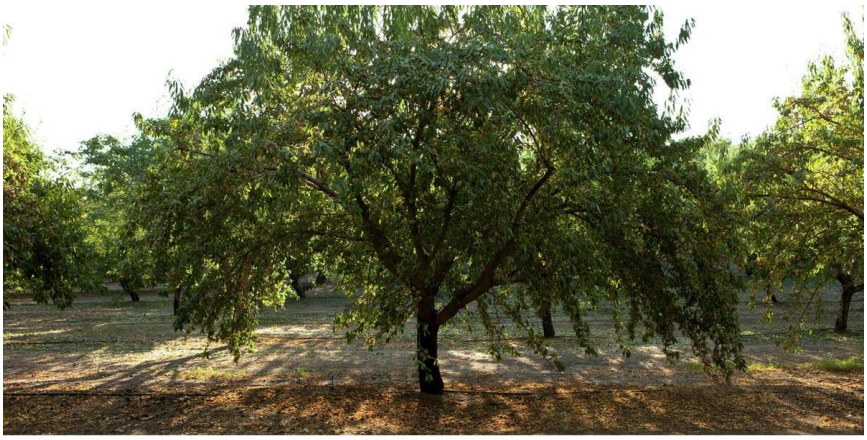

Almond

Strategic Agrichemical Review Process (SARP)

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

Date of report:
December 2020

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Hort Innovation Strategic levy investment | ALMOND FUND

This project has been funded by Hort Innovation using the almond 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 Agrichemical Review Process (SARP) - Updates (MT19008) project is a strategic levy investment of the Hort Innovation Almond Fund. A Strategic Agrichemical Review Process (SARP), through the process of a desktop audit and industry liaison;

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

Alternative pesticides should ideally be selected for benefits of:

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

The results of this process will provide the almond 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
Hull Rot	*Rhizopus* spp.
Phytophthora Root and Crown Rot	*Phytophthora* spp.
Lower Limb Dieback	

1.2 Insects and mites

The high priority insect and nematodes of almond are:

Common name	Scientific name
Carob Moth	*Ectomyelois ceratoniae*
Carpophilus Beetle	*Carpophilus* spp.

1.3 Weeds

The high priority weeds are:

Common Name	Scientific Name
Flaxleaf Fleabane	*Conyza bonariensis*
Feathertop Rhodes Grass	*Chloris virgata*

2. The Australian Almond Industry

Almonds are grown in the south of Australia, with the majority of production occurring along the Murray River downstream of Swan Hill. The industry has a strong export focus and most almonds are cracked and sold in kernel form.

Production for the year ending June 2019 was 148,571 tonnes of almonds (in-shell weight), with a kernel weight equivalent of 104,000 tonnes. The value of production was $835.1 m while the wholesale value was $383.7 m.

The global almond industry is expanding rapidly, and consumer demand is growing strongly due to the positive health benefits and increasing incomes in developing countries. The strong international market is underpinning the growth in Australian production. Most exports go to Asia, with India the largest single customer for Australian exports.

There is a discreet harvest season for almonds in late summer / autumn. This is counter cyclical to the timing of harvest in the US, which produces 80% of the world's almonds.

Almond Harvest Season by State (Kernel)[1]

State	18/19 Tonnes	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
New South Wales	24,960												
Victoria	55,120												
South Australia	21,840												
Western Australia	2,080												
Availability Legend			Harvest			End of Harvest					None		

Almond production in Australia has been stable in recent years although it is expected to grow substantially in coming years as newer plantings start to bear. Currently, approximately 30% of orchard plantings are not yet bearing a crop, and 7% of bearing trees are not yet fully mature. Tree plantings are continuing although the expansion is likely to slow compared to the 12-fold increase seen since 2000.

[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 Almond 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 Almond industry regarding pesticide access, Hort Innovation undertook a review of the pesticide requirements via a Strategic Agrichemical Review Process (SARP) in 2008. The current project is to update the SARP with the latest information and progress.

The SARP process identifies diseases, insect pests and weeds of major concern to the Almond 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 Almond 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 Almonds 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 Almond 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[2].

[2] https://www.planthealthaustralia.com.au/industries/almonds/

3.2 Minor use permits and registration

From a pesticide access perspective, the APVMA classifies almonds as a major crop. The crop fits within the APVMA Crop Group 022: Tree Nuts. Therefore, access to minor use permits can be relatively difficult unless a reasonable justification is provided in accordance to the APVMA's minor use guidance[3].

Possible justification for future permit applications could be based on:

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

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

3.3 Methods

The current update of the Almond Strategic Agrichemical Review Process (SARP), which was last updated in 2008, was conducted by desktop audit and included an online 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] https://apvma.gov.au/node/10931

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 almonds
Appendix 2. Products available for control of insects and mites in almonds
Appendix 3. Products available for weed control in almonds
Appendix 4. Current permits for use in almonds
Appendix 5. Almond Maximum Residue Limits (MRLs)
Appendix 6. Almond Agrichemical Regulatory Risk Assessment

4. Diseases, pests and weeds of almonds

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

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

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

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

4.1 Diseases of almonds

4.1.1 Disease priorities

Common name	Scientific name
High	
Hull Rot	*Rhizopus* spp.
Phytophthora Root and Crown Rot	*Phytophthora* spp.
Lower Limb Dieback	
Moderate	
Anthracnose	*Colletotrichum gloeosporioides*
Bacterial Leaf Spot	*Xanthomonas arboricola*
Almond Rust	*Tranzschelia discolor*
Shot-Hole	*Wilsonomyces carpophilus*
Low	
Brown Rot	*Monilinia laxa*
Blossom Blight	*Botrytis cinerea*
Alternaria Leaf Spot	*Alternaria* spp.
Verticillium wilt	*Verticillium dahliae*
Bacterial Canker	*Pseudomonas syringae*
Crown Gall	*Agrobacterium tumefaciens*
Freckle and Scab	*Cladosporium carpophilum*

Hull Rot, Phytophthora Root and Crown Rot have been nominated as high priorities by the almond industry. Hull Rot can have a significant impact on harvest yield and quality and there are limited fungicide options currently available. Phytophthora Root and Crown Rot is best managed by ensuring good drainage and irrigation management and protecting trees with fungicides during periods of wet weather.

Growers use a regular protectant fungicide program for managing Rust and Brown Rot. There are a good number of options available at this time and many of those options will protect against the other foliar and blossom diseases in almonds. Canopy management to assist with airflow is a useful cultural method to assist in reducing the incidence of these diseases.

In controlling fungal and bacterial diseases, the industry should be mindful of resistance management. CropLife Australia has a resistance management strategy and users must refer to it before using any product[4].

CropLife Australia recommends that in the absence of a specific resistance management strategy the use of fungicides from a specific mode of action be limited to a maximum of one-third of the total. The number of consecutive applications of the same group should also be limited by rotating/alternating between products from different activity groups. An exception is the use of Group M fungicides as they have a low risk of resistance development.

[4] https://www.croplife.org.au/resources/programs/resistance-management/fungicide-resistance-management-strategies1/fungicide-resistance-management-strategies1-draft/

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
Hull Rot (*Rhizopus* spp.) **Priority: High**							
Rated as a high priority in VIC, SA and NSW and as a moderate priority in WA. Causes hulls, nuts and kernels to blacken and stick to the tree. Hull Rot reduces quality and yield, and the diseased nuts held on the tree can perpetuate the infection. An integrated disease management approach is required including cultural measures such as irrigation management, nitrogen management and strategic use of fungicides.							
Azoxystrobin & Tebuconazole (Custodia) Adama	11+3	Protectant / Curative	15	A	ALL	Registered in almonds for control of Brown Rot, Rust and Shot-Hole and suppression of **Hull Rot**. Will reduce the incidence and severity of infected nuts and reduce the incidence of shoot dieback caused by hull rot infections. Apply a single application at early hull split. If a second fungicide application is required, rotate with an alternative fungicide after a 10-14 day interval. Do not apply more than 2 applications per season.	R3
Fluopyram & Trifloxystrobin (Luna Sensation) Bayer	7+11	Protectant / Curative	14	A	ALL	Registered in almonds for control of Brown Rot, Shot-Hole and Stone Fruit Rust and suppression of **Hull Rot**. Apply at early hull split. Repeat at first sign of infection. A reduction in the percentage of nuts infected and a consequent reduction in nuts retained on the tree after harvest can be expected. Do not use more than 3 applications per season.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Aureobasidium pullulans (Botector) Nufarm	UN	Biological / Protectant		P		Registered for suppression of **Rhizopus Rot** in berries. MRLs not required for biological product.	-
Fludioxonil (Scholar) Syngenta	12	Protectant		P		Registered for Control of **Rhizopus Rot** in stone fruit. AU MRL 0.02 mg/kg.	R3
Phytophthora Root and Crown Rot (*Phytophthora* spp.) **Priority: High**							
Rated as a high priority in all states. Phytophthora Root and Crown Rot can have devastating impacts on trees including death in severe cases. Ensure good drainage and irrigation management to reduce the risk of infection.							
Phosphorous (Phosphonic) Acid as Mono-Di K Phosphonate	33	Protectant	28	A	ALL	Registered in almonds for suppression of **Phytophthora**. Apply either as a foliar spray or through irrigation water. Do not use more than 2 applications per season. Do not apply after hull split.	-
Bacillus amyloliquefaciens Strain QST 713 (Serenade Prime) Bayer	BM 02	Biological Soil Ameliorant	NR	P-A	ALL	Available in tree crops for application to soil to improve bioavailability of soil resources to horticultural crops. Registered for suppression of soil-borne diseases such as Black Scurf in potatoes and Pineapple Disease in sugarcane.	-
Copper	M1	Protectant	1	P-A	ALL	Registered in almonds for control of Leaf Curl and Shot-Hole. Registered for control of ***Phytophthora* spp.** in various crops.	-
Mandipropamid (Revus) Syngenta	40	Protectant / Curative		P		Mandipropamid has US registrations for **Phytophthora** in various crops, including as a foliar application for protection of citrus from **Phytophthora Root Rot**.	-
Metalaxyl-M (Ridomil Gold 25G) Syngenta	4	Protectant / Curative		P		Registered in peaches (five years or older) for control of **Phytophthora** Trunk Rot.	-
Oxathiapiprolin (Zorvec Enicade) Corteva	49	Protectant / Curative		P		Current AU registrations only for Downy Mildew but known to have broad activity in the oomycete group. US registration for control of **Phytophthora** Canker and Brown Rot in citrus.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Lower Limb Dieback **Priority: High**							
Rated as a high priority in VIC, SA and NSW and as a low priority in WA. Causes death of limbs in the lower canopy and is often associated with cankers in the lower trunk. The cause of the disorder is uncertain although shading of the lower limbs is thought to be a factor. There is some evidence that high soil moisture levels in the spring may also be implicated. Cultural controls including pruning management and irrigation.							
No control options available.							
Anthracnose (*Colletotrichum acutatum*) **Priority: Moderate**							
Rated as a moderate priority in VIC, SA and WA and as a high priority in NSW. Anthracnose attacks the flowers, fruit and stems. It results in lesions on the surface of nut which can develop and infest the whole nut. Affected nuts turn into mummies and stick to the tree. Cultural measures that reduce canopy humidity will assist along with a regular fungicide program.							
Azoxystrobin (Amistar)	11	Protectant / Curative	28	A	ALL	Registered in almonds for control of **Anthracnose.** Apply as part of a protectant program. Do not apply more than 3 applications per season.	-
Captan	M4	Protectant	28	A	ALL	Registered in almonds for control of **Anthracnose**, Blossom Blight, Nut Scab and Shot Hole. Apply a total of 3 applications commencing at petal fall followed by applications at 2-3 week and 4-5 week intervals after the start of petal fall. Do not apply after the end of petal fall.	-
Propiconazole PER12989	3	Protectant / Curative	14	A	ALL (excl. VIC)	Permitted in almonds for control of Brown Rot and **Anthracnose**. Apply at pink bud, full bloom, petal fall and at 2-3 and 4-6 weeks post petal fall. Further sprays may be required during the season if conditions are conducive to disease. Do not apply more than 4 applications per crop. Do not apply after hull split. Permit to label pending.	R3
Copper	M1	Protectant	1	P-A	ALL	Registered in almonds for control of Leaf Curl and Shot-Hole. Registered in other crops including some tropical fruits and vegetables for control of **Anthracnose**.	-
Fluopyram & Trifloxystrobin (Luna Sensation) Bayer	7+11	Protectant / Curative	14	P-A	ALL	Registered in almonds for control of Brown Rot, Shot-Hole and Stone Fruit Rust and suppression of Hull Rot. Registered for control of **Anthracnose** in tropical and sub-tropical fruit (inedible peel). US registration for control of **Anthracnose** in almonds.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Mancozeb	M3	Protectant	14	P-A	ALL	Registered in almonds for control of Brown Rot, Freckle, Rust and Shot-Hole. Registered in other crops including some tropical fruits and vegetables for control of **Anthracnose**.	R2
Aureobasidium pullulans (Botector) Nufarm	UN	Biological / Protectant	NR	P		Registered for suppression of **Anthracnose** in berries and grapes. MRLs not required for a biological product.	-
Bacillus amyloliquefaciens Strain QST 713 (Serenade Opti) Bayer	BM 02	Biological / Protectant	NR	P		Registered for control of Anthracnose in avocado and mango. Registered in the USA for use in Tree nuts against **Anthracnose**, Alternaria, Shot Hole and Brown Rot. MRLs not required for a biological product.	-
BLAD (Problad Plus)	BM 01	Biological	NR	P		Registered in stone fruit for suppression of Brown Rot. US registration for control of Brown Rot / Blossom Blight in almonds and control of **Anthracnose** in grapes and strawberries. MRLs not required for a biological product.	**-**
Cyprodinil + Fludioxonil (Switch) Syngenta	9+12	Protectant		P		Registered for control of **Anthracnose** in nursery stock, ornamentals and strawberries. US registration for control of **Anthracnose** in berries, citrus and tropical fruit. Cyprodinil: AU MRL *0.01 mg/kg. Codex MRL *0.02 mg/kg.	**R3**
Florylpicoxamid (Adavelt) Corteva	21	Curative / Protectant		P		New Mode of Action fungicide being developed for registration in Australia, with activity on *Septoria*, Powdery Mildew, *Botrytis*, **Anthracnose**, *Alternaria*, Scab, *Monilinia*, Rust and *Mycosphaerella* spp. Due for registration in 2023.	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant / Curative		P		Registered in bananas for control of Yellow Sigatoka, Leaf Speckle and Cordana Leaf Spot. US registration for control of Brown Rot, Blossom Blight, Shot Hole, Powdery Mildew, Jacket Rot, Alternaria Leaf Spot, **Anthracnose**, Scab and Rust in almonds. Fluopyram - AU MRL 0.05 mg/kg. Codex MRL 0.04 mg/kg. Tebuconazole - AU MRL *0.01 mg/kg. Codex MRL *0.05 mg/kg.	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.	R3
Bacterial Leaf Spot (*Xanthomonas arboricola*) **Priority: Moderate**							
Rated as a moderate priority in all states. Bacterial Leaf Spot is favoured by wet weather and severe infections can cause significant impacts on nut yields and quality.							
Copper	M1	Protectant	1	P-A	ALL	Registered in almonds for control of Leaf Curl and Shot-Hole. Copper is registered in various crops for control bacterial diseases.	-
Bacillus amyloliquefaciens Strain QST 713 (Serenade Opti) Bayer	BM 02	Biological / Protectant		P		Registered for suppression of Bacterial Spot in tomatoes. MRLs not required for a biological product.	-
Almond Rust (*Tranzschelia discolor*) **Priority: Moderate**							
Rated as a moderate priority in all states. Rust infections occur during warm, wet weather causing spots on leaves which can expand rapidly under favourable conditions. A regular fungicide program is required to manage the disease and reduce carry over infection between seasons.							
Azoxystrobin + Tebuconazole (Custodia) Adama	11+3	Protectant / Curative	15	A	ALL	Registered in almonds for control of Brown Rot, **Rust** and Shot-Hole and suppression of Hull Rot. Commence applications from late flowering and/or when the first new leaves emerge. Apply prior to disease development and in rotation with fungicides from other mode of action groups on a 10-14 day interval. Do not apply more than 2 applications per season.	R3
Chlorothalonil (Bravo)	M5	Protectant	NR	A	SA, VIC, NSW, TAS & WA	Registered in almonds for control of Shot-Hole and **Stone Fruit Rust**. Apply at budswell, budburst, pink bud, shuckfall, capfall. Apply every 10-14 days. Apply 1 week pre-harvest.	R3
Cyprodinil (Chorus) Syngenta	9	Protectant / Curative	NR	A	ALL	Registered in almonds for control of Brown Rot, **Prune Rust** and Shot-Hole. Application of cyprodinil for brown rot and shot hole will help control early season rust infections. Do not use more than 2 applications per season.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Fluopyram & Trifloxystrobin (Luna Sensation) Bayer	7+11	Protectant / Curative	14	A	ALL	Registered in almonds for control of Brown Rot, Shot-Hole and **Stone Fruit Rust** and suppression of Hull Rot. Apply at or prior to first signs of disease. Repeat applications may be required if weather conditions favour disease development. Do not use more than 3 applications per season.	-
Mancozeb	M3	Protectant	14	A	ALL	Registered in almonds for control of Brown Rot, Freckle, **Rust** and Shot-Hole. Apply at early bloom, then repeat at mid to full bloom, at petal fall and at shuck fall.	R2
Pyraclostrobin (Cabrio) BASF	11	Protectant / Curative	NR	A	ALL	Registered in almonds for control of **Rust**. Commence application at flowering and repeat 10-14 days later. Do not use more than 2 applications per season.	-
Pyraclostrobin + Fluxapyroxad (Merivon) BASF	7+11	Protectant / Curative	21	A	ALL	Registered in almonds for control of Alternaria Leaf Spot, Black Spot, Brown Rot, Nut Scab, Shot-Hole and **Stone Fruit Rust**. Use in a preventative program with spray intervals of 10-21 days. Apply a maximum of 3 applications per year, and no more than 2 consecutive.	-
Sulfur (S) present as Polysulfide Sulfur	M2	Protectant	NR	A	ALL	Registered in almonds for control of Brown Rot, Freckle or Scab, Leaf Curl, **Rust** and Shot-Hole. Spray while trees are dormant to the bud swell stage.	-
Copper	M1	Protectant	1	P-A	ALL	Registered in almonds for control of Leaf Curl and Shot-Hole. Registered for control of **Rust** in stone fruit.	-
Florylpicoxamid (Adavelt) Corteva	21	Protectant / Curative		P		New Mode of Action fungicide being developed for registration in Australia, with activity on *Septoria*, Powdery Mildew, *Botrytis*, Anthracnose, *Alternaria*, Scab, *Monilinia*, **Rust** and *Mycosphaerella* spp. Due for registration in 2023.	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant / Curative		P		Registered in bananas for control of Yellow Sigatoka, Leaf Speckle and Cordana Leaf Spot. US registration for control of Brown Rot, Blossom Blight, Shot Hole, Powdery Mildew, Jacket Rot, Alternaria Leaf Spot, Anthracnose, Scab and **Rust** in almonds. Fluopyram - AU MRL 0.05 mg/kg. Codex MRL 0.04 mg/kg. Tebuconazole - AU MRL *0.01 mg/kg. Codex MRL *0.05 mg/kg.	R3
Mefentrifluconazole (Belanty) BASF	3	Protectant / Curative		P		Registered for control of Black Spot in apples and Powdery Mildew in grapes. US registration for control of *Alternaria*, *Monilinia*, **Leaf Rust**, Scab and Shot Hole in tree nuts.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Shot-Hole (*Wilsonamyces carpophilus*) **Priority: Moderate**							
Rated as a low priority in VIC, SA and NSW and as a moderate priority in WA. Shot-Hole affects all above-ground plant parts, but symptoms are most noticeable as lesions that develop into holes on the leaves. Incidence of the disease is very high in almonds although it is not thought to have a big impact on yield, partly as a result of regular fungicide programs to manage infections.							
Azoxystrobin + Tebuconazole (Custodia) Adama	11+3	Protectant / Curative	15	A	ALL	Registered in almonds for control of Brown Rot, Rust and **Shot-Hole** and suppression of Hull Rot. Apply from early bloom. Subsequent applications should be applied on a 7-14 day interval, targeting key growth stages including full bloom, petal fall and shuck fall. Do not apply more than 2 applications per season.	R3
Captan	M4	Protectant	28	A	ALL	Registered in almonds for control of Anthracnose, Blossom Blight, Nut Scab and **Shot Hole**. Apply a total of 3 applications commencing at petal fall followed by applications at 2-3 week and 4-5 week intervals after the start of petal fall. Do not apply after the end of petal fall.	-
Chlorothalonil (Bravo)	M5	Protectant	NR	A	SA, VIC, NSW, TAS & WA	Registered in almonds for control of **Shot-Hole** and Stone Fruit Rust. Apply at budswell, budburst, pink bud, shuckfall, capfall. Apply every 10-14 days. Apply 1 week pre-harvest.	R3
Copper (Cu) present as Copper Ammonium Acetate	M1	Protectant	1	A	ALL	Registered in almonds for control of Leaf Curl and **Shot-Hole**. Apply when buds are swelling but before and within one week of bud opening. Commence post-flowering applications 5-7 days after petal fall is complete.	-
Copper (Cu) present as copper oxychloride	M1	Protectant	1	A	QLD, VIC, TAS, SA & WA	Registered in almonds for control of Leaf Curl and **Shot-Hole**. Apply when buds are swelling but before and within one week of bud opening. Commence post-flowering applications 5-7 days after petal fall is complete.	-
Copper (Cu) present as Copper Oxychloride & Copper Hydroxide	M1	Protectant	1	A	ALL	Registered in almonds for control of Leaf Curl and **Shot-Hole**. Apply when buds are swelling but before and within one week of bud opening. Commence post-flowering applications 5-7 days after petal fall is complete.	-
Copper (Cu) present as Cupric Hydroxide	M1	Protectant	1	A	QLD, VIC, TAS, SA & WA	Registered in almonds for control of Leaf Curl and **Shot-Hole**. Apply when buds are swelling but before and within one week of bud opening. Commence post-flowering applications 5-7 days after petal fall is complete.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Copper (Cu) present as cuprous oxide	M1	Protectant	1	A	ALL	Registered in almonds for control of Leaf Curl and **Shot-Hole**. Apply when buds are swelling but before and within one week of bud opening. Commence post-flowering applications 5-7 days after petal fall is complete.	-
Cyprodinil (Chorus) Syngenta	9	Protectant / Curative	NR	A	ALL	Registered in almonds for control of Brown Rot, Prune Rust and **Shot-Hole**. Apply from early bloom to petal fall, with a minimum 7 day interval between applications. Do not use more than 2 applications per season.	-
Fluopyram & Trifloxystrobin (Luna Sensation) Bayer	7+11	Protectant / Curative	14	A	ALL	Registered in almonds for control of Blossom Blight, **Shot-Hole** and Stone Fruit Rust and suppression of Hull Rot. Apply as part of a protectant program at intervals of 10-14 days starting at early pink bud. Repeat applications may be required later in the crop cycle if weather conditions favour disease development. Do not use more than 3 applications per season.	-
Mancozeb	M3	Protectant	14	A	ALL	Registered in almonds for control of Brown Rot, Freckle, Rust and **Shot-Hole**. Apply at early bloom, then repeat at mid to full bloom, at petal fall and at shuck fall.	R2
Pyraclostrobin + Fluxapyroxad (Merivon) BASF	7+11	Protectant / Curative	21	A	ALL	Registered in almonds for control of Alternaria Leaf Spot, Black Spot, Brown Rot, Nut Scab, **Shot-Hole** and Stone Fruit Rust. Use in a preventative program with spray intervals of 10-21 days. Apply a maximum of 3 applications per year, and no more than 2 consecutive.	-
Sulfur (S) present as Polysulfide Sulfur	M2	Protectant	NR	A	ALL	Registered in almonds for control of Brown Rot, Freckle or Scab, Leaf Curl, Rust and **Shot-Hole**. Spray while trees are dormant to the bud swell stage.	-
Bacillus amyloliquefaciens Strain QST 713 (Serenade Opti) Bayer	BM 02	Biological / Protectant	NR	P		Registered for control of Anthracnose in avocado and mango. US registration for control of Anthracnose, Alternaria, **Shot Hole** and Brown Rot in tree nuts. MRLs not required for a biological product.	-
Mefentrifluconazole (Belanty) BASF	3	Protectant / Curative		P		Registered for control of Black Spot in apples and Powdery Mildew in grapes. US registration for control of *Alternaria*, *Monilinia*, Leaf Rust, Scab and **Shot Hole** in tree nuts.	-

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		Registered in bananas for control of Yellow Sigatoka, Leaf Speckle and Cordana Leaf Spot. US registration for control of Brown Rot, Blossom Blight, **Shot Hole**, Powdery Mildew, Jacket Rot, Alternaria Leaf Spot, Anthracnose, Scab and Rust in almonds. Fluopyram - AU MRL 0.05 mg/kg. Codex MRL 0.04 mg/kg. Tebuconazole - AU MRL *0.01 mg/kg. Codex MRL *0.05 mg/kg.	R3
Brown Rot (*Monolinia laxa*) **Priority: Low**							
Rated as a low priority in VIC and SA and as a moderate priority in NSW and WA. Brown Rot infection occurs at flowering and damage is caused to yield through loss of blooms at this time. A planned fungicide program during flowering is critical for management of Brown Rot.							
Azoxystrobin + Tebuconazole (Custodia) Adama	11+3	Protectant / Curative	15	A	ALL	Registered in almonds for control of **Brown Rot**, Rust and Shot-Hole and suppression of Hull Rot. Apply from early bloom. Subsequent applications should be applied on a 7-14 day interval, targeting key growth stages including full bloom, petal fall and shuck fall. Do not apply more than 2 applications per season.	R3
Captan	M4	Protectant	28	A	ALL	Registered in almonds for control of Anthracnose, **Blossom Blight (*Monilinia laxa*)**, Nut Scab and Shot Hole. Apply a total of 3 applications commencing at petal fall followed by applications at 2-3 week and 4-5 week intervals after the start of petal fall. Do not apply after the end of petal fall.	-
Cyprodinil (Chorus) Syngenta	9	Protectant / Curative	NR	A	ALL	Registered in almonds for control of **Brown Rot**, Prune Rust and Shot-Hole. Apply from early bloom to petal fall, with a minimum 7 day interval between applications. Do not use more than 2 applications per season.	-
Fluopyram & Trifloxystrobin (Luna Sensation) Bayer	7+11	Protectant / Curative	14	A	ALL	Registered in almonds for control of **Brown Rot**, Shot-Hole and Stone Fruit Rust and suppression of Hull Rot. Apply at or prior to first signs of disease. Repeat applications may be required if weather conditions favour disease development. Do not use more than 3 applications per season.	-
Iprodione (Rovral)	2	Protectant / Curative	NR	A	ALL	Registered in almonds for control of Blossom Blight and **Brown Rot**. Apply first at full bloom and, if conditions are favourable for disease development, up to 2 subsequent applications can be made, at petal fall and up to 4 weeks after petal fall.	R2

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Mancozeb	M3	Protectant	14	A	ALL	Registered in almonds for control of **Brown Rot**, Freckle, Rust and Shot-Hole. Apply at early bloom, then repeat at mid to full bloom, at petal fall and at shuck fall.	R2
Penthiopyrad (Fontelis) Corteva	7	Protectant	14	A	ALL	Registered in almonds for control of **Brown Rot**. Begin applications prior to disease development and continue on a 7–14 day interval. Do not apply more than 2 consecutive applications. Do not apply more than 3 total applications per season.	-
Propiconazole PER12989	3	Protectant	14	A	ALL (excl. VIC)	Permitted in almonds for control of **Brown Rot** and Anthracnose. Apply at pink bud, full bloom, petal fall and at 2-3 and 4-6 weeks post petal fall. Further sprays may be required during the season if conditions are conducive to disease. Do not apply more than 4 applications per crop. Do not apply after hull split.	R3
Pyraclostrobin + Fluxapyroxad (Merivon) BASF	7+11	Protectant / Curative	21	A	ALL	Registered in almonds for control of Alternaria Leaf Spot, Black Spot, **Brown Rot**, Nut Scab, Shot-Hole and Stone Fruit Rust. Use in a preventative program with spray intervals of 10-21 days. Apply a maximum of 3 applications per year, and no more than 2 consecutive.	-
Sulfur (S) present as Polysulfide Sulfur	M2	Protectant	NR	A	ALL	Registered in almonds for control of **Brown Rot**, Freckle or Scab, Leaf Curl, Rust and Shot-Hole. Spray while trees are dormant to the bud swell stage.	-
Copper (Cu)	M1	Protectant	1	P-A	ALL	Registered in almonds for control of Leaf Curl and Shot-Hole. Registered for Brown Rot control in stone fruit.	-
Bacillus amyloliquefaciens Strain QST 713 (Serenade Opti) Bayer	BM 02	Biological / Protectant	NR	P		Registered for control of Anthracnose in avocado and mango. Registered in the USA for use in Tree nuts against Anthracnose, Alternaria, Shot Hole and **Brown Rot**. MRLs not required for a biological product.	-
BLAD (Problad Plus)	BM 01	Biological	NR	P		Registered in stone fruit for suppression of **Brown Rot**. US registration for control of **Brown Rot / Blossom Blight** in almonds. MRLs not required for a biological product.	-

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 for registration in Australia, with activity on *Septoria*, Powdery Mildew, *Botrytis*, Anthracnose, *Alternaria*, Scab, ***Monilinia***, Rust and *Mycosphaerella* spp. Due for registration in 2023.	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant / Curative		P		Registered in bananas for control of Yellow Sigatoka, Leaf Speckle and Cordana Leaf Spot. US registration for control of **Brown Rot**, Blossom Blight, Shot Hole, Powdery Mildew, Jacket Rot, Alternaria Leaf Spot, Anthracnose, Scab and Rust in almonds. Fluopyram - AU MRL 0.05 mg/kg. Codex MRL 0.04 mg/kg. Tebuconazole - AU MRL *0.01 mg/kg. Codex MRL *0.05 mg/kg.	R3
Mandestrobin (Intuity) Sumitomo	11	Protectant / Curative		P		Registered for control of **Brown Rot** in stone fruit.	-
Mefentrifluconazole (Belanty) BASF	3	Protectant / Curative		P		Registered for control of Black Spot in apples and Powdery Mildew in grapes. US registration for control of *Alternaria*, ***Monilinia***, Leaf Rust, Scab and Shot Hole in tree nuts.	-
Potassium Silicate + Potassium Bicarbonate (EcoCarb Plus) OCP	M2	Protectant		P		Registered for control of **Brown Rot** in nectarines.	-
Blossom Blight (*Botrytis cinerea*) **Priority: Low**							
Rated as a low priority in VIC and SA and as a moderate priority in NSW and WA. Brown Rot can also be referred to as Blossom Blight in almonds. Botrytis can infect trees during flowering, but the disease does not usually become evident until nut development stage. Preventative fungicides should be used from early blossom onwards.							
Iprodione (Rovral)	2	Protectant / Curative	NR	A	ALL	Registered in almonds for control of **Blossom Blight** and Brown Rot. Apply first at full bloom and, if conditions are favourable for disease development, up to 2 subsequent applications can be made, at petal fall and up to 4 weeks after petal fall.	R2

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Captan (Grochem only)	M4	Protectant	28	P-A	ALL	Registered in almonds for control of Anthracnose, Blossom Blight (*Monilinia laxa*), Nut Scab and Shot Hole. Registered for control of ***Botrytis*** in strawberries. Infection time for Blossom Blight coincides with Anthracnose program in almonds.	-
Fluopyram & Trifloxystrobin (Luna Sensation) Bayer	7+11	Protectant / Curative	14	P-A	ALL	Registered in almonds for control of Brown Rot, Shot-Hole and Stone Fruit Rust and suppression of Hull Rot. US registration for control of ***Botrytis*** in almonds.	-
Penthiopyrad (Fontelis) Corteva	7	Protectant	14	P-A	ALL	Registered in almonds for control of Brown Rot. Registered for control of ***Botrytis*** in various vegetable and fruit crops.	-
Aureobasidium pullulans (Botector) Nufarm	UN	Biological / Protectant		P		Registered for control of ***Botrytis*** in berries and grapes. US registration for the control of Blossom Blight and *Monilinia* in almonds. MRLs not required for a biological product.	-
Bacillus amyloliquefaciens (strain QST 713) (Serenade Opti) Bayer	BM 02	Biological / Protectant		P		Registered for control of ***Botrytis*** in grapes and strawberries. US registration for control of Anthracnose, Alternaria, Shot Hole and Brown Rot in tree nuts. MRLs not required for a biological product.	-
Cyprodinil + Fludioxonil (Switch) Syngenta	9+12	Protectant		P		Registered for control of ***Botrytis*** in cucurbits, grapes, legume vegetables, lettuce and strawberries. US registration for control of ***Botrytis*** in various crops, including pistachios. Cyprodinil: AU MRL *0.01 mg/kg. Codex MRL *0.02 mg/kg.	R3
Fenhexamid (Teldor) Bayer	17	Protectant		P		Registered for control of ***Botrytis*** in strawberries. US registration for control of Blossom Blight in almonds. AU MRL 0.1 mg/kg. Codex 0.02 mg/kg. US MRL 0.02 mg/kg.	-
Florylpicoxamid (Adavelt) Corteva	21	Protectant / Curative		P		New Mode of Action fungicide being developed for registration in Australia, with activity on *Septoria*, Powdery Mildew, ***Botrytis***, Anthracnose, *Alternaria*, Scab, *Monilinia*, Rust and *Mycosphaerella* spp. Due for registration in 2023.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Fludioxonil (Scholar) Syngenta	12	Protectant		P		Registered for control of ***Botrytis*** in pome fruit, stone fruit and kiwi fruit. AU MRL 0.02 mg/kg.	R3
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant / Curative		P		Registered in bananas for control of Yellow Sigatoka, Leaf Speckle and Cordana Leaf Spot. US registration for control of Brown Rot, **Blossom Blight**, Shot Hole, Powdery Mildew, Jacket Rot, Alternaria Leaf Spot, Anthracnose, Scab and Rust in almonds. Fluopyram - AU MRL 0.05 mg/kg. Codex MRL 0.04 mg/kg. Tebuconazole - AU MRL *0.01 mg/kg. Codex MRL *0.05 mg/kg.	R3
NUL3195 Nufarm	TBC			P		Fungicide in development from Nufarm with activity on Powdery Mildew and **Botrytis**.	-
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 pistachio.	R3
Pyrimethanil (Scala) Bayer	9	Protectant / Curative		P		Registered for control of ***Botrytis*** in grapes and strawberries. Codex MRL 0.2 mg/kg.	-
Alternaria Leaf Spot (*Alternaria* spp.) **Priority: Low**							
Rated as a low priority in all states. Alternaria causes leaf lesions but is rarely severe enough to require treatment.							
Pyraclostrobin + Fluxapyroxad (Merivon) BASF	7+11	Protectant / Curative	21	A	ALL	Registered in almonds for control of **Alternaria Leaf Spot**, Black Spot, Brown Rot, Nut Scab, Shot-Hole and Stone Fruit Rust. Use in a preventative program with spray intervals of 10-21 days. Apply a maximum of 3 applications per year, and no more than 2 consecutive.	-
Copper (Cu)	M1	Protectant	1	P-A	ALL	Registered in almonds for control of Leaf Curl and Shot-Hole. Registered for ***Alternaria*** control in various crops.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Fluopyram & Trifloxystrobin (Luna Sensation) Bayer	7+11	Protectant / Curative	14	P-A	ALL	Registered in almonds for control of Brown Rot, Shot-Hole and Stone Fruit Rust and suppression of Hull Rot. US registration for control of ***Alternaria*** in almonds.	-
Bacillus amyloliquefaciens Strain QST 713 (Serenade Opti) Bayer	BM 02	Biological / Protectant	NR	P		Registered for control of Anthracnose in avocado and mango. US registration for control of Anthracnose, ***Alternaria***, Shot Hole and Brown Rot in tree nuts. MRLs not required for a biological product.	-
Florylpicoxamid (Adavelt) Corteva	21	Protectant / Curative		P		New Mode of Action fungicide being developed for registration in Australia, with activity on *Septoria*, Powdery Mildew, *Botrytis*, Anthracnose, ***Alternaria***, Scab, *Monilinia*, Rust and *Mycosphaerella* spp. Due for registration in 2023.	-
Mefentrifluconazole (Belanty) BASF	3	Protectant / Curative		P		Registered for control of Black Spot in apples and Powdery Mildew in grapes. US registration for control of ***Alternaria***, *Monilinia*, Leaf Rust, Scab and Shot Hole in tree nuts.	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant / Curative		P		Registered in bananas for control of Yellow Sigatoka, Leaf Speckle and Cordana Leaf Spot. US registration for control of Brown Rot, Blossom Blight, Shot Hole, Powdery Mildew, Jacket Rot, **Alternaria Leaf Spot**, Anthracnose, Scab and Rust in almonds. Fluopyram - AU MRL 0.05 mg/kg. Codex MRL 0.04 mg/kg. Tebuconazole - AU MRL *0.01 mg/kg. Codex MRL *0.05 mg/kg.	R3

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Verticillium Wilt (*Verticillium dahliae*) **Priority: Low**							
Rated as a low priority in VIC and NSW and as a moderate priority in SA and WA. Verticillium is a soil-borne fungus that can persist for many years. Its effects are not severe, but it can impact on plant health over an extended period. New plantings should not be made in areas that are infested with Verticillium.							
Bacillus amyloliquefaciens Strain QST 713 (Serenade Prime Soil Ameliorant and Biofungicide) Bayer	BM 02	Biological	NR	P-A	ALL	Available in tree crops for application to soil to improve bioavailability of soil resources to horticultural crops. No MRLs required for biological product.	-
Bacterial Canker (*Pseudomonas syringae*) **Priority: Low**							
Rated as a low priority in VIC, SA and NSW and as a moderate priority in WA. Rarely seen in almonds.							
Copper	M1	Protectant	1	P-A	ALL	Registered in almonds for control of Leaf Curl and Shot-Hole. Copper is registered for control of bacterial diseases in various crops.	-
Bacillus amyloliquefaciens Strain QST 713 (Serenade Opti) Bayer	BM 02	Biological / Protectant		P		Registered for suppression of Bacterial Spot in tomatoes. US registration for control of Anthracnose, Alternaria, Shot Hole and Brown Rot in tree nuts. MRLs not required for biological product.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Crown Gall (*Agrobacterium tumefaciens*) **Priority: Low**							
Rated as a low priority in VIC, SA and NSW and as a moderate priority in WA. Crown Gall can cause tumours and galls on the lower stems and roots.							
Agrobacterium radiobacter Var Radiobacter STRAIN K1026 (NoGall) BASF	-	Biological / Protectant / Pre-Planting	NR	A	ALL	Registered in almonds for control of **Crown Gall**. Apply as a pre-planting dip (seeds, seedlings, cuttings).	-
Freckle and Scab (*Cladosporium carpophilum*) **Priority: Low**							
Rated as a low priority in VIC, SA and NSW and as a moderate priority in WA. Freckle / Scab is an infrequent disease in almonds.							
Captan	M4	Protectant	28	A	ALL	Registered in almonds for control of Anthracnose, Blossom Blight, **Nut Scab** and Shot Hole. Apply a total of 3 applications commencing at petal fall followed by applications at 2-3 week and 4-5 week intervals after the start of petal fall. Do not apply after the end of petal fall.	-
Mancozeb	M3	Protectant	14	A	ALL	Registered in almonds for control of Brown Rot, **Freckle**, Rust and Shot-Hole. Apply at early bloom, then repeat at mid to full bloom, at petal fall and at shuck fall.	R2
Pyraclostrobin + Fluxapyroxad (Merivon) BASF	7+11	Protectant / Curative	21	A	ALL	Registered in almonds for control of Alternaria Leaf Spot, Black Spot, Brown Rot, **Nut Scab**, Shot-Hole and Stone Fruit Rust. Use in a preventative program with spray intervals of 10-21 days. Apply a maximum of 3 applications per year, and no more than 2 consecutive.	-
Sulfur (S) present as Polysulfide Sulfur	M2	Protectant	NR	A	ALL	Registered in almonds for control of Brown Rot, **Freckle or Scab**, Leaf Curl, Rust and Shot-Hole. Spray while trees are dormant to the bud swell stage.	-
Azoxystrobin (Amistar)	11	Protectant / Curative	28	P-A	ALL	Registered in almonds for control of Anthracnose. US registration for control of ***Cladosporium*** in almonds.	-
Copper	M1	Protectant	1	P-A	ALL	Registered in almonds for control of Leaf Curl and Shot-Hole. Registered in stone fruit for control of ***Cladosporium***.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Fluopyram & Trifloxystrobin (Luna Sensation) Bayer	7+11	Protectant / Curative	14	P-A	ALL	Registered in almonds for control of Brown Rot, Shot-Hole and Stone Fruit Rust and suppression of Hull Rot. US registration for control of **Scab** in almonds.	-
Mefentrifluconazole (Belanty) BASF	3	Protectant / Curative		P		Registered for control of Black Spot in apples and Powdery Mildew in grapes. US registration for control of *Alternaria*, *Monilinia*, Leaf Rust, **Scab** and Shot Hole in tree nuts.	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant / Curative		P		Registered in bananas for control of Yellow Sigatoka, Leaf Speckle and Cordana Leaf Spot. US registration for control of Brown Rot, Blossom Blight, Shot Hole, Powdery Mildew, Jacket Rot, Alternaria Leaf Spot, Anthracnose, **Scab** and Rust in almonds. Fluopyram - AU MRL 0.05 mg/kg. Codex MRL 0.04 mg/kg. Tebuconazole - AU MRL *0.01 mg/kg. Codex MRL *0.05 mg/kg.	R3

4.2 Insects and mite pests of almonds

4.2.1 Insect and mite pest priorities

Common name	Scientific name
High	
Carob Moth	*Ectomyelois ceratoniae*
Carpophilus Beetle	*Carpophilus* spp.
Moderate	
Bryobia Mite	*Bryobia praetiosa*
Two Spotted Mite	*Tetranychus urticae*
Rust Red Flour Beetle	*Tribolium castaneum*
Low	
Black Peach Aphid	*Brachycaudus persicae*
Green Peach Aphid	*Myzus persicae*
Indian Meal Moth	*Plodia interpunctella*
Almond Moth / Dried Fruit Moth	*Ephestia cautella*
Light Brown Apple Moth	*Epiphyas postvittana*
Earwigs	Dermaptera
Ants	Formicidae
Brown Almond Mite	*Bryobia rubrioculus*

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 almonds are Carob Moth and Carpophilus Beetle. Carob Moth was a high priority in the 2008 Almond SARP. There has been considerable research into monitoring and management of Carob Moth. The larvae of Carob Moth feed on the kernels, making them unsuitable for sale as whole kernels for human consumption. Hort Innovation Project AL12004 investigated the biology of Carob Moth, as well as producing guidelines for monitoring and managing the pest in almonds. More information can be found at this link[5].

Carpophilus Beetle is a relatively recent pest in almonds, and it was not mentioned in the 2008 SARP report. Almonds are most vulnerable to attack from Carpophilus Beetle during hull split. An "Attract and Kill" system is available to control the pest, more details are available from the Hort Innovation Project AL15004, Management of Carpophilus beetle in almonds[6].

Termites are an emerging pest in almonds. They have caused sporadic problems in recent years and information about their impact and management is limited.

It is important to take an Integrated Pest Management (IPM) approach to pest control in almonds. 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 almonds. 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 pests in almonds necessitates careful planning with resistance management. Refer to the pest strategies that apply to almonds on the CropLife website[7], including Green Peach Aphid and Fall Armyworm.

[5] www.horticulture.com.au/growers/help-your-business-grow/research-reports-publications-fact-sheets-and-more/al12004/
[6] www.horticulture.com.au/growers/help-your-business-grow/research-reports-publications-fact-sheets-and-more/al15004/
[7] 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 2018-19 and cotton use patterns)			
VL – Very low; L – Low; M – Moderate; H – High; VH – Very High; - not specified			

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Carob Moth (*Apomyelois ceratoniae*) **Priority: High**								
Rated as a high priority in all states. Carob Moth larvae feed on the developing kernels, making them unsuitable for sale as whole kernels. The larvae like to develop in nut mummies so the removal of these from trees is key part of managing the pest.								
Chlorantraniliprole (Altacor) FMC	28	Ingestion	14	A	ALL	Registered in almonds for control of **Carob Moth**. Commence application at early hull split. If required, retreat at minimum interval of 7 days. Do not apply more than 2 applications per season and Do not use on successive generations of the pest.	L Bee VL	-
Clothianidin (Samurai) Sumitomo PER87311	4A	Systemic / Ingestion	H:14 NG	A	NSW, SA, VIC & WA	Permitted in almonds for control of Carpophilus Beetle and **Carob Moth.** Apply initial spray as a foliar application at start of hull split and again at 40% hull split, approximately 4-5 weeks and then 2-3 weeks before harvest. Do not apply more than 2 applications per season, with a minimum 14 days between consecutive foliar sprays. Registration pending.	M Bee VH	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Methoxyfenozide (Prodigy) Corteva	18	Ingestion	7	A	ALL	Registered in almonds for control of **Carob Moth**. Early post-flower application (First Generation): Apply a maximum of 3 sprays at a minimum of 10 day intervals between sprays. Hull-split application(Second Generation): Apply at the start of hull split and apply an additional spray to coincide with the initiation of egg hatch from second generation moths.	VL Bee VL	-
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion	H:10 NG	P-A	ALL	Registered in almonds for control of Carpophilus Beetle. Also has activity on Lepidoptera and with the pest timing similar for Carob Moth and Carpophilus Beetle it is likely that some incidental control will occur.	L-M Bee VH	-
Bacillus thuringiensis subsp Kurstaki Strain Hd-1	11	Biological / Ingestion		P		Registered in fruit crops for control of various Lepidoptera. MRLs not required for a biological product.	VL Bee VL	-
Emamectin (Proclaim) Syngenta	6	Ingestion		P		Registered for control of various Lepidopteran pests in vegetables. US registration for the control of a range of Lepidopteran pests in almonds. Codex MRL *0.001 mg/kg.	M Bee H	-
Indoxacarb (Avatar) FMC	22A	Ingestion		P		Registered in stone fruit for control of Heliothis, Oriental Fruit Moth, Light Brown Apple Moth, Weevils and Wingless Grasshoppers.	M Bee H	R3
NUL3445 Nufarm	TBC			P		New insecticide from Nufarm with activity on Lepidoptera, Bugs, Beetles/Weevils, Fruit Fly and Thrips.		-
Spinetoram (Success Neo) Corteva	5	Ingestion		P		Registered for control of Lepidoptera in various crops. AU MRL 0.1 mg/kg, Codex 0.01 mg/kg.	M Bee VH	-
Spinosad (Entrust Organic) Corteva	5	Ingestion		P		Registered for control of Lepidoptera in various crops. AU MRL *T0.01 mg/kg. Codex MRL 0.07 mg/kg.	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.		-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Carpophilus Beetle (*Carpophilus* spp.) **Priority: High**								
Rated as a high priority in VIC, SA and NSW and as a moderate priority in WA. Carpophilus Beetle damage is most severe as the nut matures, with beetles penetrating the nut and also causing indirect damage by creating an entry point for Brown Rot. Beetle populations can develop rapidly as the pest is highly mobile. The Attract and Kill system is the most effective way of reducing the impact of Carpophilus beetle.								
Pheromone Lures and Ethanol Based Co-Attractants (Carpophilus Catcha Trapping System) PER14866 DICHLORVOS pest strips		Attractant	NR	A	ALL	Permitted in almonds for monitoring and management 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 plantation. 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 plantation along the perimeter and placed upwind. Replace co-attractants every 2 weeks. Use aggregation pheromone lure.	-	-
Bifenthrin (Talstar) PER87216	3A	Contact	7	A	ALL	Permitted in almonds for control of **Dried Fruit Beetle** or **Carpophilus Beetle**. Apply initial foliar spray at almond split stage. Make a maximum of 2 applications per season, with a minimum 7 days between consecutive foliar sprays.	VH Bee H	R3
Clothianidin (Samurai) Sumitomo PER87311	4A	Systemic / Ingestion	H:14 NG	A	NSW, SA, VIC & WA	Permitted in almonds for control of **Carpophilus** Beetle and Carob Moth**.** Apply initial spray as a foliar application at start of hull split and again at 40% hull split, approximately 4-5 weeks and then 2-3 weeks before harvest. Do not apply more than 2 applications per season, with a minimum 14 days between consecutive foliar sprays.	M Bee VH	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion	H:10 NG	A	ALL	Registered in almonds for control of **Carpophilus Beetle**. Monitor orchards during hull split for presence of Carpophilus Beetles. If numbers have the potential to cause economic loss, apply at mid hull split before the shells of soft-shelled varieties dry, exposing the kernel. Apply a maximum of 2 applications per crop with the second application 14-21 days later if there is a continual influx of Carpophilus Beetles from surrounding areas. Kernel damage can still occur if Carpophilus Beetles enter the orchard just prior to harvest, when the shell is open, and feed directly on the kernel.	L-M Bee VH	-
NUL3445 Nufarm	TBC			P		New insecticide from Nufarm with activity on Lepidoptera, Bugs, Beetles/Weevils, Fruit Fly and Thrips.		-
Bryobia Mite (*Bryobia praetiosa*) **Two Spotted Mite** *(Tetranychus urticae)* **Priority: Moderate**								
Bryobia Mite is rated as a moderate priority in VIC and SA and as a high priority in NSW and WA. Two Spotted Mite is rated as a low priority in VIC and SA, a moderate priority in WA and a high priority in NSW. Almonds can tolerate moderate numbers of mites, particularly if beneficial insects are abundant in the orchard. Management should include regular monitoring and careful use of non-disruptive miticides.								
Abamectin	6	Contact and Ingestion	28	A	ALL	Registered in almonds for control of **Bryobia Mite** and **Two Spotted Mite**. Apply when pest numbers exceed threshold. Do not use more than 1 application per season. Do not use in consecutive season without using an alternative Mode of Action product in between.	M Bee H	-
Bifenazate (Acramite) UPL	20D	Contact and Ingestion	H:14 G:28	A	ALL	Registered in almonds for control of **Bryobia Mite** and **Two Spotted Mite**. Apply at the first sign of mites. Do not use more than 1 application per season.	L Bee H	-
Clofentezine (Apollo) Adama	10A	IGR / Contact	35	A	ALL	Registered in almonds for control of **Bryobia Mite** and **Two Spotted Mite**. Do not apply more than one application per season to manage the development of resistance. Do not apply after hull split. Monitor crops for overwintering eggs and target application to recently hatched overwintering eggs.	L Bee L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Etoxazole (Paramite) Sumitomo	10B	IGR / Contact	H:14 NG	A	ALL	Registered in almonds for control of **Two Spotted Mite**, European Red Mite and **Bryobia Mite**. Apply at the first sign of mite crawlers. Do not use more than 1 application per season.	L Bee VL	-
Paraffinic Oil		Contact	1	A	NSW, ACT, VIC, SA, WA & TAS	Registered in almonds for control of Aphids (Eggs), **Mites (Eggs)**, San Jose Scales and **Mites** and Scales. Apply for control of mite eggs when trees are dormant.	L Bee L	-
Sulfur (S) present as Polysulfide Sulfur	M2	Contact	NR	P-A	ALL	Registered in almonds for control of Brown Rot, Freckle or Scab, Leaf Curl, Rust and Shot-Hole. Registered for control of mites in various crops.	-	-
Acequinocyl (Kanemite) UPL	20B	Contact & Ingestion		P		Application pending for registration in pome and stone fruit to control **Two Spotted Mite**. US registration for control of spider mites in tree nuts.	L Bee L	-
Spiromesifen (Oberon) Bayer	23			P		Not currently registered in AU but under development with Bayer and Hort Innovation for multiple commodities and mite species. US registrations for various mites in various crops.	M Bee VL	-
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.	-	-
Rust Red Flour Beetle (*Tribolium castaneum*) **Priority: Moderate**								
Rated as a moderate priority in VIC and WA, a high priority in SA and a low priority in NSW. Rust Red Flour Beetle is a relatively common pest of stored almonds. Fumigation can be used to treat infested storages.								
Sulfuryl Flouride (Profume Gas Fumigant)	8C	Fumigant / Contact	NR	A	ALL	Registered in almonds for post-harvest control of Indian Meal Moth, Mediterranean Flour Moth, Confused Flour Beetle, **Rust Red Flour Beetle**, Warehouse Beetle, Saw-Toothed Grain Beetle, Dried Fruit Moth, Drugstore Beetle, Tobacco Beetle, Hide Beetle, Grain Weevil, Rice Weevil, Rust Red Grain Beetle and Lesser Grain Borer. For use only by licensed fumigators. For use by licensed fumigators only, in storage structures under strict controls and supervision for fumigation procedures. Allow a minimum of 24 hours after fumigation has ceased before releasing treated commodities for human consumption.	-	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion	H:10 NG	P-A	ALL	Registered in almonds for control of Carpophilus Beetle.	L-M Bee VH	-
NUL3445 Nufarm	TBC			P		New insecticide from Nufarm with activity on Lepidoptera, Bugs, Beetles/Weevils, Fruit Fly and Thrips.		-
Black Peach Aphid (*Brachycaudus persicae*) **Green Peach Aphid** *(Myzus persicae)* **Priority: Low**								
Black Peach Aphid is rated as a low priority in VIC and WA, and as a moderate priority in SA and NSW. Green Peach Aphid is rated as a low priority in all states. Aphids are a sporadic pest in almonds.								
Paraffinic Oil		Contact	1	A	NSW, ACT, VIC, SA, WA & TAS	Registered in almonds for control of **Aphids (Eggs)**, Mites (Eggs), San Jose Scales and Mites and Scales. Apply for aphid control when trees are dormant.	L Bee L	-
Pirimicarb (Aphidex only) Adama	1A	Contact and Ingestion	28	A	ALL	Registered in almonds for control of **Green Peach Aphid**. Apply a maximum of 2 applications per season when aphids are at threshold level. Do not make consecutive applications.	VL Bee VL	R3
Pymetrozine (Chess) Syngenta	9B	Contact and Ingestion	28	A	ALL	Registered in almonds for control of **Green Peach Aphid**. Apply when pest reached threshold level. Retreat as necessary with a minimum retreatment interval of 7 days.	L Bee VL	R3
Sulfoxaflor (Transform) Corteva	4C	Contact and Ingestion	7	A	ALL	Registered in almonds for control of Aphids, including **Green Peach Aphid** and **Black Peach Aphid**. Apply when pest reached threshold level. Do not use more than 2 applications per season. Do not use consecutive applications of Group 4C on aphids.	M Bee VH	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Indian Meal Moth (*Plodia interpunctella*) **Priority: Low**								
Rated as a low priority in all states. Indian Meal Moth is a relatively common pest of stored almonds. Fumigation can be used to treat infested storages.								
Sulfuryl Flouride (Profume Gas Fumigant)	8C	Fumigant / Contact	NR	A	ALL	Registered in almonds for post-harvest control of **Indian Meal Moth**, Mediterranean Flour Moth, Confused Flour Beetle, Rust Red Flour Beetle, Warehouse Beetle, Saw-Toothed Grain Beetle, Dried Fruit Moth, Drugstore Beetle, Tobacco Beetle, Hide Beetle, Grain Weevil, Rice Weevil, Rust Red Grain Beetle and Lesser Grain Borer. For use only by licensed fumigators. For use by licensed fumigators only, in storage structures under strict controls and supervision for fumigation procedures. Allow a minimum of 24 hours after fumigation has ceased before releasing treated commodities for human consumption.	-	-
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion	H:10 NG	P-A	ALL	Registered in almonds for control of Carpophilus Beetle.	L-M Bee VH	-
NUL3445 Nufarm	TBC			P		New insecticide from Nufarm with activity on Lepidoptera, Bugs, Beetles/Weevils, Fruit Fly and Thrips.		-
Spinetoram (Success Neo) Corteva	5	Ingestion		P		Registered for control of Lepidoptera in various crops. AU MRL 0.1 mg/kg, Codex 0.01 mg/kg.	M Bee VH	-
Spinosad (Entrust Organic) Corteva	5	Ingestion		P		Registered for control of Lepidoptera in various crops. AU MRL *T0.01 mg/kg. Codex MRL 0.07 mg/kg.	L Bee H	-
SYNFOI21 Syngenta	TBC			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
Almond Moth / Dried Fruit Moth (*Ephestia cautella*) **Priority: Low**								
Rated as a low priority in VIC, SA and NSW, and a high priority in WA. Almond Moth is a relatively common pest of stored almonds. Fumigation can be used to treat infested storages.								
Sulfuryl Flouride (Profume Gas Fumigant)	8C	Fumigant / Contact	NR	A	ALL	Registered in almonds for post-harvest control of Indian Meal Moth, Mediterranean Flour Moth, Confused Flour Beetle, Rust Red Flour Beetle, Warehouse Beetle, Saw-Toothed Grain Beetle, **Dried Fruit Moth**, Drugstore Beetle, Tobacco Beetle, Hide Beetle, Grain Weevil, Rice Weevil, Rust Red Grain Beetle and Lesser Grain Borer. For use only by licensed fumigators. For use by licensed fumigators only, in storage structures under strict controls and supervision for fumigation procedures. Allow a minimum of 24 hours after fumigation has ceased before releasing treated commodities for human consumption.	-	-
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion	H:10 NG	P-A	ALL	Registered in almonds for control of Carpophilus Beetle.	L-M Bee VH	-
NUL3445 Nufarm	TBC			P		New insecticide from Nufarm with activity on Lepidoptera, Bugs, Beetles/Weevils, Fruit Fly and Thrips.		-
Spinetoram (Success Neo) Corteva	5	Ingestion		P		Registered for control of Lepidoptera in various crops. AU MRL 0.1 mg/kg, Codex 0.01 mg/kg.	M Bee VH	-
Spinosad (Entrust Organic) Corteva	5	Ingestion		P		Registered for control of Lepidoptera in various crops. AU MRL *T0.01 mg/kg. Codex MRL 0.07 mg/kg.	L Bee H	-
SYNFOI21 Syngenta	TBC			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
Light Brown Apple Moth *(Epiphyas postvittana)* **Priority: Low**								
Rated as a low priority in VIC, SA and NSW, and as a moderate priority in WA. Do not usually cause damage to almonds.								
Chlorantraniliprole (Altacor) FMC	28	Ingestion	14	P-A	ALL	Registered in almonds for control of Carob Moth. Registered for control of **Light Brown Apple Moth** in stone fruit, pome fruit and grapes.	L Bee VL	-
Methoxyfenozide (Prodigy) Corteva	18	Ingestion	7	P-A	ALL	Registered in almonds for control of Carob Moth. Registered for control of **Light Brown Apple Moth** in blueberries, citrus, grapes, kiwi fruit and pome fruit.	VL Bee VL	-
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion	H:10 NG	P-A	ALL	Registered in almonds for control of Carpophilus Beetle. Also has activity on Lepidoptera.	L-M Bee VH	-
Bacillus thuringiensis subsp Kurstaki Strain Hd-1	11	Biological / Ingestion		P		Registered in fruit crops for control of various Lepidoptera. MRLs not required for a biological product.	VL Bee VL	-
Indoxacarb (Avatar) FMC	22A	Ingestion		P		Registered in stone fruit for control of Heliothis, Oriental Fruit Moth, **Light Brown Apple Moth**, Weevils and Wingless Grasshoppers.	M Bee H	R3
NUL3445 Nufarm	TBC			P		New insecticide from Nufarm with activity on Lepidoptera, Bugs, Beetles/Weevils, Fruit Fly and Thrips.		-
Spinetoram (Success Neo) Corteva	5	Ingestion		P		Registered for control of **Light Brown Apple Moth** in various crops, including stone fruit. AU MRL 0.1 mg/kg, Codex 0.01 mg/kg.	M Bee VH	-
Spinosad (Entrust Organic) Corteva	5	Ingestion		P		Registered for control of **Light Brown Apple Moth** in various crops, including stone fruit. AU MRL *T0.01 mg/kg. Codex MRL 0.07 mg/kg.	L Bee H	-
SYNFOI21 Syngenta	TBC			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
Earwigs (*Dermaptera*) **Priority: Low**								
Rated as a low priority in all states. Earwigs only pose a threat to young trees. They can kill seedlings by feeding on the young shoots.								
Imidacloprid	4A	Contact / Systemic		P		Registered for control of **Earwigs** in various crops. AU MRL 0.05 mg/kg. Codex MRL 0.01 mg/kg.	M Bee M	-
Indoxacarb (Avatar) FMC	22A	Contact		P		Registered for control of **Earwigs** in grapes. AU MRL 0.05 mg/kg.	M Bee H	-
Ants (*Formicidae*) **Priority: Low**								
Rated as a low priority in all states. Ants are a nuisance pest in orchards, causing inconvenience to workers and potentially contaminating harvest without causing damage to nuts.								
Pyriproxyfen (Distance Ant Bait) Sumitomo	7C	IGR / Bait	NR	A	ALL	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.	-	-
Brown Almond Mite (*Bryobia rubrioculus*) **Priority: Low**								
Rated as a low priority in VIC, SA and WA, and as a moderate priority in NSW. Almonds can tolerate moderate numbers of mites, particularly if beneficial insects are abundant in the orchard. Management should include regular monitoring and careful use of non-disruptive miticides.								
Paraffinic Oil		Contact	1	A	NSW, ACT, VIC, SA, WA & TAS	Registered in almonds for control of Aphids(Eggs), **Mites(Eggs)**, San Jose Scales and **Mites** and Scales. Apply for aphid control when trees are dormant.	L Bee L	-
Abamectin	6	Contact and Ingestion	28	P-A	ALL	Registered in almonds for control of Bryobia Mite and Two Spotted Mite.	M Bee H	-
Bifenazate (Acramite) UPL	20D	Contact and Ingestion	H:14 G:28	P-A	ALL	Registered in almonds for control of Bryobia Mite and Two Spotted Mite.	L Bee H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Clofentezine (Apollo) Adama	10A	IGR / Contact	35	P-A	ALL	Registered in almonds for control of Bryobia Mite and Two Spotted Mite.	L Bee L	-
Etoxazole (Paramite) Sumitomo	10B	IGR / Contact	H-14 NG	P-A	ALL	Registered in almonds for control of Two Spotted Mite, European Red Mite and Bryobia Mite.	L Bee VL	-
Spiromesifen (Oberon) Bayer	23			P		Not currently registered in AU but under development with Bayer and Hort Innovation for multiple commodities. US registrations for Mites in various crops.	M Bee VL	-
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.	-	-
Fall Armyworm (*Spodoptera frugiperda*) **Priority: Unknown**								
Fall Armyworm has recently been detected in Australia for the first time. It has not been seen in almonds and the potential impact is currently unknown.								
Chlorantraniliprole (Altacor) FMC PER89259	28	Ingestion	14	A	ALL (excl. VIC)	Permitted in almonds 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 2 applications per season, minimum retreatment interval of 7 days. Do not use on successive generations of the pest.	L Bee VL	-
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion	H:10 NG	P-A	ALL	Registered in almonds for control of Carpophilus Beetle. Also has activity on Lepidoptera.	L-M Bee VH	-
NUL3445 Nufarm	TBC			P		New product from Nufarm with activity on Lepidoptera, Bugs, Beetles/Weevils, Fruit Fly and Thrips.	-	-
Spinetoram (Success Neo) Corteva	5	Ingestion		P		Registered for control of Lepidoptera in various crops. AU MRL 0.1 mg/kg, Codex 0.01 mg/kg.	M Bee VH	-
Spinosad (Entrust Organic) Corteva	5	Ingestion		P		Registered for control of Lepidoptera in various crops. AU MRL *T0.01 mg/kg. Codex MRL 0.07 mg/kg.	L Bee H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
SYNFOI21 Syngenta	TBC			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.	-	-

4.3 Weeds in almonds

4.3.1 Weed priorities

Common Name	Scientific Name
High	
Flaxleaf Fleabane	*Conyza bonariensis*
Feathertop Rhodes Grass	*Chloris virgata*
Moderate	
Annual Ryegrass	*Lolium rigidum*
Low	
Caltrop	*Tribulus terrestris*
Prickly Paddy Melon	*Cucumis myriocarpus*
Blackberry Nightshade	*Solanum nigrum*
Marshmallow	*Malva parviflora*
Silverleaf Nightshade	*Solanum elaeagnifolium*
Fat-Hen	*Chenopodium album*

Flaxleaf Fleabane has been nominated as a high priority weed, and there are several weeds that have been identified as moderate priority. It is unlikely that these problem weeds will be managed effectively with herbicides alone. There are a reasonable number of herbicide options available to use in almond orchards. The use of mulch and grass cover is key to keeping weed competition down. The strategic use of herbicides is useful and should be particularly used for stopping weeds from setting seed if possible.

Specific resistance management strategies for high resistance risk (A and B) and moderate resistance risk (C, D, F, G, I, J, K, L, M, N, Q and Z) herbicide modes of action are available on the CropLife Australia webpage.
https://www.croplife.org.au/resources/programs/resistance-management/herbicide-resistance-management-strategies-2/

4.3.2 Available and potential products for weed control

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

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

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Flaxleaf Fleabane (*Conyza bonariensis*) **Priority: High**							
Rated as a high priority in VIC, NSW and WA, and as a moderate priority in SA. Flaxleaf Fleabane is a difficult weed to manage because it can germinate year-round and there are limited herbicide options available.							
Flumioxazin (Chateau) Sumitomo	G**	Tree Nuts / Directed Spray / Residual Weed Control	Registered in tree nuts for control of various grass and broadleaf weeds, including **Flaxleaf Fleabane**. Apply as a directed spray.	H:98 G:28	A	ALL	-
Glufosinate (Basta)	N**	Tree Nuts / Directed or Shielded Spray	Registered in tree nuts for control of grass and broadleaf weeds, including **Flaxleaf Fleabane**. Do not allow spray to contact any part of the tree, including the trunk.	H:NR NG	A	ALL	R3
Paraquat + Amitrole (Guerrilla)	L** + Q**	Orchards / Directed Spray	Registered in orchards for control of annual weeds, including **Flaxleaf Fleabane**. Avoid contact with crop foliage.	H:NR G:1	A	ALL	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Indaziflam (Esplanade) Bayer	O**	Pre-emergent / Residual Weed Control	Registered for control of various grass and broadleaf weeds in non-crop situations. US registration for control of a range of broadleaf weeds and grasses in tree nuts. Weeds controlled include *Conyza canadensis* and *Chloris truncata.*		P		-
Mesotrione (Callisto) Syngenta	H**	Pre & Post-Emergent Weed Control	Registered for control of broadleaf weeds in cereals. US registration for control of a range of broadleaf weeds in tree nuts. Weeds controlled include *Conyza bonariensis.*		P		-
Feathertop Rhodes Grass *(Chloris virgata)* **Priority: High**							
Rated as a high priority in VIC and NSW, a moderate priority in SA and a low priority in WA. Feathertop Rhodes Grass is an aggressive grass weed that is difficult to control with herbicides. Multiple applications are required.							
Haloxyfop (Verdict)	A***	Nut Trees / Directed Spray or Spot Spray	Registered in nut trees for control of various grass weeds, including **Rhodes Grass**. Apply as a directed spray or spot spray.	NR	A	ALL	-
Indaziflam (Esplanade) Bayer	O**	Pre-emergent / Residual Weed Control	Registered for control of various grass and broadleaf weeds in non-crop situations. US registration for control of a range of broadleaf weeds and grasses in tree nuts. Weeds controlled include *Conyza canadensis* and *Chloris truncata.*		P		-
Annual Ryegrass *(Lolium rigidum)* **Priority: Moderate**							
Rated as a moderate priority in VIC, SA and WA, and a high priority in NSW. Annual Ryegrass is an aggressive grass weed that readily develops resistance to herbicides. Mechanical measures should be used to reduce seed set.							
Flumioxazin (Chateau) Sumitomo	G**	Tree Nuts / Directed Spray / Residual Weed Control	Registered in tree nuts for control of various grass and broadleaf weeds, including **Annual Ryegrass**. Apply as a directed spray.	H:98 G:28	A	ALL	-
Glyphosate (Roundup)	M**	Almond / Directed Spray, Shielded Spray or Wick Wiper	Registered in almonds for control of grass and broadleaf weeds, including **Annual Ryegrass**. Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Oxyfluorfen (Goal)	G**	Almond / Established for 3 Years / Directed Spray	Registered in almonds for control of grass and broadleaf weeds, including **Annual Ryegrass**. If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	H:NR NG	A	ALL	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Simazine	C**	Almonds / Established for 3 Years / Pre-Emergence	Registered in almonds for control of grass and broadleaf weeds, including **Annual Ryegrass**. Apply to bare moist soil before weed emergence.	NR	A	SA	R3
Simazine PER88702	C**	Almonds / Established for 3 Years / Pre-Emergence	Permitted in almonds for control of grass and broadleaf weeds, including **Annual Ryegrass**. Apply to bare moist soil before weed emergence.	NR	A	ACT, NSW, NT, QLD, TAS & WA	R3
2,2-DPA	J**		Registered in established apricots and peaches for control of annual and perennial grasses, including **Annual Ryegrass**.		P		-
Caltrop *(Tribulus terrestris)* **Priority: Low**							
Rated as a low priority in VIC and SA, and a moderate priority in NSW and WA. Caltrop is a vine-like weed that grows rapidly in warm weather. It produces a woody burr that can interfere with operations in the vineyard.							
Glyphosate (Roundup)	M**	Almond / Directed Spray, Shielded Spray or Wick Wiper	Registered in almonds for control of grass and broadleaf weeds, including **Caltrop**. Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Isoxaben (Gallery) Corteva	O**	Non-Bearing and Bearing Nut Tree / Residual Weed Control	Registered in nut trees for control of broadleaf weeds, including **Caltrop**. Apply as a directed spray to weed-free, well prepared soil. Must be activated by at least 12.5mm of rainfall or sprinkler irrigation within 21 days of application.	NR	A	ALL	-
Oxyfluorfen (Goal)	G**	Almond / Established for 3 Years / Directed Spray	Registered in almonds for control of grass and broadleaf weeds, including **Caltrop**. If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	H:NR NG	A	ALL	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Prickly Paddy Melon *(Cucumis myriocarpus)* **Priority: Low**							
Rated as a low priority in VIC, SA and NSW, and a high priority in WA. Prickly Paddy Melon is a widespread weed that is difficult to control with herbicides.							
Paraquat + Diquat (SpraySeed)	L**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass and broadleaf weeds, including **Prickly Paddy Melon**. Apply as a directed spray or spot spray. Ensure that the spray does not contact any part of the crop.	H:NR G:1	A	ALL	R3
Blackberry Nightshade *(Solanum nigrum)* **Priority: Low**							
Rated as a low priority in VIC and NSW, a moderate priority in SA and a high priority in WA. Blackberry Nightshade is a widespread weed that can be managed by a combination of strategic herbicide use and maintenance of ground cover in the inter-row.							
Flumioxazin (Chateau) Sumitomo	G**	Tree Nuts / Directed Spray / Residual Weed Control	Registered in tree nuts for control of various grass and broadleaf weeds, including **Blackberry Nightshade**. Apply as a directed spray.	H:98 G:28	A	ALL	-
Glyphosate (Roundup)	M**	Almond / Directed Spray, Shielded Spray or Wick Wiper	Registered in almonds for control of grass and broadleaf weeds, including **Blackberry Nightshade**. Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Isoxaben (Gallery) Corteva	O**	Non-Bearing and Bearing Nut Tree / Residual Weed Control	Registered in nut trees for control of broadleaf weeds, including **Blackberry Nightshade**. Apply as a directed spray to weed-free, well prepared soil. Must be activated by at least 12.5mm of rainfall or sprinkler irrigation within 21 days of application.	NR	A	ALL	-
Norflurazon (Zoliar)	F**	Nuts / Almonds Only / Pre-Emergence / Directed Spray	Registered in almonds for control of grass and broadleaf weeds, including **Blackberry Nightshade**. Apply to bare ground prior to weed emergence. Avoid contact with foliage or fruit.	NR	A	ALL	-
Oryzalin	D**	Almond / Directed Spray	Registered in almonds for control of grass and broadleaf weeds, including **Blackberry Nightshade**. Apply as a directed spray.	NR	A	ALL	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Oxyfluorfen (Goal)	G**	Almond / Established for 3 Years / Directed Spray	Registered in almonds for control of grass and broadleaf weeds, including **Blackberry Nightshade**. If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	H:NR NG	A	ALL	-
Marshmallow *(Malva parviflora)* **Priority: Low**							
Rated as a low priority in VIC and SA, a moderate priority in NSW and a high priority in WA. Marshmallow is a widespread weed that can grow year-round in most areas. Difficult to control with broadspectrum herbicides.							
Carfentrazone-Ethyl (Spotlight)	G**	Almond / Directed Spray / Pre-Flowering	Registered in almonds for control of various broadleaf weeds, including **Marshmallow**. If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	NR	A	ALL	-
Flumioxazin (Chateau) Sumitomo	G**	Tree Nuts / Directed Spray / Residual Weed Control	Registered in tree nuts for control of various grass and broadleaf weeds, including **Marshmallow**. Apply as a directed spray.	H:98 G:28	A	ALL	-
Isoxaben (Gallery) Corteva	O**	Non-Bearing and Bearing Nut Tree / Residual Weed Control	Registered in nut trees for control of broadleaf weeds, including **Small Flowered Mallow**. Apply as a directed spray to weed-free, well prepared soil. Must be activated by at least 12.5mm of rainfall or sprinkler irrigation within 21 days of application.	NR	A	ALL	-
Oxyfluorfen (Goal)	G**	Almond / Established for 3 Years / Directed Spray	Registered in almonds for control of grass and broadleaf weeds, including **Marshmallow**. If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	H:NR NG	A	ALL	-
Silverleaf Nightshade *(Solanum elaeagnifolium)* **Priority: Low**							
Rated as a low priority in VIC, SA and WA, and as a moderate priority in NSW. Silverleaf Nightshade is a widespread weed that can be managed by a combination of strategic herbicide use and maintenance of ground cover in the inter-row.							
Flumioxazin (Chateau) Sumitomo	G**	Tree Nuts / Directed Spray / Residual Weed Control	Registered in tree nuts for control of various grass and broadleaf weeds, including ***Solanum* spp**. Apply as a directed spray.	H:98 G:28	A	ALL	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Glyphosate (Roundup)	M**	Almond / Directed Spray, Shielded Spray or Wick Wiper	Registered in almonds for control of grass and broadleaf weeds, including **Silverleaf Nightshade**. Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Oryzalin	D**	Almond / Directed Spray	Registered in almonds for control of grass and broadleaf weeds, including **Silverleaf Nightshade**. Apply as a directed spray.	NR	A	ALL	-
Oxyfluorfen (Goal)	G**	Almond / Established for 3 Years / Directed Spray	Registered in almonds for control of grass and broadleaf weeds, including **Silverleaf Nightshade**. If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	H:NR NG	A	ALL	-
Isoxaben (Gallery) Corteva	O**	Non-Bearing and Bearing Nut Tree / Residual Weed Control	Registered in nut trees for control of broadleaf weeds, including Blackberry Nightshade (*Solanum nigrum*). Apply as a directed spray to weed-free, well prepared soil. Must be activated by at least 12.5mm of rainfall or sprinkler irrigation within 21 days of application.	NR	P-A	ALL	-
Fat-Hen *(Chenopodium album)* **Priority: Low**							
Rated as a low priority in VIC and SA, a moderate priority in NSW and a high priority in WA. Fat-Hen is a quick growing and competitive weed which is abundant in most regions. Mulching and ground cover will help to reduce the incidence.							
Flumioxazin (Chateau) Sumitomo	G**	Tree Nuts / Directed Spray / Residual Weed Control	Registered in tree nuts for control of various grass and broadleaf weeds, including **Fat-Hen**. Apply as a directed spray.	H:98 G:28	A	ALL	-
Glyphosate (Roundup)	M**	Almond / Directed Spray, Shielded Spray or Wick Wiper	Registered in almonds for control of grass and broadleaf weeds, including **Fat-Hen**. Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Isoxaben (Gallery) Corteva	O**	Non-Bearing and Bearing Nut Tree / Residual Weed Control	Registered in nut trees for control of broadleaf weeds, including **Fat-Hen**. Apply as a directed spray to weed-free, well prepared soil. Must be activated by at least 12.5mm of rainfall or sprinkler irrigation within 21 days of application.	NR	A	ALL	-
Norflurazon (Zoliar)	F**	Nuts / Almonds Only / Pre-Emergence / Directed Spray	Registered in almonds for control of grass and broadleaf weeds, including **Fat-Hen**. Apply to bare ground prior to weed emergence. Avoid contact with foliage or fruit.	NR	A	ALL	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Oryzalin	D**	Almond / Directed Spray	Registered in almonds for control of grass and broadleaf weeds, including **Fat-Hen**. Apply as a directed spray.	NR	A	ALL	-
Oxyfluorfen (Goal)	G**	Almond / Established for 3 Years / Directed Spray	Registered in almonds for control of grass and broadleaf weeds, including **Fat-Hen**. If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	H:NR NG	A	ALL	-
Simazine	C**	Almonds / Established for 3 Years / Pre-Emergence	Registered in almonds for control of grass and broadleaf weeds, including **Fat-Hen**. Apply to bare moist soil before weed emergence.	NR	A	SA	R3
Simazine PER88702	C**	Almonds / Established for 3 Years / Pre-Emergence	Permitted in almonds for control of grass and broadleaf weeds, including **Fat-Hen**. Apply to bare moist soil before weed emergence.	NR	A	ACT, NSW, NT, QLD, TAS & WA	R3
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.							
Carfentrazone-Ethyl (Spotlight)	G**	Almond / Directed Spray / Pre-Flowering	Registered in almonds for control of various broadleaf weeds. If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	NR	A	ALL	-
Flumioxazin (Chateau) Sumitomo	G**	Tree Nuts / Directed Spray / Residual Weed Control	Registered in tree nuts for control of various grass and broadleaf weeds. Apply as a directed spray.	H:98 G:28	A	ALL	-
Glufosinate (Basta)	N**	Tree Nuts / Directed or Shielded Spray	Registered in tree nuts for control of grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	H:NR NG	A	ALL	R3
Glyphosate (Roundup)	M**	Almond / Directed Spray, Shielded Spray or Wick Wiper	Registered in almonds for control of grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Haloxyfop (Verdict)	A***	Nut Trees / Directed Spray or Spot Spray	Registered in nut trees for control of various grass weeds. Apply as a directed spray or spot spray.	NR	A	ALL	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Isoxaben (Gallery) Corteva	O**	Non-Bearing and Bearing Nut Tree / Residual Weed Control	Registered in nut trees for control of broadleaf weeds. Apply as a directed spray to weed-free, well prepared soil. Must be activated by at least 12.5mm of rainfall or sprinkler irrigation within 21 days of application.	NR	A	ALL	-
Napropamide (Devrinol)	K**	Almonds / Pre-Emergence / Directed Spray	Registered in almonds for control of grass and broadleaf weeds. Apply to bare ground prior to weed emergence. Avoid contact with foliage or fruit. Do not apply when nuts are on the ground.	H:NR NG	A	VIC, TAS & SA	-
Norflurazon (Zoliar)	F**	Nuts / Almonds Only / Pre-Emergence / Directed Spray	Registered in almonds for control of grass and broadleaf weeds. Apply to bare ground prior to weed emergence. Avoid contact with foliage or fruit.	NR	A	ALL	-
Oryzalin	D**	Almond / Directed Spray	Registered in almonds for control of grass and broadleaf weeds. Apply as a directed spray.	NR	A	ALL	-
Oxyfluorfen (Goal)	G**	Almond / Established for 3 Years / Directed Spray	Registered in almonds for control of grass and broadleaf weeds. If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	H:NR NG	A	ALL	-
Paraquat (Gramoxone)	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.	H:1 G:7	A	ALL	R3
Paraquat + Amitrole (Guerrilla)	L** + Q**	Orchards / Directed Spray	Registered in orchards for control of annual weeds. Avoid contact with crop foliage.	H:NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	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.	H:NR G:1	A	ALL	R3
Simazine	C**	Almonds / Established for 3 Years / Pre-Emergence	Registered in almonds for control of grass and broadleaf weeds. Apply to bare moist soil before weed emergence.	NR	A	SA only	R3
Simazine PER88702	C**	Almonds / Established for 3 Years / Pre-Emergence	Permitted in almonds for control of grass and broadleaf weeds. Apply to bare moist soil before weed emergence.	NR	A	ACT, NSW, NT, QLD, TAS & WA	R3
Pendimethalin (Stomp)	D**	Almond / Directed Spray / Residual Weed Control	Registered in nuts for pre-emergence control of grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
2,2-DPA	J**		Registered in established apricots and peaches for control of annual and perennial grasses.		P		-
Dichlobenil (Casoron) UPL	K**		Registered in apricots, peaches and plums for control of annual grass and broadleaf weeds.		P		-

5. References

5.1 Information:

AgChem Access Priority Access Forum	https://www.agrifutures.com.au/national-rural-issues/agvet-chemicals/
Australian Pesticide and Veterinary Medicines Authority	www.apvma.gov.au
APVMA Chemical review	https://apvma.gov.au/chemicals-and-products/chemical-review/listing
APVMA MRLs	www.legislation.gov.au/Details/F2020C00050
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 2020-21	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
Ausveg	https://ausveg.com.au/
Agriculture and Food - WA	https://www.agric.wa.gov.au

5.2 Abbreviations and Definitions:

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

5.3 Acknowledgements:

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

6. Appendices:

Appendix 1. Products available for disease control in almonds
Appendix 2. Products available for control of insects and mite pests in almonds
Appendix 3. Products available for weed control in almonds
Appendix 4. Current permits for use in almonds
Appendix 5. Almond Maximum Residue Limits (MRLs)
Appendix 6. Almond Agrichemical Regulatory Risk Assessment

Appendix 1. Products available for disease control in almonds

Active Ingredient (Trade Name)	Chem. group	Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Agrobacterium radiobacter Var Radiobacter Strain K1026 (NoGall)	-	Almond	Crown Gall	ALL	NR	-
Azoxystrobin (Amistar)	11	Almond	Anthracnose (*Colletotrichum acutatum*)	ALL	28	-
Azoxystrobin & Tebuconazole (Custodia) Adama	11 3	Almond	Brown Rot Hull Rot (Suppression Only) Rust Shot Hole	ALL	NR	R3
Captan	M4	Almond	Anthracnose (*Colletotrichum acutatum*) Blossom Blight (*Monilinia laxa*) Nut scab (*Cladosporium carpophilum*) Shot hole (*Wilsonomyces carpophilum*)	ALL	28	-
Chlorothalonil (Bravo)	M5	Almond	Shot Hole Stone Fruit Rust	SA, VIC, NSW, TAS & WA	NR	R3
Copper (Cu) Present as Copper Ammonium Acetate	M1	Almond	Leaf Curl Shot Hole	ALL	1	-
Copper (Cu) present as copper oxychloride	M1	Almond	Leaf Curl Shot Hole	QLD, VIC, TAS, SA & WA	1	-
Copper Present as Copper Oxychloride & Copper Hydroxide	M1	Almond	Leaf Curl Shot Hole	ALL	1	-
Copper (Cu) Present as Cupric Hydroxide	M1	Almond	Leaf Curl Shot Hole	QLD, VIC, TAS, SA & WA	1	-
Copper (Cu) present as cuprous oxide	M1	Almond	Leaf Curl Shot Hole	ALL	1	-

Active Ingredient (Trade Name)	Chem. group	Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Copper (Cu) Present as Tribasic Copper Sulphate	M1	Almond	Leaf Curl	ALL	1	-
Cyprodinil (Chorus) Syngenta	9	Almond	Brown Rot Prune Rust Shot Hole	ALL	NR	-
Fluopyram & Trifloxystrobin (Luna Sensation) Bayer	7+11	Almond	Blossom Blight (*Botrytis* spp.) Hull Rot (Suppression Only) Shot Hole Stone Fruit Rust	ALL	14	-
Iprodione (Rovral)	2	Almond	Blossom Blight (*Botrytis spp.*) Brown Rot (*Monolinia* spp.)	ALL	NR	R2
Mancozeb	M3	Almond	Brown Rot Freckle Rust Shot-hole	ALL	14	R2
Penthiopyrad (Fontelis) Corteva	7	Almond	Brown Rot (*Monilinia* spp.)	ALL	14	-
Phosphorous (Phosphonic) Acid as Mono-Di K Phosphonate	33	Almond	Phytophthora - Suppression	ALL	28	-
Propiconazole PER12989	3	Almonds	Brown Rot (*Monilinia laxa*) Anthracnose (*Colletotrichum acutatum*)	ALL (excl. VIC)	14	R3
Pyraclostrobin (Cabrio) BASF	11	Almond	Rust	ALL	NR	-
Pyraclostrobin + Fluxapyroxad (Merivon) BASF	7+11	Almond	Alternaria Leaf Spot (*Alternaria* spp.) Black Spot (*Colletotrichum acutatum*) Brown Rot (*Monilinia* spp.) Nut Scab Shot Hole Stone Fruit Rust	ALL	21	-

Active Ingredient (Trade Name)	Chem. group	Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Sulfur (S) Present as Polysulfide Sulfur	M2	Almond	Brown Rot (*Monilinia* spp.) Freckle or Scab Leaf Curl Rust Shothole	ALL	NR	-

Appendix 2. Products available for control of insects and mite pests in almonds

Active Ingredient (Trade Name)	Chem. group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
1-Dodecanol, (E,E) 8,10 Dodecadien-1-OL, Dodecenol Acetate - 8 Z, Dodecenyl Acetate - 8 E, Tetradecan-1-OL (Isomate)		Almond / Mating Disruption	Oriental Fruit Moth (*Cydia molesta*) Codling Moth (*Cydia pomonella*)	SA, VIC, NSW, QLD & TAS	NR	-
Abamectin	6	Almond	Bryobia Mite (*Bryobia rubrioculus*) Two Spotted Mite (*Tetranychus urticae*)	ALL	28	-
1. BeetleJuice A – containing a mixture of ethanol, ethyl acetate, 2-methyl-1-propanol, 2-methyl-1-butanol and 3-methyl-1-butanol 2. BeetleJuice B – containing a mixture of ethanol and acetaldehyde 3. BeetleJuice Pheromone Lure (BeetleJuice Carpophilus Trapping System) PER14866		Almonds / Pest Trapping and Monitoring	Carpophilus Beetle (*C. davidsoni C. hemipterus C. mutilates*)	ALL	NR	-
Bifenazate (Acramite) UPL	20D	Almond	Bryobia Mite (*Bryobia rubrioculus*) Two Spotted Mite (*Tetranychus urticae*)	ALL	H:14 G:28	-
Bifenthrin (Talstar) PER87216	3A	Almonds	Dried Fruit Beetle (*Carpophilus* spp.)	ALL	7	R3
Chlorantraniliprole (Altacor) FMC	28	Almond	Carob Moth	ALL	14	-

Active Ingredient (Trade Name)	Chem. group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Chlorantraniliprole (Altacor) FMC PER89259	28	Almonds	Fall Armyworm (*Spodoptera frugiperda*)	ALL (excl. VIC)	14	-
Clofentezine (Apollo) Adama	10A	Almonds	Bryobia Mite (*Bryobia rubrioculus*) Two Spotted Mite (*Tetranychus urticae*)	ALL	35	-
Clothianidin (Samurai) Sumitomo PER87311	4A	Almonds	Carpophilus Beetle (*Carpophilus davidsoni* or *Carpophilus hemipterus*) Carob Moth (*Ectomyelois ceratoniae*)	NSW, SA, VIC & WA	H:14 NG	R2
Etoxazole (Paramite) Sumitomo	10B	Almond	Two Spotted Mite (*Tetranychus urticae*) European Red Mite (*Panonychus ulmi*) Bryobia Mite (*Bryobia rubrioculus*)	ALL	H:14 NG	-
Maldison PER13642	1B	Tree Nuts	Australian Plague Locust (*Chortoicetes terminifera*)	ALL (excl. VIC)	H:NR G:2	R3
Methoxyfenozide (Prodigy) Corteva	18	Almond	Carob Moth	ALL	7	-
Paraffinic Oil		Almond	Aphids (Eggs) Mites (Eggs) San Jose Scales Mites and Scales	NSW, ACT, VIC, SA, WA & TAS	1	-
Pirimicarb (Aphidex) Adama	1A	Almond	Green Peach Aphid	ALL	28	R3
Pymetrozine (Chess) Syngenta	9B	Almond	Green Peach Aphid (*Myzus persicae*)	ALL	28	R3
Pyriproxyfen (Distance Ant Bait) Sumitomo	7C	Tree Nuts / Ant Bait	Invasive and Nuisance Ants	ALL	NR	-

Active Ingredient (Trade Name)	Chem. group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Sulfoxaflor (Transform / Expedite Full) Corteva	4C	Tree Nuts	Aphids, including Green Peach Aphid and Black Peach Aphid	ALL	7	-
Sulfuryl Flouride (Profume Gas Fumigant)	8C	Nuts / Post-Harvest Fumigation	Indian Meal Moth *(Plodia interpunctella)* Mediterranean Flour Moth *(Ephestia kuehniella)* Confused Flour Beetle *(Tribolium confusum)* Rust Red Flour Beetle *(Tribolium castaneum)* Warehouse Beetle *(Trogoderma variabile)* Saw-Toothed Grain Beetle *(Oryzaephilus surinamensis)* Dried Fruit Moth *(Ephestia cautella)* Drugstore Beetle *(Stegobium paniceum)* Tobacco Beetle *(Lasioderma serricorne)* Hide Beetle *(Dermestes maculatus)* Grain Weevil *(Sitophilius granarius)* Rice Weevil *(Sitophilius oryzae)* Rust Red Grain Beetle *(Cryptolestes ferrugineus)* Lesser Grain Borer *(Rhyzopertha dominica)*	ALL	NR	-
Tetraniliprole (Vayego 200SC) Bayer	28	Almonds	Carpophilus Beetles (incl. *Carpophilus near dimidiatus*)	ALL	H:10 NG	-

Appendix 3. Products available for weed control in almonds

Active ingredient (Trade Name)	Chem. Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Carfentrazone-Ethyl (Spotlight)	G**	Almond / Directed Spray / Pre-Flowering	If weeds are already present, use as a spike in a mixture with glyphosate or paraquat. Weeds Controlled: Australian Crassula, Chickweed, Paterson's Curse, Smallflower Mallow, Subterranean Clover	NR	ALL	-
Flumioxazin (Chateau) Sumitomo	G**	Tree Nuts / Directed Spray / Residual Weed Control	Annual Ryegrass (*Lolium rigidum*), Barnyard Grass (*Echinochloa colona*), Blackberry Nightshade (Solanum nigrum), Bluetop (*Ageratum houstonianum*), Capeweed (*Crassula colorata*), Creeping Speedwell (*Veronica persica*), Crowsfoot (*Eleusine indica*), Dwarf Nettle or Stinging Nettle (*Urtica urens*), Fat Hen (*Chenopodium album*), Feathertop Rhodes Grass (*Chloris virgata*), Fleabane (*Conyza bonariensis*), Green Summer Grass (*Brachiaria subquadripara*), Hog Weed (*Polygonum aviculare*), Marshmallow (*Malva parviflora*), Milk Thistle (*Sonchus oleraceus*), Pigweed (*Portulaca oleracea*), Small Flowered Mallow (*Modiola caroliniana*), Squirreltail Fescue (*Vulpia bromoides*), Summer Grass (*Digitaria ciliaris*), Toadrush (*Juncus bufonius*), Wild Mustard (*Sinapis arvensis*), Wild Radish (*Raphanus raphanistrum*), Wild Rose (*Cleome aculeate*), Wild Turnip (*Brassica tournefortii*)	H:98 G:28	ALL	-
Glufosinate (Basta)	N**	Tree Nuts / 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
Glyphosate (Roundup)	M**	Almond / 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

Active ingredient (Trade Name)	Chem. Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Haloxyfop (Verdict)	A***	Nut Trees / Directed Spray or Spot Spray	Grass weeds	NR	ALL	-
Isoxaben (Gallery) Corteva	O**	Bearing and Non-Bearing Nut Tree / Residual Weed Control	Broadleaf Weeds.	NR	ALL	-
Napropamide (Devrinol)	K**	Almonds / Pre-Emergence / Directed Spray	Grass and broadleaf weeds. Apply to bare ground prior to weed emergence. Avoid contact with foliage or fruit. Do not apply when nuts are on the ground.	H:NR NG	VIC, TAS & SA	-
Norflurazon (Zoliar)	F**	Nuts / Almonds Only / Pre-Emergence / Directed Spray	Grass and broadleaf weeds. Apply to bare ground prior to weed emergence. Avoid contact with foliage or fruit.	NR	ALL	-
Oryzalin	D**	Almond / Directed Spray	Grass and broadleaf weeds	NR	ALL	-
Oxyfluorfen (Goal)	G**	Almond / Established For 3 Years / Directed Spray	Grass and broadleaf weeds. If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	H:NR NG	ALL	-
Paraquat (Gramoxone)	L**	Orchards / Directed Spray or Spot Spray	Annual Grass and broadleaf weeds	H:1 G:7	ALL	R3
Paraquat + Amitrole (Guerrilla)	L** + Q**	Orchards / Directed Spray	Annual Weeds Capeweed or *Erodium* spp.	H:NR G:1	QLD, VIC, SA, WA, TAS and NT	R3
			Annual Weeds Fat Hen Pigweed		NSW	
			Flaxleaf Fleabane		ALL	
Paraquat + Diquat (SpraySeed)	L**	Orchards / Directed Spray or Spot Spray	Annual Grass and broadleaf weeds	H:NR G:1	ALL	R3
Pendimethalin (Stomp)	D**	Nuts / Directed Spray / Residual Weed Control	Do not allow spray to contact any part of the tree, including the trunk. Grass and broadleaf weeds.	NR	ALL	-

Active ingredient (Trade Name)	Chem. Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Simazine	C**	Almonds / Established For 3 Years / Pre-Emergence	Grass and broadleaf weeds. Apply to bare moist soil before weed emergence.	NR	SA only	R3
Simazine PER88702	C**	Almonds / Established For 3 Years / Pre-Emergence	Grass and broadleaf weeds. Apply to bare moist soil before weed emergence.	NR	ACT, NSW, NT, QLD, TAS & WA	R3

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

Appendix 4. Current permits for use in almonds

Permit No.	Description	Issued Date	Expiry Date	Permit Holder
PER89259	Chlorantraniliprole (Altacor) / Various Crops / Fall Armyworm Emergency Use Permit	6-Mar-20	31-Mar-23	Hort Innovation
PER88702	Simazine / Almonds / Broadleaf weeds and grasses (ACT, NSW, NT, QLD, TAS & WA)	1-Apr-20	31-Mar-25	Hort Innovation
PER12989 Version 3	Propiconazole / Almonds / Blossom blight, Anthracnose	1-Sep-11	31-Aug-21	Almond Board of Australia c/- Hort Innovation
PER14866	Carpophilus Catcha Trapping System / Almonds / Carpophilus Beetles	29-Mar-15	29-Mar-25	Almond Board of Australia c/- Hort Innovation
PER87216	Bifenthrin (Talstar) / Almonds / Carpophilus Beetle & Dried Fruit Beetle	1-Apr-19	31-Mar-22	Hort Innovation
PER87311 Version 2	Clothianidin (Samurai) / Almonds / Carpophilus beetle and Carob moth (NSW, SA, VIC & WA)	14-Nov-18	30-Nov-22	Almond Board of Australia c/- Hort Innovation
PER13642 Version 2	Chlorpyrifos & Maldison / Tree nuts / Australian plague locust	1-Sep-12	30-Jun-25	Australian Nut Industry Council C/- Hort Innovation

Appendix 5. Almond Maximum Residue Limits (MRLs)

Codex commodity groupings of Almonds and subgroups:

TN 0085 Tree nuts
TN 0660 Almonds

Chemical	Codex Code	Description	APVMA MRL mg/kg	Codex MRL mg/kg
2,4-D	TN 0085	Tree nuts	-	0.2
Abamectin	TN 0660	Almonds	*0.01	-
	TN 0085	Tree nuts	-	*0.005
Acetamiprid	TN 0085	Tree nuts	-	0.06
Aminoethoxyvinylglycine	TN 0660	Almonds	*0.05	-
Azoxystrobin	TN 0660	Almonds	*0.01	-
	TN 0085	Tree nuts	-	0.01
Bifenazate	TN 0660	Almonds	0.1	-
	TN 0085	Tree nuts	-	0.2
Bifenthrin	TN 0660	Almonds	T0.1	-
	TN 0085	Tree nuts	-	0.05
Boscalid	TN 0085	Tree nuts	-	*0.05
Buprofezin	TN 0660	Almonds	-	*0.05
Captan	TN 0660	Almonds	0.3	0.3
Carbaryl	TN 0085	Tree nuts	-	1
Carbendazim	TN 0085	Tree nuts	-	*0.1
Carfentrazone-ethyl	TN 0085	Tree nuts	*0.05	-
Chlorantraniliprole	TN 0660	Almonds	0.1	-
	TN 0085	Tree nuts	-	0.02
Chlordane	TN 0660	Almonds	-	E0.02
Chlorothalonil	TN 0660	Almonds	T0.1	-
Chlorpyrifos	TN 0085	Tree nuts	T0.05	-
	TN 0660	Almonds	-	0.05
Clofentezine	TN 0660	Almonds	T0.5	-
	TN 0085	Tree nuts	-	0.5
Clothianidin	TN 0660	Almonds	T0.05	-
Cyantraniliprole	TN 0085	Tree nuts	-	0.04
Cyflumetofen	TN 0085	Tree nuts	-	*0.01
Cyhalothrin (includes lambda-cyhalothrin)	TN 0085	Tree nuts	-	*0.01
Cypermethrins (including alpha- and zeta-cypermethrin)	TN 0085	Tree nuts	-	*0.05
Cyprodinil	TN 0660	Almonds	*0.01	*0.02
Diazinon	TN 0085	Tree nuts	0.1	-
	TN 0660	Almonds	-	0.05
Dicofol	TN 0660	Almonds	5	-
Difenoconazole	TN 0085	Tree nuts	-	0.03
Diflubenzuron	TN 0085	Tree nuts	-	0.2
Diquat	TN 0085	Tree nuts	*0.05	-

Chemical	Codex Code	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Dithianon	TN 0660	Almonds	-	*0.05
Dithiocarbamates	TN 0660	Almonds	-	*0.1
Dithiocarbamates (mancozeb, metham, metiram, thiram, zineb and ziram)	TN 0660	Almonds	3	-
Emamectin benzoate	TN 0085	Tree nuts	-	*0.001
Etoxazole	TN 0660	Almonds	*0.01	-
	TN 0085	Tree nuts	-	*0.01
Fenbuconazole	TN 0085	Tree nuts	-	*0.01
Fenbutatin Oxide	TN 0660	Almonds	-	0.5
Fenhexamid	TN 0660	Almonds	-	*0.02
Fenpropathrin	TN 0085	Tree nuts	-	0.15
Fenpyrazamine	TN 0660	Almonds	-	*0.01
Fenpyroximate	TN 0085	Tree nuts	-	*0.05
Flonicamid	TN 0660	Almonds	-	*0.01
Fluazifop-p-butyl	TN 0660	Almonds	-	*0.01
Flubendiamide	TN 0085	Tree nuts	-	0.1
Flumioxazin	TN 0085	Tree nuts	*0.02	*0.02
Fluopyram	TN 0660	Almonds	0.05	-
	TN 0085	Tree nuts	-	0.04
Fluxapyroxad	TN 0085	Tree nuts	0.07	0.04
Fosetyl Al	TN 0085	Tree nuts	-	400
Glufosinate and Glufosinate ammonium	TN 0085	Tree nuts	0.1	-
Glufosinate-Ammonium	TN 0085	Tree nuts	-	0.1
Glyphosate	TN 0085	Tree nuts	0.2	-
Haloxyfop	TN 0085	Tree nuts	*0.05	-
Hexythiazox	TN 0085	Tree nuts	-	*0.05
Hydrogen Phosphide	TN 0085	Tree nuts	-	Po0.01
Imidacloprid	TN 0085	Tree nuts	-	0.01
Iprodione	TN 0660	Almonds	*0.02	0.2
Isofetamid	TN 0660	Almonds	-	*0.01
Isoxaben	TN 0085	Tree nuts	*0.01	-
Maldison	TN 0085	Tree nuts	8	-
Methoxyfenozide	TN 0660	Almonds	0.2	-
	TN 0085	Tree nuts	-	0.1
Methyl Bromide	TN 0085	Tree nuts	-	*Po0.01
Napropamide	TN 0660	Almonds	*0.1	-
Norflurazon	TN 0085	Tree nuts	*0.2	-
Oryzalin	TN 0085	Tree nuts	0.1	-
Oxyfluorfen	TN 0085	Tree nuts	0.05	-
Paraquat	TN 0085	Tree nuts	*0.05	0.05
Pendimethalin	TN 0085	Tree nuts	*0.05	0.05
Penthiopyrad	TN 0085	Tree nuts	0.1	0.05
Permethrin	TN 0660	Almonds	-	0.1

Chemical	Codex Code	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Phosmet	TN 0085	Tree nuts	-	0.2
Phosphine	TN 0085	Tree nuts	*0.01	-
Phosphorous acid	TN 0085	Tree nuts	3000	-
Piperonyl butoxide	TN 0085	Tree nuts	8	-
Pirimicarb	TN 0660	Almonds	0.05	-
Propargite	TN 0660	Almonds	-	*0.1
Propiconazole	TN 0660	Almonds	0.2	-
Propylene oxide	TN 0660	Almonds	100	-
Pymetrozine	TN 0660	Almonds	*0.01	-
Pyraclostrobin	TN 0085	Tree nuts	0.07	*0.02
Pyrethrins	TN 0085	Tree nuts	1	*Po0.5
Pyridaben	TN 0085	Tree nuts	*T0.05	-
Pyrimethanil	TN 0660	Almonds	-	0.2
Saflufenacil	TN 0085	Tree nuts	*0.03	0.01
Simazine	TN 0085	Tree nuts	*0.1	-
Spinetoram	TN 0085	Tree nuts	-	0.01
Spinosad	TN 0085	Tree nuts	*T0.01	0.07
Spirodiclofen	TN 0085	Tree nuts	-	0.05
Spirotetramat	TN 0085	Tree nuts	-	0.5
Sulfoxaflor	TN 0085	Tree nuts	0.02	0.03
Sulfuryl fluoride	TN 0085	Tree nuts	7	Po3
Tebuconazole	TN 0660	Almonds	*0.01	-
	TN 0085	Tree nuts	-	*0.05
Tebufenozide	TN 0660	Almonds	-	0.05
Tetraniliprole	TN 0660	Almonds	0.05	-
Terbacil	TN 0660	Almonds	0.5	-
Thiacloprid	TN 0085	Tree nuts	-	0.02
Trifloxystrobin	TN 0660	Almonds	0.05	-
	TN 0085	Tree nuts	-	0.02

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 (Almonds), crop group exclusions (if any) have not been specified.

NOTE: Major export markets for almonds are China and India, with lesser volumes being exported to Vietnam, Germany and Spain. Available information indicates that in the absence specific limits in legislation that many countries defer to Codex, followed by EU MRL standards or applies a 0.01ppm default value. Food exported to New Zealand from Australia may be legally sold if it complies with Australian requirements. MRLs and legislation are subject to change; the values presented should not be relied on.

* 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 4. Prepared 15 January 2020.
CODEX MRLs: CODEX Alimentarius International Food Standards database (February 2020), http://www.fao.org/fao-who-codexalimentarius/codex-texts/dbs/pestres/en/

Appendix 6. Almond Agrichemical Regulatory Risk Assessment

Almond
Agrichemical Regulatory
Risk Assessment

September 2020

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

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

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

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

Almond Agrichemical Regulatory Risk Assessment

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

Problem	Active Constituents	Chemical Group	Comment	Activities
INSECT AND MITE PESTS				
Ants				
Fire ants	Indoxacarb	**22A**	EU: Proposed non-renewal	
	Pyriproxyfen	**7C**	EU – Authorisation renewal process underway	
	S-methoprene (PER81094)	**7A**		
Aphids				
Aphids	Paraffinic oil/petroleum oil	**-**		
	Potassium salts of fatty acids	**U1**		
	Sulfoxaflor	**4C**	USA – Pollinator concerns	
Black peach aphid	Sulfoxaflor	**4C**	USA – Pollinator concerns	
Green peach aphid	Pirimicarb	**1A**	Codex - JMPR Periodic re-evaluation 2022/23 EU: Candidate for substitution	
	Pymetrozine	**9B**	EU- Failed re-evaluation. Being phased out Codex – No registrant support	
	Sulfoxaflor	**4C**	USA – Pollinator concerns	
Beetles				
Carpophilus beetle	Bifenthrin (PER87216)	**3A**	Canada: Subject to phase-out until 31/12/2020 EU: No authorisation in place	
	Clothianidin (PER87311)	**4A**	APVMA – Under review Canada – Proposal to cancel foliar use in orchards strawberries and turf Europe – Outdoor uses deregistered USA: Re-registration with new risk mitigation measures[i]	
	Tetraniliprole	**28**		

Problem	Active Constituents	Chemical Group	Comment	Activities
Caterpillars/Lepidoptera				
Carob moth	Chlorantraniliprole	**28**		
	Clothianidin (PER87311)	**4A**	APVMA – Under review Canada – Proposal to cancel foliar use in orchards strawberries and turf Europe – Outdoor uses deregistered USA: Re-registration with new risk mitigation measures	
	Methoxyfenozide	**18**	EU: Proposed restricted authorisation & Candidate for substitution	
	Spinetoram	**5**		
Fall armyworm	Chlorantraniliprole (PER89259)	**28**		
Mites				
Bryobia mite (Brown almond mite)	Abamectin	**6**		
	Bifenazate	**20D**	EU: Proposed non-renewal	
	Clofentezine	**10A**		
	Etoxazole	**10B**	EU: Only uses on greenhouse ornamentals approved EU: Candidate for substitution	
	Paraffinic oil	**-**		
	Sulfur	**UN**		
European red mite	Etoxazole	**10B**	EU: Only uses on greenhouse ornamentals approved EU: Candidate for substitution	
Mites	Paraffinic oil/petroleum oil	**-**		
Spider mites	Fatty acids - K salt	**U1**		
Two-spotted mites	Abamectin	**6**		
	Bifenazate	**20D**	EU: Proposed non-renewal	
	Clofentezine	**10A**		
	Etoxazole	**10B**	EU: Only uses on greenhouse ornamentals approved EU: Candidate for substitution	
	Fatty acids - K salt	**U1**		

Problem	Active Constituents	Chemical Group	Comment	Activities
Plant bugs and leaf hoppers				
Brown marmorated stink bug	Bifenthrin (PER82374)	**3A**	Canada: Subject to phase-out until 31/12/2020 EU: No authorisation in place	
Yellow spotted stink bug	Bifenthrin (PER82374)	**3A**		
Scale and mealybug				
Frosted scale	Sulphur	**UN**		
Mealybug	Fatty acids - K salt	**U1**		
San Jose scale	Paraffinic oil/petroleum oil	**-**		
	Sulfur	**UN**		
Scale insects	Paraffinic oil/petroleum oil	**-**		
Thrips				
Thrips	Fatty acids - K salt	**U1**		
Others insect pests				
Plague locusts	Chlorpyrifos (PER13642)	**1B**	APVMA: Currently under review, outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure. Codex: Scheduled for review by JMPR in 2021 Canada – proposed cancellation of most uses. EU: Proposed cancellation of use USA – EPA decision to allow continued use	
	Malathion/Maldison (PER13642)	**1B**	APVMA: Under review – chemistry Codex: Re-evaluation scheduled for 2022/23	
Vertebrate pests				
Rodents	Zinc phosphide	**-**		

Problem	Active Constituents	Chemical Group	Comment	Activities
DISEASES				
Alternaria leaf spot	Fluxapyroxad + pyraclostrobin	**7 + 11**		
Anthracnose	Azoxystrobin	**11**		
	Captan	**M4**		
	Fluxapyroxad + pyraclostrobin	**7 + 11**		
	Propiconazole (PER12989)	**3**	APVMA - Nominated for review	
Blossom blight	Azoxystrobin + tebuconazole	**3 + 11**	Tebuconazole APVMA - Nominated for review EU: Candidate for substitution	
	Captan	**M4**		
	Cyprodinil	**9**	Canada – Under review EU: Candidate for substitution	
	Fluopyram + trifloxystrobin	**7 + 11**		
	Fluxapyroxad + pyraclostrobin	**7 + 11**		
	Iprodione	**2**	Europe – Deregistered Canada – Majority of food crop uses deleted Codex – Review scheduled for 2022/23	
	Mancozeb	**M3**	APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2022/23 EU: Proposed non-renewal of authorisation	
	Penthiopyrad	**7**		
	Propiconazole (PER12989)	**3**	APVMA - Nominated for review	
	Sulfur	**M2**		

Problem	Active Constituents	Chemical Group	Comment	Activities
Brown rot	Azoxystrobin + tebuconazole	**3 + 11**	Tebuconazole APVMA - Nominated for review EU: Candidate for substitution	
	Copper	**M1**	Europe: Candidates for substitution and their uses to be phased out	
	Iprodione	**2**	Europe – Deregistered Canada – Majority of food crop uses deleted Codex – Review scheduled for 2022	
	Mancozeb	**M3**	APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2022/23 EU: Proposed non-renewal of authorisation	
	Penthiopyrad	**7**		
	Sulfur	**M2**		
Crown gall	*Agrobacterium radiobacter*	**-**		
Freckle and scab	Copper	**M1**	Europe: Candidates for substitution and their uses to be phased out	
	Mancozeb	**M3**	APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2022/23 EU: Proposed non-renewal of authorisation	
	Sulfur	**M2**		
Hull rot	Fluopyram + trifloxystrobin	**7 + 11**		
Leaf curl	Copper	**M1**	Europe: Candidates for substitution and their uses to be phased out	
	Sulfur	**M2**		
Nut scab	Captan	**M4**		
	Fluxapyroxad + pyraclostrobin	**7 + 11**		
Phytophthora	Phosphorous acid (PER13199)	**33**		

Problem	Active Constituents	Chemical Group	Comment	Activities
Rust	Azoxystrobin + tebuconazole	**3 + 11**	Tebuconazole APVMA - Nominated for review EU: Candidate for substitution	
	Chlorothalonil	**M5**	APVMA – Previously nominated for review Canada – Review recently completed, continued use considered acceptable Europe - Deregistered[ii].	
	Cyprodinil	**9**	Canada – Under review EU: Candidate for substitution	
	Fluopyram + trifloxystrobin	**7 + 11**		
	Fluxapyroxad + pyraclostrobin	**7 + 11**		
	Mancozeb	**M3**	APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2022/23 EU: Proposed non-renewal of authorisation	
	Pyraclostrobin	**11**		
	Sulfur	**M2**		

Problem	Active Constituents	Chemical Group	Comment	Activities
Shot hole	Azoxystrobin + tebuconazole	**3 + 11**	Tebuconazole APVMA - Nominated for review EU: Candidate for substitution	
	Captan	**M4**		
	Chlorothalonil	**M5**	APVMA – Previously nominated for review Canada – Review recently completed, continued use considered acceptable Europe - Deregistered	
	Copper	**M1**	Europe: Candidates for substitution and their uses to be phased out	
	Cyprodinil	**9**	Canada – Under review EU: Candidate for substitution	
	Fluopyram + trifloxystrobin	**7 + 11**		
	Fluxapyroxad + pyraclostrobin	**7 + 11**		
	Mancozeb	**M3**	APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2022/23 EU: Proposed non-renewal of authorisation	
	Sulfur	**M2**		

Problem	Active Constituents	Chemical Group	Comment	Activities
WEEDS				
Broadleaf weeds and grasses	Carfentrazone-methyl	**G**		
	Diquat	**L**	APVMA - Currently under review Europe – deregistered	
	Flumioxazin	**G**	EU: Candidate for substitution	
	Glufosinate	**N**	Europe – deregistered	
	Glyphosate	**M**	Ongoing issues internationally	
	Haloxyfop-P	**A**	EU: Candidate for substitution	
	Isoxaben	**O**		
	Napropamide	**K**		
	Norflurazon	**F**	EU: No authorisation in place	
	Oryzalin	**D**		
	Oxyfluorfen	**G**	EU: Candidate for substitution	
	Paraquat	**L**	APVMA: Currently under review Europe: No authorisation in place Rotterdam Convention - nominated	
	Pendimethalin	**D**	EU: Candidate for substitution	
	Saflufenacil	**G**	EU: No authorisation in place	
	Simazine (PER88702)	**C**	APVMA – Nominated for review EU: No authorisation in place	
Plant growth regulators				
Extend flower life	Aminoethoxyvinylglycine			
Regulation of bud dormancy	Cyanamide-			

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

[i] Clothianidin: Berry fruit, Fruiting vegetables, ornamentals, pome fruit, turf Reduction in yearly total rate

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