Blueberry

Strategic Agrichemical Review Process (SARP)

September 2020

Hort Innovation
Project – MT19008

Hort Innovation Project Number:
MT19008 – Strategic Agrichemical Review Process (SARP) - Updates

SARP Service Provider:
AGK Services

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

Date of report:
September 2020

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Hort Innovation Strategic levy investment | BLUEBERRY FUND

This project has been funded by Hort Innovation using the blueberry research and development levy and funds from the Australian Government. For more information on the fund and strategic levy investment visit horticulture.com.au

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1. Summary

The strategic levy investment project Strategic Agrichemical Review Process (SARP) - Updates (MT19008) is part of the Hort Innovation Blueberry Fund. A Strategic Agrichemical Review Process (SARP), through the process of a desktop audit and industry liaison; Assesses the importance of the diseases, insects and weeds (plant pests) that can affect a horticultural industry;

(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 Blueberry 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
Blueberry Rust	*Thekopsora minima*
Flower Blight / Grey Mould	*Botrytis cinerea*
Stem Blight	*Neofusicoccum* spp., *Lasiodiplodia* spp. and *Botryosphaeria dothidea*

1.2 Insects and mites

The high priority insects and mites are:

Common name	Scientific name
Light Brown Apple Moth	*Epiphyas postvittana*
Queensland Fruit Fly	*Bactrocera tryoni*
Longicorn Trunk Borer	*Phoracantha* spp.
Broad Mite	*Polyphagotarsonemus latus*
Red Shouldered Leaf Beetle	*Monolepta australis*

1.3 Weeds

No high priority weeds identified but several weeds were nominated as a moderate priority.

Common Name	Scientific Name
Moderate	
Blue Heliotrope	*Heliotropium amplexicaule*
Para Grass	*Brachiaria mutica*
Flaxleaf Fleabane	*Conyza bonariensis*
Sowthistle	*Sonchus oleraceus*
Blackberry Nightshade	*Solanum nigrum*
Nutgrass	*Cyperus rotundus*
Couch Grass	*Cynodon dactylon*
Wireweed	*Polygonum aviculare*

1.4 Plant Growth Regulators

There were no high priority Plant Growth Regulator issues identified but Initiation of Flowering, Promote Fruit Ripening and Promote Vegetative Growth were rated as moderate priority.

Issue
Moderate
Initiation of Flowering
Promote Fruit Ripening
Promote Vegetative Growth

2. The Australian Blueberry Industry

Blueberry production is centred in the northern New South Wales region of Coffs Harbour. The majority of the production in this region occurs over the summer months. A number of other blueberry production regions across Australia allow for close to year-round availability.

Production for the year ending June 2019 was 19,008 tonnes. The value of production was worth $338.7 m while the wholesale value of fresh supply was $436.1 m.

Blueberry Harvest Season by State[1]

State	18/19 Tonnes	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
New South Wales	16,537												
Queensland	760												
Tasmania	1,236												
Victoria	380												
South Australia	95												
Imports	1,555												
Availability Legend			High			Medium			Low			None	

Blueberry production has been growing strongly in recent years, with increasing domestic consumption underpinning demand and continued favourable prices for growers. Export volumes are low, with only 1 percent of total production going to fresh export in 2018/19. Another 9 percent went to processing and 90 percent went into domestic fresh supply. Australia is a net importer of blueberries, with the majority of imports coming from New Zealand. Exports are focused into South East Asia, with 62 percent going to Hong Kong.

A significant proportion of blueberries are grown under protected cropping, usually in polytunnels with open ends. In some cases, the tunnels can be deskinned at key times during the growing season. There is also an increasing trend for growing in substrate rather than in ground. Pots can be located on a hard floor or on benches to allow better control of drainage.

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

3. Introduction

3.1 Background

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

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

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

In combination with cultural practices, pesticides are important tools in Blueberry 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 Blueberry industry regarding pesticide access, Hort Innovation has undertaken the current project to develop the first Strategic Agrichemical Review Process (SARP) for blueberries.

The SARP process identifies diseases, insect pests and weeds of major concern to the Blueberry 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 Blueberry 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 blueberries but attempts to prioritise the major problems.

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

3.2 Minor use permits and registration

From a pesticide access perspective, the APVMA classifies blueberry as a minor crop. The crop fits within the APVMA crop group Crop Group 004: Berries and other small fruits, within the Subgroup 004B: Bush Berries. Therefore, access to minor use permits can be relatively straight forward as long as a reasonable justification is provided in accordance to the APVMA's minor use guidance (https://apvma.gov.au/node/10931).
Possible justification for future permit applications could be based on:

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

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

3.3 Methods

The current version of the Blueberry Strategic Agrichemical Review Process (SARP) is the first report for the industry and was conducted by desktop audit and included an online industry survey. The process included gathering, collating and confirming information. The steps in the process were:

Process of Review	Activity / Date
Industry survey	Preparation and circulation of online industry survey to update priority pests and identify priority control gaps. Survey released: 14 January 2020 Survey closed: 31 March 2020
SARP data updated via a desktop audit	Updated registrations and permits Updated MRL tables Updated available and potential pesticides against low, moderate and high priority pests, including an assessment of their suitability Included information on regulatory risks from MT17019
Captured industry input	Collated and analysed survey results Consolidated and incorporated industry needs and insights

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 Blueberries
Appendix 2. Products available for control of insects and mites in Blueberries
Appendix 3. Products available for weed control in Blueberries
Appendix 4. Plant Growth Regulators available in Blueberries
Appendix 5. Current permits for use in Blueberries
Appendix 6. Blueberry Maximum Residue Limits (MRLs)
Appendix 7. Blueberry regulatory risk assessment

4. Diseases, pests and weeds of Blueberries

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

Information on regulatory risk derived from project MT17019 (Chapter 4) - Regulatory support and coordination (Appendix 7) has been incorporated.
Some of the suggested options have no overseas MRLs (see Appendix 6). If treated fruit is to be exported nil residues at harvest would be needed for these options.
While care has been taken to ensure the accuracy of the information provided in this document the APVMA registered label and where relevant the APVMA approved permit must always be followed.

4.1 Diseases of Blueberries

4.1.1 Disease priorities

Common name	Scientific name
High	
Blueberry Rust	*Thekopsora minima*
Flower Blight / Grey Mould	*Botrytis cinerea*
Stem Blight	*Neofusicoccum* spp., *Lasiodiplodia* spp. and *Botryosphaeria dothidea*
Moderate	
Phytophthora Root Rot	*Phytophthora* spp.
Anthracnose	*Colletotrichum simondsii*
Alternaria Rot (Post-Harvest)	*Alternaria* spp.
Phomopsis Blight	*Phomopsis vaccinii*
Bacterial Canker	*Pseudomonas syringae*
Charcoal Rot	*Macrophomina phaseolina*
Botryosphaeria Stem Canker	*Botryosphaeria corticis*
Crown Gall	*Agrobacterium tumefaciens*
Low	
Rhizoctonia Root Rot	*Rhizoctonia* spp.
Septoria Leaf Spot	*Septoria* spp.
Spur Blight	*Didymella applanata*

Blueberry Rust is the most important disease of blueberries in Australia, being rated as a high priority in all growing regions. The disease is present in all states, including Tasmania which was thought to be rust free until recent years. Consideration was given to eradicating the disease from Tasmania, however this was deemed impractical and it is proving manageable with a combination of cultural controls and fungicides. Rust infections require long periods of leaf wetness, so pruning to maintain an open canopy is important, as well as orchard hygiene to remove diseased wood and leaves as sources of new infection. Flower Blight / Grey Mould is also rated as a high priority in all regions except Victoria and Tasmania, where it is rated as a moderate priority.

Extended periods of wet, cool conditions can lead to outbreaks of Flower Blight during flowering and through to harvest. It can lead to fruit rot after harvest although the infection always occurs in the field during flowering. Pruning to keep an open canopy will assist to reduce the risk of infection. A planned program of fungicides is required to manage the disease during periods of high infection risk.

Two diseases that may be emerging issues for blueberries are Leaf Spot (*Pestalotiopsis photiniae*) and Florida Disease / Bacterial Wilt (*Ralstonia solanacearum*). Florida Disease has only been confirmed in blueberries on the Atherton Tableland in Queensland. No control options are currently available for these diseases.

4.1.2 Available and potential products for priority diseases

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

Availability		Regulatory risk (refer to Appendix 6)	
A	Available via either registration or permit approval	R1	Short-term: Critical concern over retaining access
P	Potential - a possible candidate to pursue for registration or permit	R2	Medium-term: Maintaining access of significant concern
P-A	Potential, already approved in the crop for another use	R3	Long-term: Potential issues associated with use - Monitoring required

Withholding Period (WHP) – Number of days from last treatment to harvest (H) or Grazing (G)			
Harvest	H	Not Required when used as directed	NR
Grazing	G	No Grazing Permitted	NG

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Blueberry Rust *(Thekopsora minima)* **Priority: High**							
Blueberry Rust is rated as a high priority in all growing regions. Infection occurs as a result of extended periods of leaf wetness, resulting in leaf spots which can spread and become necrotic over time. In severe cases, leaf drop can occur and whole plants can be defoliated. Lesions can also form on fruit, reducing berry quality and marketability. Control is achieved by maintaining an open canopy in conjunction with fungicide applications.							
Boscalid + Pyraclostrobin (Pristine) BASF PER82986	7+11	Protectant / Curative	3	A	ALL	Permitted in blueberries for control of Grey Mould and Anthracnose and the suppression of **Rust**. Use preventatively. Commence applications when conditions favour disease infection. Apply maximum 3 applications within an annual production cycle. Consecutive treatments should be applied 7-14 days apart. Do not apply more than 2 consecutive applications.	-
Chlorothalonil (Bravo) PER14309	M5	Protectant	28	A	ALL (excl. VIC)	Permitted in blueberries for control of Grey Mould, **Rust** and Downy Mildew. Apply when conditions favour the disease, then repeat at 7-14 day intervals. Do not apply more than 3 sprays per year.	R3
Copper (Cu) present as Copper Hydroxide PER84176	M1	Protectant	1	A	ALL (excl. VIC)	Permitted in blueberries for control of Anthracnose and **Blueberry Rust**. Apply as a foliar application at first sign of disease. Apply at 10-14 day intervals while conditions favour disease development. Treatments per season not limited.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Dithianon (Dragon) PER82601	M9	Protectant	H:21 NG	A	ALL (excl. VIC)	Permitted in blueberries for control of **Blueberry Rust**. Apply only to field-grown crops. Apply at first sign of rust infection on leaves and continue while weather is conducive to infection. Make a maximum of 3 applications per season, with minimum 21 day retreatment interval.	-
Mancozeb PER13958	M3	Protectant	7	A	ALL (excl. VIC)	Permitted in blueberries for control of Grey Mould, **Rust** and Mildew. Apply early bloom and repeat at 10-14 day intervals. Continue spraying until threat of disease is past. Treatments per season not limited.	R2
Propiconazole (Tilt) PER14740	3	Protectant / Curative	3	A	ACT, NSW, QLD, SA, TAS & WA	Permitted in blueberries for control of **Blueberry Rust**. Apply at first sign of infection on leaves and continue at 14 day intervals while the weather is favourable for infection. Treatments per season not limited.	R3
Aureobasidium pullulans Strain DSM 14940 & DSM 14941 (Botector) Nufarm	-	Biological / Protectant	NR	P-A	ALL	Registered in berries for control of Grey Mould and suppression of Anthracnose Fruit Rot, Phomopsis Fruit Rot and Rhizopus Fruit Rot. Also has activity on various types of rust.	-
Azoxystrobin + Tebuconazole (Custodia) Adama	11+3	Protectant / Curative		P		Registered in almonds, grapevines and macadamias for control of various diseases. Adama claim possible activity on **Blueberry Rust**. Azoxystrobin: No AU MRL. Codex MRL 5 mg/kg. Tebuconazole: No MRLs for AU or Codex.	R3
Bacillus amyloliquefaciens (strain QST 713) (Serenade Opti) Bayer	44	Biological / Protectant	NR	P		Registered in various fruit crops, including strawberries, for control and suppression of various diseases. Possible activity on **Blueberry Rust**. No MRLs required for biological product.	-
Bacillius amyloliquefaciens (Serifel) BASF	44	Biological / Protectant		P		Registered for control of Botrytis in grapes and strawberries. BASF claim control/suppression of **Rust**. No MRLs required for biological product.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant / Curative		P		Registration work underway through Hort Innovation projects ST16006 and ST17000 for control of Grey Mould and Anthracnose in raspberries, blackberries, and strawberries (Botrytis). Registered in the US against various rust species. Fluopyram: Codex MRL 7 mg/kg. Tebuconazole: No MRLs for AU or Codex.	R3
Flower Blight / Grey Mould *(Botrytis cinerea)* **Priority: High**							
Flower Blight is rated as a high priority in all regions except Victoria and Tasmania, where it is rated as a moderate priority. *Botrytis cinerea* is always present on blueberry plants but causes serious losses when the weather is wet and cool for several consecutive days. Blossoms are the most susceptible tissue, turning brown when infected. Developing berries also become infected, but few rot in the field before harvest. A range of control measures are required including keeping an open canopy, avoiding excessive nitrogen use in spring, in-crop fungicides, cooling berries rapidly after harvest and using sulphur pads in stacked trays post-harvest.							
Aureobasidium pullulans Strain DSM 14940 & DSM 14941 (Botector) Nufarm	-	Biological / Protectant	NR	A	ALL	Registered in berries for the control of **Botrytis Blight & Fruit Rot / Grey Mould**, and the suppression of Anthracnose Fruit Rot, Phomopsis Fruit Rot and Rhizopus Fruit Rot. Apply as a preventative treatment from beginning of bloom until harvest. Apply as part of a spray program, using up to 6 applications at 5-7 day intervals, particularly when weather conditions favour disease infection.	-
Boscalid + Pyraclostrobin (Pristine) BASF PER82986	7+11	Protectant / Curative	3	A	ALL	Permitted in blueberries for control of **Grey Mould** and Anthracnose and the suppression of Rust. Use preventatively. Commence applications from the white bud stage onwards and when conditions favour disease infection. Apply maximum 3 applications within an annual production cycle. Consecutive treatments should be applied 7-14 days apart. Do not apply more than 2 consecutive applications.	-
Captan PER13958	M4	Protectant	1	A	ALL (excl. VIC)	Permitted in blueberries for control of Cane Spot, Spur Blights, **Botrytis Flower & Fruit Rot** and Anthracnose. First application should occur after the green tip spray and then repeat every 10-14 days until the season ends. Do not make more than 5 applications per year.	-
Chlorothalonil (Bravo) PER14309	M5	Protectant	28	A	ALL (excl. VIC)	Permitted in blueberries for control of **Grey Mould**, Rust and Downy Mildew. Apply when conditions favour the disease, then repeat at 7-14 day intervals. Do not apply more than 3 sprays per year.	R3

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Cyprodinil + Fludioxinil (Switch) Syngenta PER84891	9+12	Protectant / Curative	7	A	ALL (excl. VIC)	Permitted in blueberries for control of **Grey Mould** and Anthracnose. Apply as a protectant treatment at the first signs of infection or at early stages of flower, fruit or foliage development prior to, or at the onset of disease. Do not exceed a maximum of 4 applications per season, with no more than 2 applications sequentially (7-14 days apart) before using another fungicide from a different MoA group for 2 applications.	R3
Fenhexamid (Teldor) Bayer PER86489	17	Protectant	1	A	ALL (excl. VIC)	Permitted in blueberries for control of **Grey Mould**. Reduce background levels by removing plant debris and rotted fruit. Apply at first signs of infection or at white bud. Do not exceed a maximum of 4 applications per season with not more than 2 applications sequentially before using a fungicide from a different MoA group. Allow a minimum retreatment interval of 7-10 days between consecutive applications.	-
Iprodione (Ippon 500 Aquaflo)	2	Protectant / Curative	1	A	NSW, QLD, TAS & WA	Registered in blueberries for control of **Grey Mould**. Apply every 10-14 days from flowering. Treatments per season not limited.	R2
Mancozeb PER13958	M3	Protectant	7	A	ALL (excl. VIC)	Permitted in blueberries for control of **Grey Mould**, Rust and Mildew. Apply early bloom and repeat at 10-14 day intervals. Continue spraying until threat of disease is past. Treatments per season not limited.	R2
Pyrimethanil (Scala) Bayer PER13958	9	Protectant / Curative	1	A	ALL (excl. VIC)	Permitted in blueberries for control of **Grey Mould**. Applications should be made when conditions favour disease development. Do not use more than 1 application per season.	-
Sodium Metabisulphite (Sulphur Dioxide Pads) PER13955	M	Post-Harvest Treatment	1	A	ALL (excl. VIC)	Permitted for use as a post-harvest treatment in blueberries for the control of **Grey Mould**. Blueberries are packed by arranging 12 trays each comprising 12 punnets in a layer up to a maximum of 21 layers. Place 1 pad on top of every layer arranged in a spiralling manner throughout the stack. The whole pallet stack is sealed in plastic and stored under refrigerated conditions. Pads are to be placed so that they do not contact the fruit. Do not exceed 3 months storage. Pallet stack is to be labelled as per permit conditions to warn supply chain handlers of the pads presence and of the refrigeration requirement. Blueberries must be removed from sealed wrap at least 1 day before sale.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Bacillus amyloliquefaciens (strain QST 713) (Serenade Opti) Bayer	44	Biological / Protectant	NR	P		Registered in strawberries for control of **Grey Mould**. No MRLs required for biological product.	-
Fenpyrazamine (Prolectus) Sumitomo	17	Protectant / Curative		P		Registered for control of **Botrytis** in grapes and has US registration for berries. No AU MRL. Codex MRL 4 mg/kg.	-
Florylpicoxamid (Adavelt) Corteva	21	Protectant / Curative		P		New Mode of Action fungicide being developed in AU. Corteva claim activity on **Botrytis**. No MRL's for AU or Codex. Scheduled for JMPR evaluation in 2023.	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant / Curative		P		Registration work underway through Hort Innovation project ST16006 and ST17000 for control of **Grey Mould** and Anthracnose in raspberries, blackberries, and strawberries (Botrytis). Fluopyram: No AU MRL. Codex MRL 7 mg/kg. Tebuconazole: No MRLs for AU or Codex.	R3
Isofetamid (Kenja) ISK	7	Curative / Protectant		P		Registration pending for control of **Botrytis** in berries. No AU MRL. Codex MRL 3 mg/kg.	-
NUL3195 Nufarm	TBC			P		New fungicide from Nufarm with activity on **Botrytis** and Powdery Mildew.	-
Pydiflumetofen + Fludioxonil (Miravis Prime) Syngenta	7+12	Curative / Protectant		P		Registration pending in Australia for control of **Botrytis**, Alternaria, Powdery Mildew & Anthracnose in berries. Registered in the US for control of Botrytis in various crops, including berry crops. Pydiflumetofen: No AU MRL. Codex MRL 4 mg/kg. Fludioxonil: AU MRL T3 mg/kg. Codex MRL 2 mg/kg.	R3

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Stem Blight (*Neofusicoccum* spp., *Lasiodiplodia* spp. and *Botryosphaeria dothidea*) **Priority: High**							
Stem Blight is rated as a high priority in NSW and as a moderate priority in all other regions. Infection starts in the branches and in severe cases it progresses into the base of the plant, resulting in systemic branch dieback over a period of weeks or months, eventually killing the plant. Infection enters the plant through wounds, including herbicide injury, pruning wounds and insect damage, or natural openings such as growth cracks, leaf scars, stem pores and root to root contact. Symptoms may not appear until the plant becomes stressed. Management should include the use of disease-free planting material, avoiding stress and plant injury and ensuring good irrigation and nutrition practices and strict orchard hygiene. Infected plant parts should be pruned out and removed from the orchard.							
No Options Available							
Phytophthora Root Rot (*Phytophthora* spp.) **Priority: Moderate**							
Phytophthora is rated as a moderate priority in all regions except Queensland, where it is rated as a high priority. Phytophthora is a widespread soil-borne pathogen that thrives in poorly drained soil and warm temperatures. Young roots are especially susceptible to infection. Severe infections can lead to severe necrosis of roots and subsequent yellowing and wilting of above ground plant parts. Bushes can eventually die. Management includes site selection to ensure good drainage, improving soil organic matter, careful irrigation management and fungicide treatments.							
Metalaxyl-M (Ridomil Gold 25G) PER13958	4	Protectant / Curative	48	A	ALL (excl. VIC)	Permitted in blueberries for control of ***Phytophthora* spp.** Apply directly to the soil and water in. Treatments per season not limited.	-
Metham PER82024	-	Fumigant	NR	A	ALL (excl. VIC)	Permitted in blueberries for control of germinating weed seeds and soil borne pathogens, including **Phytophthora**. Apply through trickle irrigation to moist soil under plastic mulch at 5-8 weeks prior to planting. Flush all lines and equipment with clean water after use. Puncture plastic 2 weeks after treatment to allow dissipation of metham.	-
Phosphorous Acid PER13958	33	Protectant / Curative	NR	A	ALL (excl. VIC)	Permitted in blueberries for control of ***Phytophthora* spp.** Apply as a foliar spray. Apply a maximum of 3 applications when new growth is 200-300mm high, 1 week prior to first flower and 1 month prior to leaf fall in autumn.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Bacillus amyloliquefaciens Strain QST 713 (Serenade Prime Soil Ameliorant and Biofungicide)	44	Biological Soil Ameliorant	NR	P-A	ALL	Available in berries for application to soil to improve bioavailability of soil resources to horticultural crops. No MRLs required for biological product.	-
Mandipropamid (Revus) Syngenta	40	Curative / Protectant		P		Current AU registration for control of Downy Mildew in grapes, lettuce, leafy vegetables and oilseed poppies. Registered in the US for **Phytophthora** in various crops, including as a foliar application for protection of citrus from Phytophthora Root Rot. No MRLs in place for AU or Codex.	-
Oxathiapiprolin (Zorvec Enicade) Corteva	49	Curative / Protectant		P		Current AU registrations for control of Downy Mildew in bulb vegetables, brassicas, cucurbits, leafy vegetables and poppies. Registered in the US for control of Phytophthora Canker and Brown Rot in citrus. No AU MRL. Codex MRL 0.5 mg/kg.	-
Anthracnose (*Colletotrichum simondsii*) **Priority: Moderate**							
Anthracnose is rated as a moderate priority in all regions. The disease is favoured in moist, warm conditions, with spores released through the spring and summer from infected plant material that has overwintered in the orchard. Flowering is the most critical time for infection. Infected fruit remain symptom free until berries ripen, initially as shrivelling or sunken lesions and developing into orange-pink spore masses on ripe fruit. Management includes strict orchard hygiene, pruning to maintain canopy ventilation and the use of fungicides during flowering to prevent infection.							
Aureobasidium pullulans Strain DSM 14940 & DSM 14941 (Botector) Nufarm	-	Biological / Protectant	NR	A	ALL	Registered in berries for the control of Botrytis Blight & Fruit Rot / Grey Mould, and the suppression of **Anthracnose Fruit Rot**, Phomopsis Fruit Rot and Rhizopus Fruit Rot. Apply as a preventative treatment from beginning of bloom until harvest. Apply as part of a spray program, using up to 6 applications at 5-7 day intervals, particularly when weather conditions favour disease infection.	-
Boscalid + Pyraclostrobin (Pristine) BASF PER82986	7+11	Protectant / Curative	3	A	ALL	Permitted in blueberries for control of Grey Mould and **Anthracnose** and the suppression of Rust. Use preventatively. Commence applications when conditions favour disease infection. Apply maximum 3 applications within an annual production cycle. Consecutive treatments should be applied 7-14 days apart. Do not apply more than 2 consecutive applications.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Captan PER13958	M4	Protectant	1	A	ALL (excl. VIC)	Permitted in blueberries for control of Cane Spot, Spur Blights, Botrytis Flower & Fruit Rot and **Anthracnose**. First application should occur after the green tip spray and then repeat every 10-14 days until the season ends. Do not make more than 5 applications per year.	-
Copper (Cu) present as Copper Hydroxide PER84176	M1	Protectant	1	A	ALL (excl. VIC)	Permitted in blueberries for control of **Anthracnose** and Blueberry Rust. Apply as a foliar application at first sign of disease. Apply at 10-14 day intervals while conditions favour disease development. Treatments per season not limited.	-
Cyprodinil + Fludioxinil (Switch) Syngenta PER84891	9+12	Protectant / Curative	7	A	ALL (excl. VIC)	Permitted in blueberries for control of Grey Mould and **Anthracnose**. Apply as a protectant treatment at the first signs of infection or at early stages of flower, fruit or foliage development prior to, or at the onset of disease. Do not exceed a maximum of 4 applications per season, with no more than 2 applications sequentially (7-14 days apart) before using another fungicide from a different MoA group for 2 applications.	R3
Bacillus amyloliquefaciens (strain QST 713) (Serenade Opti) Bayer	44	Biological / Protectant	NR	P		Registered in avocados for control of **Anthracnose** and in strawberries for control of Grey Mould. No MRLs required for biological product.	-
Florylpicoxamid (Adavelt) Corteva	21	Protectant / Curative		P		New Mode of Action fungicide being developed in AU. Corteva claim activity on **Anthracnose**. No MRL's for AU or Codex. Scheduled for JMPR evaluation in 2023.	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant / Curative		P		Registration work underway through Hort Innovation project ST16006 and ST17000 for control of Grey Mould and **Anthracnose** in raspberries, blackberries, and strawberries (Botrytis). Fluopyram: No AU MRL. Codex MRL 7 mg/kg. Tebuconazole: No MRLs for AU or Codex.	R3
Isofetamid (Kenja) ISK	7	Curative / Protectant		P		Registration pending for control of Botrytis in berries, and with known activity on **Anthracnose**. Has registration in the US for control of **Anthracnose** in berries. No AU MRL. Codex MRL 3 mg/kg.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Pydiflumetofen + Fludioxonil (Miravis Prime) Syngenta	7+12	Curative / Protectant		P		Registration pending in Australia for control of Botrytis, Alternaria, Powdery Mildew & **Anthracnose** in berries. Registered in the US for control of Anthracnose in various crops, including berry crops. Pydiflumetofen: No AU MRL. Codex MRL 4 mg/kg. Fludioxonil: AU MRL T3 mg/kg. Codex MRL 2 mg/kg.	R3
Alternaria Rot / Post-Harvest (*Alternaria* spp.) **Priority: Moderate**							
Alternaria is rated as a moderate priority in all regions and is the most serious post-harvest disease of blueberries. First symptoms are sunken lesions on the berries which develop into a grey-green mass of mycelium and dark green spores on the surface of the berries. Management should include strict orchard hygiene, pruning to maintain good canopy ventilation and rapid cooling of fruit after harvest in combination with post-harvest treatments.							
Bromo Chloro Dimethyl Hydantoin (BCDMH)	-	Sanitiser / Post-Harvest Treatment	NR	A	ALL	Registered in fruit & vegetables for control of bacteria and **fungi** by post-harvest surface sterilisation of fruit using spray or dip. Minimum contact 60 seconds.	-
Chlorine		Sanitiser / Post-Harvest Treatment	NR	A	ALL	Registered in fruit & vegetables for control of bacteria and **fungi** as a post-harvest spray. Minimum contact 30 seconds.	-
Iodine		Post-Harvest Treatment	NR	A	ALL	Registered in berries for sanitation of **post-harvest decay and diseases**. Dip fruit for a minimum of 1 minute.	-
Florylpicoxamid (Adavelt) Corteva	21	Protectant / Curative		P		New Mode of Action fungicide being developed in AU. Corteva claim activity on **Alternaria**. No MRL's for AU or Codex. Scheduled for JMPR evaluation in 2023.	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant / Curative		P		Registration work underway through Hort Innovation project ST16006 and ST17000 for control of Grey Mould and Anthracnose in raspberries, blackberries, and strawberries (Botrytis). Registered in the US for control of ***Alternaria* spp.** in various crops. Fluopyram: No AU MRL. Codex MRL 7 mg/kg. Tebuconazole: No MRLs for AU or Codex.	R3

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Pydiflumetofen + Fludioxonil (Miravis Prime) Syngenta	7+12	Curative / Protectant		P		Registration pending in Australia for control of Botrytis, **Alternaria**, Powdery Mildew & Anthracnose in berries. Registered in the US for control of Anthracnose in various crops, including berry crops. Pydiflumetofen: No AU MRL. Codex MRL 4 mg/kg. Fludioxonil: AU MRL T3 mg/kg. Codex MRL 2 mg/kg.	R3
Phomopsis Blight (*Phomopsis vaccinii*) **Priority: Moderate**							
Phomopsis Blight is rated as a moderate priority in all regions. The disease has the potential to cause large impacts on yield, by causing premature ripening of fruit, death of stems or whole plants, and rotted fruit. The disease causes necrotic lesions to form on the bud shortly after green tip. These lesions can spread and cause the infected buds to die. Leaf spots can develop later in the season and a fruit rot can also develop at harvest. Management includes strict orchard hygiene and removal of infected plant material, avoiding overhead irrigation, the use of resistant varieties, and timely harvest.							
Aureobasidium pullulans Strain DSM 14940 & DSM 14941 (Botector) Nufarm	-	Biological / Protectant	NR	A	ALL	Registered in berries for the control of Botrytis Blight & Fruit Rot / Grey Mould, and the suppression of Anthracnose Fruit Rot, **Phomopsis Fruit Rot** and Rhizopus Fruit Rot. Apply as a preventative treatment from beginning of bloom until harvest. Apply as part of a spray program, using up to 6 applications at 5-7 day intervals, particularly when weather conditions favour disease infection.	-
Boscalid + Pyraclostrobin (Pristine) BASF PER82986	7+11	Curative / Protectant		P-A		Permitted in blueberries for control of Grey Mould and Anthracnose and the suppression of Rust. Permitted in *Rubus* spp. for control of ***Phomopsis* spp**. Boscalid: AU MRL T15 mg/kg, Codex MRL 10 mg/kg. Pyraclostrobin: AU MRL T3 mg/kg, Codex MRL 3 mg/kg	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant / Curative		P		Registration work underway through Hort Innovation project ST16006 and ST17000 for control of Grey Mould and Anthracnose in raspberries, blackberries, and strawberries (Botrytis). Registered in the US for suppression of **Phomopsis** Cane and Leaf Spot in grapes, and in California for control of **Phomopsis** Canker and Blight in walnuts. Fluopyram: No AU MRL. Codex MRL 7 mg/kg. Tebuconazole: No MRLs for AU or Codex.	R3

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Mancozeb + Metalaxyl-M (Ridomil Gold MZ) Syngenta	M3+4	Protectant		P		Registered for control of **Phomopsis** Leaf Blight in strawberries. Mancozeb: No MRLs for AU or Codex. Metalaxyl-M: AU MRL T0.5 mg/kg. No Codex MRL.	R2
Bacterial Canker (*Pseudomonas syringae*) **Priority: Moderate**							
Bacterial Canker is rated as a moderate priority in all regions. The disease overwinters in stems and buds and will infect spring growth through plant wounds caused by pruning or weather damage. Can be particularly severe in young plants because the wood is succulent and more susceptible to disease. Cankers form on the canes and buds in the canker are killed. Cultural controls are required to manage the disease, including pruning out diseased wood, avoiding late summer nitrogen applications and maintaining strict hygiene to avoid spreading the pathogen within the orchard.							
Bacillus amyloliquefaciens (strain QST 713) (Serenade Opti) Bayer	44	Biological / Protectant	NR	P		Registered in capsicum, chilli and tomato for suppression of Bacterial Spot and in strawberries for control of Grey Mould. No MRLs required for biological product.	-
Copper	M1	Protectant		P		Registered in various crops for control of bacterial diseases. MRL not required for copper products.	-
Charcoal Rot (*Macrophomina phaseolina*) **Priority: Moderate**							
Charcoal Rot is rated as a moderate priority in all regions. It is a soil-borne disease that causes wilting and collapse of the leaves. Infected plants eventually die, and plant losses can be significant. Hort Innovation Project BS15005 is investigating management techniques for Charcoal Rot in strawberries which may also benefit the blueberry industry.							
Metham PER82024	-	Fumigant	NR	A	ALL (excl. VIC)	Permitted in blueberries for control of germinating weed seeds and soil borne pathogens, including **Charcoal Rot**. Apply through trickle irrigation to moist soil under plastic mulch at 5-8 weeks prior to planting. Flush all lines and equipment with clean water after use. Puncture plastic 2 weeks after treatment to allow dissipation of metham.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Botryosphaeria Stem Canker (*Botryosphaeria corticis*) **Priority: Moderate**							
Botryosphaeria Stem Canker is rated as a moderate priority in all regions. The fungus overwinters in infected canes and current season stems are infected in spring. Initial symptoms are small lesions on succulent stems, which can develop into large swollen cankers. Stems may be girdled and killed as these cankers grow over the course of the growing season. Control should include removal of infected canes and general orchard hygiene practices. Fungicides are generally ineffective.							
No options available.							
Crown Gall (*Agrobacterium tumefaciens*) **Priority: Moderate**							
Crown Gall is rated as a moderate priority in NSW, but a low priority in other regions. Galls form at the bases of canes or on major roots. The bacterium enters through natural or mechanical wounds on stems and roots and induces gall formation. Management techniques include planting disease-free nursery stock, removing infected plants, minimising wounding and maintaining an acid soil pH.							
Agrobacterium radiobacter var. *radiobacter* (NoGall) BASF	-	Protectant / Pre-Plant Seedling Treatment		P		Registered in stone fruit, almonds, pecans, walnuts and roses as a pre-plant treatment for control of **Crown Gall**.	-
Copper	M1	Protectant		P		Registered in various crops for control of bacterial diseases. No MRLs for AU or Codex.	-
Rhizoctonia Root Rot (*Rhizoctonia* spp.) **Priority: Low**							
Rhizoctonia Root Rot is rated as a low priority in all regions. It is a common soil-borne disease that can affect blueberries during propagation in substrate. Fumigation is the only control currently available.							
Metham PER82024	-	Fumigant	NR	A	ALL (excl. VIC)	Permitted in blueberries for control of germinating weed seeds and soil borne pathogens, including **Rhizoctonia**. Apply through trickle irrigation to moist soil under plastic mulch at 5-8 weeks prior to planting. Flush all lines and equipment with clean water after use. Puncture plastic 2 weeks after treatment to allow dissipation of metham.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Bacillus amyloliquefaciens Strain QST 713 (Serenade Prime Soil Ameliorant and Biofungicide) Bayer	44	Biological Soil Ameliorant	NR	P-A	ALL	Available in berries for application to soil to improve bioavailability of soil resources to horticultural crops. No MRLs required for biological product.	-
Fludioxonil + Cyprodinil (Switch) Syngenta PER84891	12+9	Protectant / Curative		P-A		Permitted in blueberries for control of Grey Mould and Anthracnose. Registered in nursery stocks and ornamentals for control of **Rhizoctonia** and in strawberries for control of Anthracnose, Botrytis and Root and Crown Rots.	R3
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant / Curative		P		Registration work underway through Hort Innovation project ST16006 and ST17000 for control of Grey Mould and Anthracnose in raspberries, blackberries, and strawberries (Botrytis). Registered in the US for suppression of Rhizoctonia in brassica leafy greens. Fluopyram: No AU MRL. Codex MRL 7 mg/kg. Tebuconazole: No MRLs for AU or Codex.	R3
Septoria Leaf Spot (*Septoria* spp.) **Priority: Low**							
Septoria Leaf Spot is rated as a low priority in all regions except Victoria and Tasmania, where it is rated as a moderate priority. The disease causes small brown leaf spots and lesions on succulent stems. Infection generally appears mid to late season and is favoured by wet weather. The pathogen will overwinter in infected plant tissue. Management strategies include avoiding overhead irrigation, pruning to maintain good canopy ventilation and orchard hygiene. No fungicides are available although incidental control may be achieved by the regular rust control program.							
Boscalid + Pyraclostrobin (Pristine) BASF PER82986	7+11	Curative / Protectant		P-A		Permitted in blueberries for control of Grey Mould and Anthracnose and the suppression of Rust. Permitted in *Rubus* spp. for control of **Leaf Spot.** Boscalid: AU MRL T15 mg/kg, Codex MRL 10 mg/kg. Pyraclostrobin: AU MRL T3 mg/kg, Codex MRL 3 mg/kg	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Florylpicoxamid (Adavelt) Corteva	21	Protectant / Curative		P		New Mode of Action fungicide being developed in AU. Corteva claim activity on **Septoria**. No MRL's for AU or Codex. Scheduled for JMPR evaluation in 2023.	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant / Curative		P		Registration work underway through Hort Innovation project ST16006 and ST17000 for control of Grey Mould and Anthracnose in raspberries, blackberries, and strawberries (Botrytis). Registered in the US for control of **Septoria Leaf Spot** in dry and succulent beans and pistachios. Fluopyram: No AU MRL. Codex MRL 7 mg/kg. Tebuconazole: No MRLs for AU or Codex.	R3

4.2 Insect and mite pests of Blueberries

4.2.1 Insect and mite pest priorities

Common name	Scientific name
High	
Light Brown Apple Moth	*Epiphyas postvittana*
Queensland Fruit Fly	*Bactrocera tryoni*
Longicorn Trunk Borer	*Phoracantha* spp.
Broad Mite	*Polyphagotarsonemus latus*
Red-Shouldered Leaf Beetle	*Monolepta australis*
Moderate	
Elephant Weevil	*Orthorhinus cylindrirostris*
Scarab Beetle / African Black Beetle	*Heteronychus arator*
Cotton Bollworm / Corn Earworm	*Helicoverpa armigera*
Native Budworm	*Helicoverpa punctigera*
Western Flower Thrips	*Frankliniella occidentalis*
Plague Thrips	*Thrips imaginis*
Flatid Leaf Hopper	*Flatormenis* spp.
Scale insects	*Coccidae* spp., *Diaspididae* spp., *Eriococcidae* spp.
Ants	*Formicidae*
Low	
Painted Apple Moth	*Orgyia anartoides*
Mango Webworm	*Dudua aprobola*
Orange Fruit Borer	*Isotenes miserana*
Green Vegetable Bug	*Nezara viridula*
Green Stink Bug	*Plautia affinis*
Cottonseed Bug	*Oxycarenus luctuosus*
Two Spotted Mite	*Tetranychus urticae*
Dried Fruit Beetle	*Carpophilus* spp.
Green Peach Aphid	*Myzus persicae*
European Wasp	*Vespula germanica*

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

Common Name	Scientific name
Fall Armyworm	*Spodoptera frugiperda*

The pests identified as a high priority in blueberries are Light Brown Apple Moth, Queensland Fruit Fly, Longicorn Trunk Borer, Broad Mite and Red-Shouldered Leaf Beetle. Light Brown Apple Moth do not survive well at high temperatures. They are a more serious problem in cooler areas with mild summers. Queensland Fruit Fly are most active in warm, humid conditions and after rain. Adults lay their eggs in maturing and ripe fruit on bushes and sometimes in fallen fruit. A combination of control methods is required to manage Fruit Fly, including population monitoring with traps, male annihilation technology, protein bait sprays and strict orchard hygiene practices. Longicorn Trunk Borers attack damaged, recently pruned or stressed bushes. Crops need to be monitored closely for Borers and affected limbs removed and destroyed. Broad Mites favour hot, dry conditions and can be flared by the use of disruptive insecticides that remove beneficial predators and parasitoids. An integrated approach is required to manage Mites. Red-Shouldered Leaf Beetles are a sporadic and voracious pest that often appear after heavy rainfall in spring and summer. Large populations will shred leaves and strip plants of flowers.

Green Mirids are an emerging pest in parts of Queensland. They are suspected to cause tip dieback and fruit loss, particularly in dry conditions. Investigations to determine the impact of Green Mirids in blueberries may be required in future.

It is important to take an Integrated Pest Management (IPM) Approach to pest control in blueberries. The diversity of insects that will attack the crop means that a planned, strategic approach is required. A range of control measures should be used, including cultural controls, biological controls and insecticides. Beneficial insects such as predators, parasitoids and pollinators should be encouraged and can be introduced artificially if required. Insecticide choice should be made with regard to preserving the beneficial insects that play an important role in the crop.

Bees also play an important role as pollinators of blueberries. Extra care should be taken with insect control measures used at flowering time, to avoid impacting on pollinators. Always refer to the pesticide label for guidance about preserving bees.

The diverse range of insect and mite pests in blueberries necessitates careful planning with resistance management. There are several pest strategies that apply to berries on the CropLife website[2], including Fall Armyworm and Western Flower Thrips.

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

4.2.2 Available and potential products for priority insects and mites

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

Availability		Regulatory risk (refer to Appendix 6)	
A	Available via either registration or permit approval	R1	Short-term: Critical concern over retaining access
P	Potential - a possible candidate to pursue for registration or permit	R2	Medium-term: Maintaining access of significant concern
P-A	Potential, already approved in the crop for another use	R3	Long-term: Potential issues associated with use - Monitoring required
Withholding Period (WHP) – Number of days from last treatment to harvest (H) or Grazing (G)			
Harvest	H	Not Required when used as directed	NR
Grazing	G	No Grazing Permitted	NG
IPM – indicative overall impact on beneficials (based on the Cotton Pest Management Guide 2019-20 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
Light Brown Apple Moth *(Epiphyas postvittana)* **Priority: High**								
Light Brown Apple Moth is rated as a high priority in all regions except NSW, where it is rated as a moderate priority. Larvae feed on the leaves, buds, flower and berries. Their feeding on berry surfaces under webbed leaves causes scarring as well as providing a site for rot or infection. Light Brown Apple Moth should be managed with a planned program of insecticides and rotating modes of action to avoid the development of insecticide resistance.								
Bacillus thuringiensis Berliner subsp. *aizawai* strain GC-91 (Bacchus WG) Campbell	11C	Ingestion	NR	A	ALL	Registered in fruit crops for control of Armyworm, Cotton Bollworm, Native Budworm, Cabbage Moth, Cabbage White Butterfly, Loopers, **Light Brown Apple Moth** and Vine Moth. Time spraying to coincide with egg hatch. Treatments per season not limited.	VL Bee VL	-
Chlorantraniliprole (Coragen) FMC PER84178	28	Ingestion	3	A	ALL (excl. VIC)	Permitted in blueberries for control of **Lepidopteran Pests**. Commence applications when populations reach determined economic threshold levels. Do not apply more than 3 applications per crop, with a minimum retreatment interval of 7 days between sprays.	L Bee VL	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Emamectin (Proclaim) Syngenta PER85422	6	Ingestion	5	A	ALL (excl. VIC)	Permitted in blueberries for control of **Lepidopteran Pests**. Apply at first signs of infestation. Do not apply more than 4 foliar applications per crop with a minimum retreatment interval of 14 days between consecutive sprays. Apply no more than 2 applications sequentially before using an insecticide from a different MoA group for 2 applications.	M Bee H	-
Ethyl Formate	-	Fumigant	NR	A	ALL	Registered in blueberries as a post-harvest fumigation treatment for the control of **Light Brown Apple Moth**, Red Back Spiders, Two Spotted Mite, Long Tailed Mealy Bug, Western Flower Thrips and Plague Thrips. Use only approved fumigation equipment. Treatment chamber must remain completely sealed for 1 hour exposure period.	-	-
Indoxacarb (Avatar Evo) FMC	22A	Ingestion	7	A	ALL	Registered in blueberries for control of **Light Brown Apple Moth**. Apply as eggs and larvae reach economic thresholds and damage is observed. Do not use more than 2 applications per crop and do not use a retreatment interval of less than 7 days.	M Bee H	R3
Indoxacarb (Avatar) FMC PER13289	22A	Ingestion	3	A	ALL	Permitted in blueberries for control of **Light Brown Apple Moth** and Elephant Weevil Borer. Apply as eggs and larvae reach economic thresholds and damage is observed. Apply a maximum of 2 applications per crop with a minimum retreatment interval of 7 days between consecutive applications.	M Bee H	R3
Methoxyfenozide (Prodigy) Corteva	18	Ingestion	7	A	ALL	Registered in blueberries for control of **Light Brown Apple Moth**. Target eggs and newly hatched larvae. Apply when locally determined thresholds are exceeded. Treatments per season not limited.	VL Bee VL	-
Spinetoram (Success Neo) Corteva	5	Ingestion	1	A	ALL	Registered in blueberries for control of Loopers, **Light Brown Apple Moth**, *Helicoverpa* and Western Flower Thrips. Target sprays against mature eggs and newly hatched larvae when numbers exceed spray threshold. Apply repeat applications at 7-14 day intervals as new infestations occur. Do not make more than 4 applications per season.	M Bee VH	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Spinosad (Entrust Organic) Corteva	5	Ingestion	1	A	ALL	Registered in blueberries for control of Looper, **Light Brown Apple Moth**, Heliothis and Western Flower Thrips. Target sprays against mature eggs and newly hatched larvae when numbers exceed spray threshold. Apply repeat applications at 7-14 day intervals as new infestations occur. Do not make more than 4 applications per season.	L Bee H	-
NUL3445 Nufarm	TBC			P		New active in development. Nufarm claim activity on Lepidoptera.		-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.		-
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion		P		Registered for control of various weevils, beetles and Lepidoptera in almonds, macadamias, pome and stone fruit. Hort Innovation project ST17000 data generation under development to register in raspberries and blackberries for various pests including **Light Brown Apple Moth**, Loopers, Helicoverpa, Cluster Caterpillar and Monolepta beetle.	L-M Bee VH	-
Queensland Fruit Fly *(Bactrocera tryoni)* **Priority: High**								
Queensland Fruit Fly is rated as a high priority in all regions except Victoria and Tasmania, where it is rated as a moderate priority. The pest lays its eggs in maturing and ripe fruit on bushes and sometimes in fallen fruit. The larvae hatch and their feeding and associated decay destroys the fruit. A combination of management strategies is required for dealing with QFF, including fruit fly traps, male annihilation technology, protein bait sprays and strict orchard hygiene practices.								
Abamectin	6	Contact / Ingestion	7	A	ALL	Registered in blueberries for control of **Queensland Fruit Fly**. Apply as a directed spray to the base of bushes where fruit bearing is sparse. Apply on a weekly basis starting from a month prior to harvest (i.e. green berry stage) through to the end of the berry harvest. Add yeast autolysate as an attractant. Allow approximately 7 days between consecutive spray applications. Do not make more than 12 applications per season. Apply no more than 4 sequential applications before switching to an insecticide from another chemical group for at least 2 applications.	M Bee H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Dimethoate	1B	Contact	1	A	NSW, WA	Registered in blueberries for control of **Queensland Fruit Fly**, Spider Mites, Thrips, Jassids, Aphids, Redlegged Earth Mite, Strawberry Bug and Rutherglen Bug. Do not exceed 7 applications per season with a minimum retreatment interval of 21 days between consecutive applications.	H Bee H	R3
Dimethoate (Danadim) PER88174	1B	Contact	1	A	QLD	Permitted in blueberries for control of **Queensland Fruit Fly**. Do not exceed 7 applications per season, with a minimum retreatment interval of 21 days between consecutive applications.	H Bee H	R3
Dimethoate PER13859	1B	Contact	NR	A	ALL	Permitted in fruit fly host crops for orchard clean-up of **Fruit Fly** following harvest. Do not apply more than 2 applications per host crop. Apply as a foliar and/or ground spray to both fallen and retained fruit. Produce treated must not be harvested, collected or supplied for human or animal consumption.	H Bee H	R3
Spinetoram (Success Neo) Corteva PER87408	5	Ingestion	1	A	ALL (excl. VIC)	Permitted in blueberries for suppression of **Queensland Fruit Fly**, Lesser Queensland Fruit Fly and Mediterranean Fruit Fly. For suppression of adult flies only, this treatment must be used in conjunction with other control strategies to be effective in reducing fruit fly damage. Apply as a foliar spray after flower set. Do not apply more than 4 applications per season, with a minimum 7-14 days between consecutive applications.	M Bee VH	-
Spinosad (Naturalure) Corteva	5	Bait / Ingestion	NR	A	ALL	Registered in fruit for control of Fruit Flies including **Queensland Fruit Fly** and Mediterranean Fruit Fly. Apply as either a band or a spot spray to the lower canopy of fruiting plants. Begin applications as soon as monitoring traps indicate flies are present and fruit is at a susceptible stage. Repeat applications every 7 days, re-applying sooner if rain washes off the deposit. Avoid spraying the fruit as phytotoxicity may occur.	L Bee H	-
Trichlorfon (Lepidex)	1B	Contact	2	A	NSW	Registered in blueberries for control of **Queensland Fruit Fly**. Apply 21, 14 and 7 days before harvesting, when fruit fly are numerous. Treatments per season not limited.	H Bee H	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Trichlorfon (Lepidex) PER12486	1B	Contact	2	A	ACT, NSW, NT, QLD, SA & WA	Permitted in blueberries for control of **Queensland Fruit Fly** and Mediterranean Fruit Fly. Apply as a cover spray. Do not apply more than 3 applications per season with a minimum retreatment interval of 7 days between applications.	H Bee H	R2
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C	Contact & Ingestion / IGR		P		Registration work underway through Hort Innovation project ST16006 for control of hoppers and bugs in *Rubus* spp. Registered for suppression of **Queensland Fruit Fly** in avocado, citrus and mango. Acetamiprid: No AU MRL, Codex MRL 2 mg/kg. Pyriproxyfen: No MRLs for AU or Codex.	M Bee H	-
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact and Ingestion		P		Registered in macadamias for control of Fruit Spotting Bugs, Lace Bug and Scirtothrips. Registered in the US for control of Aphids, Blueberry Thrips and Blueberry Maggot in bushberries. Possible activity against fruit fly. No AU MRL. Codex MRL 4 mg/kg.	L Bee L	-
NUL3445 Nufarm	TBC			P		New active in development. Nufarm claim activity on Fruit Flies.		-
Longicorn Trunk Borer *(Phoracantha* spp.*)* **Priority: High**								
Longicorn Trunk Borers are rated as a high priority in all regions. Damaged or stressed bushes are more prone to attack. The pest lays its eggs into splits in the bark, and the when hatched the larvae tunnel and feed beneath the bark. Can be difficult to detect, especially as the entry points often close over after infestation. Management is restricted to pruning and removal of affected branches.								
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.		-
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion		P		Registered for control of various weevils, beetles and Lepidoptera in almonds, macadamias, pome and stone fruit. Hort Innovation project ST17000 data generation under development to register in raspberries and blackberries for various pests including Light Brown Apple Moth, Loopers, Helicoverpa, Cluster Caterpillar and Monolepta beetle.	L-M Bee VH	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Broad Mite (*Polyphagotarsonemus latus*) **Priority: High**								
Broad Mites are rated as a high priority in all regions. Young, actively growing plants are particularly susceptible to attack. The mite feeds by piercing the leaf and feeding on the plant sap. Severe infestations will cause discolouration and distortion of leaves and berries.								
Paraffinic Oil		Contact	1	A	ALL	Registered in blueberries for control of **Mites** and Scale. Apply as a cover spray early in the pest infestation. Do not spray more than 4 times per season with 2 weeks minimum application interval. Avoid spraying open blooms.	L Bee L	-
Abamectin	6	Contact & Ingestion		P-A		Registered for control of **Broad Mite** in citrus. No foliar registrations in blueberries but registered as a fruit fly bait applied to the base of the plant. AU MRL T*0.02 mg/kg. No Codex MRL.	M Bee H	-
Acequinocyl (Kanemite) UPL	20B	Contact & Ingestion		P		Registration is progressing for control of Mites in pome and stone fruit. Registered in the US for control of Spider Mite in low growing berries and control of **Broad Mite** in melons and okra. No MRLs for AU or Codex.	L Bee L	-
Fenbutatin Oxide (Torque) BASF	12B	Contact		P		Permitted in blackberries and raspberries for control of various mites, including **Broad Mite**. AU MRL 1 mg/kg. No Codex MRL.	L Bee L	R3
Hexythiazox (Calibre) Nufarm	10A	IGR / Contact		P		Registered in pome fruit, stone fruit and strawberries for control of Mites. AU MRL 1 mg/kg. No Codex MRL.	L Bee L	-
Spiromesifen (Oberon) Bayer	23	Ingestion		P		New Australian Registration pending for control of Mites. Hort Innovation is undertaking data generation projects across multiple commodities for a new label registration in Australia, including project ST19020 for control of various mites in *Rubus* spp. and strawberries. US registration for control of **Broad Mite** in fruiting vegetables and Two Spotted Mite in low growing berries. No MRLs for AU or Codex.	M Bee VL	-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.		-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Red Shouldered Leaf Beetle (*Monolepta australis*) **Priority: High**								
Red Shouldered Leaf Beetle is rated as a high priority in NSW and as a moderate priority elsewhere, except Queensland where it is rated as a low priority. The adults attack leaves, fruit and flowers and in high numbers they can strip plants of leaves and flowers. Hatching occurs from grassed rows in spring through autumn after rain. Early detection will enable spot spraying to control outbreaks before they spread through the orchard.								
Methomyl (Lannate)	1A	Contact	5	A	NSW, WA	Registered in blueberries for control of **Red Shouldered Leaf Beetle**, *Helicoverpa* spp. and Plague Thrips. Apply according to pest incidence. Treatments per season not limited.	H Bee H	R2
Methomyl (Lannate) PER14134	1A	Contact	5	A	QLD	Permitted in blueberries for control of **Red Shouldered Leaf Beetle**, *Helicoverpa* spp. and Plague Thrips. Apply according to pest incidence. Treatments per season not limited.	H Bee H	R2
NUL3445 Nufarm	TBC			P		New active in development. Nufarm claim activity on Beetles.		-
Pyrethrins (Pyganic) Sumitomo	3A	Contact		P		Minor use permit PER80070 expired June 2020, for use in Blueberries for the control of **Monolepta Beetle**, Green Vegetable Bug and Green Stink Bug. The Berry Industry has applied for a renewal of this permit.	VH Bee H	-
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion		P		Registered for control of various weevils, beetles and Lepidoptera in almonds, macadamias, pome and stone fruit. Hort Innovation project ST17000 data generation under development to register in raspberries and blackberries for various pests including Light Brown Apple Moth, Loopers, Helicoverpa, Cluster Caterpillar and **Monolepta Beetle**.	L-M Bee VH	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Elephant Weevil (*Orthorhinus cylindrirostris*) **Priority: Moderate**								
Elephant Weevil is rated as a moderate priority in all regions except Queensland, where it is rated as a high priority. Adult weevils bore holes into the stem to lay eggs. The larvae hatch and feed by boring tunnels through the stem, crown and roots of the bush. The best time to control the pest is when the adults emerge during spring / summer, usually a few weeks after pruning. Cultural controls include removing and destroying infested plant material, growing less susceptible varieties and reducing plant stresses.								
Bifenthrin (Talstar) PER84972	3A	Contact	1	A	ALL (excl. VIC)	Permitted in blueberries for control of **Elephant Weevil**. Apply one week after pruning or when adults have emerged and are present and are observed on cut surfaces or foliage of pruned plants. Apply a maximum of 4 foliar applications with a minimum retreatment interval of 7 days.	VH Bee H	-
Indoxacarb (Avatar) FMC PER13289	22A	Ingestion	3	A	ALL	Permitted in blueberries for control of Light Brown Apple Moth and **Elephant Weevil Borer**. Apply 1 week after pruning or when adults have emerged and are observed on cut surfaces or foliage of pruned plants. Apply a maximum of 2 applications per crop with a minimum retreatment interval of 7 days between consecutive applications.	M Bee H	R3
NUL3445 Nufarm	TBC			P		New active in development. Nufarm claim activity on Weevils.		-
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion		P		Registered for control of various weevils, beetles and Lepidoptera in almonds, macadamias, pome and stone fruit. Hort Innovation project ST17000 data generation under development to register in raspberries and blackberries for various pests including Light Brown Apple Moth, Loopers, Helicoverpa, Cluster Caterpillar and Monolepta beetle.	L-M Bee VH	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Scarab Beetle / African Black Beetle (*Heteronychus arator*) **Priority: Moderate**								
Scarab Beetle is rated as a moderate priority in all regions. Most damage is caused by larvae feeding on the roots of young plants. Populations build up in dry spring / summer periods. Insecticide treatments should be applied at planting and prior to root flushes each year.								
Chlorpyrifos (Suscon Blue) Nufarm PER82022	1B	Contact	NR	A	ALL	Permitted in blueberries for control of **Scarab Beetles**. Apply maximum of 2 applications per crop per year, with approximately 6 months between treatments. Apply following planting and pruning (October to April).	H Bee H	R1
Imidacloprid (Confidor) Bayer PER12534	4A	Contact / Ingestion	NR NG	A	ALL (excl. VIC)	Permitted in blueberries for control of **Scarab Beetle Larvae**. Apply after harvest, and before flowering begins the next season. Apply via subsurface trickle irrigation or injection through fertigation system. Do not use more than 1 application per year. Do not apply using surface trickle irrigation or any other type of above ground irrigation system.	M Bee M	R2
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact and Ingestion		P		Registered in macadamias for control of Fruit Spotting Bugs, Lace Bug and Scirtothrips. Registered in the US for control of Aphids, Blueberry Thrips and Blueberry Maggot in bushberries. Has some beetle activity, including US registration for control of Colorado Potato Beetle in fruiting vegetables and tuberous and corm vegetables. No AU MRL. Codex MRL 4 mg/kg.	L Bee L	-
NUL3445 Nufarm	TBC			P		New active in development. Nufarm claim activity on Beetles.		-
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion		P		Registered for control of various weevils, beetles and Lepidoptera in almonds, macadamias, pome and stone fruit Hort Innovation project ST17000 data generation under development to register in raspberries and blackberries for various pests including Light Brown Apple Moth, Loopers, Helicoverpa, Cluster Caterpillar and Monolepta beetle.	L-M Bee VH	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Cotton Bollworm *(Helicoverpa armigera)* **Native Budworm** *(Helicoverpa punctigera)* **Priority: Moderate**								
Helicoverpa spp. are rated as a moderate priority in all regions except Queensland, where they are rated as a high priority. The pest causes feeding damage to leaves, flowers and fruit in the larval stage. Insecticides should be targeted to egg hatch to ensure feeding damage is minimised.								
Bacillus thuringiensis Berliner subsp. *aizawai* strain GC-91 (Bacchus WG) Campbell	11C	Ingestion	NR	A	ALL	Registered in fruit crops for control of Armyworm, **Cotton Bollworm**, **Native Budworm**, Cabbage Moth, Cabbage White Butterfly, Loopers, Light Brown Apple Moth and Vine Moth. Time spraying to coincide with egg hatch. Treatments per season not limited.	VL Bee VL	-
Chlorantraniliprole (Coragen) FMC PER84178	28	Ingestion	3	A	ALL (excl. VIC)	Permitted in blueberries for control of **Lepidopteran Pests**. Commence applications when populations reach determined economic threshold levels. Do not apply more than 3 applications per crop, with a minimum retreatment interval of 7 days between sprays.	L Bee VL	-
Emamectin (Proclaim) Syngenta PER85422	6	Ingestion	5	A	ALL (excl. VIC)	Permitted in blueberries for control of **Lepidopteran Pests**. Apply at first signs of infestation. Do not apply more than 4 foliar applications per crop with a minimum retreatment interval of 14 days between consecutive sprays. Apply no more than 2 applications sequentially before using an insecticide from a different MoA group for 2 applications.	M Bee H	-
Methomyl (Lannate)	1A	Contact	5	A	NSW, WA	Registered in blueberries for control of Red Shouldered Leaf Beetle, ***Helicoverpa* spp.** and Plague Thrips. Apply when infestation reaches economically damaging level. Treatments per season not limited.	H Bee H	R2
Methomyl (Lannate) PER14134	1A	Contact	5	A	QLD	Permitted in blueberries for control of Red Shouldered Leaf Beetle, ***Helicoverpa* spp.** and Plague Thrips. Apply when infestation reaches economically damaging level. Treatments per season not limited.	H Bee H	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Nuclear Polyhedrosis Virus (Vivus) AgBiTech	-	Ingestion	NR	A	ALL	Registered in blueberries for control of ***Helicoverpa* spp.** Apply as a foliar spray when larvae are newly hatched. Retreatment may be required at 2-3 day intervals. Treatments per season not limited.	VL Bee VL	-
Spinetoram (Success Neo) Corteva	5	Ingestion	1	A	ALL	Registered in blueberries for control of Looper, Light Brown Apple Moth, ***Helicoverpa*** and Western Flower Thrips. Target sprays against mature eggs and newly hatched larvae when numbers exceed spray threshold. Apply repeat applications at 7-14 day intervals as new infestations occur. Do not make more than 4 applications per season.	M Bee VH	-
Spinosad (Entrust Organic) Corteva	5	Ingestion	1	A	ALL	Registered in blueberries for control of Looper, Light Brown Apple Moth, **Heliothis** and Western Flower Thrips. Target sprays against mature eggs and newly hatched larvae when numbers exceed spray threshold. Apply repeat applications at 7-14 day intervals as new infestations occur. Do not make more than 4 applications per season.	L Bee H	-
Indoxacarb (Avatar) FMC PER13289	22A	Contact / Ingestion	H:42 NG	P-A	NSW, QLD	Permitted in blueberries for control of Light Brown Apple Moth and Elephant Weevil Borer. Registered for control of ***Helicoverpa* spp.** in various vegetable crops.	M Bee H	R3
Clitoria ternatea Extract (Sero-X) Growth Agriculture		Biological / Ingestion	NR	P		Registered in cotton for control of ***Helicoverpa* spp.**, Green Mirids and Silverleaf Whitefly and in brassica leafy vegetables for control of Diamondback Moth. No MRLs required for biological product.		-
Indoxacarb + Novaluron (Plemax) Adama	22A+15	Contact / Ingestion		P		Registration pending in AU. Crops not known at this stage. Adama claim activity on Lepidoptera. Indoxacarb – AU MRL 1 mg/kg. No Codex MRL. Novaluron – No AU MRL. Codex MRL 7 mg/kg.	M Bee H	R3
NUL3445 Nufarm	TBC			P		New active in development. Nufarm claim activity on Lepidoptera.		-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.		-
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion		P		Registered for control of various weevils, beetles and Lepidoptera in almonds, macadamias, pome and stone fruit. Hort Innovation project ST17000 data generation under development to register in raspberries and blackberries for various pests including Light Brown Apple Moth, Loopers, **Helicoverpa**, Cluster Caterpillar and Monolepta beetle.	L-M Bee VH	-
Western Flower Thrips (*Frankliniella occidentalis*) **Plague Thrips** (*Thrips imaginis*) **Priority: Moderate**								
Western Flower Thrips are rated as a moderate priority in all regions and Plague Thrips are rated as a moderate priority in all regions except Victoria and Tasmania, where they are rated as a low priority. Thrips are usually carried into orchards on winds during spring. The nymphs and adults feed in growing points and inside flowers. An integrated pest management approach should be used with thrips control, including the use of predatory mites along with a planned and strategic insecticide program to preserve beneficial insects in crop.								
Dimethoate	1B	Contact	1	A	ALL	Registered in blueberries for control of Queensland Fruit Fly, Spider Mites, **Thrips**, Jassids, Aphids, Red Legged Earth Mite, Strawberry Bug and Rutherglen Bug. Do not exceed 7 applications per season with a minimum retreatment interval of 21 days between consecutive applications.	H Bee H	R1
Ethyl Formate		Fumigant	NR	A	ALL	Registered in blueberries as a post-harvest fumigation treatment for the control of Light Brown Apple Moth, Red Back Spiders, Two Spotted Mite, Long Tailed Mealy Bug, **Western Flower Thrips** and **Plague Thrips**. Use only approved fumigation equipment. Treatment chamber must remain completely sealed for 1 hour exposure period.	-	-
Methomyl (Lannate)	1A	Contact	5	A	NSW, WA	Registered in blueberries for control of Red Shouldered Leaf Beetle, *Helicoverpa* spp. and **Plague Thrips**. Apply when infestation reaches economically damaging level. Treatments per season not limited.	H Bee H	R2
Methomyl (Lannate) PER14134	1A	Contact	5	A	QLD	Permitted in blueberries for control of Red Shouldered Leaf Beetle, *Helicoverpa* spp. and **Plague Thrips**. Apply when infestation reaches economically damaging level. Treatments per season not limited.	H Bee H	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Spinetoram (Success Neo) Corteva	5	Ingestion	1	A	ALL	Registered in blueberries for control of Looper, Light Brown Apple Moth, *Helicoverpa* and **Western Flower Thrips**. Make 3 consecutive applications at 3-5 day intervals when temperatures are greater than 20°C or at 6-12 day intervals when temperatures are less than 20°C. Do not make more than 3 consecutive applications and do not make more than 4 applications in total per season.	M Bee VH	-
Spinosad (Entrust Organic) Corteva	5	Ingestion	1	A	ALL	Registered in blueberries for control of Looper, Light Brown Apple Moth, Heliothis and **Western Flower Thrips**. Make 3 consecutive applications at 3-5 day intervals when temperatures are greater than 20°C or at 6-12 day intervals when temperatures are less than 20°C. Do not make more than 3 consecutive applications and do not make more than 4 applications in total per season.	L Bee H	-
Beauveria bassiana (Velifer) BASF	UN			P		Registered for suppression of Onion Thrips and **Western Flower Thrips** in protected vegetables and ornamentals and has activity on Thrips, Aphids, Whitefly and Mites. No MRLs required for a biological product.	L Bee L	-
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact and Ingestion		P		Registered in macadamias for control of Fruit Spotting Bugs, Lace Bug and Scirtothrips. Registered in the US for control of Aphids, Blueberry Thrips and Blueberry Maggot in bushberries. No AU MRL. Codex MRL 4 mg/kg.	L Bee L	-
NUL3445 Nufarm	TBC			P		New active in development. Nufarm claim activity on Thrips.		-
Spirotetramat (Movento) Bayer	23	Ingestion		P		Registered for control of **Western Flower Thrips** in various vegetable crops. AU MRL T2 mg/kg. Codex MRL 1.5 mg/kg.	M Bee L	-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.		-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Flatid Leaf Hopper (*Flatormenis* spp.) **Priority: Moderate**								
Flatid Leaf Hopper is rated as a moderate priority although it is only found in the Burnett area of Queensland. Adults and nymphs pierce the leaf and feed on the plant sap. Severe infestations can cause damage to foliage, flowers and fruit.								
Dimethoate	1B	Contact	1	A	ALL	Registered in blueberries for control of Queensland Fruit Fly, Spider Mites, Thrips, **Jassids**, Aphids, Redlegged Earth Mite, Strawberry Bug and Rutherglen Bug. Do not exceed 7 applications per season with a minimum retreatment interval of 21 days between consecutive applications.	H Bee H	R1
Spinetoram (Success Neo)	5	Ingestion	1	P-A	ALL	Registered in blueberries for control of Light Brown Apple Moth, *Helicoverpa* and Western Flower Thrips. Will control **Leafhoppers** in the nymph stage only. Do not make more than 4 applications per season.	M Bee VH	-
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C	Contact & Ingestion / IGR		P		Registration work underway through Hort Innovation project ST16006 for control of hoppers and bugs in *Rubus* spp. Acetamiprid: No AU MRL, Codex MRL 2 mg/kg. Pyriproxyfen: No MRLs for AU or Codex.	M Bee H	-
Flonicamid (Mainman) UPL	29	Ingestion		P		Registration work underway through Hort Innovation project ST17000 and permit pending for control of **Hoppers**, Aphids and Bugs in *Rubus* spp. No MRLs for AU or Codex.	M Bee VL	-
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact and Ingestion		P		Registered in macadamias for control of Fruit Spotting Bugs, Lace Bug and Scirtothrips. Registered in the US for control of Aphids, Blueberry Thrips and Blueberry Maggot in bushberries and for the control of **Leaf Hoppers** in various vegetables and tree crops. No AU MRL. Codex MRL 4 mg/kg.	L Bee L	-
NUL3445 Nufarm	TBC			P		New active in development. Nufarm claim activity on **Leaf Hoppers**.		

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Sulfoxaflor (Transform) Corteva	4C	Contact and Ingestion		P		Current permit in blueberries for control of Cottonseed Bug will not be renewed in blueberries based on additional data requirements. MT18018 to generate residue data for permit renewal for *Rubus* spp. and is also registered in strawberries for control of Green Peach Aphid and Green Mirid. Registered in the US for control of **Leaf Hoppers** in various fruit and vegetable crops. AU MRL T0.7 mg/kg. No Codex MRL.	M Bee VH	-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.		-
Scale Insects (*Coccidae* spp., *Diaspididae* spp., *Eriococcidae* spp.) **Priority: Moderate**								
Scale Insects are rated as a moderate priority in all regions except Victoria and Tasmania, where they are rated as a low priority. The pest feeds on young growing tips and leaves, and if left uncontrolled they can weaken the bush and predispose it to disease. Scale on fruit can cause blemishes or distortions and honeydew often causes sooty mould growth which, if on fruit, can make it unsaleable.								
Diazinon	1B	Contact	14	A	NSW	Registered in blueberries for control of **Scale Insects**. Apply as a cover spray when scale is present. Treatments per season not limited.	H Bee H	R3
Paraffinic Oil	-	Contact	1	A	ALL	Registered in blueberries for control of Mites and **Scale**. Apply as a cover spray early in the pest infestation. Do not spray more than 4 times per season with 2 weeks minimum application interval. Avoid spraying open blooms.	L Bee L	-
Spirotetramat (Movento) Bayer PER82607	23	Ingestion	H:7 NG	A	ALL (excl. VIC)	Permitted in blueberries for control of **White Wax Scale**. Commence applications at the onset of the crawler emergence stage or when pest numbers reach economically damaging levels. Make a maximum of 3 applications per season, with a minimum 14 day retreatment interval.	M Bee L	-
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C	Contact & Ingestion / IGR		P		Hort Innovation project ST16006 data generation under development for a label extension in *Rubus* spp. for various pests on the Trivor label. Registered in grapes for control of **Scale**, Light Brown Apple Moth and Long Tailed Mealybug. Acetamiprid: No AU MRL, Codex MRL 2 mg/kg. Pyriproxifen: No MRLs for AU or Codex.	M Bee H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Buprofezin (Applaud) Corteva	16	IGR / Ingestion		P		Registered for control of various types of Scale in citrus, custard apple, mango, passionfruit and persimmons. No MRLs for AU or Codex.	M Bee L	-
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact and Ingestion		P		Registered in macadamias for control of Fruit Spotting Bugs, Lace Bug and Scirtothrips. Registered in the US for control of Aphids, Blueberry Thrips and Blueberry Maggot in bushberries and for the control of **Scale** in citrus and pome fruit. No AU MRL. Codex MRL 4 mg/kg.	L Bee L	-
NUL3145 Nufarm	TBC			P		New active in development. Nufarm claim activity on Scale Insects.		-
Sulfoxaflor (Transform) Corteva	4C	Contact and Ingestion		P		Current permit in blueberries for control of Cottonseed Bug will not be renewed in blueberries based on additional data requirements. MT18018 to generate residue data for permit renewal for *Rubus* spp. and is also registered in strawberries for control of Green Peach Aphid and Green Mirid. Registered for control of various types of **Scale** in citrus. AU MRL T0.7 mg/kg. No Codex MRL.	M Bee VH	-
Ants (*Formicidae*) **Priority: Moderate**								
Ants are rated as a moderate priority in all regions. Ants can be a nuisance in orchards. The ants do not cause damage to bushes, but they can interfere with operations and severe infestations can impact on beneficial predators. They are a competitor for space in substrate which can impact on the health of bushes.								
Pyriproxyfen (Distance Ant Bait) Sumitomo	7C	IGR / Bait	NR	A	ALL	Registered in fruit crops for control of invasive and nuisance **ants**. Apply baits in early spring or summer at first sign of ant activity. Do not exceed 3 applications per year and a minimum of 3 months between each treatment.	VL Bee L	-
Metaflumizone (Siesta Ant Bait) BASF	22B	Ingestion		P		Registration pending in Australia.	-	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Painted Apple Moth (*Orgyia anartoides*) **Mango Webworm** (*Dudua aprobola*) **Orange Fruit Borer** (*Isotenes miserana*) **Priority: Low**								
These Lepidopteran pests are rated as a low priority in all regions, except Painted Apple Moth which is rated as a moderate priority in Victoria and Tasmania and Mango Webworm and Orange Fruit Borer that are both rated as a high priority in Queensland. Larvae of Painted Apple Moth feed on the foliage, while larvae of the Mango Webworm feed on the flowers and young fruits. The larvae of Orange Fruit Borer chew and burrow into the fruit, causing it to fall and decay.								
Chlorantraniliprole (Coragen) FMC PER84178	28	Ingestion	3	A	ALL (excl. VIC)	Permitted in blueberries for control of **Lepidopteran Pests**. Commence applications when populations reach determined economic threshold levels. Do not apply more than 3 applications per crop, with a minimum retreatment interval of 7 days between sprays.	L Bee VL	-
Emamectin (Proclaim) Syngenta PER85422	6	Ingestion	5	A	ALL (excl. VIC)	Permitted in blueberries for control of **Lepidopteran Pests**. Apply at first signs of infestation. Do not apply more than 4 foliar applications per crop with a minimum retreatment interval of 14 days between consecutive sprays. Apply no more than 2 applications sequentially before using an insecticide from a different MoA group for 2 applications.	M Bee H	-
NUL3445 Nufarm	TBC			P		New active in development. Nufarm claim activity on Lepidoptera.		-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.		-
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion		P		Registered for control of various weevils, beetles and Lepidoptera in almonds, macadamias, pome and stone fruit. Hort Innovation project ST17000 data generation under development to register in raspberries and blackberries for various pests including Light Brown Apple Moth, Loopers, Helicoverpa, Cluster Caterpillar and Monolepta beetle.	L-M Bee VH	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Green Vegetable Bug (*Nezara viridula*) **Green Stink Bug** (*Plautia affinis*) **Cottonseed Bug** (*Oxycarenus luctuosus*) **Priority: Low**								
Green Vegetable Bug is rated as a low priority in all regions except Queensland, where it is rated as a moderate priority and Victoria and Tasmania where it is rated as a high priority. Green Stink Bug is rated as a low priority in all regions except Victoria and Tasmania, where it is rated as a high priority. Cottonseed Bug is rated as a low priority in all regions except Queensland, where it is rated as a moderate priority. Adults bugs use their long thin mouthpiece to pierce and feed directly on berries, causing the fruit to fall or rot.								
Sulfoxaflor (Transform) Corteva PER87141	4C	Contact and Ingestion	1	A	NSW, QLD	Permitted in blueberries for control of **Cottonseed Bug**. Apply as a foliar cover spray following first signs of pest infestation. Do not apply more than 2 applications per crop with a minimum retreatment interval of 14 days.	M Bee VH	-
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C	Contact & Ingestion / IGR		P		Registration work underway through Hort Innovation project ST16006 for control of hoppers and bugs in *Rubus* spp. Acetamiprid: No AU MRL, Codex MRL 2 mg/kg. Pyriproxyfen: No MRLs for AU or Codex.	M Bee H	-
Flonicamid (Mainman) UPL	29	Ingestion		P		Registration work underway through Hort Innovation project ST17000 and permit pending for control of Hoppers, Aphids and **Bugs** in *Rubus* spp. No MRLs for AU or Codex.	M Bee VL	-
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact and Ingestion		P		Registered in macadamias for control of Fruit Spotting Bugs, Lace Bug and Scirtothrips. Registered in the US for control of Aphids, Blueberry Thrips and Blueberry Maggot in bushberries. Activity indicated on various bug species in Australia. No AU MRL. Codex MRL 4 mg/kg.	L Bee L	-
NUL3445 Nufarm	TBC			P		New active in development. Nufarm claim activity on Bugs.		-
Pyrethrins (Pyganic) Sumitomo	3A	Contact		P		Minor use permit PER80070 expired June 2020, for use in Blueberries for the control of Monolepta Beetle, **Green Vegetable Bug** and **Green Stink Bug**. The Berry Industry has applied for a renewal of this permit.	VH Bee H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.		-
Two Spotted Mite (*Tetranychus urticae*) **Priority: Low**								
Two Spotted Mite is rated as a low priority in all regions except Victoria and Tasmania, where it is rated as a moderate priority. Mites mainly feed on the leaves, but they can cause damage to flowers and fruit if they are present in large numbers. Outbreaks can be associated with extensive use of broad spectrum insecticides which flare mites by eliminating natural predators.								
Botanical Oil (Eco-Oil) PER14234	-	Contact	NR	A	ALL (excl. VIC)	Permitted in blueberries for control of **Two Spotted Mite**. Apply as a cover spray when mite activity first appears. Apply 2 sprays 3-5 days apart. If mite reinfestation is observed, repeat application, with a minimum of 7 day interval since the last treatment. Do not apply more than 3 separate applications to plants within a 4-8 week period.	L Bee L	-
Dimethoate	1B	Contact	1	A	ALL	Registered in blueberries for control of Queensland Fruit Fly, Spider **Mites**, Thrips, Jassids, Aphids, Redlegged Earth Mite, Strawberry Bug and Rutherglen Bug. Do not exceed 7 applications per season with a minimum retreatment interval of 21 days between consecutive applications.	H Bee H	R1
Ethyl Formate		Fumigant	NR	A	ALL	Registered in blueberries as a post-harvest fumigation treatment for the control of Light Brown Apple Moth, Red Back Spiders, **Two Spotted Mite**, Long Tailed Mealy Bug, Western Flower Thrips and Plague Thrips. Use only approved fumigation equipment. Treatment chamber must remain completely sealed for 1 hour exposure period.	-	-
Paraffinic Oil	-	Contact	1	A	ALL	Registered in blueberries for control of **Mites** and Scale. Apply as a cover spray early in the pest infestation. Do not spray more than 4 times per season with 2 weeks minimum application interval. Avoid spraying open blooms.	L Bee L	-
Acequinocyl (Kanemite) UPL	20B	Contact & Ingestion		P		Registration is progressing for control of Mites in pome and stone fruit. Registered in the US for control of **Two Spotted Mite** and other Spider Mites in low growing berries. No MRLs for AU or Codex.	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	P		Registered for suppression of Onion Thrips and Western Flower Thrips in protected vegetables and ornamentals and has activity on Thrips, Aphids, Whitefly and Mites. No MRLs required for a biological product.	L Bee L	-
Cyflumetofen (Danisaraba) BASF	25A	Contact		P		BASF is seeking registration in Australia for the control of Spider Mites in various crops. Will not control mite species other than Spider Mites. Blueberries not currently in scope but strawberries expected on the initial label. No MRLs for AU or Codex.	L Bee L	-
Hexythiazox (Calibre) Nufarm	10A	IGR / Contact		P		Registered in pome fruit, stone fruit and strawberries for control of Mites. AU MRL 1 mg/kg. No Codex MRL.	L Bee L	-
Spiromesifen (Oberon) Bayer	23	Ingestion		P		New Australian Registration pending for control of Mites. Hort Innovation is undertaking data generation projects across multiple commodities for a new label registration in Australia, including project ST19020 for control of various mites in *Rubus* spp. and strawberries. US registration for control of Broad Mite in fruiting vegetables and **Two Spotted Mite** in low growing berries. No MRLs for AU or Codex.	M Bee VL	-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.		-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Dried Fruit Beetle (*Carpophilus* spp.) **Priority: Low**								
Dried Fruit Beetle is rated as a low priority in all regions except Victoria and Tasmania, where they are rated as a moderate priority. The pest has the potential to cause serious losses when the beetle bores into ripening fruit. Orchard hygiene is a key cultural control as the adults lay their eggs in rotting or damaged fruit. Fallen fruit should be destroyed to break the insect life-cycle. Cover sprays are not currently available but an attract-and-kill trapping system can be used to reduce the population in spring.								
3-Methyl-1-Butanol | 2-Methyl-1-Butanol | Ethyl Acetate | Acetaldehyde | Sec Butanol | Ethanol | Carpophilus Aggregation Pheromones (Carpophilus Catcha Trapping System)	-	Attract & Kill	NR	A	ALL	Registered in berry fruit for monitoring and control of **Carpophilus Beetle**. Contains 2 feeding attractants and an aggregation pheromone lure, which are prepared and/or placed into a trap. To be used in conjunction with Pest Strips containing dichlorvos. For Monitoring: Prior to fruit ripening, place 2 traps per block where block is <10ha, or 4 traps per block where block is >10ha. Install at eye level in the orchard. Replace co-attractants every 2 weeks. Do not use aggregation pheromones. For population management: Prior to fruit ripening, place 3 traps per ha. Install traps external to the orchard along the perimeter and placed upwind. Replace co-attractants every 2 weeks. Use aggregation pheromone lure.		-
NUL3445 Nufarm	TBC			P		New active in development. Nufarm claim activity on Bugs.		-
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion		P		Registered for control of various weevils, beetles and Lepidoptera in almonds, macadamias, pome and stone fruit. Hort Innovation project ST17000 data generation under development to register in raspberries and blackberries for various pests including; Light Brown Apple Moth, Loopers, Helicoverpa, Cluster Caterpillar and Monolepta beetle.	L-M Bee VH	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Green Peach Aphid (*Myzus persicae*) **Priority: Low**								
Green Peach Aphid is rated as a low priority in all regions except Victoria and Tasmania, where they are rated as a moderate priority. Aphids feed on tender growing shoots and high infestations can reduce fruiting bud formation for the following crop. The pest produces large amounts of honeydew, making the leaves and fruit sticky and promoting the growth of sooty mould. The use of a planned, integrated control approach is required to ensure preservation of beneficial predators.								
Dimethoate	1B	Contact	1	A	ALL	Registered in blueberries for control of Queensland Fruit Fly, Spider Mites, Thrips, Jassids, **Aphids**, Redlegged Earth Mite, Strawberry Bug and Rutherglen Bug. Do not exceed 7 applications per season with a minimum retreatment interval of 21 days between consecutive applications.	H Bee H	R1
Pirimicarb (Pirimor) Syngenta	1A	Contact	2	A	ALL	Registered in blueberries for control of **Aphids**. Apply as a cover spray when infestation starts. Use a maximum of 2 non-consecutive applications per season, provided that there is no known resistance in the aphid population. Do not use as the first spray of the season if a carbamate was used as the last spray of the previous season.	VL Bee VL	R3
Afidopyropen (Versys) BASF	9D	Ingestion		P		Registered for control of **Aphids** in various crops. Hort Innovation project ST18001 for control of Aphids and Apple Dimpling Bug in *Rubus* spp. with registration expected in early 2021. ST16006 residue and efficacy data with registration planned for control of aphids in strawberries (field and protected). No MRLs for AU or Codex.	L Bee VL	-
Beauveria bassiana (Velifer) BASF	UN	Biological	NR	P		Registered for suppression of Onion Thrips and Western Flower Thrips in protected vegetables and ornamentals and has activity on Thrips, **Aphids**, Whitefly and Mites. No MRLs required for a biological product.	L Bee L	-
Flonicamid (Mainman) UPL	29	Ingestion		P		Registration work completed through Hort Innovation project ST17000 and permit pending for control of Hoppers, **Aphids** and Bugs in *Rubus* spp. No MRLs for AU or Codex.	M Bee VL	-
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact and Ingestion		P		Registered in macadamias for control of Fruit Spotting Bugs, Lace Bug and Scirtothrips. Registered in the US for control of **Aphids**, Blueberry Thrips and Blueberry Maggot in bushberries. No AU MRL. Codex MRL 4 mg/kg.	L Bee L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Sulfoxaflor (Transform) Corteva	4C	Contact and Ingestion		P		Current permit in blueberries for control of Cottonseed Bug will not be renewed in blueberries based on additional data requirements. MT18018 to generate residue data for permit renewal for *Rubus* spp. and is also registered in strawberries for control of Green Peach Aphid and Green Mirid. Registered for control of **Green Peach Aphid** in various crops. AU MRL T0.7 mg/kg. No Codex MRL.	M Bee VH	-
European Wasp (*Vespula germanica*) **Priority: Low**								
European Wasp is rated as a low priority in all regions except Victoria and Tasmania, where it is rated as a moderate priority. The pest will not attack the fruit, but it is a nuisance to orchard workers. Nests should be destroyed and baiting can be used to control infestations in the orchard.								
Fipronil PER86492	2B	Bait	NR	A	ALL	Permitted in berry crops as a bait treatment for control of **European Wasp** and Common Wasp. Monitor wasp population by free-feeding with non-toxic bait prior to baiting with toxicant. Substitute non-toxic bait with toxic bait when baits constantly attract 3-5 wasps feeding during the warmer part of the day. Toxic bait must only be used when monitoring indicates that non-target insects are not feeding on the bait substrate. Contain bait in suitable trap/feeding device and label the trap in accordance with the permit instructions.	M Bee VH	R3
Fall Armyworm *(Spodoptera frugiperda)* **Priority: Unknown**								
Fall Armyworm has recently been detected in Australia for the first time. It has not been seen in blueberry crops and the potential impact is currently unknown.								
Chlorantraniliprole (Altacor) FMC PER89281	28	Ingestion	3	A	ALL (excl. VIC)	Permitted in blueberries for control of **Fall Armyworm**. Treat when pests appear, targeting eggs at hatch or small larvae (prior to third instar stage) before the pest becomes entrenched. Do not apply more than 3 applications per crop, with a minimum retreatment interval of 7 days.	L Bee VL	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Emamectin (Proclaim Opti) Syngenta PER89285	6	Ingestion	5	A	ALL (excl. VIC)	Permitted in blueberries for control of **Fall Armyworm**. Treat when pests appear, targeting eggs at hatch or small larvae (prior to third instar stage) before the pests become entrenched. Apply no more than 2 applications sequentially before using an insecticide from a different MoA group for 2 applications. Do not make more than 4 applications per year.	M Bee H	-
Indoxacarb (Avatar) FMC PER89278	22A	Ingestion	3	A	ALL (excl. VIC)	Permitted in blueberries for control of **Fall Armyworm**. Treat when pests appear, targeting eggs at hatch or small larvae (prior to third instar stage) before the pest becomes entrenched. Do not exceed a maximum of 2 applications per crop with a 7 day retreatment interval.	M Bee H	R3
Methomyl (Lannate) PER89293	1A	Contact	5	A	ALL	Permitted in blueberries for control of **Fall Armyworm**. Target sprays against eggs and newly hatched larvae (prior to third instar stage) before they become entrenched. Apply as a foliar spray. Treatments per season not limited.	H Bee H	R2
Spinetoram (Success Neo) Corteva PER89241	5	Ingestion	1	A	ALL (excl. VIC)	Permitted in berryfruit for control of **Fall Armyworm**. Treat when pests appear, targeting eggs at hatch or small larvae (prior to third instar stage) before the pest becomes entrenched. Do not make more than 4 applications to any crop in one season.	M Bee VH	-
Spinosad (Entrust Organic) Corteva PER89870	5	Ingestion	1	A	ALL (excl. VIC)	Permitted in berryfruit for control of **Fall Armyworm**. Target treatments against eggs at hatch or small larvae (prior to third instar stage) before the pest becomes entrenched. Do not make more than 4 applications to any crop in one season.	L Bee H	-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.		-
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion		P		Registered for control of various weevils, beetles and Lepidoptera in almonds, macadamias, pome and stone fruit. Hort Innovation project ST17000 data generation under development to register in raspberries and blackberries for various pests including; Light Brown Apple Moth, Loopers, Helicoverpa, Cluster Caterpillar and Monolepta beetle.	L-M Bee VH	-

4.3 Weeds of Blueberries

4.3.1 Weed priorities

Common Name	Scientific Name
Moderate	
Blue Heliotrope	*Heliotropium amplexicaule*
Para Grass	*Brachiaria mutica*
Flaxleaf Fleabane	*Conyza bonariensis*
Sowthistle	*Sonchus oleraceus*
Blackberry Nightshade	*Solanum nigrum*
Nutgrass	*Cyperus rotundus*
Couch Grass	*Cynodon dactylon*
Wireweed	*Polygonum aviculare*

No high priority weeds have been identified but several species have been nominated as a moderate priority. Blueberry orchards should have a planned, integrated weed management program which combines cultural controls with strategic use of herbicides. Ground cover should be maintained in the inter-row with grass, mulch, weed mat, or a combination of these. The key to achieving effective results with herbicides is to target young, actively growing weeds.

All of these weeds are prolific and highly competitive. In the case of Sowthistle, there has been confirmed cases of herbicide resistance to Groups B, I and M, and Blackberry Nightshade has confirmed resistance to Group L[3].

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

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

[3] www.croplife.org.au/resources/programs/resistance-management/herbicide-resistance-management-strategies-3-draft/

4.3.2 Available and potential products for weed control

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

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

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Blue Heliotrope *(Heliotropium amplexicaule)* **Priority: Moderate**							
Blue Heliotrope is rated as a moderate priority weed in all regions. It is a widespread, perennial weed which is difficult to kill with herbicides. Herbicide control should target newly germinated seedlings that are actively growing.							
Paraquat (Gramoxone) Syngenta	L**	Orchards / directed spray or spot spray	Registered in orchards for control of Annual Grass and Broadleaf Weeds, including **Blue Heliotrope**. Apply as a directed spray or spot spray. Treatments per season not limited.	H:1 G:7	A	ALL	R3
Fluroxypyr (Starane) Corteva	I**		Registered in non-crop areas and pastures for control of **Blue Heliotrope**. No MRLs for AU or Codex.		P		-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Para Grass *(Brachiaria mutica)* **Priority: Moderate**							
Para Grass is rated as a moderate priority weed in all regions. It is a highly invasive, semi-aquatic grass that is present in all Australian states but is most abundant throughout coastal and sub-coastal Queensland. Registered herbicides provide effective control.							
Fluazifop-P (Fusilade) Syngenta	A***	Blueberries / Directed Spray or Shielded Spray	Registered in blueberries for control of Grass Weeds, including **Para Grass**. Apply as a directed spray to young, actively growing weeds. Treatments per season not limited.	28	A	QLD	-
Fluazifop-P (Fusilade) Syngenta PER86586	A***	Blueberries / Directed Spray or Shielded Spray	Permitted in blueberries for control of Grass Weeds, including **Para Grass**. Apply as a directed spray to young, actively growing weeds. Treatments per season not limited.	28	A	NSW, ACT, NT, SA, TAS & WA	-
Glyphosate (Roundup)	M**	Blueberries / Directed Spray, Shielded Spray or Wick Wiper	Registered in blueberries for control of Grass and Broadleaf Weeds, including **Para Grass**. Do not allow spray to contact any part of the bush. Treatments per season not limited.	NR	A	ALL	R3
Flaxleaf Fleabane *(Conyza bonariensis)* **Priority: Moderate**							
Flaxleaf Fleabane is rated as a moderate priority weed in all regions. It is a widespread weed that is difficult to control with herbicides. Weed control should be targeted at small, actively growing weeds and usually multiple applications will be required. A good strategy is to use a combination of residual and knockdown herbicides.							
Flumioxazin (Chateau) Sumitomo	G**	Blueberries / Directed Spray / Residual Weed Control	Registered in blueberries for control of Grass and Broadleaf Weeds, including **Flaxleaf Fleabane**. Apply to bare soil using a directed spray at the base of the bushes. At least 15mm of irrigation or rainfall is required to activate the herbicide. Best application is during the period following final harvest up to bud break. Avoid direct or indirect spray contact to foliage, fruit and green bark. Do not apply to bushes established in the orchard for less than 1 year.	H:98 G:28	A	ALL	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Glufosinate (Basta)	N**	Blueberries / Directed or Shielded Spray	Registered in blueberries control of Grass and Broadleaf Weeds, including **Flaxleaf Fleabane**. Do not allow spray to contact any part of the bush. Do not apply to young, green or un-calloused and damaged blueberry plants. Treatments per season not limited.	NR G:56	A	ALL	R3
Glufosinate (Basta) PER87902	N**	Blueberries / Directed or Shielded Spray	Permitted in blueberries for control of Grass and Broadleaf Weeds, including **Flaxleaf Fleabane**. Do not allow spray to contact any part of the bush. Do not apply to young, green or un-calloused and damaged blueberry plants. Treatments per season not limited.	NR	A	ALL (excl. VIC)	R3
Paraquat + Diquat (SpraySeed) Syngenta	L**	Orchards / Directed Spray	Registered in orchards for control of Grass and Broadleaf Weeds, including **Flaxleaf Fleabane**. Treatments per season not limited.	G:7	A	ALL	R3
Sowthistle *(Sonchus oleraceus)* **Priority: Moderate**							
Sowthistle is rated as a moderate priority weed in all regions except Queensland, Victoria and Tasmania, where it is rated as a high priority. Sowthistle is prolific and widespread in all regions and it is also prone to development of herbicide resistance.							
Flumioxazin (Chateau) Sumitomo	G**	Blueberries / Directed Spray / Residual Weed Control	Registered in blueberries for control of Grass and Broadleaf Weeds, including **Sowthistle**. Apply to bare soil using a directed spray at the base of the bushes. At least 15mm of irrigation or rainfall is required to activate the herbicide. Best application is during the period following final harvest up to bud break. Avoid direct or indirect spray contact to foliage, fruit and green bark. Do not apply to bushes established in the orchard for less than 1 year.	H:98 G:28	A	ALL	-
Glufosinate (Basta)	N**	Blueberries / Directed or Shielded Spray	Registered in blueberries control of Grass and Broadleaf Weeds, including **Sowthistle**. Do not allow spray to contact any part of the bush. Do not apply to young, green or un-calloused and damaged blueberry plants. Treatments per season not limited.	NR G:56	A	ALL	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Glufosinate (Basta) PER87902	N**	Blueberries / Directed or Shielded Spray	Permitted in blueberries for control of Grass and Broadleaf Weeds, including **Sowthistle**. Do not allow spray to contact any part of the bush. Do not apply to young, green or un-calloused and damaged blueberry plants. Treatments per season not limited.	NR	A	ALL (excl. VIC)	R3
Glyphosate (Roundup)	M**	Blueberries / Directed Spray, Shielded Spray or Wick Wiper	Registered in blueberries for control of Grass and Broadleaf Weeds, including **Sowthistle**. Do not allow spray to contact any part of the bush. Treatments per season not limited.	NR	A	ALL	R3
Oryzalin	D**	Berry Fruits / Non-Bearing Fruit / Directed Spray	Registered in non-bearing berry fruits for the control of Grass and Broadleaf Weeds, including **Sowthistle**. Apply as a directed spray to weed-free soil. At least 12.5mm of irrigation or rainfall is required within 21 days of application to activate the herbicide. Treatments per season not limited.	NR	A	ALL	-
Paraquat + Diquat (SpraySeed) Syngenta	L**	Orchards / Directed Spray	Registered in orchards for control of Grass and Broadleaf Weeds, including **Sowthistle**. Treatments per season not limited.	G:7	A	ALL	R3
Simazine	C**	Berry Fruit / Directed Spray / Residual Weed Control	Registered in berry fruit for control of Grass and Broadleaf Weeds, including **Sowthistle**. Berry vines should be at least 1 year old. Do not apply to foliage or when fruit is present. Apply to bare, moist soil. Treatments per season not limited.	NR	A	ALL	R3
Fluroxypyr (Starane) Corteva	I**		Registered in non-crop areas and pastures for control of **Sowthistle**. No MRLs for AU or Codex.		P		-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Blackberry Nightshade *(Solanum nigrum)* **Priority: Moderate**							
Blackberry Nightshade is rated as a moderate priority weed in all regions except Victoria and Tasmania, where it is rated as a high priority. It is a competitive weed that is widespread in all regions. Herbicide control is effective but requires timely application and avoidance of seed set over several years to bring the soil seed bank down.							
Flumioxazin (Chateau) Sumitomo	G**	Blueberries / Directed Spray / Residual Weed Control	Registered in blueberries for control of Grass and Broadleaf Weeds, including **Blackberry Nightshade**. Apply to bare soil using a directed spray at the base of the bushes. At least 15mm of irrigation or rainfall is required to activate the herbicide. Best application is during the period following final harvest up to bud break. Avoid direct or indirect spray contact to foliage, fruit and green bark. Do not apply to bushes established in the orchard for less than 1 year.	H:98 G:28	A	ALL	-
Oryzalin	D**	Berry Fruits / Non-Bearing Fruit / Directed Spray	Registered in non-bearing berry fruits for the control of Grass and Broadleaf Weeds, including **Blackberry Nightshade**. Apply as a directed spray to weed-free soil. At least 12.5mm of irrigation or rainfall is required within 21 days of application to activate the herbicide. Treatments per season not limited.	NR	A	ALL	-
Paraquat + Diquat (SpraySeed) Syngenta	L**	Orchards / Directed Spray	Registered in orchards for control of Grass and Broadleaf Weeds, including **Blackberry Nightshade**. Treatments per season not limited.	G:7	A	ALL	R3
Fluroxypyr (Starane) Corteva	I**		Registered in non-crop areas and pastures for control of **Blackberry Nightshade**. No MRLs for AU or Codex.		P		-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Nutgrass *(Cyperus rotundus)* **Priority: Moderate**							
Nutgrass is rated as a moderate priority weed in all regions except New South Wales, where it is rated as a high priority. Few options are available for controlling nutgrass. Maintain good ground cover and improve drainage.							
Glyphosate (Roundup)	M**	Blueberries / Directed Spray, Shielded Spray or Wick Wiper	Registered in blueberries for control of Grass and Broadleaf Weeds, including **Sowthistle**. Do not allow spray to contact any part of the bush. Treatments per season not limited.	NR	A	ALL	R3
Couch Grass *(Cynodon dactylon)* **Priority: Moderate**							
Couch Grass is rated as a moderate priority weed in all regions. It is a widespread, perennial weed that grows year-round in most areas. Herbicide control is effectively provided it is targeted to young, actively growing weeds. Multiple applications are usually required.							
Fluazifop-P (Fusilade) Syngenta	A***	Blueberries / Directed Spray or Shielded Spray	Registered in blueberries for control of Grass Weeds, including **Couch Grass**. Apply as a directed spray to young, actively growing weeds. Treatments per season not limited.	28	A	QLD	-
Fluazifop-P (Fusilade) Syngenta PER86586	A***	Blueberries / Directed Spray or Shielded Spray	Permitted in blueberries for control of Grass Weeds, including **Couch Grass**. Apply as a directed spray to young, actively growing weeds. Treatments per season not limited.	28	A	NSW, ACT, NT, SA, TAS & WA	-
Glufosinate (Basta)	N**	Blueberries / Directed or Shielded Spray	Registered in blueberries control of Grass and Broadleaf Weeds, including **Couch Grass**. Do not allow spray to contact any part of the bush. Do not apply to young, green or un-calloused and damaged blueberry plants. Treatments per season not limited.	NR G:56	A	ALL	R3
Glufosinate (Basta) PER87902	N**	Blueberries / Directed or Shielded Spray	Permitted in blueberries for control of Grass and Broadleaf Weeds, including **Couch Grass**. Do not allow spray to contact any part of the bush. Do not apply to young, green or un-calloused and damaged blueberry plants. Treatments per season not limited.	NR	A	ALL (excl. VIC)	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Glyphosate (Roundup)	M**	Blueberries / Directed Spray, Shielded Spray or Wick Wiper	Registered in blueberries for control of Grass and Broadleaf Weeds, including **Couch Grass**. Do not allow spray to contact any part of the bush. Treatments per season not limited.	NR	A	ALL	R3
Haloxyfop (Verdiict)	A***	Blueberry / Directed Spray or Spot Spray	Registered in blueberries for control of Grass Weeds, including **Couch Grass**. Apply as a directed spray or spot spray. Treatments per season not limited.	NR	A	ALL	-
Wireweed *(Polygonum aviculare)* **Priority: Moderate**							
Wireweed is rated as a moderate priority weed in all regions except Victoria and Tasmania, where it is rated as a high priority. It is widespread and a vigorous, annual weed that germinates and grows rapidly in warm weather. Timely herbicide control is effective.							
Glufosinate (Basta)	N**	Blueberries / Directed or Shielded Spray	Registered in blueberries control of Grass and Broadleaf Weeds, including **Wireweed**. Do not allow spray to contact any part of the bush. Do not apply to young, green or un-calloused and damaged blueberry plants. Treatments per season not limited.	NR G:56	A	ALL	R3
Glufosinate (Basta) PER87902	N**	Blueberries / Directed or Shielded Spray	Permitted in blueberries for control of Grass and Broadleaf Weeds, including **Wireweed**. Do not allow spray to contact any part of the bush. Do not apply to young, green or un-calloused and damaged blueberry plants. Treatments per season not limited.	NR	A	ALL (excl. VIC)	R3
Glyphosate (Roundup)	M**	Blueberries / Directed Spray, Shielded Spray or Wick Wiper	Registered in blueberries for control of Grass and Broadleaf Weeds, including **Wireweed**. Do not allow spray to contact any part of the bush. Treatments per season not limited.	NR	A	ALL	R3
Oryzalin	D**	Berry Fruits / Non-Bearing Fruit / Directed Spray	Registered in non-bearing berry fruits for the control of Grass and Broadleaf Weeds, including **Wireweed**. Apply as a directed spray to weed-free soil. At least 12.5mm of irrigation or rainfall is required within 21 days of application to activate the herbicide. Treatments per season not limited.	NR	A	ALL	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Paraquat + Diquat (SpraySeed) Syngenta	L**	Orchards / Directed Spray	Registered in orchards for control of Grass and Broadleaf Weeds, including **Wireweed**. Treatments per season not limited.	G:7	A	ALL	R3
Simazine	C**	Berry Fruit / Directed Spray / Residual Weed Control	Registered in berry fruit for control of Grass and Broadleaf Weeds, and suppression of **Wireweed**. Berry vines should be at least 1 year old. Do not apply to foliage or when fruit is present. Apply to bare, moist soil. Treatments per season not limited.	NR	A	ALL	R3
Fluroxypyr (Starane) Corteva	I**		Registered in non-crop areas and pastures for control of **Wireweed**. No MRLs for AU or Codex.		P		-
Grass and Broadleaf Weeds **Priority: Low**							
The key to weed management in orchards is maintaining ground cover in the inter-row with grass and mulch.							
Dichlobenil (Casoron) UPL PER12219	O**	Blueberries / Granule Application / Residual Weed Control	Permitted in blueberries for control of **Annual Grass and Broadleaf Weeds**. Apply using a calibrated granular chemical applicator. Apply first application prior to budburst and the second application following final harvest. Do not use more than 2 applications per year.	NR NG	A	ALL (excl. VIC)	-
Fluazifop-P (Fusilade)	A***	Blueberries / Directed Spray or Shielded Spray	Registered in blueberries for control of **Grass Weeds**. Apply as a directed spray to young, actively growing weeds. Treatments per season not limited.	28	A	QLD	-
Fluazifop-P (Fusilade) PER86586	A***	Blueberries / Directed Spray or Shielded Spray	Permitted in blueberries for control of **Grass Weeds**. Apply as a directed spray to young, actively growing weeds. Treatments per season not limited.	28	A	NSW, ACT, NT, SA, TAS & WA	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Flumioxazin (Chateau) Sumitomo	G**	Blueberries / Directed Spray / Residual Weed Control	Registered in blueberries for control of **Grass and Broadleaf Weeds**. Apply to bare soil using a directed spray at the base of the bushes. At least 15mm of irrigation or rainfall is required to activate the herbicide. Best application is during the period following final harvest up to bud break. Avoid direct or indirect spray contact to foliage, fruit and green bark. Do not apply to bushes established in the orchard for less than 1 year.	H:98 G:28	A	ALL	-
Glufosinate (Basta)	N**	Blueberries / Directed or Shielded Spray	Registered in blueberries control of **Grass and Broadleaf Weeds**. Do not allow spray to contact any part of the bush. Do not apply to young, green or un-calloused and damaged blueberry plants. Treatments per season not limited.	NR G:56	A	ALL	R3
Glufosinate (Basta) PER87902	N**	Blueberries / Directed or Shielded Spray	Permitted in blueberries for control of **Grass and Broadleaf Weeds**. Do not allow spray to contact any part of the bush. Do not apply to young, green or un-calloused and damaged blueberry plants. Treatments per season not limited.	NR	A	ALL (excl. VIC)	R3
Glyphosate (Roundup)	M**	Blueberries / Directed Spray, Shielded Spray or Wick Wiper	Registered in blueberries for control of **Grass and Broadleaf Weeds**. Do not allow spray to contact any part of the bush. Treatments per season not limited.	NR	A	ALL	R3
Haloxyfop (Verdiict)	A***	Blueberry / Directed Spray or Spot Spray	Registered in blueberries for control of **Grass Weeds**. Apply as a directed spray or spot spray. Treatments per season not limited.	NR	A	ALL	-
Metham PER82024	-	Blueberry / Soil Fumigation / Trickle Irrigation	Permitted in blueberries for as a fumigation treatment for control of **Germinating Weed Seeds**. Apply through trickle irrigation to moist soil under plastic mulch. Puncture plastic 2 weeks after treatment to allow dissipation of fumigant.	NR	A	ALL (excl. VIC)	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Oryzalin	D**	Berry Fruits / Non-Bearing Fruit / Directed Spray	Registered in non-bearing berry fruits for the control of **grass and broadleaf weeds**. Apply as a directed spray to weed-free soil. At least 12.5mm of irrigation or rainfall is required within 21 days of application to activate the herbicide. Treatments per season not limited.	NR	A	ALL	-
Paraquat (Gramoxone) Syngenta	L**	Orchards / directed spray or spot spray	Registered in orchards for control of **annual grass and broadleaf weeds**. Apply as a directed spray or spot spray. Treatments per season not limited.	H:1 G:7	A	ALL	R3
Paraquat + Diquat (SpraySeed) Syngenta	L**	Orchards / Directed Spray	Registered in orchards for control of **Grass and Broadleaf Weeds**. Treatments per season not limited.	G:7	A	ALL	R3
Simazine	C**	Berry Fruit / Directed Spray / Residual Weed Control	Registered in berry fruit for control of **Grass and Broadleaf Weeds**. Berry vines should be at least 1 year old. Do not apply to foliage or when fruit is present. Apply to bare, moist soil. Treatments per season not limited.	NR	A	ALL	R3
Oryzalin + Oxyfluorfen (Rout)	D+G**	Substrate Application / Residual Weed Control	Registered as a pre-emergent herbicide applied to substrate in ornamentals for control of grass and broadleaf weeds. Registered in the US for use in Homebell Blueberry.		P		-

4.4 Plant Growth Regulators in Blueberries

4.4.1 Plant Growth Regulator Priorities

Priority
Moderate
Initiation of Flowering
Promote Fruit Ripening
Promote Vegetative Growth
Low
Restriction of Vegetative Growth

Plant Growth Regulators (PGRs) are not commonly used in blueberry orchards. No PGR issues have been nominated as high priority. Initiation of Flowering, Promoting Fruit Ripening and Promoting Vegetative Growth were identified as being of moderate priority.

4.4.2 Available and Potential Plant Growth Regulators

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

Availability		Regulatory risk (refer to Appendix 7)	
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

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Promote Fruit Ripening **Priority: Moderate**							
Promoting Fruit Ripening is rated as a moderate priority in all regions. The use of Ethephon is available as a minor use permit, to promote uniform ripening of berries. This enables more efficient harvesting. Application to stressed crops is not recommended as it can result in defoliation and reduced yield.							
Ethephon PER86213	Plant Growth Regulator	Blueberries / Field and Protected	Permitted in blueberries to **promote uniform maturity** of berries at harvest. Apply as a foliar spray when 15-20% of berries are blue. Maximum of 1 application per season.	7	A	NSW	-

5. References

5.1 Information:

AgChem Access Priority Access Forum	https://www.agrifutures.com.au/national-rural-issues/agvet-chemicals/
Australian Pesticide and Veterinary Medicines Authority	www.apvma.gov.au
APVMA Chemical review	https://apvma.gov.au/chemicals-and-products/chemical-review/listing
APVMA MRLs	www.legislation.gov.au/Details/F2020C00713
APVMA Permit search	https://productsearch.apvma.gov.au/permits
APVMA Product search	https://productsearch.apvma.gov.au/products
Codex MRL database	http://www.fao.org/fao-who-codexalimentarius/codex-texts/dbs/pestres/en/
Cotton Pest Management Guide 2019-20	https://www.cottoninfo.com.au/publications/cotton-pest-management-guide
CropLife Australia	https://www.croplife.org.au/
Growcom – Infopest Database	www.infopest.com.au
Hort Innovation	www.horticulture.com.au

5.2 Abbreviations and Definitions:

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

5.3 Acknowledgements:

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6. Appendices

Appendix 1. Products available for disease control in Blueberries
Appendix 2. Products available for control of insects and mites in Blueberries
Appendix 3. Products available for weed control in Blueberries
Appendix 4. Plant Growth Regulators available in Blueberries
Appendix 5. Current permits for use in Blueberries
Appendix 6. Blueberry Maximum Residue Limits (MRLs)
Appendix 7. Blueberry regulatory risk assessment

Appendix 1. Products available for disease control in Blueberries

Active Ingredient (Trade Name)	Chemical group	Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Aureobasidium pullulans Strain DSM 14940 & DSM 14941 (Botector) Nufarm	-	Berries	Botrytis Blight & Fruit Rot / Grey Mould (*Botrytis cinerea*) Suppression of: Anthracnose Fruit Rot (*Colletotrichum* spp.) Phomopsis Fruit Rot (*Phomopsis* spp.) Rhizopus Fruit Rot (*Rhizopus* spp.)	ALL	NR	-
Bacillus amyloliquefaciens Strain QST 713 (Serenade Prime Soil Ameliorant and Biofungicide)	44	Berries / Biological Soil Ameliorant	For application to soil to improve bioavailability of soil resources.	ALL	NR	-
Boscalid + Pyraclostrobin (Pristine) BASF PER82986	7+11	Blueberries / Field & Protected Grown	Grey Mould (*Botrytis* spp.) Anthracnose (*Gloesporoides* spp.) Suppression Only: Rust (*Thekospora minima*)	ALL (excl. VIC)	3	-
Bromo Chloro Dimethyl Hydantoin (BCDMH)	-	Sanitiser / Post-Harvest Treatment	External Rot Causing Organisms	ALL	NR	-
Captan PER13958	M4	Blueberries	Cane Spot Spur Blights Botrytis Flower & Fruit Rot Anthracnose (*Colletotrichum* spp.)	ALL (excl. VIC)	1	-
Chlorine	-	Sanitiser / Post-Harvest Treatment	Bacteria and Fungi	ALL	NR	-
Chlorothalonil (Bravo) PER14309	M5	Blueberries	Grey Mould Rust Downy Mildew	ALL (excl. VIC)	28	R3
Copper (Cu) present as Copper Hydroxide PER84176	M1	Blueberries	Anthracnose (*Collectotrichum* spp.) Blueberry Rust (*Thekospora minima*)	ALL (excl. VIC)	1	-

Active Ingredient (Trade Name)	Chemical group	Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Cyprodinil + Fludioxinil (Switch) Syngenta PER84891	9+12	Blueberries / Field & Protected Cropping Systems	Grey Mould (*Botrytis cinerea*) Anthracnose (*Gloesporoides* spp.)	ALL (excl. VIC)	7	-
Dithianon (Dragon) Nufarm PER82601	M9	Blueberries / Field Grown Only	Blueberry Rust (*Thekospora minima*)	ALL (excl. VIC)	H:21 NG	-
Fenhexamid (Teldor) Bayer PER86489	17	Blueberry / Field & Protected	Grey Mould (*Botrytis cinerea*)	ALL (excl. VIC)	1	-
Iodine	-	Berries / Post-Harvest Sanitiser	Bacteria & Fungi	ALL	NR	-
Iprodione (Ippon 500 Aquaflo) Campbells	2	Blueberries	Grey Mould (*Botrytis* spp.)	NSW, QLD, TAS & WA	1	R3
Mancozeb PER13958	M3	Blueberries	Grey Mould Rust Mildew	ALL (excl. VIC)	7	R2
Metalaxyl-M (Ridomil Gold 25G) Syngenta PER13958	4	Blueberries	*Phytophthora* spp.	ALL (excl. VIC)	48	-
Metham PER82024	-	Blueberries / Soil Fumigation / Trickle Irrigation	Soil-Borne Pathogens	ALL (excl. VIC)	NR	-
Peroxyacetic Acid	-	Sanitiser / Post-Harvest Treatment	Bacteria	ALL	NR	-

Active Ingredient (Trade Name)	Chemical group	Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Phosphorous Acid PER13958	33	Blueberries	*Phytophthora* spp.	ALL (excl. VIC)	NR	-
Propiconazole (Tilt) PER14740	3	Blueberries	Blueberry Rust (*Pucciniastrum vaccinii, Thekospora minima*)	ACT, NSW, QLD, SA, TAS & WA	3	R3
Pyrimethanil (Scala) Bayer PER13958	9	Blueberries	Grey Mould (*Botrytis cinerea*)	ALL (excl. VIC)	1	-
Sodium Metabisulphite (Sulphur Dioxide Pads) PER13955	M	Blueberries / Post-Harvest Treatment	Grey Mould (*Botrytis cinerea*)	ALL (excl. VIC)	1	-
Triadimenol (Bayfidan) Bayer PER13958	3	Blueberries	Powdery Mildew	ALL (excl. VIC)	7	R3

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

Active Ingredient (Trade Name)	Chemical group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
3-Methyl-1-Butanol | 2-Methyl-1-Butanol | Ethyl Acetate | Acetaldehyde | Sec Butanol | Ethanol | Carpophilus Aggregation Pheromones (Carpophilus Catcha Trapping System)	-	Berry Fruit	Carpophilus Beetles	ALL	NR	-
Abamectin	6	Blueberries	Queensland Fruit Fly *(Bactrocera tryoni)*	ALL	7	-
Abamectin PER14423	6	Blueberries / Field & Protected Use	Queensland Fruit Fly *(Bactrocera tryoni)*	ALL	7	-
Bacillus thuringiensis Berliner subsp. *aizawai* strain GC-91 (Bacchus WG) Campbell	11C	Fruit	Armyworm (*Spodoptera* spp.) Cotton Bollworm (*Helicoverpa armigera*) Native Budworm (*Helicoverpa punctigera*) Cabbage Moth (*Plutella xylostella*) Cabbage White Butterfly (*Pieris rapae*) Loopers (C*hrysodeixis* spp., *Ectropis excursaria*, *Thysanoplusia orichalcea*) Light Brown Apple Moth (*Epiphyas postvittana*) Vine Moth (*Phalaenoides glycinae, Agarista Agricola*)	ALL	NR	-
Bifenthrin (Talstar) PER84972	3A	Blueberries	Elephant Weevil (*Orthorhinus cylindrirostris*)	ALL (excl. VIC)	1	-
Botanical Oil (Eco-Oil) PER14234		Blueberries	Two Spotted Mite (*Tetranychus urticae*)	ALL (excl. VIC)	NR	-

Active Ingredient (Trade Name)	Chemical group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Chlorantraniliprole (Coragen) FMC PER84178	28	Blueberries / Field & Protected	Lepidopteran Pests	ALL	3	-
Chlorantraniliprole (Coragen) FMC PER89281	28	Blueberries / Field & Protected	Fall Armyworm (*Spodoptera frugiperda*)	ALL (excl. VIC)	3	-
Chlorpyrifos (Suscon Blue) Nufarm PER82022	1B	Blueberries	Scarab Beetles (*Scarabaeidae*)	ALL	NR	R1
Copper (Cu) present as Buffered Copper Complex	M1	Berry Fruit	Slug Snail	ALL	1	-
Diazinon	1B	Blueberry	Scale Insects	NSW	14	R3
Dimethoate	1B	Blueberry	Queensland Fruit Fly	NSW, WA	1	R3
			Spider Mites Thrips Jassids Aphids Redlegged Earth Mite	ALL		
			Strawberry Bug Rutherglen Bug	QLD, VIC, TAS, SA & WA		
Dimethoate PER13859	1B	Orchard Cleanup – Fruit Fly host crops following harvest	Fruit Fly	ALL	NR	R3

Active Ingredient (Trade Name)	Chemical group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Dimethoate (Danadim) PER88174	1B	Blueberries	Queensland Fruit Fly *(Bactrocera tryoni)*	QLD	1	R3
Emamectin (Proclaim) Syngenta PER85422	6	Blueberries / Field & Protected	Lepidopteran Pests	ALL (excl. VIC)	5	-
Emamectin (Proclaim Opti) Syngenta PER89285	6	Blueberries / Field & Protected Cropping	Fall Armyworm (*Spodoptera frugiperda*)	ALL (excl. VIC)	5	-
Ethyl Formate		Blueberry	Light Brown Apple Moth (*Epiphyas postvittana*) Red Back Spiders (*Latrodectus hasselti*) Two Spotted Mite (*Tetranychus urticae*) Long Tailed Mealy Bug (*Pseudococcus longispinus*) Western Flower Thrips (*Frankliniella occidentalis*) Plague Thrips (T*hrips imaginis*)	ALL	NR	-
Fipronil PER86492	2B	Berry Crops / Bait	European Wasp (*Vespula germanica*) Common Wasp (*Vespula vulgaris*)	ALL	NR	-
Imidacloprid (Confidor) Bayer PER12534	4A	Blueberry / Field & Protected / Soil Application Only	Scarab Beetle Larvae (*Rhapaea magnicorni*)	ALL (excl. VIC)	NR NG	R2
Indoxacarb (Avatar Evo) FMC	22A	Blueberries / Field Grown Only	Light Brown Apple Moth (*Epiphyas postvittana*)	ALL	7	R3
Indoxacarb (Avatar) FMC PER13289	22A	Blueberries / Field & Protected Grown	Light Brown Apple Moth (*Epiphyas postvittana*) Elephant Weevil Borer (*Orthorhinus cylindrirostris*)	ALL	3	R3

Active Ingredient (Trade Name)	Chemical group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Indoxacarb (Avatar) FMC PER89278	22A	Blueberries	Fall Armyworm (*Spodoptera frugiperda*)	ALL (excl. VIC)	3	R3
Iron Powder		Berry Fruit	Slug Snail	ALL	NR	-
Maldison (Fyfanon) FMC	1B	Blueberry	Fruit Fly	ALL	3	-
Methomyl (Lannate)	1A	Blueberry	Monolepta Beetle (*Monolepta australis*) *Helicoverpa* spp. Plague Thrips (*Thrips imaginis*)	NSW, WA	5	R2
Methomyl (Lannate) PER14134	1A	Blueberries	Red-Shouldered Leaf Beetle (*Monolepta australis*) *Helicoverpa* spp. Plague Thrips (*Thrips imaginis*)	QLD	5	R2
Methomyl (Lannate) PER89293	1A	Blueberries	Fall Armyworm (*Spodoptera frugiperda*)	ALL	5	R2
Methoxyfenozide (Prodigy) Corteva	18	Blueberry	Light Brown Apple Moth	ALL	7	-
Nuclear Polyhedrosis Virus (Vivus) AgBiTech		Blueberry	Cotton Bollworm (*Helicoverpa armigera*) Native Budworm (*Helicoverpa punctigera*)	ALL	NR	-
Paraffinic Oil		Blueberry	Mites Scale	ALL	1	-
Pirimicarb (Pirimor) Syngenta	1A	Blueberry	Aphids	ALL	2	R3

Active Ingredient (Trade Name)	Chemical group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Pyriproxyfen (Distance Ant Bait) Sumitomo	7C	Fruit Crops / Ant Bait	Invasive and Nuisance Ants	ALL	NR	-
Spinetoram (Success Neo) Corteva	5	Blueberry	Loopers Light Brown Apple Moth *Helicoverpa* Western Flower Thrips	ALL	1	-
Spinetoram (Success Neo) Corteva PER87408	5	Blueberries	Suppression Only Of: Queensland Fruit Fly *(Bactrocera tryoni)* Lesser Queensland Fruit Fly *(Bactrocera neohumeralis)* Mediterranean Fruit Fly *(Ceratitis capitata)*	ALL (excl. VIC)	1	-
Spinetoram (Success Neo) Corteva PER89241	5	Berry Fruit	Fall Armyworm (*Spodoptera frugiperda*)	ALL (excl. VIC)	1	-
Spinosad (Entrust Organic) Corteva	5	Blueberry	Loopers Light Brown Apple Moth Heliothis Western Flower Thrips	ALL	1	-
Spinosad (Entrust Organic) Corteva	5	Berry Fruit	Fall Armyworm (*Spodoptera frugiperda*)	ALL (excl. VIC)	1	-
Spinosad (Naturalure) Corteva	5	Tree, Fruit, Nut, Vine & Vegetable Crops / Fruit Fly Bait	Queensland Fruit Fly *(Bactrocera tryoni)* Mediterranean Fruit Fly *(Ceratitis capitata)*	ALL	NR	-
Spirotetramat (Movento) Bayer PER82607	23	Blueberries / Field & Protected	White Wax Scale (*Ceroplastes destructor*)	ALL (excl. VIC)	H:7 NG	-

Active Ingredient (Trade Name)	Chemical group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Sulfoxaflor (Transform) Corteva PER87141	4C	Blueberries	Cottonseed Bug (*Oxycarenus luctuosus*)	NSW, QLD	1	-
Trichlorfon (Lepidex)	1B	Blueberry	Queensland Fruit Fly	NSW	2	R2
Trichlorfon (Lepidex) PER12486	1B	Blueberries	Queensland Fruit Fly *(Bactrocera tryoni)* Mediterranean Fruit Fly *(Ceratitis capitata)*	ACT, NSW, NT, QLD, SA & WA	2	R2

Appendix 3. Products available for weed control in Blueberries

Active ingredient (Trade Name)	Chemical Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Dichlobenil (on) UPL PER12219	O**	Blueberries / Granule Application / Residual Weed Control	Annual Grass and Broadleaf Weeds	NR NG	ALL (excl. VIC)	-
Fluazifop-P (Fusilade)	A***	Blueberries / Directed Spray or Shielded Spray	Grass Weeds	28	QLD only	-
Fluazifop-P (Fusilade) PER86586	A***	Blueberries / Directed Spray or Shielded Spray	Grass Weeds	28	NSW, ACT, NT, SA, TAS & WA	-
Flumioxazin (Chateau) Sumitomo	G**	Blueberries / Directed Spray / Residual Weed Control	Grass and Broadleaf Weeds	H:98 G:28	ALL	-
Glufosinate (Basta)	N**	Blueberries / Directed or Shielded Spray	Do not allow spray to contact any part of the tree, including the trunk. Grass and broadleaf weeds	H:NR G:56	ALL	R3
Glufosinate (Basta) PER87902	N**	Blueberries / Directed or Shielded Spray	Grass and Broadleaf Weeds	NR	ALL (excl. VIC)	R3
Glyphosate (Roundup)	M**	Berries and Other Small Fruit / Directed Spray, Shielded Spray or Wick Wiper	Do not allow spray to contact any part of the tree, including the trunk. Grass and broadleaf weeds.	NR	ALL	R3
Haloxyfop (Verdict)	A***	Blueberry / Directed Spray or Spot Spray	Grass weeds	NR	ALL	-
Metham PER82024	-	Blueberry / Soil Fumigation / Trickle Irrigation	Germinating Weed Seeds	NR	ALL (excl. VIC)	-

Active ingredient (Trade Name)	Chemical Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Oryzalin	D**	Berry Fruits / Non-Bearing Fruit / Directed Spray	Grass and broadleaf weeds	NR	ALL	-
Paraquat (Gramoxone) Syngenta	L**	Orchards / directed spray or spot spray	Annual Grass and broadleaf weeds	H:1 G:7	ALL	R3
Paraquat + Diquat (SpraySeed) Syngenta	L**	Orchards / Directed Spray	Grass and Broadleaf Weeds	G:7	ALL	R3
Simazine	C**	Berry Fruit	Grass and Broadleaf Weeds	NR	ALL	R3

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

Appendix 4. Plant Growth Regulators available in Blueberries

Active ingredient (Trade Name)	Chemical Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Ethephon PER86213	Plant Growth Regulator	Blueberry / Field and Protected	Aid harvesting by promoting uniform maturity of berries	7	NSW	-

Appendix 5. Current permits for use in Blueberries

Permit ID	Description	Date Issued	Expiry Date	Permit holder
PER89870	Spinosad (Entrust Organic) / Various Crops / Fall Armyworm Emergency Use Permit	21-Jul-20	31-Jul-23	Hort Innovation
PER89293	Methomyl (Lannate) / Various Crops as per Label / Fall Armyworm Field Grown Crops Only	10-Apr-20	30-Apr-23	Hort Innovation
PER89285	Emamectin(Proclaim) / Various Leafy Vegetables, Celery, Blueberry / Fall Armyworm Field and Protected Cropping	16-Mar-20	31-Mar-23	Hort Innovation
PER89281	Chlorantraniliprole (Altacor / Coragen) / Blueberry and Avocado / Fall Armyworm Field and Protected Cropping	13-Mar-20	31-Mar-23	Hort Innovation
PER89278	Indoxacarb (Avatar) / Various Crops / Fall Armyworm Field Grown Crops Only	13-Mar-20	31-Mar-23	Hort Innovation
PER89241	Spinetoram (Success Neo) / Berry Fruit / Fall Armyworm Field and Protected Cropping.	6-Mar-20	31-Mar-23	Hort Innovation
PER88174	Dimethoate / Blueberries / Queensland Fruit Fly (QLD only) Field and Protected Cropping	25-Jul-19	31-Jul-24	Australian Blueberry Growers Association c/- Wollongbar Primary Industries Inst.
PER87902	Glufosinate (Basta) / Blueberry / Various Broadleaf and Grass Weeds Field and Protected Cropping Use now registered.	3-Jul-19	31-Jul-24	Australian Blueberry Growers Association c/- Wollongbar Primary Industries Inst.
PER87408	Spinetoram (Success Neo) / Blueberries, Strawberries, Rubus And Rubus Hybrids / Fruit Fly (Suppression only) Field and Protected Cropping	15-Apr-19	30-Apr-24	Hort Innovation
PER86489	Fenhexamid (Teldor) / Blueberry / Grey Mould Field and Protected Cropping	25-Jan-19	31-Jan-24	Australian Blueberry Growers Association c/- Wollongbar Primary Industries Inst.
PER87464	Colecalciferol (Selontra Soft Bait Rodenticide) / Rubus, Rubus hybrid & Blueberry / Rats and mice Registration pending with BASF.	17-Dec-18	31-Dec-20	Hort Innovation

Permit ID	Description	Date Issued	Expiry Date	Permit holder
PER86213	Ethephon / Harvest Aid / Blueberry (NSW only) Field and Protected Cropping	5-Dec-18	31-Dec-21	Australian Blueberry Growers Association c/- Wollongbar Primary Industries Inst.
PER87141	Sulfoxaflor (Transform) / Blueberries, Blackberries, Raspberries / Cotton Seed Bug (NSW, QLD) Field and Protected Cropping Renewal for Rubus only, due to outstanding data requirements for blueberry.	18-Oct-18	31-Oct-20	Hort Innovation
PER86586	Fluazifop-P / Blueberry / Weeds per label (NSW, ACT, NT, SA, TAS & WA) Field and Protected Cropping	14-Aug-18	31-Aug-23	Australian Blueberry Growers Association c/- Wollongbar Primary Industries Inst.
PER86469	Zinc Phosphide (Rattoff Zinc Phosphide Baits) / Blueberry Orchards / Black rat & House mouse	26-Jul-18	30-Jul-21	Australian Blueberry Growers Association c/- Wollongbar Primary Industries Inst.
PER85422	Emamectin (Proclaim) / Blueberry / Lepidopteran (including but not exclusively *Lobesia* and *Helicoverpa*) Field and Protected Cropping	26-Mar-18	31-Mar-23	Australian Blueberry Growers Association c/- Wollongbar Primary Industries Inst.
PER84972	Bifenthrin / *Rubus* spp., *Ribes* spp. & Blueberries / *Monolepta* Beetle, Plague Thrips & Elephant Weevil	12-Feb-18	28-Feb-23	Raspberries & Blackberries Australia c/- Hort Innovation
PER84891	Cyprodinil + fludioxonil (Switch) / Blueberries / Grey Mould and Anthracnose Field and Protected Cropping	29-Jan-18	31-Jan-23	Australian Blueberry Growers Association c/- Hort Innovation
PER84176	Copper / Blueberries / Anthracnose	21-Dec-17	31-Dec-20	Australian Blueberry Growers Association c/- Wollongbar Primary Industries Inst.

Permit ID	Description	Date Issued	Expiry Date	Permit holder
PER84178	Chlorantraniliprole (Coragen) / Blueberry / Lepidopteran Field and Protected Cropping	31-Oct-17	30-Nov-22	Australian Blueberry Growers Association c/- Wollongbar Primary Industries Inst.
PER82607	Spirotetramat (Movento) / Blueberry / White Wax Scale Field and Protected Cropping	27-Aug-17	30-Nov-21	Australian Blueberry Growers Association c/- Hort Innovation
PER82986 Version 2	Boscalid + Pyraclostrobin (Pristine) / Rubus and Rubus Hybrids / Various diseases Field and Protected Cropping	25-Aug-17	31-Aug-24	Hort Innovation
PER82601 Version 2	Dithianon (Dragon) / Blueberry / Blueberry Rust Field Grown Crops Only	26-Jul-17	31-Jul-22	Australian Blueberry Growers Association c/- Hort Innovation
PER86492 Version 3	Fipronil / Orchards, Vineyards and Berry Farms / European Wasp	14-Sep-18	30-Sep-23	NSW Dept of Primary Industries
PER82024	Metham Soil Fumigant / Blueberry and Rubus / Germinating Weed Seeds and Soil Borne Pathogens	1-Feb-16	31-Mar-21	Australian Blueberry Growers Association c/- Hort Innovation
PER82022	Chlorpyrifos (Suscon Blue Soil Insecticide) / Blueberries / Scarab Beetles	1-Feb-16	31-Mar-21	Australian Blueberry Growers Association c/- Hort Innovation
PER13859	Dimethoate / Orchard clean-up - fruit fly host crops following harvest / Fruit Fly	9-Feb-15	31-Jul-24	Growcom
PER14740 Version 2	Propiconazole (Tilt) / Blueberries / Rust (*Pucciniastrum vaccinii*) (ACT, NSW, WA, QLD, SA & TAS)	1-Jul-14	30-Jun-24	Australian Blueberry Growers Association c/- Wollongbar Primary Industries Inst.
PER14423 Version 3	Abamectin / Blackberries, Blueberries and Raspberries / Fruit Fly Field and Protected Cropping Use now registered	23-May-14	31-Mar-24	Raspberries & Blackberries Australia c/- Hort Innovation
PER14234 Version 2	Emulsifiable Botanical Oil (Eco-Oil) / Rubus / Two Spotted Mite	10-Sep-13	31-Aug-23	Raspberries & Blackberries Australia c/- Hort Innovation

Permit ID	Description	Date Issued	Expiry Date	Permit holder
PER14309 Version 2	Chlorothalonil / Blueberries / Various Fungal Diseases	27-Aug-13	30-Sep-21	Australian Blueberry Growers Association c/- Hort Innovation
PER14134	Methomyl / Blueberries / Red-Shouldered Leaf Beetle, *Helicoverpa* spp. & Plague Thrips (QLD only) Employees of or persons operating under the direction of the permit holder.	31-May-13	30-Jun-23	Perfection Agri-Fresh
PER13958 Version 5	Pyrimethanil, Captan, Metalaxyl, Metalaxyl-M, Mancozeb, Triadimenol, Phosphorous Acid / Rubus, Ribes & Blueberries / Various Fungal Blights	1-Apr-13	31-Aug-25	Hort Innovation
PER13955	Infruta Sulphur Dioxide Pads / Blueberries / *Botrytis cinerea*	1-Apr-13	31-Mar-23	Australian Blueberry Growers Association c/- AgAware Consulting
PER12534 Version 4	Imidacloprid (Confidor Guard) / Blueberry / Scarab Beetle Larvae Field and Protected Cropping	1-Nov-12	31-Oct-25	Australian Blueberry Growers Association c/- Hort Innovation
PER13289 Version 4	Indoxacarb (Avatar) / Blueberries & *Rubus* Spp. / Light Brown Apple Moth Field and Protected Cropping	31-Oct-12	31-Aug-23	Raspberries & Blackberries Australia c/- Hort Innovation
PER12219 Version 4	Dichlobenil (Casoron 4G) / Blueberries / Specified Weeds Field Grown Crops Only	5-Apr-12	31-Mar-22	Australian Blueberry Growers Association c/- Wollongbar Primary Industries Inst.
PER12486 Version 5	Trichlorfon / Specified Berry Fruit / Fruit Fly (ACT, NSW, NT, WA, QLD & SA)	6-Oct-11	31-May-21	Australian Blueberry Growers Association c/- Hort Innovation

Appendix 6. Blueberry Maximum Residue Limits (MRLs)

CODEX commodity groupings of Blueberries and subgroups:

	Fruits
FB 0018	Berries and other small fruits
FB 0020	Blueberries
FB 2006	Bush berries
FB 4073	Blueberry, highbush
FB 4075	Blueberry, lowbush
FB 4077	Blueberry, Rabbiteye

Note: Exports account for less than 1 percent of blueberry production, with the major destinations including Hong Kong, Singapore, Thailand, Indonesia and Malaysia. Available information indicates that in the absence of specific limits in legislation, that some countries defer to Codex, followed by EU MRL standards, or apply 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 Code	Description	APVMA MRL mg/kg	Codex MRL mg/kg
2,4-D	FB 0018	Berries and other small fruits	-	0.1
Abamectin	FB 0020	Blueberries	T*0.02	-
Acetamiprid	FB 0018	Berries and other small fruits	-	2
Aldrin and Dieldrin		Fruits	E0.05	-
Azinphos-methyl	FB 0020	Blueberries	5	-
Azoxystrobin	FB 0018	Berries and other small fruits	-	5
Bifenthrin	FB 0020	Blueberries	T3	3
Boscalid	FB 0020	Blueberries	T15	-
	FB 0018	Berries and other small fruits	-	10
Bromide Ion		Fruits	-	20
Captan	FB 0020	Blueberries	20	20
Carbendazim	FB 0018	Berries and other small fruits	-	1
Carfentrazone-ethyl	FB 0018	Berries and other small fruits	T*0.05	-
Chlorantraniliprole	FB 0020	Blueberries	T3	-
	FB 0018	Berries and other small fruits	-	1
Chlorothalonil	FB 0018	Berries and other small fruits	T10	-
Chlorpyrifos	FB 0020	Blueberries	*0.01	-
Clothianidin (see also thiamethoxam)	FB 0020	Blueberries	T*0.01	-
	FB 0018	Berries and other small fruits	-	0.07
Cyanamide	FB 0020	Blueberries	*0.05	-
Cyantraniliprole	FB 2006	Bush berries	-	4
Cyhalothrin	FB 0018	Berries and other small fruits	-	0.2
Cyprodinil	FB 0020	Blueberries	T3	-
	FB 0018	Berries and other small fruits	-	10
Diazinon		Fruit	0.5	-
DDT		Fruits	E1	-
Dichlobenil	FB 0020	Blueberries	T1	-
Dichlofluanid	FB 0018	Berries and other small fruits	T50	-

Chemical	Codex Code	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Dicofol		Fruit	5	-
Difenoconazole	FB 0020	Blueberries	-	4
Diquat		Fruit	*0.05	-
Dithianon	FB 0020	Blueberries	T7	-
Dithiocarbamates	FB 0018	Berries and other small fruits	T15	-
Emamectin	FB 0020	Blueberries	T0.07	-
Ethephon	FB 0020	Blueberries	T10	-
Fenbuconazole	FB 0020	Blueberries	-	0.5
Fenbutatin oxide	FB 0018	Berries and other small fruits	1	-
Fenhexamid	FB 0020	Blueberries	T5	5
Fenpyrazamine	FB 2006	Bush berries	-	4
Fluazifop-p-butyl	FB 0018	Berries and other small fruits	0.2	-
Fludioxonil	FB 0020	Blueberries	T3	2
Flumioxazin	FB 0020	Blueberries	*0.02	-
	FB 2006	Bush berries	-	*0.02
Fluopyram	FB 2006	Bush berries	-	7
Flupyradifurone	FB 2006	Bush berries	-	4
Fluxapyroxad	FB 0018	Berries and other small fruits	-	7
Forchlorfenuron	FB 0020	Blueberries	T*0.01	-
Glufosinate and Glufosinate-ammonium	FB 0018	Berries and other small fruits	0.1	0.1
Glyphosate	FB 0018	Berries and other small fruits	*0.05	-
Haloxyfop	FB 0018	Berries and other small fruits	*0.05	-
Hexythiazox	FB 0018	Berries and other small fruits	1	-
Imidacloprid	FB 0020	Blueberries	T0.1	-
	FB 0018	Berries and other small fruits	-	5
Indoxacarb	FB 0018	Berries and other small fruits	1	-
Inorganic bromide		Fruit	20	-
Iprodione	FB 0018	Berries and other small fruits	12	-
Lindane		Fruit	E0.5	-
Malathion / Maldison	FB 0020	Blueberries	-	10
	FB 0018	Berries and other small fruits	10	-
Mesotrione	FB 2006	Bush berries	-	*0.01
Metalaxyl	FB 0018	Berries and other small fruits	T0.5	-
Metaldehyde		Fruit	1	-
Methiocarb		Fruit	T0.1	-
Methomyl	FB 0020	Blueberries	2	-
Methoxyfenozide	FB 0020	Blueberries	2	4
Methyl bromide		Fruit	T*0.05	-
Napropamide	FB 0018	Berries and other small fruits	*0.1	-
Novaluron	FB 0020	Blueberries	-	7
Omethoate		Fruit	2	-
Oryzalin		Fruit	0.1	-
Oxycarboxin	FB 0020	Blueberries	T10	-

Chemical	Codex Code	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Paraquat		Fruits	*0.05	-
	FB 0018	Berries and other small fruits	-	*0.01
Pendimethalin	FB 0018	Berries and other small fruits	*0.05	-
Phosmet	FB 0020	Blueberries	-	10
Phosphine	FB 0018	Berries and other small fruits	T*0.01	-
Piperonyl butoxide		Fruit	8	-
Pirimicarb		Fruit	0.5	-
	FB 0018	Berries and other small fruits	-	1
Propiconazole	FB 0020	Blueberries	2	
Prothioconazole	FB 2006	Bush berries		1.5
Pyraclostrobin	FB 0020	Blueberries	T5	4
Pyrethrins		Fruit	1	-
Pyrimethanil	FB 0018	Berries and other small fruits	T5	8
Pyriofenone	FB 2006	Bush berries	-	1.5
Simazine		Fruit	*0.1	-
Spinetoram	FB 0018	Berries and other small fruits	0.5	-
	FB 0020	Blueberries	-	0.2
Spinosad	FB 0018	Berries and other small fruits	0.7	-
	FB 0020	Blueberries	-	0.4
Spirodiclofen	FB 0020	Blueberries	-	4
Spirotetramat	FB 0020	Blueberries	T2	-
	FB 2006	Bush berries	-	1.5
Sulfoxaflor	FB 0020	Blueberries	T0.7	
Sulphur dioxide	FB 0020	Blueberries	T10	-
Tebufenozide	FB 0020	Blueberries	-	3
Thiacloprid	FB 0018	Berries and other small fruits	-	1
Thiamethoxam	FB 0018	Berries and other small fruits	-	0.5
Triadimenol	FB 0018	Berries and other small fruits	T0.5	-
Trichlorfon	FB 0018	Berries and other small fruits	T2	-
Trifluralin		Fruit	*0.05	-
Triforine	FB 0020	Blueberries	-	0.03

NOTE: MRLs are constantly under review and subject to change. Check for current MRLs and do not rely on the values stated above.
NOTE: For the groups "Tree Nuts" listed above (Blueberries), crop group exclusions (if any) have not been specified.
Note: Exports account for less than 1 percent of blueberry production, with the major destinations including Hong Kong, Singapore, Thailand, Indonesia and Malaysia. Available information indicates that in the absence of specific limits in legislation, some countries defer to Codex, followed by EU MRL standards or apply 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.

* Indicates that an MRL is at the Limit of Quantitation (LOQ)
T = Temporary MRL
E = The MRL is based on extraneous residues
Po = The MRL accommodates post-harvest treatment of the commodity

Sources:

APVMA MRLs: Agricultural and Veterinary Chemicals Code (MRL Standard) Instrument 2019. Compilation 8. Prepared 9 July 2020.
CODEX MRLs: CODEX Alimentarius International Food Standards database (July 2020), http://www.fao.org/fao-who-codexalimentarius/codex-texts/dbs/pestres/en/

Appendix 7. Blueberry regulatory risk assessment

Blueberry
Agrichemical Regulatory
Risk Assessment

August 2020

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

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

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

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

Blueberries 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				
Aphids				
Aphids	Dimethoate	**1B**	Codex: MRL deletion recommended. EU proposing to set all MRLs to < 0.01 mg/kg	
	Pirimicarb	**1A**	Codex - JMPR Periodic re-evaluation 2020	
Beetles				
Elephant weevil	Bifenthrin	**3A**	Canada: Subject to phase-out until 31/12/2020 EU: No authorisation in place	
	Indoxacarb	**22A**	EU: Proposed non-renewal	
Monolepta beetle	Bifenthrin (84972)	**3A**	Canada: Subject to phase-out until 31/12/2020 EU: No authorisation in place	
Redshouldered leaf beetle	Methomyl	**1A**	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed	
	Pyrethrins (PER80070)	**3A**		
Scarab Beetles	Chlorpyrifos (PER82022)	**1B**	Currently under review by the APVMA & outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure. Ongoing issues internationally Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
Scarab beetles - Larvae	Imidacloprid (PER12534)	**4A**	APVMA – Under review Canada – Under review EU – Removal of all field uses USA: Re-registration with new risk mitigation measures	

Problem	Active Constituents	Chemical Group	Comment	Activities
Lepidoptera				
Helicoverpa spp. (Heliothis) Cotton Bollworm / Corn earworm (H. *armigera*) Native budworm (H. *punctigera*)	Helicoverpa NPV	**-**		
	Methomyl	**1A**	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed EU: No authorisations (Authorisation expired 31/8/19)	
	Spinetoram	**5**		
	Spinosad	**5**		
Caterpillars	Chlorantraniliprole (PER84178)	**28**		
	Emamectin (PER85422)	**6**		
	Methomyl	**1A**	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed EU: No authorisations (Authorisation expired 31/8/19)	
	Spinetoram	**5**		
Lightbrown apple moth	Ethyl formate	**8A**		
	Indoxacarb (PER13289)	**22A**	EU: Proposed non-renewal of authorisation	
	Methoxyfenozide	**18**	EU: Proposed restricted authorisation & Candidate for substitution	
	Spinetoram	**5**		
	Spinosad	**5**		
Loopers	Spinetoram	**5**		
	Spinosad	**5**		

Blueberries regulatory risk assessment

Problem	Active Constituents	Chemical Group	Comment	Activities
Fall Armyworm	Chlorantraniliprole (PER89281)	**28**		
	Emamectin (PER89285)	**6**		
	Indoxacarb (PER89278)	**22A**	EU: Proposed non-renewal of authorisation	
	Methomyl (PER89293)	**1A**	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed EU: No authorisations (Authorisation expired 31/8/19)	
Fruit fly				
Fruit flies	Maldison	**1B**	APVMA – Under review – chemistry	
	Spinetoram (PER87408)	**5**		
Mediterranean fruit fly	Trichlorfon (PER12486)	**1B**	APVMA – nominated for review Codex – No MRLs Europe – Deregistered US – No MRLs	
Queensland fruit fly	Abamectin (PER14423)	**6**		
	Dimethoate	**1B**	Codex: MRL deletion recommended. EU proposing to set all MRLs to < 0.01 mg/kg	
	Trichlorfon (PER12486)	**1B**	APVMA – nominated for review Codex – No MRLs Europe – Deregistered US – No MRLs	
Jassids/Plant bugs				
Cottonseed bug	Sulfoxaflor (PER87141)	**4C**		
Green stink bug	Pyrethrins (PER80070)	**3A**		
Green vegetable bug	Pyrethrins (PER80070)	**3A**		
Jassids	Dimethoate	**1B**	Codex: MRL deletion recommended. EU proposing to set all MRLs to < 0.01 mg/kg	
Rutherglen bug	Dimethoate	**1B**		
Strawberry bug	Dimethoate	**1B**		

Blueberries regulatory risk assessment

Problem	Active Constituents	Chemical Group	Comment	Activities
Scale and mealybug				
Scale insects	Diazinon	**1B**	EU – Deregistered Codex - To be reviewed by 2020/21.	
	Paraffinic oil			
White wax scale	Spirotetramat (PER82607)	**23**		
Mites				
Mites	Paraffinic oil			
Spider mites (Red spider)	Dimethoate	**1B**	Codex: MRL deletion recommended. EU proposing to set all MRLs to < 0.01 mg/kg	
Redlegged earth mite	Dimethoate	**1B**		
Two-spotted (Red spider) mite	Ethyl formate	**8A**		
Thrips				
Plague thrips	Bifenthrin (84972)	**3A**	Canada: Subject to phase-out until 31/12/2020 EU: No authorisation in place	
	Ethyl formate	**8A**		
	Methomyl	**1A**	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed EU: No authorisations (Authorisation expired 31/8/19)	
Thrips	Dimethoate	**1B**	Codex: MRL deletion recommended. EU proposing to set all MRLs to < 0.01 mg/kg	
Western flower thrips	Ethyl formate	**8A**		
	Spinetoram	**5**		
	Spinosad			
Other				
English wasp	Fipronil	**2B**	APVMA – Under review Codex: Re-evaluation scheduled for 2021/22 EU: No authorisation in place	
European wasp	Fipronil	**2B**		

Problem	Active Constituents	Chemical Group	Comment	Activities
		DISEASES		
Anthracnose	*A. pullulans*	**Biological**		
	Boscalid + pyraclostrobin (PER82986)	**7 + 11**		
	Captan (PER13958)	**M4**		
	Copper (PER84176)	**M1**	Europe: Candidates for substitution and their uses to be phased out	
	Cyprodinil + fludioxonil (PER84891)	**9 + 12**	Cyprodinil - Canada – Under review EU: Candidate for substitution Fludioxonil - EU – Under review EU: Candidate for substitution	
Botrytis / Grey mould	*A. pullulans*	**Biological**		
	Boscalid + pyraclostrobin (PER82986)	**7 + 11**		
	Chlorothalonil	**M5**	APVMA - Nominated for review Canada - continued use considered acceptable Europe - Deregistration proposed.	
	Cyprodinil + fludioxonil (PER84891)	**9 + 12**	Cyprodinil - Canada – Under review EU: Candidate for substitution Fludioxonil - EU – Under review EU: Candidate for substitution	
	Fenhexamid	**17**		
	Iprodione	**2**	Europe – Deregistered Canada – Majority of food crop uses deleted Codex – Review scheduled for 2022	
	Mancozeb (PER13958)	**M3**	APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2020/21	
	Pyrimethanil (PER13958)	**9**		
	Sodium metabisulfite [4] (PER13955)	**M**		

[4] Sulfur dioxide (Po) pads

Blueberries regulatory risk assessment

Problem	Active Constituents	Chemical Group	Comment	Activities
Downy mildew	Chlorothalonil	**M5**	APVMA - Nominated for review Canada – Review recently completed, continued use considered acceptable Europe - Deregistration proposed.	
Phomopsis fruit rot	*A. pullulans*	**Biological**		
Phytophthora spp.	Metalaxyl & Metalaxyl-M (PER13958)	**4**	Metalaxyl EU: Candidate for substitution Metalaxyl-M EU: Restricted use approval	
	Phosphorous acid (PER13958)	**33**		
Rhizopus rot	*A. pullulans*	**Biological**		
Rust	Boscalid +pyraclostrobin (PER82986)	**7 + 11**		
	Chlorothalonil (PER14309)	**M5**	APVMA - Nominated for review Canada – Review recently completed, continued use considered acceptable Europe - Deregistration proposed.	
	Copper	**M1**	Europe: Candidates for substitution and their uses to be phased out	
	Dithianon (PER82601)	**M9**	EU: Restricted use to non-edible crops	
	Mancozeb (PER13958)	**M3**	APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2020/21	
	Propiconazole (per14740)	**3**	APVMA - Nominated for review	
Storage rot	Sodium metabisulfite	**M**		

Blueberries regulatory risk assessment

Problem	Active Constituents	Chemical Group	Comment	Activities
WEEDS				
Broadleaf weeds and grasses	Dichlobenil (PER12219	**O**	Europe – deregistered	
	Fluazifop-P	**A**		
	Flumioxazin	**G**		
	Glyphosate	**M**	Ongoing issues internationally	
	Glufosinate (PER87902)	**N**	Europe – deregistered	
	Haloxyfop	**A**		
	Oryzalin	**D**		
	Simazine	**C**	APVMA – Nominated for review Europe - Deregistered	
Plant growth regulators				
Harvest aid	Ethephon (PER86213)			

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