priority in VIC, QLD & NSW. A low growing, winter annual weed that can continue growing all through summer. Targeting weeds prior to their flowering is critical.							
Chlorthal-Dimethyl (Dacthal) PER14032	D**	Parsley / Pre-emergent	Permitted for use in parsley for control of various grass and broadleaf weeds including Amaranth, Blackberry Nightshade, **Chickweed**, Fat Hen, Pigweed, Ryegrass, Milk Thistle, Stinging Nettle & Winter Grass. Spray at times of transplanting. [Max. 1 application per crop]	NR G:85	A	ALL (excl. VIC)	-
Glyphosate (Roundup)	M**	General knockdown / Pre-crop spray	Registered for control of grass and broadleaf weeds as a pre-crop spray.	NR	A	ALL	R3
S-Metolachlor (Dual Gold) Syngenta	K**	Parsley / Pre-emergent	Registered for use in parsley for control of various grass and broadleaf weeds including Amaranth, Common Sowthistle, Blackberry Nightshade, **Chickweed**, Fat Hen, Pigweed, Potato Weed, Annual Ryegrass, Italian Ryegrass, Winter Grass, Stinging Nettle & Wireweed. Spray at transplanting. [Max. 1 application per season]	56	A	ALL (excl. VIC)	-

Active ingredient (Trade Name)	Chem. Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Paraquat + Diquat (SpraySeed)	L***	General seed bed preparation / Post-emergent inter-row weed control	Registered for control of grass and broadleaf weeds as a pre-crop spray.	NR	A	ALL	R3
Norflurazon (Zoliar) AgNova	F**		Registered for control of grass and broadleaf weeds including **Chickweed** in asparagus, citrus, grapes, nuts, stone & pome fruits.		P		-
Phenmedipham (Betanal) Bayer	C**		Registered for control of broadleaf weeds including **Chickweed** in silverbeet.		P		R3
Fat Hen (*Chenopodium album*) **Priority: Moderate**							
Fat Hen was ranked as moderate priority in VIC, QLD & NSW. Herbicide control can be difficult and targeting weeds at early growth stages is critical.							
Chlorthal-Dimethyl (Dacthal) PER14032	D**	Parsley / Pre-emergent	Permitted for use in parsley for control of various grass and broadleaf weeds including Amaranth, Blackberry Nightshade, Chickweed, **Fat Hen**, Pigweed, Ryegrass, Milk Thistle, Stinging Nettle & Winter Grass. Spray at times of transplanting. [Max. 1 application per crop]	NR G:85	A	ALL (excl. VIC)	-
Glyphosate (Roundup)	M**	General knockdown / Pre-crop spray	Registered for control of grass and broadleaf weeds as a pre-crop spray.	NR	A	ALL	R3
S-Metolachlor (Dual Gold) Syngenta	K**	Parsley / Pre-emergent	Registered for use in parsley for control of various grass and broadleaf weeds including Amaranth, Common Sowthistle, Blackberry Nightshade, Chickweed, **Fat Hen**, Pigweed, Potato Weed, Annual Ryegrass, Italian Ryegrass, Winter Grass, Stinging Nettle & Wireweed. Spray at transplanting. [Max. 1 application per season]	56	A	ALL (excl. VIC)	-
Paraquat + Diquat (SpraySeed)	L***	General seed bed preparation / Post-emergent inter-row weed control	Registered for control of grass and broadleaf weeds as a pre-crop spray.	NR	A	ALL	R3

Active ingredient (Trade Name)	Chem. Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Norflurazon (Zoliar) AgNova	F**		Registered for control of grass and broadleaf weeds including **Fat Hen** in asparagus, citrus, grapes, nuts, stone & pome fruits.		P		-
Marshmallow (*Malva parviflora*) **Priority: Moderate**							
Marshmallow was ranked as a moderate priority VIC & QLD. Adapted to a wide variety of environments and highly competitive weed. Control with knockdown herbicides can be unreliable. Pre-crop spraying for weed control is an option. Management can be done by spot spraying and mechanical removal.							
Glyphosate (Roundup)	M**	General knockdown / Pre-crop spray	Registered for control of grass and broadleaf weeds as a pre-crop spray.	NR	A	ALL	R3
Paraquat + Diquat (SpraySeed)	L***	General seed bed preparation / Post-emergent inter-row weed control	Registered for control of grass and broadleaf weeds as a pre-crop spray.	NR	A	ALL	R3
Oxyfluorfen (Goal)	G**		Registered for pre-emergent control of several broadleaf and grass weeds including **Marshmallow**.		P		-
Chloridazon (Pyramin) BASF	C**		Registered for control of broadleaf weeds including **Marshmallow** in silverbeet and baby spinach leaf.		P		-
Nutgrass (*Cyperus rotundus*) **Priority: Moderate**							
Nutgrass was ranked as moderate priority in VIC & QLD. Prefers damp, water-logged soils but can survive for years underground during dry times. Herbicide options are limited and unreliable. Improve soil drainage if possible.							
Glyphosate (Roundup)	M**	General knockdown / Pre-crop spray	Registered for control of grass and broadleaf weeds as a pre-crop spray.	NR	A	ALL	R3
Norflurazon (Zoliar) AgNova	F**		Registered for control of grass and broadleaf weeds including **Nutgrass** in asparagus, citrus, grapes, nuts, stone & pome fruits.		P		-

Active ingredient (Trade Name)	Chem. Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Potato Weed (*Galinsoga* spp.) **Priority: Moderate**							
Potato Weed was ranked as moderate in VIC & NSW. Potato weed is spread via seed, producing several generations in one year that can remain dormant for some time. It forms a dense mat, outcompeting newly germinating crop seedlings. Cultivation is an option to supplement herbicide use.							
Glyphosate (Roundup)	M**	General knockdown / Pre-crop spray	Registered for control of grass and broadleaf weeds as a pre-crop spray.	NR	A	ALL	R3
S-Metolachlor (Dual Gold) Syngenta	K**	Parsley / Pre-emergent	Registered for use in parsley for control of various grass and broadleaf weeds including Amaranth, Common Sowthistle, Blackberry Nightshade, Chickweed, Fat Hen, Pigweed, **Potato Weed**, Annual Ryegrass, Italian Ryegrass, Winter Grass, Stinging Nettle & Wireweed. Spray at transplanting. [Max. 1 application per season]	56	A	ALL (excl. VIC)	-
Paraquat + Diquat (SpraySeed)	L***	General seed bed preparation / Post-emergent inter-row weed control	Registered for control of grass and broadleaf weeds as a pre-crop spray.	NR	A	ALL	R3
Chloridazon (Pyramin) BASF	C**		Registered for control of broadleaf weeds including **Potato Weed** in silverbeet and baby spinach leaf.		P		-
Oxyfluorfen (Goal)	G**		Registered for pre-emergent control of several broadleaf and grass weeds including **Potato Weed**.		P		-
Wild Turnip (*Brassica* spp.) **Priority: Moderate**							
Wild Turnip was ranked as moderate priority in VIC, QLD & TAS. It is a Winter growing weed that competes aggressively with crops and runs to seed quickly.							
Glyphosate (Roundup)	M**	General knockdown / Pre-crop spray	Registered for control of grass and broadleaf weeds as a pre-crop spray.	NR	A	ALL	R3

Active ingredient (Trade Name)	Chem. Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Paraquat + Diquat (SpraySeed)	L***	General seed bed preparation / Post-emergent inter-row weed control	Registered for control of grass and broadleaf weeds as a pre-crop spray.	NR	A	ALL	R3
Trifluralin	D**	Parsley / Pre-emergent	Registered in parsley for control of various label registered grass and broadleaf weeds including Amaranth, Annual ryegrass, Pigweed, **Wild radish, Wild turnip**, Winter grass and Wireweed in parsley. Apply prior to sowing and incorporate into the top 5 cm of soil within 4 hours. [Max. 1 application per crop]	NR	A	ALL (excl. VIC)	-
Oxyfluorfen (Goal)	G**		Registered for pre-emergent control of several broadleaf and grass weeds including **Wild Turnip**.		P		-
Amaranthus (Amaranthus spp.) **Priority: Moderate** (QLD only)							
Amaranthus was ranked as moderate priority in QLD. It is a short-lived annual weed that can pose a problem every year as they are prolific seed producers.							
Chlorthal-Dimethyl (Dacthal) PER14032	D**	Parsley / Pre-emergent	Permitted for use in parsley for control of various grass and broadleaf weeds including **Amaranth**, Blackberry Nightshade, Chickweed, Fat Hen, Pigweed, Ryegrass, Milk Thistle, Stinging Nettle & Winter Grass. Spray at times of transplanting. [Max. 1 application per crop]	NR G:85	A	ALL (excl. VIC)	-
Glyphosate (Roundup)	M**	General knockdown / Pre-crop spray	Registered for control of grass and broadleaf weeds as a pre-crop spray.	NR	A	ALL	R3
S-Metolachlor (Dual Gold) Syngenta	K**	Parsley / Pre-emergent	Registered for use in parsley for control of various grass and broadleaf weeds including **Amaranth**, Common Sowthistle, Blackberry Nightshade, Chickweed, Fat Hen, Pigweed, Potato Weed, Annual Ryegrass, Italian Ryegrass, Winter Grass, Stinging Nettle & Wireweed. Spray at transplanting. [Max. 1 application per season]	56	A	ALL (excl. VIC)	-

Active ingredient (Trade Name)	Chem. Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Paraquat + Diquat (SpraySeed)	L***	General seed bed preparation / Post-emergent inter-row weed control	Registered for control of grass and broadleaf weeds as a pre-crop spray.	NR	A	ALL	R3
Trifluralin	D**	Parsley / Pre-emergent	Registered in parsley for control of various label registered grass and broadleaf weeds including **Amaranth**, Annual ryegrass, Pigweed, Wild radish, Wild turnip, Winter grass & wireweed. Apply prior to sowing and incorporate into the top 5 cm of soil within 4 hours. [Max. 1 application per crop]	NR	A	ALL (excl. VIC)	-
Groundsel (*Senecio vulgaris*) **Priority: Moderate** (VIC only)							
Groundsel was ranked as a moderate priority VIC. Highly invasive as it produces numerous seeds which disperse widely. Managing these would be possible using herbicides mentioned below or by various management practices such as soil fumigation, pre-crop spraying, spot spraying, or using mechanical devices.							
Glyphosate (Roundup)	M**	General knockdown / Pre-crop spray	Registered for control of grass and broadleaf weeds as a pre-crop spray.	NR	A	ALL	R3
Paraquat + Diquat (SpraySeed)	L***	General seed bed preparation / Post-emergent inter-row weed control	Registered for control of grass and broadleaf weeds as a pre-crop spray.	NR	A	ALL	R3
Oxyfluorfen (Goal)	G**		Registered for pre-emergent control of several broadleaf and grass weeds including **Groundsel**.		P		-
Phenmedipham (Betanal) Bayer	C**		Registered for control of broadleaf weeds including **Groundsel** in silverbeet.		P		R3

Active ingredient (Trade Name)	Chem. Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Milk Thistle (*Sonchus* spp.) **Priority: Moderate** (QLD only)							
Milk Thistle was ranked as moderate priority in QLD. Spring to autumn are the best times to control thistle. Spraying at early stages of growth is the most effective.							
Chlorthal-Dimethyl (Dacthal) PER14032	D**	Parsley / Pre-emergent	Permitted for use in parsley for control of various grass and broadleaf weeds including Amaranth, Blackberry Nightshade, Chickweed, Fat Hen, Pigweed, Ryegrass, **Milk Thistle**, Stinging Nettle & Winter Grass. Spray at times of transplanting. [Max. 1 application per crop]	NR G:85	A	ALL (excl. VIC)	-
Glyphosate (Roundup)	M**	General knockdown / Pre-crop spray	Registered for control of grass and broadleaf weeds as a pre-crop spray.	NR	A	ALL	R3
Paraquat + Diquat (SpraySeed)	L***	General seed bed preparation / Post-emergent inter-row weed control	Registered for control of grass and broadleaf weeds as a pre-crop spray.	NR	A	ALL	R3
S-Metolachlor (Dual Gold) Syngenta	K**	Parsley / Pre-emergent	Registered for use in parsley for control of various grass and broadleaf weeds including Amaranth, Common **Sowthistle**, Blackberry Nightshade, Chickweed, Fat Hen, Pigweed, Potato Weed, Annual Ryegrass, Italian Ryegrass, Winter Grass, Stinging Nettle & Wireweed. Spray at transplanting. [Max. 1 application per season]	56	A	ALL (excl. VIC)	-
Norflurazon (Zoliar) AgNova	F**		Registered for control of grass and broadleaf weeds including **Milk Thistle** in asparagus, citrus, grapes, nuts, stone & pome fruits.		P		-

Active ingredient (Trade Name)	Chem. Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Grass Weeds (various spp.) **Priority: Moderate**							
Grass weeds were ranked as a moderate priority VIC, WA, SA & TAS. Managing grass weeds would be possible by various management practices such as soil fumigation, pre-crop spraying, spot spraying or using mechanical devices. Populations of Annual ryegrass are prone to herbicide resistance so integrated weed management and rotation of herbicide modes of action are important aspects of a long-term control strategy.							
Chlorthal-Dimethyl (Dacthal) PER14032	D**	Parsley / Pre-emergent	Permitted for use in parsley for control of various grass and broadleaf weeds including Amaranth, Blackberry Nightshade, Chickweed, Fat Hen, Pigweed, Ryegrass, Milk Thistle, Stinging Nettle & Winter Grass. Spray at times of transplanting. [Max. 1 application per crop]	NR G:85	A	ALL (excl. VIC)	-
Fluazifop-P (Fusilade) PER81244	A***	Parsley / Post-emergent	Permitted for use in parsley for control of various grass weeds. [Max. 1 application per crop]	28 G:28	A	ALL (excl. VIC)	-
Glyphosate (Roundup)	M**	General knockdown / Pre-crop spray	Registered for control of grass and broadleaf weeds as a pre-crop spray.	NR	A	ALL	R3
Paraquat + Diquat (SpraySeed)	L***	General seed bed preparation / Post-emergent inter-row weed control	Registered for control of grass and broadleaf weeds as a pre-crop spray.	NR	A	ALL	R3
S-Metolachlor (Dual Gold) Syngenta	K**	Parsley / Pre-emergent	Registered for use in parsley for control of various grass and broadleaf weeds including Amaranth, Common Sowthistle, Blackberry Nightshade, Chickweed, Fat Hen, Pigweed, Potato Weed, Annual Ryegrass, Italian Ryegrass, Winter Grass, Stinging Nettle & Wireweed. Spray at transplanting. [Max. 1 application per season]	56	A	ALL (excl. VIC)	-
Trifluralin	D**	Parsley / Pre-emergent	Registered in parsley for control of various label registered grass and broadleaf weeds including Amaranth, **Annual ryegrass**, Pigweed, Wild radish, Wild turnip, **Winter grass** and wireweed. Apply prior to sowing and incorporate into the top 5 cm of soil within 4 hours. [Max. 1 application per crop]	NR	A	ALL (excl. VIC)	-

Active ingredient (Trade Name)	Chem. Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Metolachlor + Prosulfocarb (Boxer Gold) Syngenta	J+K**		Registered for control of **Ryegrass** in potatoes.		P		-
Norflurazon (Zoliar) AgNova	F**		Registered for control of grass and broadleaf weeds in asparagus, citrus, grapes, nuts, stone & pome fruits.		P		-

5. References

5.1 Information:

AgChem Access Priority Access Forum	https://www.agrifutures.com.au/national-rural-issues/agvet-chemicals/
Australian Pesticide and Veterinary Medicines Authority	www.apvma.gov.au
APVMA Chemical review	https://apvma.gov.au/chemicals-and-products/chemical-review/listing
APVMA MRLs	www.legislation.gov.au/Details/F2021C00236
APVMA Permit search	https://productsearch.apvma.gov.au/permits
APVMA Product search	https://productsearch.apvma.gov.au/products
AUSVEG	https://ausveg.com.au
Codex MRL database	http://www.fao.org/fao-who-codexalimentarius/codex-texts/dbs/pestres/en/
Cotton Pest Management Guide 2018-19	https://www.cottoninfo.com.au/publications/cotton-pest-management-guide
CropLife Australia (resistance management)	https://www.croplife.org.au/resources/programs/resistance-management/
Growcom – Infopest Database	www.infopest.com.au
Hort Innovation	www.horticulture.com.au

5.2 Abbreviations and Definitions:

APVMA	Australian Pesticides and Veterinary Medicines Authority
IPM	Integrated pest management
LOQ	Limit of quantification
MRL	Maximum residue limit (mg/kg or ppm)
Pesticides	Plant protection products (fungicide, insecticide, herbicide, nematicides, rodenticides, etc.).
Plant pests	Diseases, insects, nematodes, rodents, viruses, weeds, etc.
SARP	Strategic Agrichemical Review Process
TBC	To be 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 parsley
Appendix 2. Products available for control of insects, mites and other pests in parsley
Appendix 3. Products available for weed control in parsley
Appendix 4. Current permits for use in parsley
Appendix 5. Parsley Maximum Residue Limits (MRLs)
Appendix 6. Parsley Agrichemical Regulatory Risk Assessment

Appendix 1. Products available for disease control in parsley

Active Ingredient (Trade Name)	Chem. group	Situation	Diseases / Comments	States	WHP Days	Regulatory risk
1,3-Dichloropropene + Chloropicrin (Telone C-35)	8B	Vegetables / General pre-plant soil fumigation	Soil borne diseases. ***For use by professional and registered fumigators only.***	ALL	NR	-
Chloropicrin (Agrocelhone NE Soil Fumigant)	8	General pre-plant soil fumigation	Nematodes, insects*, Pythium, Phytophthora, Fusarium,* and *Verticillium* ***For use by professional and registered fumigators only.***	ALL	NR	-
Chlorothalonil (Bravo) PER82895	M5	Parsley (field/foliage)	Downy Mildew, Botrytis, Alternaria, & Cercospora	ALL	14	R3
Cyazofamid (Ranman) UPL PER89216	21	Parsley (field)	Phytophthora Root Rot	ALL	3	-
Dazomet (Basamid, Cerlong)	8F	Pre-plant fumigant in seed beds	Soil fungi including *Pythium*, *Phytophthora*, *Sclerotinia*, *Sclerotium*, *Rhizoctonia*, *Verticillium*, *Plasmodiophora*, *Armillaria* and *Fusarium* spp.	ALL	NR	-
Difenoconazole (Score) Syngenta PER87973	3	Parsley (field & protected)	Leaf Blight (Cercospora spp.) & Alternaria Leaf Spot	ALL (excl. VIC)	7 NG	R3
Iodine Granules	-	Vegetables / Post Harvest Sanitiser	Bacteria and Fungi	ALL	NR	-
Iprodione (Rovral) PER81589	2	Parsley (field)	Sclerotinia Rot, Grey Mould (*Botrytis* spp.)	ALL (excl. VIC)	7 NG	R2
Mancozeb PER80538	M3	Parsley (field)	Anthracnose and Septoria Leaf Spot	ALL (excl. VIC)	14 NG	R2

Active Ingredient (Trade Name)	Chem. group	Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Mancozeb + Dimethomorph (Mancozeb + Acrobat) PER14958	M3 +40	Parsley (field & protected)	Downy Mildew, Alternaria Leaf Spot	ALL (excl. VIC)	14 NG	R2
Metalaxyl-M (Ridomil Gold 480 SL/EC) PER83797	4	Parsley (field)	Pythium Root Rot and Phytophthora Root Rot	ALL (excl. VIC)	NR	-
Metham Sodium	-	Food crops / Pre-plant fumigant	Fungal diseases including *Rhizoctonia*, *Pythium*, *Fusarium*, *Phytophthora*, *Verticillium*, *Sclerotinia* and Club Root of crucifers & Nematodes	ALL	NR	-
Phosphorous Acid (Agri-Fos) PER13698	33	Parsley (field)	Pythium Root Rot and Phytophthora Root Rot	ALL (excl. VIC)	1	-
Potassium Bicarbonate (EcoCarb) PER13695	M2	Herbs (field & protected)	Powdery Mildew	ALL (excl. VIC)	NR	-
Propiconazole PER80977	3	Parsley (field and protected)	Septoria Spot, *Cercospora* spp., Rusts & Powdery Mildew	ALL (excl. VIC)	14 NG	R3
Sulphur	UN	Vegetables (field)	Powdery Mildew, Rust, Tomato Russet Mite and Bean Spider Mite (NSW only) and Two-Spotted Mite	VIC, TAS, SA & WA	NR	-

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

Active Ingredient (Trade Name)	Chem. group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
1,3-Dichloropropene + Chloropicrin (Telone C-35)	8B	Vegetable crops / soil fumigant	Plant parasitic Nematodes, Symphylans, Wireworms, soil borne diseases (including *Fusarium* and *Verticillium* wilts, *Rhizoctonia, Pythium*) and suppression of weeds ***For use by professional and registered fumigators only.***	ALL (Restricted use TAS, VIC & SA)	NR	-
Afidopyropen (Versys) BASF	9D	Parsley (field)	Suppression of Silverleaf whitefly (*Bemisia tabaci* Biotype B) and control of Green peach aphid	ALL	1	-
Bacillus thuringiensis subsp. Kurstaki (Dipel)	11A	Herbs (field & protected)	Armyworm, Cabbage Moth, Cabbage White Butterfly, Green Looper, Lightbrown Apple Moth, Pear Looper, Soybean Looper, Vine Moth, and Tobacco Looper *& Helicoverpa* spp.	ALL	NR	-
Bacillus thuringiensis (DiPel) PER14694	11A	Herbs (protected)	Fungus Gnats	ALL (excl. VIC)	NR	-
Beauveria bassiana (Velifer) BASF	UNF	Protected vegetables and ornamentals	Suppression of various pests including: Western Flower Thrips, Onion thrips, Greenhouse Whitefly, Silverleaf Whitefly, Sweet Potato Whitefly, Green Peach Aphid & Two-Spotted Spider Mites	ALL	NR	-
Chlorantraniliprole (Coragen) FMC PER89353	28	Parsley (field & protected)	Fall armyworm (*Spodoptera frugiperda*)	ALL (excl. VIC)	3 NG	-
Chlorpyrifos (Lorsban) PER14583	1B	Parsley (field)	Vegetable Weevil	ALL (excl. VIC)	70 NG	R1
Dazomet (Basamid, Cerlong)	8F	Soil fumigant	Soil fungi, nematodes, soil insects and weeds	ALL	NR	-

Active Ingredient (Trade Name)	Chem. group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Diazinon PER82551	1B	Parsley (field)	Onion Maggot	ALL (excl. VIC)	NR	R3
Emulsifiable Botanical Oil (Eco-Oil)	-	Vegetables	Greenhouse Whitefly	ALL	NR	-
Flubendiamide (Belt) Bayer	28	Herbs (field & protected)	Diamondback Moth, Cabbage White Butterfly, Cluster Caterpillar, *Helicoverpa* spp.	ALL	1	-
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Vegetables (field)	Ants, Aphids, Caterpillars, Earwigs, Whitefly, Thrips and Leafhoppers. Suitable for organic growers	ALL	1	-
Iron EDTA Complex	-	Plants generally	Slugs and Snails	ALL	NR	-
Lambda-Cyhalothrin (Karate Zeon) Syngenta PER80975	3A	Parsley (field and protected)	Redlegged Earth Mite, Rutherglen Bug, Grey Cluster Bug, Looper, Plague Thrips, Onion Thrips	NSW, QLD, SA, WA, ACT & NT	7	-
Metaldehyde	-	Plants generally	Slugs and snails	ALL	7	-
Methomyl (Lannate) PER82428	1A	Parsley (field)	*Helicoverpa* spp., Cabbage Moth, Cucumber Moth, Cluster Caterpillar, Looper, Webworm, Rutherglen Bug, Thrips including Western Flower Thrips	ALL	3	R2
Petroleum Oil PER12221	UN	Parsley (field & protected)	Aphids, Green Mirid, Green Vegetable Bug, Grey Cluster Bug, Leafhopper, Mites, Rutherglen Bug, and Thrips	ALL (excl. VIC)	1	-
Potassium Salts of Fatty Acids (Natrasoap)	-	Herbs (field & protected)	Aphids, Thrips, Mealybug, Two-Spotted Mite, Spider Mite, Whitefly	ALL	Nil	-
Pyrethrins + Piperonyl Butoxide	3A	Vegetables (field & protected)	Ants, Aphids, Thrips, Caterpillars, leaf hoppers, & Whitefly	ALL	1	-

Active Ingredient (Trade Name)	Chem. group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Pyriproxyfen (Distance Plus) Sumitomo	7C	Herbs (field)	Invasive and Nuisance Ants	ALL	NR	-
Spinetoram (Success Neo) Corteva	5	Herbs (field)	Diamondback Moth, Loopers, Light Brown Apple Moth, *Helicoverpa* spp.	ALL	3	-
Spinetoram (Success Neo) Corteva PER89241	5	Culinary herbs (field & protected)	Fall Armyworm (*Spodoptera frugiperda*)	ALL (excl. VIC)	1	-
Spinosad (Entrust Organic) Corteva	5	Culinary herbs (field)	Diamondback Moth, Loopers, Light Brown Apple Moth & *Helicoverpa*	ALL	3	-
Spinosad (Entrust Organic) Corteva PER89870	5	Culinary herbs (Protected)	Fall armyworm (*Spodoptera frugiperda*)	ALL	3 G:14	-
Spinosad (Entrust Organic) Corteva PER90928	5	Culinary Herbs (field & protected)	Vegetable Leaf Miner (*Liriomyza sativae*) Pea Leaf Miner / Serpentine Leaf Miner (*Liriomyza huidobrensis*) American Serpentine Leaf Miner (*Liriomyza trifolii*)	ALL (excl. VIC)	3 G:14	-
Spirotetramat (Movento) Bayer	23	Herbs (field & protected)	Green Peach Aphid, Cotton Aphid, Western Flower Thrips, Tomato Thrips, Plague Thrips	ALL	3	-
Spirotetramat (Movento) Bayer PER88640	23	Parsley (field & protected)	Liriomyza Leafminers (*Liriomyza* spp.)	ALL (excl. VIC)	3	-
Trichlorfon (Lepidex)	1B	Vegetables (field)	Cabbage White Butterfly, Cabbage Moth, Green Vegetable Bug and Rutherglen Bug.	ALL	2	R2

Appendix 3. Products available for weed control in parsley

Active ingredient (Trade Name)	Chem. Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Chlorthal-Dimethyl (Dacthal) PER14032	D**	General knockdown and residual	Various broadleaf weeds and grasses	NR G:85	ALL (excl. VIC)	-
Fluazifop-P Butyl (Fusilade) PER81244	A***	Grass selective post emergent	Grass weeds	28 G:28	ALL (excl. VIC)	-
Glyphosate (Roundup)	M**	General seed bed preparation	General weeds as a pre-crop spray	NR	ALL	R3
Paraquat + Diquat (SpraySeed)	L***	General seed bed preparation	General weeds as a pre-crop spray	NR	ALL	R3
S-Metolachlor (Dual Gold) Syngenta	K**	Pre-plant residual	Weeds as specified on the product label	56	ALL (excl. VIC)	-
Trifluralin	D**	Parsley	Selected broadleaf and grass weeds	NR	ALL (excl. VIC)	-

Chemical Group Resistance Risk: ** Moderate, *** High

Appendix 4. Current permits for use in parsley

Permit No.	Description	Issued Date	Expiry Date	Permit Holder
PER14694	*Bacillus thuringiensis* (Vectobac) / Various including **Herbs** / Fungus gnats (Protected Cropping)	01-Jun-14	30-Jun-24	Hort Innovation
PER89353	Chlorantraniliprole (Altacor Hort / Coragen) / Various crops including Parsley (field and protected) / Fall Armyworm	5-May-20	31-May-23	Hort Innovation
PER82895 Version 2	Chlorothalonil (Bravo 720 SC) / Various including Parsley (foliage only) / Downy mildew, Botrytis, Alternaria & Cercospora (Field Only)	04-Aug-17	31-Aug-25	Hort Innovation
PER14583 Version 4	Chlorpyrifos / Various including Parsley / Vegetable weevil	01-Apr-14	31-Oct-21	Hort Innovation
PER14032 Version 2	Chlorthal-dimethyl (Dacthal) / Parsley / Various broadleaf weeds & grasses	01-May-13	31-Mar-23	Hort Innovation
PER89216	Cyazofamid (Ranman) / Parsley / Phytophthora Root Rot	12-Aug-20	31-Aug-23	Hort Innovation
PER82551 Version 3	Diazinon / Various including Parsley & Coriander / Onion maggot (field)	20-May-16	31-Jan-24	Hort Innovation
PER87973	Difenoconazole (Score) / Various including Parsley & Coriander / Cercospora leaf spot & Alternaria leaf blight	27-Aug-20	31-Aug-25	Hort Innovation
PER81244 Version 3	Fluazifop-P butyl (Fusilade) / Various including Parsley / Grass weeds as specified on the approved label	01-Jul-16	30-Jun-22	Hort Innovation
PER81589 Version 2	Iprodione (Rovral) / Various including Parsley / Sclerotinia rot & Grey mould (*Botrytis* spp.) (field)	21-Sep-16	31-Oct-21	Hort Innovation
PER80975 Version 3	Lambda-cyhalothrin (Karate Zeon) / Parsley / Redlegged earth mite, Rutherglen bug, Grey cluster bug, Looper, Plague thrips & Onion thrips	11-Oct-15	31-Jul-25	Hort Innovation
PER80538 Version 2	Mancozeb / Various including Parsley / Anthracnose & Septoria leaf spot (field)	01-Apr-15	31-Mar-25	Hort Innovation

Permit No.	Description	Issued Date	Expiry Date	Permit Holder
PER14958 Version 2	Mancozeb + dimethomorph / Various including Parsley / Downy mildew & Alternaria leaf spot	21-Dec-14	31-Dec-22	Hort Innovation
PER83797	Metalaxyl-M (Ridomil Gold 480 SL & 480EC) / Parsley / *Pythium* root rot & *Pytophthora* root rot (field)	20-Mar-17	31-Mar-22	Hort Innovation
PER82428 Version 4	Methomyl (Lannate L) / Various including Parsley / Helicoverpa spp, cabbage, Cucumber moth, Cluster caterpillar, Looper, Webworm, Rutherglen bug & Thrips including Western Flower Thrips (Field Only)	22-Apr-16	31-Mar-24	Hort Innovation
PER89293	Methomyl (Lannate) / Various; including Parsley / Fall Armyworm (Field Only)	10-Apr-20	30-Apr-23	Hort Innovation
PER12221 Version 4	Petroleum oil / Various including Parsley / Aphids, Green mirid, Green vegetable bug, Grey cluster bug, leafhopper, Mites, Rutherglen bug & Thrips (field & protected)	29-Jun-12	30-Nov-22	Hort Innovation
PER13698 Version 3	Phosphorous acid / Various including Parsley & Coriander / *Pythium* root rot & *Pytophthora* root rot (field)	01-Oct-12	30-Sep-22	Hort Innovation
PER13695 Version 3	Potassium bicarbonate / Various including **Herbs** / Powdery mildew	31-Oct-12	31-Jul-25	Hort Innovation
PER80977 Version 3	Propiconazole (Arysta) / Parsley / *Septoria* spot, *Cercospora* spp, Rusts & Powdery mildew (field and protected)	08-Dec-15	31-Jan-26	Hort Innovation
PER89241	Spinetoram (Success Neo and Delegate Insecticide) / Various crops including, **Culinary herbs** / Fall Armyworm (field & protected)	06-Mar-20	31-Mar-23	Hort Innovation
PER89870	Spinosad (Entrust Organic) / Various Crops including **Culinary herbs** / Fall Armyworm (protected)	21-Jul-20	31-Jul-23	Hort Innovation
PER90928	Spinosad (Entrust Organic) / Various, including Culinary Herbs / Leafminers (field & protected)	23-Apr-21	30-Apr-24	Hort Innovation

Permit No.	Description	Issued Date	Expiry Date	Permit Holder
PER88640	Spirotetramat (Movento 240 SC) / Various crops, including **Parsley** / Liriomyza leafminers (*Liriomyza* spp.)	18-May-20	31-May-23	Hort innovation

Appendix 5. Parsley Maximum Residue Limits (MRLs)

CODEX commodity groupings of Parsley and subgroups:

HH 0092 Herbs
HH 0740 Parsley
- Vegetables

Note: Currently production of all Parsley is for the Australian market and no exports are recorded. Available information indicates that in the absence specific limits in legislation the most countries defers to Codex, followed by EU MRL standards or applies a 0.01ppm default value. Food exported to New Zealand from Australia may be legally sold if it complies with Australian requirements. MRLs and legislation are subject to change; the values presented should not be relied on.

Chemical	Codex	Description	APVMA MRL mg/kg	Codex MRL mg/kg
1,3-dichloropropene		Soil fumigant / MRLs not required	NR	
2,2-DPA	-	Vegetables	*0.1	
2,4-D			NA	NA
Afidopyropen	HH 0740	Parsley	5	
Azoxystrobin	HH 0092	Herbs	-	70
Bentazone	HH 0092	Herbs	-	0.1
Bifenthrin	HH 0092	Herbs	T0.5	-
Chlorantraniliprole	HH 0092	Herbs	T20	-
Chlordane	-	Vegetables	E0.02	-
Chloropicrin			NA	NA
Chlorothalonil	HH 0740	Parsley	T20	-
	-	Vegetables (Except for Brussels sprouts)	T7	-
Chlorpyrifos	HH 0740	Parsley	0.05	-
Chlorthal-dimethyl	HH 0740	Parsley	T2	-
	-	Vegetables	5	
Cyazofamid	HH 0740	Parsley	T10	
Cyhalothrin	HH 0740	Parsley	T1	-
Cypermethrins (including alpha- and zeta- cypermethrin)	HH 0740	Parsley	T5	-
Cyprodinil	HH 0092	Herbs	-	40
Dazomet		Soil fumigant / MRLs not required	NR	
DDT	-	Vegetables	E1	
Diazinon	HH 0740	Parsley	*0.05	-
	-	Vegetables	0.7	
Diclofop-methyl	-	Vegetables	5	
Difenoconazole	HH 0740	Parsley	T20	-
Dimethomorph	HH 0740	Parsley	T20	-
Diquat		Vegetables	0.05	
Dithiocarbamates (mancozeb, metham, metiram, thiram, zineb and ziram)	HH 0740	Parsley	5	-
Etoxazole	HH 0092	Herbs	T1	-

Chemical	Codex	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Fluazifop-p-butyl	HH 0740	Parsley	T2	-
Flubendiamide	HH 0092	Herbs	20	-
Fludioxonil	HH 0092	Herbs	-	9
Glyphosate			NA	NA
Heptachlor	-	Vegetables	E0.05	
Inorganic bromide	-	Vegetables	20	
Iprodione	HH 0740	Parsley	T20	-
Iron EDTA Complex		MRLs not required	NR	
Lindane	-	Vegetables	E2	
Linuron	HH 0740	Parsley	T1	-
	-	Vegetables	*0.05	
Metalaxyl	-	Vegetables	T0.1	
Metalaxyl-M		Vegetables	T0.1	
Metaldehyde	HH 0092	Herbs	1	-
		Vegetables	1	
Metham sodium	HH 0740	Parsley	5	
Methiocarb	-	Vegetables	0.1	-
Methomyl	HH 0740	Parsley	T10	-
Metolachlor	HH 0092	Herbs	T*0.05	-
Methyl bromide	HH 0092	Herbs	*0.05	-
	-	Vegetables	T*0.05	
Paraquat	-	Vegetables	*0.05	-
Pendimethalin	HH 0740	Parsley	T*0.05	-
Petroleum oil		MRLs not required	NR	
Phorate	HH 0740	Parsley	T*0.01	-
Phosphorous acid	HH 0740	Parsley	T300	-
Piperonyl butoxide	HH 0092	Herbs	8	-
Pirimicarb	-	Vegetables (some exceptions)	1	-
Potassium bicarbonate		MRLs not required	NR	
Potassium salts of fatty acids		MRLs not required	NR	
Procymidone	HH 0092	Herbs	T3	-
Prometryn	-	Vegetables	*0.1	-
Propargite	-	Vegetables	3	
Propazine	-	Vegetables	*0.1	-
Propiconazole	HH 0740	Parsley	T30	-
Pyrethrins		Vegetables	1	
Pyriproxyfen	HH 0092	Herbs	T5	-
Roteone		MRLs not required	NR	
Spinetoram	HH 0092	Herbs	1	-
Spinosad	HH 0092	Herbs	5	
Spirotetramat	HH 0092	Herbs	15	-
Sulphur		MRLs not required	NR	
Trichlorfon	-	Vegetables (some exceptions)	0.1	
Trifluralin	HH 0092	Herbs	T*0.05	-
	-	Vegetables (some exceptions)	0.05	

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.
NA – MRLs are not in place.
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: Parsley Agrichemical Regulatory Risk Assessment

Parsley Agrichemical Regulatory Risk Assessment

October 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 require the generation of new data. A consequence of which can be that many of these chemicals 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 farm chemicals 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 prohibiting the use in the exporting country to ensure compliance, as breaches of MRLs would adversely affect market access.

The effects of the above are greater pressure placed on the availability and use of individual chemicals 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 leeks as well as current initiatives aimed at addressing identified pest management deficiencies.

Parsley Agrichemical Regulatory Risk Assessment

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

Problem	Active Constituents	Chemical Group	Comment	Activities
INSECT AND MITE PESTS				
Ants				
Ants	Pyriproxyfen	**7C**	EU: Authorisation renewal process underway	
Aphids				
Aphids	Petroleum oil (PER12221)			
Cabbage aphid	Afidopyropen	**9D**		
Cotton aphid	Afidopyropen	**9D**		
Currant lettuce aphid	Afidopyropen	**9D**		
Green peach aphid	Afidopyropen	**9D**		
Beetles / Weevils				
Vegetable weevil	Chlorpyrifos (PER14583)	**1B**	APVMA: Under review. Potential issues w.r.t. environmental loading and worker exposure. EU: Proposed cancellation of use Canada: proposed cancellation of most uses. USA: EPA decision to allow continued use	

Problem	Active Constituents	Chemical Group	Comment	Activities
Caterpillars/Lepidoptera				
Armyworm	*Bacillus thuringiensis*	**11A**		
Cluster caterpillar	Flubendiamide	**28**		
	Methomyl (PER82428)	**1A**	APVMA: nominated for review Canada: Majority of uses cancelled EU: No authorisations (expired 31/8/19)	
Cucumber moth	Methomyl (PER82428)	**1A**	APVMA: nominated for review Canada: Majority of uses cancelled EU: No authorisations (expired 31/8/19)	
Diamondback (Cabbage) moth	*Bacillus thuringiensis*	**11A**		
	Flubendiamide	**28**		
	Spinetoram	**5**		
	Spinosad	**5**		
Fall armyworm	Chlorantraniliprole (PER89353)	**28**		
	Methomyl (PER89293)	**1A**	APVMA: nominated for review Canada: Majority of uses cancelled EU: No authorisations (expired 31/8/19)	
	Spinetoram (PER89241)	**5**		
	Spinosad (PER89870)	**5**		
Helicoverpa species Native Budworm (*H. punctigera*) Corn earworm/Cotton bollworm (*H. armigera*)	*Bacillus thuringiensis*	**11A**		
	Methomyl (PER82428)	**1A**	APVMA: nominated for review Canada: Majority of uses cancelled EU: No authorisations (expired 31/8/19)	
	Flubendiamide	**28**		
	Spinetoram	**5**		
	Spinosad	**5**		
Lightbrown apple moth	*Bacillus thuringiensis*	**11A**		
	Spinetoram	**5**		
	Spinosad	**5**		

Problem	Active Constituents	Chemical Group	Comment	Activities
Looper caterpillars	*Bacillus thuringiensis*	**11A**		
	Lambda-cyhalothrin (PER80975)	**3A**		
	Methomyl (PER82428)	**1A**	APVMA: nominated for review Canada: Majority of uses cancelled EU: No authorisations (expired 31/8/19)	
	Spinetoram	**5**		
	Spinosad	**5**		
Webworms	Methomyl (PER82428)	**1A**	APVMA: nominated for review Canada: Majority of uses cancelled EU: No authorisations (expired 31/8/19)	
Jassids/Plant bugs				
Green mirids	Petroleum oil (PER12221)			
Green vegetable bug	Petroleum oil (PER12221)			
Grey cluster bug	Lambda-cyhalothrin (PER80975)	**3A**		
	Petroleum oil (PER12221)			
Leafhoppers	Petroleum oil (PER12221)			
Rutherglen bug	Lambda-cyhalothrin (PER80975)	**3A**		
	Methomyl (PER82428)	**1A**	APVMA: nominated for review Canada: Majority of uses cancelled EU: No authorisations (expired 31/8/19)	
	Petroleum oil (PER12221)			
Mites				
Mites	Petroleum oil (PER12221)			
Redlegged earth mite	Lambda-cyhalothrin (PER80975)	**3A**		
Thrips				
Onion thrips	Lambda-cyhalothrin (PER80975)	**3A**		
Plague thrips	Lambda-cyhalothrin (PER80975)	**3A**		
Thrips	Methomyl (PER82428)	**1A**	APVMA: nominated for review Canada: Majority of uses cancelled EU: No authorisations (expired 31/8/19)	
	Petroleum oil (PER12221)			
Western flower thrips	Methomyl (PER82428)	**1A**	APVMA: nominated for review Canada: Majority of uses cancelled EU: No authorisations (expired 31/8/19)	

Problem	Active Constituents	Chemical Group	Comment	Activities
Whitefly				
Silverleaf (Poinsettia) whitefly	Afidopyropen	**9D**		
Other				
Leafminer	Spirotetramat (PER88640)	**23**		
Onion seedling maggot	Diazinon	**1B**	EU: Deregistered Codex: To be reviewed by 2020/21.	

Problem	Active Constituents	Chemical Group	Comment	Activities
DISEASES				
Alternaria leaf spots/blight	Chlorothalonil (PER82895)	**M5**	APVMA: Nominated for review Canada: Review recently completed; continued use considered acceptable Europe: Deregistered[i].	
	Difenoconazole (PER87973)	**3**	APVMA: Nominated for review Canada: Currently being reviewed	
	Dimethomorph + Mancozeb (PER14958)	**M3/40**	Mancozeb: APVMA: Nominated for review Canada: Many uses cancelled Codex: To be reviewed 2022/23 EU: Authorisation not renewed	
Anthracnose	Mancozeb (PER80538)	**M3**		
Bacterial leaf spot	Copper (PER88815)	**M1**	EU: Candidate for substitution	
Botrytis grey mould	Iprodione (PER81589)	**2**	Canada: Majority of food crop uses deleted Codex: Review scheduled for 2022/23 EU: Deregistered	
Botrytis rot	Chlorothalonil (PER82895)	**M5**	APVMA: Nominated for review Canada: Review recently completed; continued use considered acceptable Europe: Deregistered.	
Cercospora leaf spot	Chlorothalonil (PER82895)			
	Difenoconazole (PER87973)	**3**	APVMA: Nominated for review Canada: Currently being reviewed	
	Propiconazole (PER80977)	**3**	APVMA: Nominated for review Europe: Deregistered[ii]	

Problem	Active Constituents	Chemical Group	Comment	Activities
Downy mildew	Chlorothalonil (PER82895)	**M5**	APVMA: Nominated for review Canada: Review recently completed; continued use considered acceptable Europe: Deregistered.	
	Dimethomorph + Mancozeb (PER14958)	**M3/40**	Mancozeb: APVMA: Nominated for review Canada: Many uses cancelled Codex: To be reviewed 2022/23 EU: Authorisation not renewed	
Phytophthora root rot	Cyazofamid (PER89216)	**21**		
	Metalaxyl-M (PER83797)	**4**	EU: Metalaxyl-M restricted use approval	
	Phosphorous acid (PER13698)	**33**		
Powdery mildew	Propiconazole	**3**	APVMA: Nominated for review Europe: Deregistered	
Pythium root rot	Metalaxyl-M (PER83797)	**4**	EU: Metalaxyl-M restricted use approval	
	Phosphorous acid (PER13698)	**33**		
Rust	Propiconazole (PER80977)	**3**	APVMA: Nominated for review Europe: Deregistered	
Sclerotinia rot	Iprodione (PER81589)	**2**	Canada: Majority of food crop uses deleted Codex: Review scheduled for 2022/23 EU: Deregistered	
Septoria leaf spot	Mancozeb (PER80538)	**M3**	APVMA: Nominated for review Canada: Many uses cancelled Codex: To be reviewed 2022/23 EU: Authorisation not renewed	
	Propiconazole (PER80977)	**3**	APVMA: Nominated for review Europe: Deregistered	

Problem	Active Constituents	Chemical Group	Comment	Activities
WEEDS				
Broadleaf weeds and grasses	Chlorthal-dimethyl (PER14032)	**D**	EU: No authorisation in place	
	Fluazifop-P (PER81244)	**A**		
	Linuron	**C**	EU: No authorisation in place	
	S-metolachlor	**K**		
	Trifluralin	**D**	EU: No authorisation in place	

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

[ii] Commission Implementing Regulation (EU) 2018/1865