Avocado

Strategic Agrichemical Review Process (SARP)

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

Date of report:
June 2020

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Hort Innovation Strategic levy investment | AVOCADO FUND

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

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1. Summary

The strategic levy investment project Strategic Agrichemical Review Process (SARP) - Updates (MT19008) is part of the Hort Innovation Avocado Fund. A Strategic Agrichemical Review Process (SARP), through the process of a desktop audit and industry liaison;

Assesses the importance of the diseases, insects and weeds (plant pests) that can affect a horticultural industry;

(i) Assesses the importance of the diseases, insects and weeds (plant pests) that can affect a horticultural industry;

(ii) Evaluates the availability and effectiveness of fungicides, insecticides and herbicides (pesticides) to control the plant pests;

(iii) Determines any gaps in the pest control strategy and

(iv) Identifies suitable new or alternatives pesticides to address the gaps.

Alternative pesticides should ideally be selected for benefits of:

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

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

1.1 Diseases

The high priority diseases are:

Common name	Scientific name
Phytophthora Root Rot	*Phytophthora cinnamomi*
Anthracnose	*Colletotrichum gloeosporioides*
Side rot (post-harvest)	Caused by Anthracnose (*Colletotrichum spp* and *Botryosphaeriaceae*)
Stem End Rot (post-harvest)	*Lasiodiplodia sp, Fusicoccum* spp., *Neofusicoccum* spp., *Colletotrichum* spp. and other Botryosphaeriaceous fungi

1.2 Insects and Mites

The high priority insect pests of avocado are:

Common name	Scientific name
Banana Spotting Bug	*Amblypelta lutescens*
Fruit Spotting Bug	*Amblypelta nitida*
Red Shouldered Leaf Beetle	*Monolepta australis*

1.3 Weeds

The high priority weeds of avocado are:

Common name	Scientific name
Flaxleaf Fleabane	*Conyza bonariensis*

1.4 Plant Growth Regulators

The high priority Plant Growth Regulator issues of avocado are:

Issue
Fruit Drop Control
Control of Vegetative Growth

2. The Australian Avocado Industry

Avocado production occurs mainly in Queensland and Northern NSW during the winter, and Western Australia during the summer. The most common varieties of avocado in Australia are the Hass and Shepard. Production for the year ending June 2019 was 85,546 tonnes of avocados. The value of production was $444 m while the wholesale value of the fresh supply was $512 m. Hass avocados accounted for 78% of fresh production and Shepard made up 20% of fresh production.

The geographical spread of the industry and different harvest times of varieties allows avocado production to continue year-round. Avocados can be left on the tree with little risk of product deterioration, which also allows for growers to extend their harvest season if needed. Australia does import avocados, mainly from New Zealand, at times when we have a production shortfall relative to domestic consumption.

Table 1 Fresh Avocado Seasonality by State[1]

State	18/19 Tonnes	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Queensland	46,623												
Western Australia	25,664												
New South Wales	11,976												
Victoria	428												
South Australia	855												
Availability Legend			High			Medium			Low			None	

The growth in avocado production has been supported by a growing domestic market, particularly as Australians are consuming more per capita every year. The export market is relatively small at 2-3% of total production, however the proportion being exported is expected to grow to accommodate forecasted production increases. Avocados Australia are forecasting production to increase strongly over the next few years, with at least 115,000 tonnes per annum expected to be produced by 2025. Current export markets in South East Asia, particularly Malaysia and Singapore, have been growing strongly in recent years. This trend is expected to continue.

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

The SARP process identifies diseases, insect pests and weeds of major concern to the Avocado 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 Avocado 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 Avocados 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 Avocado 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.

For more information visit: https://www.planthealthaustralia.com.au/industries/avocados/

3.2 Minor use permits and registration

From a pesticide access perspective, the APVMA classifies avocados as a major crop. The crop fits within the APVMA Crop Group 006: Assorted tropical and sub-tropical fruits – inedible peel, and Subgroup 006B, Assorted tropical and sub-tropical, Inedible Smooth Peel – Large. Therefore, access to minor use permits can be relatively difficult. 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 avocado industry is for manufacturers to register new pesticides uses in the crop.

3.3 Methods

The current update of the Avocado Strategic Agrichemical Review Process (SARP), which was last updated in 2014, was conducted by desktop audit and included an online industry survey. The process included gathering, collating and confirming information. The steps in the process were:

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

3.4 Results and discussions

3.4.1 Detail

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

3.4.2 Appendices

Refer to additional information in the appendices:

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

4. Diseases, pests and weeds of avocados

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.

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 avocado

4.1.1 Disease priorities

Common name	Scientific name
High	
Phytophthora Root Rot	*Phytophthora cinnamomi*
Anthracnose	*Colletotrichum gloeosporioides*
Side rot (post-harvest)	Caused by anthracnose (*Colletotrichum spp* and *Botryosphaeriaceae*)
Stem End Rot (post-harvest)	*Lasiodiplodia sp, Fusicoccum spp, Neofusicoccum spp, Colletotrichum spp* and other *Botryosphaeriaceae*
Moderate	
Brown Root Rot	*Phellinus noxius*
Verticillium Wilt	*Verticillium dahliae*
Low	
Flower Die Back / Panicle and Shoot Blight	(The list of possible causes is extensive including; *Botryosphaeria*, *Collectotrichum*, *Fusarium* and *Alternaria* like pathogens)
Black Root Rot	*Calonectria ilicicola*
Trunk and Stem Canker	*Phytophthora citricola*
Sunblotch	Avocado Sunblotch Viroid (ASBVd)
Sooty Blotch	Various including *Stomiopeltis citri Bitanc*
Cercospora Spot	*Pseudocercospora purpurea*

The most important disease identified through the industry survey was Phytophthora Root Rot. This disease has the potential for large impacts on production and the solutions for dealing with it are costly and time consuming. Phytophthora Root Rot can severely impact on tree health and can lead to death of trees in severe cases.

The Hort Innovation Project "*Exploring alternatives for managing Phytophthora root rot in avocado"* (AV13021) stated that the successful management of this disease will rely on an integrated approach, which utilises as many cultural, chemical and agronomic options as possible. It also identified the need for alternative chemical options for controlling the disease, with the industry currently relying heavily on treatment with Phosphorous Acid.

Other diseases identified as high priority were Anthracnose, Side Rot and Stem End Rot. There is heavy reliance on a protectant fungicide program using copper for Anthracnose. The Dithiocarbamate fungicides are the only current alternative to copper and are subject to regulatory review. Canopy management is a critical part of an integrated management program for Anthracnose, along with post-harvest management and treatments. Side Rot and Stem End Rot symptoms appear after harvest, but the infection occurs before harvest. A combination of in-crop management and post-harvest treatments are required to maintain fruit quality. Cultural controls such as keeping an open canopy, removing dead limbs and mulching fallen leaves to remove inoculum are critical for an effective disease management strategy.

Diseases ranked of moderate importance are Brown Root Rot and Verticillium Wilt. Removal of infected limbs is the most effective treatment for Verticillium Wilt. No chemical options are available. Brown Root Rot is a very serious soil borne pathogen and there are very few options available apart from stopping the spread between trees in an orchard.
In managing 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.
http://www.croplife.org.au/industry-stewardship/resistance-management

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.
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
Phytophthora Root Rot *(Phytophthora cinnamomi)* **Priority: High**							
Rated as high priority in all growing regions, except NSW where it is rated moderate priority. *Phytophthora cinnamomi* is the scientific name of the causal organism of phytophthora root rot. It is a soil-borne water mould and it is the single greatest threat to the effective production of healthy and productive avocado trees. An integrated management system is required to manage root rot in avocados consisting of site selection for new plantings, irrigation management, chemical control, mulch and Inorganic nutrition.							
Fosetyl Aluminium (Aliette)	33	Protectant	1	A	QLD, NSW, SA, VIC & WA	Registered in avocados for control of **Phytophthora Root Rot**. Apply as a foliar spray during the spring flush and again at intervals of 6 weeks until autumn. Treatments per season not limited.	-
Metalaxyl-M (Ridomil Gold 25G)	4	Protectant & Curative	7	A	QLD & NSW, SA & WA	Registered in avocados for control of **Phytophthora Root Rot**. Replanting Infested Sites / Potted Nursery Trees / Dry Soil Mix: Apply to the soil at planting and repeat 8-12 weeks later. Incorporate by cultivation or watering. Curative Treatment: Apply as a soil application at the start of summer wet season and repeat 8-12 weeks later, until trees have recovered. Protective Treatment: Apply as a soil application at the start of summer wet season and repeat 3-6 months later. Apply in alternate years only. Treatments per season not limited.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Phosphorous (Phosphonic) Acid as Mono-Di K Phosphonate (Agri-Fos only)	33	Protectant & Curative	H:NR G:14	A	QLD, NSW, SA, VIC & WA	Registered in avocados for control of **Phytophthora Root Rot**. Trunk Injection: Inject trees at spring flush maturity and repeat in February or March. Foliar Spray: Curative – apply every 3 weeks until disease is under control. Preventative – apply every 5-6 weeks. Treatments per season not limited.	-
Bacillus amyloliquefaciens Strain QST 713 (Serenade Prime Soil Ameliorant and Biofungicide)	44	Biological Soil Ameliorant	NR	P-A	ALL	Avaiable 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 and it is also registered as a biofungicide for control of Yellow Sigatoka in bananas as a foliar spray. Note: Bayer have a Serenade Prime users guide for Avocadoes on their website.	-
Mandipropamid (Revus) Syngenta	40	Protectant & Curative		P		Current AU registration for control of Downy Mildew in grapes, lettuce, leafy vegetables and oilseed poppies. Registered in the US for Phytophthora in various crops, including as a foliar application for protection of citrus from Phytophthora Root Rot. No MRLs in place for AU or Codex.	-
Oxathiopiprolin (Zorvec Enicade) Corteva	49	Protectant & Curative		P		Current AU registrations for control of Downy Mildew in bulb vegetables, brassicas, cucurbits, leafy vegetables and poppies. Registered in the US for control of Phytophthora Canker and Brown Rot in citrus. No MRLs in place for AU or Codex.	-
Anthracnose *(Colletotrichum acutatum)* **Priority: High**							
Rated as high priority in all growing regions except WA, where it is rated as moderate priority. Anthracnose is a high priority disease and is particularly prevalent in wet seasons. A sustained protectant program, along with good canopy management is required to ensure that the disease does not affect yields and quality. Anthracnose can also cause secondary issues such as post-harvest diseases.							
Azoxystrobin (Amistar)	11	Protectant & Curative	7	A	ALL	Registered in avocados for control of **Anthracnose** and Stem End Rot. Apply one application during early fruit set. Follow with applications of an approved fungicide from a different chemical group. Apply 2 final applications of azoxystrobin at 14-28 day intervals with the final application applied 7 days prior to harvest. DO NOT use more than 3 applications per season. DO NOT use curatively and do not start disease control program with azoxystrobin.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Bacillus amyloliquefaciens Strain QST 713 (Serenade Opti)	44	Protectant	NR	A	ALL	Registered in avocados for control of **Anthracnose** and Stem End Rot. Use preventatively before disease symptoms appear. Begin applications as soon as crop development has reached susceptible stages for anthracnose infections to occur. Rotate with other registered fungicides and repeat every 7-21 days, use the shorter interval when conditions are very favourable for infection. Treatments per season not limited.	-
Copper (Cu) present as Copper Ammonium Acetate	M1	Protectant	1	A	ALL	Registered in avocados for control of **Anthracnose**, Cercospora Spot, Sooty Blotch and Phytophthora Stem Canker. Spray every 4 weeks from the end of flowering to harvest. During extended wet weather, spray every 14 days. Treatments per season not limited.	-
Copper (Cu) present as copper oxychloride	M1	Protectant	1	A	ALL	Registered in avocados for control of **Anthracnose.** Spray every 4 weeks from the end of flowering to harvest. During extended wet weather, spray every 14 days. Treatments per season not limited.	-
Copper (Cu) present as cuprous oxide	M1	Protectant	1	A	ALL	Registered in avocados for control of **Anthracnose** and Phytophthora Stem Canker. Spray every 4 weeks from the end of flowering to harvest. During extended wet weather, spray every 14 days. Treatments per season not limited.	-
Copper (Cu) present as cupric hydroxide	M1	Protectant	1	A	ALL	Registered in avocados for control of **Anthracnose** and Phytophthora Stem Canker. Spray every 4 weeks from the end of flowering to harvest. During extended wet weather, spray every 14 days. Treatments per season not limited.	-
Thiram	M3	Protectant	7	A	ALL	Registered in avocados for control of **Anthracnose** and Stem End Rot. Apply foliar spray every 30 days from flowering to harvest. During extended wet periods reduce the interval to 14 days. Treatments per season not limited.	R2
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant & Curative		P		**Pending registration** in Tropical & Subtropical Fruit (Inedible Peel) Fluopyram - AU MRL 0.1 mg/kg. No Codex MRL. Tebuconazole - AU MRL 0.2 mg/kg. No Codex MRL.	R3
Benzovindiflupyr + Propiconazole (Elatus) Syngenta	7+3	Protectant & Curative		P		Current AU registration for control of various disease in wheat and barley. US registration for Anthracnose in sweet corn. Benzovindiflupyr - No MRLs for AU or Codex. Propiconazole - AU MRL 0.05 mg/kg. No Codex MRL.	R3

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 AU, activity claimed on Anthracnose. Due for registration in 2023.	-
Fluopyram + Trifloxystrobin (Luna Sensation) Bayer	7+11	Protectant & Curative		P		**Pending registration** in Tropical & Subtropical Fruit (Inedible Peel) Fluopyram - AU MRL 0.1 mg/kg. No Codex MRL. Trifloxystrobin - AU MRL 0.05 mg/kg. No Codex MRL.	-
Fluxapyroxad + Pyraclostrobin (Merivon) BASF	7+11	Protectant & Curative		P		Registered for anthracnose control in almonds. Fluxapyroxad – No MRLs for AU or Codex. Pyraclostrobin – No AU MRL. Codex MRL 0.2 mg/kg.	-
Mefentrifluconazole (Belanty) BASF	3	Protectant & Curative		P		Registered on apples and grapes and BASF claim activity on Anthracnose. No MRLs for AU or Codex.	-
Pyraclostrobin + Metiram (Aero) BASF	11+M3	Protectant & Curative		P		Registered for control of Anthracnose, Stem End Rots and Powdery Mildew in Mangoes, as well as various diseases in potatoes, fruiting vegetables and poppies. Pyraclostrobin - AU MRL 0.05 mg/kg. Codex MRL 0.2 mg/kg. Metiram - AU MRL 7 mg/kg. No Codex MRL.	R2
Side Rot – Post Harvest. Caused by Anthracnose *(Colletotrichum spp)* **and other *Botryosphaeriaceae*** **Priority: High**							
Priority disease in all regions and of high concern in QLD. Side Rot symptoms only appear after harvest, but the infection occurs before harvest. In-crop management of Anthracnose is important and post-harvest treatments assist in maintaining fruit quality.							
Bromo Chloro Methyl Hydantoin (BCDMH) Sanitiser		Sanitiser / Post-harvest treatment	NR	A	ALL	Registered as a post-harvest treatment for external rot causing organisms. Post-harvest spray or dip. Minimum contact time 60 seconds. Can also be used as a general disinfectant for equipment.	-
Chlorine		Sanitiser / Post-harvest treatment	NR	A	ALL	Registered as a post-harvest treatment for bacteria and fungi. Post-harvest spray. Must make contact with the fruit for at least 30 seconds. Can also be used as a general disinfectant for equipment.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Fludioxonil + Azoxystrobin (Graduate A+)	12+11	Protectant / Post-harvest treatment	NR	A	ALL	Registered in avocados as a post-harvest treatment for **Anthracnose** and Stem End Rot. Apply as a dip, drench or flood spray. Ensure fruit is immersed in dip or exposed to solution for a minimum of 30 seconds and up to 60 seconds. DO NOT apply to avocados if a Group 11 fungicide was the final pre-harvest application.	-
Peroxyacetic Acid		Sanitiser / Post-harvest treatment	NR	A	ALL	Registered as a post-harvest treatment for bacteria. Post-harvest spray or dip. Ensure a minimum of 45 seconds contact time.	-
Prochloraz (Sportak)	3	Protectant / Post Harvest Treatment	NR	A	QLD, NSW, WA & NT	Registered in avocados as a post-harvest treatment for **Anthracnose** and Stem End Rot. Spray fruit for 30 seconds. Do not use on avocado cultivar Rincon.	-
Fludioxonil (Scholar) Syngenta	12	Protectant / Post-Harvest Treatment		P		Registered for Anthracnose control in mangoes. AU MRL 2 mg/kg. Codex MRL 1.5 mg/kg.	-
Thiabendazole (Tecto) Syngenta	1	Protectant / Post-Harvest Treatment		P		Registered as a post-harvest treatment for *Colletotrichum musae* in bananas. AU MRL 0.03 mg/kg. Codex MRL 15 mg/kg.	-
Stem End Rot – Post Harvest *(Lasiodiplodia sp, Fusicoccum spp, Neofusicoccum spp, Colletotrichum spp* & other *Botryosphaeriaceae)* **Priority: High**							
Priority disease in all regions, of concern in Southern QLD. Stem End Rot symptoms only appear after harvest, but the infection occurs before harvest. A combination of in-crop management and post-harvest treatments is required to maintain fruit quality. Pre-harvest fungicides treatments to control bacterial black spot or anthracnose may reduce the incidence of stem-end rot in fruit. Prune trees to improve ventilation and spray penetration. Remove dead branches from trees. Avoid harvesting immature fruit. Use appropriate registered fungicides for post-harvest treatment to help to control the disease and cool fruit immediately after harvest and store in well-ventilated containers.							
Azoxystrobin (Amistar)	11	Protectant & Curative	7	A	ALL	Registered in avocados for control of Anthracnose and **Stem End Rot**. Apply one application during early fruit set. Follow with applications of an approved fungicide from a different chemical group. Apply 2 final applications of azoxystrobin at 14-28 day intervals with the final spray applied 7 days prior to harvest. DO NOT use more than 3 applications per season. DO NOT use curatively and do not start disease control program with azoxystrobin.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Bacillus amyloliquefaciens Strain QST 713 (Serenade Opti)	44	Protectant	NR	A	ALL	Registered in avocados for control of Anthracnose and **Stem End Rot**. Use preventatively before disease symptoms appear. Begin applications as soon as crop development has reached susceptible stages for anthracnose infections to occur. Rotate with other registered fungicides and repeat every 7-21 days, use the shorter interval when conditions are very favourable for infection. Treatments per season not limited.	-
Bromo Chloro Methyl Hydantoin (BCDMH) Sanitiser		Sanitiser / Post-harvest treatment	NR	A	ALL	Registered as a post-harvest treatment for **external rot causing organisms**. Post-harvest spray or dip. Minimum contact time 60 seconds. Can also be used as a general disinfectant for equipment.	-
Chlorine	-	Sanitiser / Post-harvest treatment	NR	A	ALL	Registered as a post-harvest treatment for bacteria and **fungi**. Post-harvest spray. Must make contact with the fruit for at least 30 seconds. Can also be used as a general disinfectant for equipment.	-
Fludioxonil + Azoxystrobin (Graduate A+)	12+11	Protectant / Post-harvest treatment	NR	A	ALL	Registered in avocados as a post-harvest treatment for Anthracnose and **Stem End Rot**. Apply as a dip, drench or flood spray. Ensure fruit is immersed in dip or exposed to solution for a minimum of 30 seconds and up to 60 seconds. DO NOT apply to avocados if a Group 11 fungicide was the final pre-harvest spray.	-
Peroxyacetic Acid	-	Sanitiser / Post-harvest treatment	NR	A	ALL	Registered as a post-harvest treatment for bacteria. Post-harvest spray or dip. Ensure a minimum of 45 seconds contact time.	-
Prochloraz (Sportak)	3	Protectant / Post Harvest Treatment	NR	A	QLD, NSW, WA & NT	Registered in avocados as a post-harvest treatment for Anthracnose and **Stem End Rot**. Spray fruit for 30 seconds. Do not use on avocado cultivar Rincon.	-
Thiram	M3	Protectant	7	A	ALL	Registered in avocados for control of Anthracnose and **Stem End Rot**. Apply foliar spray every 30 days from flowering to harvest. During extended wet periods reduce the interval to 14 days. Treatments per season not limited.	R2
Fludioxonil (Scholar) Syngenta	12	Protectant / Post-Harvest Treatment		P		Registered as a post-harvest treatment on Stem End Rot in citrus. AU MRL 2 mg/kg. Codex MRL 1.5 mg/kg.	-
Thiabendazole (Tecto) Syngenta	1	Protectant / Post-Harvest Treatment		P		Registered as a post-harvest treatment on Stem End Rot in citrus. AU MRL 0.03 mg/kg. Codex MRL 15 mg/kg.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Brown Root Rot *(Phellinus noxious)* **Priority: Moderate**							
Brown Root Rot is a very serious soil borne pathogen. It is rated as high priority in Far North QLD and moderate priority in Southern QLD. It is not considered to be an issue in NSW and WA. Once the disease is present in an orchard the focus needs to be on preventing the spread between trees. It can spread via root to root contact, but spores are not thought to be air-borne.							
Bacillus amyloliquefaciens Strain QST 713 (Serenade Prime)	44	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.	-
Verticillium Wilt *(Verticillium dahliae)* **Priority: Moderate**							
Rated as a moderate priority in most growing regions, except NSW where it is rated low priority. Verticillium Wilt is a soil borne disease. There is no treatment available for infected trees apart from removing and mulching dead limbs.							
Bacillus amyloliquefaciens Strain QST 713 (Serenade Prime)	44	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.	-
Flower Die Back / Panicle and Shoot Blight (The list of possible causes is extensive including; *Botryosphaeria, Collectotrichum, Fusarium* and *Alternaria* like pathogens) **Priority: Low**							
Recently rated as a high priority in Hass in Central QLD (Bundaberg/Childers) only and not an issue in other regions. Infects the branches and flowers, causing continual flush and branch dieback. Avocado panicle blight resulted in considerable losses in production via reduction in fruit set in the Bundaberg/Childers region during the 2019 flowering season. There was also some death of vegetative buds and shoots in newly planted trees. However, severity was variable across the region. This has been observed in previous years, but not as severe. Overseas data suggests fungicides applied at early to full bloom and again in spring and summer appear to have the most success. Dormant and or pre-bloom sprays do not seem to have any effect on the disease. Hort Innovation project AV16007 is underway to investigate the fungi associated with avocado panicle and shoot blight cause and identify potential management practices that can be adopted by industry.							
Bacillus amyloliquefaciens Strain QST 713 (Serenade Opti)	44	Protectant	NR	P-A	ALL	Registered in avocados for control of Anthracnose and Stem End Rot. Efficacy on Flower Die Back not known. Treatments per season not limited.	-

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 AU. Efficacy on Flower Die Back not known. Due for registration in 2023.	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant & Curative		P		**Pending registration** in Tropical & Subtropical Fruit (Inedible Peel). Efficacy on Flower Die Back not known. Fluopyram - AU MRL 0.1 mg/kg. No Codex MRL. Tebuconazole - AU MRL 0.2 mg/kg. No Codex MRL.	R3
Fluopyram + Trifloxystrobin (Luna Sensation) Bayer	7+11	Protectant & Curative		P		**Pending registration** in Tropical & Subtropical Fruit (Inedible Peel). Efficacy on Flower Die Back not known. Fluopyram - AU MRL 0.1 mg/kg. No Codex MRL. Trifloxystrobin - AU MRL 0.05 mg/kg. No Codex MRL.	-
Mefentrifluconazole (Belanty) BASF	3	Protectant & Curative		P		Registered on apples and grapes in AU. Efficacy on Flower Die Back not known. No MRLs for AU or Codex.	-
Black Root Rot *(Calonectria ilicicola)* **Priority: Low**							
Black Root Rot is a soil borne disease with low incidence in all growing regions. There is no treatment available for infected trees apart from removing and mulching dead limbs.							
Bacillus amyloliquefaciens Strain QST 713 (Serenade Prime)	44	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.	-
Trunk & Stem Canker *(Phytophthora citricola)* **Priority: Low**							
Trunk cankers are regarded as a low priority. They should be removed and treated promptly.							
Copper (Cu) present as Copper Ammonium Acetate	M1	Protectant	1	A	ALL	Registered in avocados for control of Anthracnose, Cercospora Spot, Sooty Blotch and **Phytophthora Stem Canker**. Apply only to stems of trees wherever cankers appear, after removing dead tissue. Repeat applications up to a maximum of 5 per season until natural healing is commenced. Treatments per season not limited.	-
Copper (Cu) present as cupric hydroxide	M1	Protectant	1	A	QLD & NSW	Registered in avocados for control of Anthracnose and **Phytophthora Stem Canker**. Apply only to stems of trees wherever cankers appear, after	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
						removing dead tissue. Repeat applications up to a maximum of 5 per season until natural healing is commenced. Treatments per season not limited.	
Copper (Cu) present as cuprous oxide	M1	Protectant	1	A	ALL	Registered in avocados for control of Anthracnose and **Phytophthora Stem Canker**. Apply only to stems of trees wherever cankers appear, after removing dead tissue. Repeat applications up to a maximum of 5 per season until natural healing is commenced. Treatments per season not limited.	-
Sunblotch (Avocado Sunblotch Viroid (ASBVd)) **Priority: Low**							
Not currently a priority because the incidence is low. A test is available to assist in identifying symptomless planting materials.							
No options available							
Sooty Blotch (various, including *Stomiopeltis citri Bitanc*) **Priority: Low**							
Rated as a low priority in all growing regions. Sooty Blotch affects the surface of the fruit and may result in marketability problems. Fungicide program for Anthracnose should keep the disease in check, unless poor application techniques have been used.							
Copper (Cu) present as Copper Ammonium Acetate	M1	Protectant	1	A	QLD, NSW, VIC, SA & WA	Registered in avocados for control of Anthracnose, Cercospora Spot, **Sooty Blotch** and Phytophthora Stem Canker. Spray every 4 weeks from the end of flowering to harvest. During extended wet weather, spray every 14 days. Treatments per season not limited.	-
Cercospora Spot *(Pseudocercospora purpurea)* **Priority: Low**							
Rated as a low priority in all growing regions. Infested crops may develop dark brown lesions on the leaves and fruit.							
Copper (Cu) Present as Copper Ammonium Acetate	M1	Protectant	1	A	ALL	Registered in avocados for control of Anthracnose, **Cercospora Spot**, Sooty Blotch and Phytophthora Stem Canker. Spray every 4 weeks from the end of flowering to harvest. During extended wet weather, spray every 14 days. Start use preferably during low infestation and preferably as a last spray in a spray program. Treatments per season not limited.	-

4.2 Insect and mite pests of avocados

4.2.1 Insect and mite pest priorities

Common name	Scientific name
High	
Banana Spotting Bug	*Amblypelta lutescens*
Fruit Spotting Bug	*Amblypelta nitida*
Red Shouldered Leaf Beetle	*Monolepta australis*
Moderate	
Ectropis looper	*Ectropis sabulosa*
Leafhoppers / Jassids	*Cicadellidae*
Avocado Leafroller	*Homona spargotis*
Tea Red Spider Mite	*Oligonychus coffeae*
Six-Spotted Mite	*Eotetranychus sexmaculatus*
Greenhouse Thrips	*Heliothrips haemorrhoidalis*
Queensland Fruit Fly	*Bactrocera tryoni*
Mediterranean Fruit Fly	*Ceratitis capitata*
Low	
Two Spotted Mite	*Tetranychus urticae*
Red-Banded Thrips	*Selenothrips rubrocinctus*
Citrus Blossom Bug	*Austropeplus* spp.
Ivy Leafroller	*Cryptoptila immersana*
Latania Scale	*Hemiberlesia lataniae*
Flower-Eating Caterpillar	Including *Homoeosoma vagella & Xanthodes congenita*
Rutherglen Bug	*Nysius vinitor*
Swarming Leaf Beetle	*Rhyparida spp*
Garden Weevil	*Phlyctinus callosus*
Silverleaf Whitefly	*Bemisia tabaci*
Yellow Peach Moth	*Conogethes punctiferalis*
Green Tree Ant	*Oecophylla smaragdina*
Leafminers	*Lyriomyza spp*

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

Common Name	Scientific name
Fall Armyworm	*Spodoptera frugiperda*

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
Banana Spotting Bug *(Amblypelta lutescens)* **Fruit Spotting Bug** *(Amblypelta nitida)* **Priority: High**								
Reported as a major priority by growers in all regions except WA. Both species are found in all QLD and NSW avocado growing areas. These are serious pests which sting the fruit at all stages from fruit set until picking. Damage caused affects the marketability of fruit. An insecticide program is required to protect the developing fruit. It may be possible to identify and treat hot-spots in the orchard.								
Acetamiprid + Pyriproxyfen (Trivor)	4A+7C	Ingestion / IGR	28	A	ALL	Registered in avocados for control of **Banana Spotting Bug, Fruit Spotting Bug**, Oleander Scale, Pink Wax Scale, Queensland Fruit Fly and Mediterranean Fruit Fly. Apply up to 2 applications per season as part of a monitoring and spray program for the management of fruit spotting bugs. Apply post-flowering when monitoring indicates pest is becoming active in the crop. If additional insecticide treatments are required, apply an alternative mode of action product after a minimum 14 day spray interval and prior to applying a second Trivor application.	M Bee H	R2
Beta-Cyfluthrin (Bulldock)	3A	Contact	7	A	ALL	Registered in avocados for control of **Fruit Spotting Bug**. Spray when numbers exceed threshold. Apply a maximum of 4 sprays with a minimum of 21 days between consecutive applications.	VH Bee H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Methidathion (Suprathion)	1B	Contact	7	A	QLD & WA	**Note: Suprathion Registration Cancelled by ADAMA and the use of Suprathion will not be permitted after 4-Feb-21.** Previously registered in avocados for control of **Banana Spotting Bug**, **Fruit Spotting Bug**, Monolepta Beetle, Latania Scale, Red Banded Thrips and Mealy Bug. Apply when pests are active. Repeat applications at 7-10 day intervals. Treatments per season not limited.	H Bee H	R1
Sulfoxaflor (Transform)	4C	Contact & Ingestion	7	A	ALL	Registered in avocados for control of **Banana Spotting Bug** and **Fruit Spotting Bug.** Apply as part of a season long spray programme targeting pests when active in the crop. DO NOT use more than 4 applications per season. DO NOT reapply before 21 days after each application.	M Bee VH	-
Trichlorfon (Lepidex)	1B	Contact	2	A	QLD, NSW & NT	Registered in avocados for control of **Fruit Spotting Bug** and Monolepta Beetle. Apply when pests are first seen. Number of applications not limited, use spray intervals of 7-10 days.	H Bee H	R2
Flupyradifurone (Sivanto Prime) Bayer	4D	Ingestion / Systemic		P		Current AU registration for control of Fruit Spotting Bug in macadamia. Studies to commence June 2020 for label extension to include control of Fruit Spotting Bug and Banana Spotting Bug in Tropical and Subtropical Fruit (Inedible Peel) group.	L Bee L	-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.		-
Red Shouldered Leaf Beetle *(Monolepta australis)* **Priority: High**								
Monolepta is present in all growing regions but is only a major problem in some seasons. Feeding damage can occur with leaves and flowers, which affects fruit set and fruit development. The pest tends to swarm in big numbers which can rapidly lead to significant crop damage.								
Carbaryl (Bugmaster)	1A	Contact	3	A	ALL	Registered in avocados for control of **Red Shouldered Leaf Beetle** and Wingless Grasshoppers. Apply when infestation is first observed and repeat as swarms re-infest. Treatments per season not limited.	H Bee H	-
Chlorpyrifos (Lorsban)	1B	Contact	7	A	QLD & NSW	Registered in avocados for control of Avocado Leafroller, Ivy Leafroller, Latania Scale, Hairy Caterpillars, Light Brown Apple Moth, **Red Shouldered Leaf Beetle** and Queensland Fruit Fly. Apply when populations indicate treatment is required. Spot spray affected trees only. Repeat as necessary. Treatments per season not limited.	H Bee H	R1

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Indoxacarb (Avatar) FMC	22A	Contact & Ingestion		P		Registered in soybean for Monolepta control. AU MRL 0.05mg/kg, No Codex MRL in place.	L-M Bee H	R3
NUL3445 Nufarm	TBC			P		New active in development from Nufarm with activity on Lepidoptera and various beetles.		-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.		-
Tetraniliprole (Vayego) Bayer	28			P		Registered for control of Carpophilus Beetle in almonds, Macadamia Seed Weevil in macadamia, Weevils, Codling Moth and Light Brown Apple Moth in pome fruit and Dried Fruit Beetle, Oriental Fruit Moth, Mediterranean Fruit Fly and Weevils in stone fruit. Hort Innovation has several projects underway towards assisting registration in minor crops. Data generation project to assess the efficacy on various pests in avocado due for completion November 2020.	L-M Bee VH	-
Ectropis Looper *(Ectropis sabulosa)* **Priority: Moderate**								
Ectropis Looper is seasonal in incidence and only occurs in North Queensland and occasionally in the Bundaberg region. Causes extensive damage through leaf feeding and will also feed directly on the fruit as it develops.								
Chlorantraniliprole (Altacor) (PER81560)	28	Ingestion	3	A	NSW, Qld & WA	Permitted in avocados for control of Lepidopteran Pests, including **Ectropis Looper** and Avocado Leaf Roller. Apply at first sign of insect pest infestation. For looper control, apply post-harvest and post-pruning before flush and flowering occurs. Apply a maximum of 3 applications per season, with a 21 – 28 day interval between consecutive foliar treatments.	L Bee VL	-
Methomyl (Lannate) (PER14597)	1A	Contact	3	A	NSW & QLD	Permitted in avocados for control of **Ectropis Looper**. Use as a cover spray as required. Treatments per season not limited.	H Bee H	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Spinetoram (Success Neo)	5	Ingestion	NR	A	ALL	Registered in avocados for control of Avocado Leafroller, Ivy Leafroller, Light Brown Apple Moth, **Loopers**, Flower Eating Caterpillars, Leafrollers & Loopers, Yellow Peach Moth, Red-Banded Thrips and Sorghum Head Caterpillar. Target applications against mature eggs and newly hatched larvae when numbers exceed spray threshold. Apply repeat applications at 7-14 day intervals as new infestations occur. Treatments per season not limited.	M Bee VH	-
Bacillus thuringiensis subsp Kurstaki Strain Hd-1	11	Ingestion		P		Registered for control of various Lepidoptera including loopers in various crops. No MRLs required for biological product.	VL Bee VL	-
Diafenthiuron + Cyantraniliprole (Minecto Forte) Syngenta	12A+28	Ingestion & Contact		P		Registration progressing for control of various Lepidoptera, Aphids and Mites in fruiting vegetables and cucurbits. No MRLs in place for AU or Codex.	M Bee VH	-
Indoxacarb + Novaluron (Plemax) Adama	22A+15	Ingestion		P		Registration pending for control of various Lepidoptera in avocados.	M Bee H	R3
NUL3445 Nufarm	TBC			P		New active in development from Nufarm with activity on Lepidoptera and various beetles.		-
Spinosad (Entrust Organic) Corteva	5	Ingestion		P		Registration pending in AU, suitable for organic growers.	L Bee L	-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.		-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Tetraniliprole (Vayego) Bayer	28			P		Registered for control of Carpophilus Beetle in almonds, Macadamia Seed Weevil in macadamia, Weevils, Codling Moth and Light Brown Apple Moth in pome fruit and Dried Fruit Beetle, Oriental Fruit Moth, Mediterranean Fruit Fly and Weevils in stone fruit. Hort Innovation has several projects underway towards assisting registration in minor crops. Data generation project to assess the efficacy on various pests in avocado due for completion November 2020.	L-M Bee VH	-
Leafhoppers / Jassids (Cicadellidae) **Priority: Moderate**								
Rated as a moderate priority in all regions except WA where they are rated a low priority. Occur frequently in avocados but are incidentally controlled with insecticides used for other pests. Sucking pest causes direct feeding damage to leaves and can mark the developing fruit.								
Petroleum Oil		Contact	1	P-A	QLD, NSW, ACT & WA	Registered in avocados for control of Scale Insects. Will provide suppression of jassids if applied early to developing populations. Do not apply if trees need watering. Treatments per season not limited.	L Bee L	-
Buprofezin (Applaud) Corteva	16	Ingestion / IGR		P		Registered for control of leafhoppers in citrus. AU MRL 0.05 mg/kg, Codex MRL 0.1 mg/kg.	M Bee L	-
Avocado Leafroller *(Homona spargotis)* **Priority: Moderate**								
An occasional pest in Far North QLD, and although it can be found in other parts of QLD it causes relatively little damage in the more southern regions. The larvae roll and web leaves together and can also web the leaves to the developing fruit. Direct feeding damage to the fruit can allow infection by Anthracnose or it may cause fruit to drop.								
Chlorantraniliprole (Altacor) (PER81560)	28	Ingestion	3	A	NSW, QLD & WA	Permitted in avocados for control of Lepidopteran Pests, including Ectropis Looper and **Avocado Leaf Roller**. Apply at first sign of insect pest infestation. Apply a maximum of 3 applications per season, with a 21 – 28 day interval between consecutive foliar treatments.	L Bee VL	-
Chlorpyrifos (Lorsban)	1B	Contact	7	A	QLD & NSW	Registered in avocados for control of **Avocado Leafroller**, Ivy Leafroller, Latania Scale, Hairy Caterpillars, Light Brown Apple Moth, Red Shouldered Leaf Beetle and Queensland Fruit Fly. Apply at first sign of pest activity before larvae move to fruit. Treatments per season not limited.	H Bee H	R1

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Methoxyfenozide (Prodigy)	18	Ingestion	14	A	ALL	Registered in avocados for control of **Avocado Leafroller**. Commence monitoring from pre-bloom and apply at first sign of pest incidence and target eggs and newly hatched larvae. Additional applications may be required if reinfestation occurs. Treatments per season not limited.	VL Bee VL	-
Spinetoram (Success Neo)	5	Ingestion	NR	A	ALL	Registered in avocados for control of **Avocado Leafroller**, Ivy Leafroller, Light Brown Apple Moth, Loopers, Flower Eating Caterpillars, Leafrollers & Loopers, Yellow Peach Moth, Red-Banded Thrips and Sorghum Head Caterpillar. Target applications against mature eggs and newly-hatched larvae when numbers exceed spray threshold. Apply repeat applications at 7-14 day intervals as new infestations occur. Treatments per season not limited.	M Bee VH	-
Tebufenozide (Mimic)	16A	Ingestion / IGR	14	A	ALL	Registered in avocados for control of **Avocado Leafroller.** Commence monitoring from pre-bloom and apply at first sign of pest incidence. Additional applications may be required if reinfestation occurs. Treatments per season not limited.	L Bee L	-
Bacillus thuringiensis subsp Kurstaki Strain Hd-1	11	Ingestion		P		Registered for control of various Lepidoptera in various crops. No MRLs required for biological product.	VL Bee VL	-
Diafenthiuron + Cyantraniliprole (Minecto Forte) Syngenta	12A+28	Ingestion & Contact		P		Registration progressing for control of various Lepidoptera, Aphids and Mites in fruiting vegetables and cucurbits. No MRLs in place for AU or Codex.	M Bee VH	-
Indoxacarb + Novaluron (Plemax) Adama	22A+15	Ingestion		P		Registration pending for control of various Lepidoptera in avocados.	M Bee H	R3
NUL3445 Nufarm	TBC			P		New active in development from Nufarm with activity on Lepidoptera and various beetles.		-
Spinosad (Entrust Organic) Corteva	5	Ingestion		P		Registration pending in AU, suitable for organic growers.	L Bee L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.		-
Tetraniliprole (Vayego) Bayer	28			P		Registered for control of Carpophilus Beetle in almonds, Macadamia Seed Weevil in macadamia, Weevils, Codling Moth and Light Brown Apple Moth in pome fruit and Dried Fruit Beetle, Oriental Fruit Moth, Mediterranean Fruit Fly and Weevils in stone fruit. Hort Innovation has several projects underway towards assisting registration in minor crops. Data generation project to assess the efficacy on various pests in avocado due for completion November 2020.	L-M Bee VH	-
Tea Red Spider Mite *(Oligonychus coffeae)* **Priority: Moderate**								
Identified as a priority in QLD although can be present in all growing regions. Feeding damage to leaves can reduce general tree health and in severe cases can lead to significant leaf drop. Incidence is sporadic as the pest prefers warm temperatures and extended periods of dry weather.								
Abamectin	6	Contact & Ingestion	H:14 NG	A	ALL	Registered in avocados for control of **Tea Red Spider Mite**. Apply as a foliar spray at the first signs of infection and before severe infestation. For good control apply in early spring. Do not apply more than 2 applications per crop. Applications should be applied 14-28 days apart.	M Bee H	-
Abamectin (PER14618)	6	Contact & Ingestion	H:14 NG	A	ALL (excl. VIC)	Permitted in avocados for control of **Tea Red Spider Mite** and Six Spotted Mite. Apply maximum 2 applications per crop. Applications should be applied 14 - 28 days apart. Apply with summer oil. Apply at the first signs of infection and before severe infestation. For good control apply in early spring. Use now registered by APVMA permit to label project.	M Bee H	-
Fenbutatin Oxide (Torque)	12A	Contact	14	A	QLD, NSW, & WA	Registered in avocados for control of **Tea Red Spider Mite** and Six Spotted Mite. Apply at first sign of mite activity and repeat as infestations indicate. Spot spray individual trees only. Two applications 14 days apart is normally adequate to control these pests.	L Bee L	R2
Potassium Salts of Fatty Acid (Natrasoap)		Contact	NR	A	ALL	Soft option registered in fruit trees for control of Aphids, Thrips, Mealybug, Two-Spotted Mite, **Spider Mite** and Whitefly. Apply as a cover spray. Treatments per season not limited.	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	Contact / IGR	H:14 NG	P-A	WA only	Permit application submitted to extend current permit for Six Spotted Mite to include Tea Red Spider Mite and extend to all states.	L Bee VL	-
Beauveria bassiana (Velifer) BASF	UN			P		Registered for suppression of Onion Thrips and Western Flower Thrips in protected vegetables and ornamentals and has activity on Thrips, Aphids, Whitefly and Mites. No MRLs required for a biological product.	L Bee L	-
Bifenazate (Acramite) UPL	20D	Contact & Ingestion		P		Permit application submitted to the APVMA for Tea Red Spider Mite and Six Spotted Mite (all states).	L Bee H	R3
Diafenthiuron + Cyantraniliprole (Minecto Forte) Syngenta	12A+28	Ingestion & Contact		P		Registration progressing for control of various Lepidoptera, Aphids and Mites in fruiting vegetables and cucurbits. No MRLs in place for AU or Codex.	M Bee VH	-
Spiromesifen (Oberon) Bayer	23	Ingestion		P		Not currently registered in AU but under development with Bayer and Hort Innovation for multiple commodities. US registrations for mites in various crops. No MRLs in place for AU or Codex.	M Bee VL	-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.		-
Six-Spotted Mite *(Eotetranychus sexmaculatus)* **Priority: Moderate**								
Six-Spotted Mite is a moderate issue in the lower south west of WA (Pemberton) and a low pest issue in Eastern Australia. Six-spotted mite can defoliate avocado trees in the lower south-west of Western Australia. Avocados are particularly susceptible to the mite and low numbers can defoliate trees, exposing fruit to sunburn. The use of miticides has been required to prevent defoliation by Six-Spotted Mite. The use of predatory mite releases has proven unsuccessful in controlling Six Spotted Mite.								
Abamectin (PER14618)	6	Contact & Ingestion	H:14 NG	A	ALL (excl. VIC)	Permitted in avocados for control of Tea Red Spider Mite and **Six Spotted Mite**. Apply maximum 2 applications per crop. Applications should be applied 14 - 28 days apart. Apply with summer oil. Apply at the first signs of infection and before severe infestation. For good control apply in early spring. Use now registered by APVMA permit to label project.	M Bee H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Etoxazole (Paramite) PER85167	10B	Contact / IGR	H:14 NG	A	WA only	Permitted in avocados for control of **Six Spotted Mite**. Apply as foliar cover spray when mites first appear to prevent defoliation. DO NOT apply more than 1 application per season. Requested to add Tea Red Spider Mite and extend jurisdiction to all states in new permit submission.	L Bee VL	-
Fenbutatin Oxide (Torque)	12A	Contact	14	A	QLD, NSW & WA	Registered in avocados for control of Tea Red Spider Mite and **Six Spotted Mite**. Apply at first sign of mite activity and repeat as infestations indicate. Spot spray individual trees only. Two applications 14 days apart is normally adequate to control these pests.	L Bee L	R2
Potassium Salts of Fatty Acid (Natrasoap)		Contact	NR	A	ALL	Soft option registered in fruit trees for control of Aphids, Thrips, Mealybug, Two-Spotted Mite, **Spider Mite** and Whitefly. Apply as a cover spray. Treatments per season not limited.	L Bee L	-
Beauveria bassiana (Velifer) BASF	UN			P		Registered for suppression of Onion Thrips and Western Flower Thrips in protected vegetables and ornamentals and has activity on Thrips, Aphids, Whitefly and Mites. No MRLs required for a biological product.	L Bee L	-
Bifenazate (Acramite) UPL	20D	Contact & Ingestion		P		Permit application submitted to the APVMA for Tea Red Spider Mite and **Six Spotted Mite** (All states).	L Bee H	R3
Diafenthiuron + Cyantraniliprole (Minecto Forte) Syngenta	12A+28	Ingestion & Contact		P		Registration progressing for control of various Lepidoptera, Aphids and Mites in fruiting vegetables and cucurbits. No MRLs in place for AU or Codex.	M Bee VH	-
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. No MRLs in place for AU or Codex.	M Bee VL	-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.		-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Greenhouse Thrips *(Heliothrips haemorrhoidalis)* **Priority: Moderate**								
Rated as a moderate priority in QLD only, low priority in other growing regions. Sporadic pest that can cause direct feeding damage to fruit as it matures.								
Potassium Salts of Fatty Acid (Natrasoap)		Contact	NR	A	ALL	Soft option registered in fruit trees for control of Aphids, **Thrips**, Mealybug, Two-Spotted Mite, Spider Mite and Whitefly. Apply as a cover spray. Treatments per season not limited.	L Bee L	-
Pyrethrins (Pyganic)	3A	Contact	NR	A	ALL	Registered in avocados for control of **Greenhouse Thrips**. Control may be expected to last 24-72 hours only. Treat when pest first observed on fruit. Repeat applications may be necessary. Treatments per season not limited.	VH Bee H	-
Acetamiprid + Pyriproxyfen (Trivor)	4A+7C	Ingestion / IGR	28	P-A	ALL	Registered in avocados for control of Fruit Spotting Bugs, Oleander Scale, Pink Wax Scale, Mediterranean Fruit Fly and Queensland Fruit Fly. Registered for control of Kellys Citrus Thrips in citrus.	M Bee H	R2
Spinetoram (Success Neo)	5	Ingestion	NR	P-A	ALL	Registered in avocados for control of Avocado Leafroller, Ivy Leafroller, Light Brown Apple Moth and Loopers. Registered for control of thrips in various crops.	M Bee VH	-
Beauveria bassiana (Velifer) BASF	UN			P		Registered for suppression of Onion Thrips and Western Flower Thrips in protected vegetables and ornamentals and has activity on Thrips, Aphids, Whitefly and Mites. No MRLs required for a biological product.	L Bee L	-
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
Queensland Fruit Fly *(Bactrocera tryoni)* **Mediterranean Fruit Fly** *(Ceratitis capitata)* **Priority: Moderate**								
Fruit Flies frequent avocado crops but they cause limited economic damage in crop. QLD Fruit Fly is deemed high priority in Southern QLD and moderate priority in NSW. Mediterranean Fruit Fly is rated a low priority in all areas, but it is of greater concern to WA growers as they need to pick fruit green to comply with interstate quarantine requirements. Post-harvest treatments for Fruit Fly are required as a biosecurity measure for interstate and overseas exports.								
Acetamiprid + Pyriproxyfen (Trivor)	4A+7C	Ingestion / IGR	28	A	ALL	Registered in avocados for control of Banana Spotting Bug, Fruit Spotting Bug, Oleander Scale, Pink Wax Scale, **Queensland Fruit Fly** and **Mediterranean Fruit Fly**. Apply when monitoring indicates fruit fly activity. Apply in rotation with insecticides from a different mode of action using a 7 day spray interval. DO NOT use more than 2 applications per season.	M Bee H	R2
Chlorpyrifos (Lorsban)	1B	Contact	7	A	QLD & NSW	Registered in avocados for control of Avocado Leafroller, Ivy Leafroller, Latania Scale, Hairy Caterpillars, Light Brown Apple Moth, Red Shouldered Leaf Beetle and **Queensland Fruit Fly**. Apply weekly as a strip or a patch low on the tree. Avoid contact with fruit. Treatments per season not limited.	H Bee H	R1
Dimethoate	1B	Contact	7	A	QLD & WA	Registered in avocados for control of **Queensland Fruit Fly**. Apply when pests first appear and repeat as necessary. Treatments per season not limited.	H Bee H	R1
Dimethoate	1B	Contact / Post-Harvest Dip	NR	A	NSW & WA	Registered as a post-harvest treatment in avocados for **Queensland Fruit Fly**. Dip the fruit for 1 minute and allow to drain before packing.	H Bee H	R1
Trichlorfon (Lepidex) (PER12450)	1B	Contact	2	A	ACT, NSW, NT, QLD, SA & WA	Permitted in avocados for control of **Queensland Fruit Fly** and **Mediterranean Fruit Fly**. Apply as a cover spray. Repeat at half concentration every 7-10 days. Apply a maximum of 4 applications per season.	H Bee H	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Two Spotted Mite *(Tetranychus urticae)* **Priority: Low**								
Not a frequent pest of avocado. Moderate priority in Far North QLD, low priority in all other growing regions.								
Potassium Salts of Fatty Acid (Natrasoap)		Contact	NR	A	ALL	Soft option registered in fruit trees for control of Aphids, Thrips, Mealybug, **Two-Spotted Mite**, Spider Mite and Whitefly. Apply as a cover spray. Treatments per season not limited.	L Bee L	-
Abamectin (PER14618)	6	Contact & Ingestion	H:14 NG	P-A	ALL (excl. VIC)	Permitted in avocados for control of Tea Red Spider Mite. Registered for control of Two Spotted Mite in various crops. Permit application submitted to the APVMA to request to add control of Six-Spotted Mite to current permit for Tea Red Spider Mite (All States).	M Bee H	-
Etoxazole (Paramite) (PER85167)	10B	Contact / IGR	H:14 NG	P-A	WA only	Permitted in avocados for control of Six-Spotted Mite in WA. Registered for control of Two Spotted Mite in various crops. Permit application submitted to the APVMA to request to extend current permit for Six Spotted Mite to include Tea Red Spider Mite and extend to all states.	L Bee VL	-
Red-Banded Thrips *(Selenothrips rubrocinctus)* **Priority: Low**								
Sporadic pest that can cause direct feeding damage to fruit as it matures. Rated as moderate priority in QLD only, low priority in other growing regions.								
Methidathion (Suprathion)	1B	Contact	7	A	QLD & WA	**Note: Suprathion Registration Cancelled by ADAMA and the use of Suprathion will not be permitted after 4-Feb-21.** Previously registered in avocados for control of Banana Spotting Bug, Fruit Spotting Bug, Monolepta Beetle, Latania Scale, **Red Banded Thrips** and Mealy Bug. Apply when pests are active. Repeat applications at 7-10 day intervals. Treatments per season not limited.	H Bee H	R1
Potassium Salts of Fatty Acid (Natrasoap)		Contact	NR	A	ALL	Soft option registered in fruit trees for control of Aphids, **Thrips**, Mealybug, Two-Spotted Mite, Spider Mite and Whitefly. Apply as a cover spray. Treatments per season not limited.	L Bee L	-
Acetamiprid + Pyriproxyfen (Trivor)	4A+7C	Ingestion / IGR	28	P-A	ALL	Registered in avocados for control of Fruit Spotting Bugs, Oleander Scale, Pink Wax Scale, Mediterranean Fruit Fly and Queensland Fruit Fly. Registered for control of Kellys Citrus Thrips in citrus.	M Bee H	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Beauveria bassiana (Velifer) BASF	UN			P		Registered for suppression of Onion Thrips and Western Flower Thrips in protected vegetables and ornamentals and has activity on Thrips, Aphids, Whitefly and Mites. No MRLs required for a biological product.	L Bee L	-
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.		-
Citrus Blossom Bug (*Austropeplus* spp.) **Priority: Low**								
The impact of Citrus Blossom Bug is not well understood in avocados. Current research is investigating whether it affects flowering and fruit set. It has been identified as a high priority pest in South QLD.								
Acetamiprid + Pyriproxyfen (Trivor)	4A+7C	Ingestion / IGR	28	P-A	ALL	Registered in avocados for control of Fruit Spotting Bugs, Oleander Scale, Pink Wax Scale, Mediterranean Fruit Fly and Queensland Fruit Fly.	M Bee H	R2
Beta-Cyfluthrin (Bulldock)	3A	Contact	7	P-A	ALL	Registered in avocados for control of Fruit Spotting Bug. Spray when numbers exceed threshold. Apply a maximum of 4 sprays with a minimum of 21 days between consecutive applications.	VH Bee H	-
Sulfoxaflor (Transform)	4C	Contact & Ingestion	7	P-A	ALL	Registered in avocados for control of Banana Spotting Bug and Fruit Spotting Bug. Apply as part of a season long spray programme targeting pests when active in the crop. DO NOT use more than 4 applications per season. DO NOT reapply before 21 days after each application.	M Bee VH	-
Flupyradifurone (Sivanto Prime) Bayer	4D	Ingestion / Systemic		P		Current AU registration for control of Fruit Spotting Bug in macadamia. Studies to commence June 2020 for label extension to include control of Fruit Spotting Bug and Banana Spotting Bug in Tropical and Subtropical Fruit (Inedible Peel) group.	L Bee L	-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.		-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Ivy Leafroller *(Crytoptila immersana)* **Priority: Low**								
Rated as moderate priority in QLD, but not an issue in other growing regions.								
Chlorantraniliprole (Altacor) (PER81560)	28	Ingestion	3	A	NSW, QLD & WA	Permitted in avocados for control of **Lepidopteran Pests**, including Ectropis Looper and Avocado Leaf Roller. Apply at first sign of insect pest infestation. Apply a maximum of 3 applications per season, with a 21 – 28 day interval between consecutive foliar treatments.	L Bee VL	-
Chlorpyrifos (Lorsban)	1B	Contact	7	A	QLD & NSW	Registered in avocados for control of Avocado Leafroller, **Ivy Leafroller**, Latania Scale, Hairy Caterpillars, Light Brown Apple Moth, Red Shouldered Leaf Beetle and Queensland Fruit Fly. Apply at first sign of pest activity before larvae move to fruit. Treatments per season not limited.	H Bee H	R1
Spinetoram (Success Neo)	5	Ingestion	NR	A	ALL	Registered in avocados for control of Avocado Leafroller, **Ivy Leafroller**, Light Brown Apple Moth, Loopers, Flower Eating Caterpillars, Leafrollers & Loopers, Yellow Peach Moth, Red-Banded Thrips and Sorghum Head Caterpillar. Target sprays against mature eggs and newly-hatched larvae when numbers exceed spray threshold. Apply repeat applications at 7-14 day intervals as new infestations occur. Treatments per season not limited.	M Bee VH	-
Methoxyfenozide (Prodigy)	18	Ingestion	14	P-A	ALL	Registered in avocados for control of Avocado Leafroller.	VL Bee VL	-
Tebufenozide (Mimic)	16A	Ingestion / IGR	14	P-A	ALL	Registered in avocados for control of Avocado Leafroller.	L Bee L	-
Bacillus thuringiensis subsp Kurstaki Strain Hd-1	11	Ingestion		P		Registered for control of various Lepidoptera in various crops. No MRLs required for biological product.	VL Bee VL	-
Diafenthiuron + Cyantraniliprole (Minecto Forte) Syngenta	12A+28	Ingestion & Contact		P		Registration progressing for control of various Lepidoptera, Aphids and Mites in fruiting vegetables and cucurbits. No MRLs in place for AU or Codex.	M Bee VH	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Indoxacarb + Novaluron (Plemax) Adama	22A+15	Ingestion		P		Registration pending for control of various Lepidoptera in avocados.	M Bee H	R3
NUL3445 Nufarm	TBC			P		New active in development from Nufarm with activity on Lepidoptera and various beetles.		-
Spinosad (Entrust Organic) Corteva	5	Ingestion		P		Registration pending in AU, suitable for organic growers.	L Bee L	-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.		-
Tetraniliprole (Vayego) Bayer	28			P		Registered for control of Carpophilus Beetle in almonds, Macadamia Seed Weevil in macadamia, Weevils, Codling Moth and Light Brown Apple Moth in pome fruit and Dried Fruit Beetle, Oriental Fruit Moth, Mediterranean Fruit Fly and Weevils in stone fruit. Hort Innovation has several projects underway towards assisting registration in minor crops. Data generation project to assess the efficacy on various pests in avocado due for completion November 2020.	L-M Bee VH	-
Latania Scale *(Hemiberlesia lataniae)* **Priority: Low**								
Rated as low priority in most growing regions although of higher priority in NSW. Large outbreaks have the potential to causes substantial damage to foliage and fruit.								
Chlorpyrifos (Lorsban)	1B	Contact	7	A	QLD & NSW	Registered in avocados for control of Avocado Leafroller, Ivy Leafroller, **Latania Scale**, Hairy Caterpillars, Light Brown Apple Moth, Red Shouldered Leaf Beetle and Queensland Fruit Fly. Apply when populations indicate treatment is required. Spot spray affected trees only. Repeat as necessary. Treatments per season not limited.	H Bee H	R1

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Methidathion (Suprathion)	1B	Contact	7	A	QLD & WA	**Note: Suprathion Registration Cancelled by ADAMA and the use of Suprathion will not be permitted after 4-Feb-21.** Previously registered in avocados for control of Banana Spotting Bug, Fruit Spotting Bug, Monolepta Beetle, **Latania Scale**, Red Banded Thrips and Mealy Bug. Apply when pests are active. Repeat applications at 7-10 day intervals. Treatments per season not limited.	H Bee H	R1
Petroleum Oil		Contact	1	A	QLD, NSW, ACT & WA	Registered in avocados for control of **Scale Insects**. Apply when heavy scale populations occur on stem, foliage or fruit. Do not apply if trees need watering. Application is most effective against young crawler stages. Treatments per season not limited.	L Bee L	-
Acetamiprid + Pyriproxyfen (Trivor)	4A+7C	Ingestion / IGR	28	P-A	ALL	Registered in avocados for control of Fruit Spotting Bugs, Oleander Scale, Pink Wax Scale, Mediterranean Fruit Fly and Queensland Fruit Fly. Registered for control of scale insects in citrus, grapes, macadamia and mango.	M Bee H	R2
Sulfoxaflor (Transform)	4C	Contact & Ingestion	7	P-A	ALL	Registered in avocados for control of Fruit Spotting Bugs. Registered for control of various scale insects in citrus.	M Bee VH	-
Flower-Eating Caterpillar *(Including Homoeosoma vagella & Xanthodes congenita)* **Priority: Low**								
Infrequent pest rated as moderate priority in South QLD and low in other growing regions. Controlled incidentally with insecticides targeting loopers and Avocado Leafroller.								
Chlorantraniliprole (Altacor) (PER81560)	28	Ingestion	3	A	NSW, QLD & WA	Permitted in avocados for control of **Lepidopteran Pests**, including Ectropis Looper and Avocado Leaf Roller. Apply at first sign of insect pest infestation. Apply a maximum of 3 applications per season, with a 21 – 28 day interval between consecutive foliar treatments.	L Bee VL	-
Methoxyfenozide (Prodigy)	18	Ingestion	14	P-A	ALL	Registered in avocados for control of Avocado Leafroller.	VL Bee VL	-
Spinetoram (Success Neo)	5	Ingestion	NR	P-A	ALL	Registered in avocados for control of Avocado Leafroller, Ivy Leafroller, Light Brown Apple Moth and Loopers.	M Bee VH	-
Bacillus thuringiensis subsp Kurstaki Strain Hd-1	11	Ingestion		P		Registered for control of various Lepidoptera in various crops. No MRLs required for biological product.	VL Bee VL	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Diafenthiuron + Cyantraniliprole (Minecto Forte) Syngenta	12A+28	Ingestion & Contact		P		Registration progressing for control of various Lepidoptera, Aphids and Mites in fruiting vegetables and cucurbits. No MRLs in place for AU or Codex.	M Bee VH	-
Indoxacarb + Novaluron (Plemax) Adama	22A+15	Ingestion		P		Registration pending for control of various Lepidoptera in avocados.	M Bee H	R3
NUL3445 Nufarm	TBC			P		New active in development from Nufarm with activity on Lepidoptera and various beetles.		-
Spinosad (Entrust Organic) Corteva	5	Ingestion		P		Registration pending in AU, suitable for organic growers.	L Bee L	-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.		-
Tetraniliprole (Vayego) Bayer	28			P		Registered for control of Carpophilus Beetle in almonds, Macadamia Seed Weevil in macadamia, Weevils, Codling Moth and Light Brown Apple Moth in pome fruit and Dried Fruit Beetle, Oriental Fruit Moth, Mediterranean Fruit Fly and Weevils in stone fruit. Hort Innovation has several projects underway towards assisting registration in minor crops. Data generation project to assess the efficacy on various pests in avocado due for completion November 2020.	L-M Bee VH	-
Rutherglen Bug *(Nysius vinitor)* **Priority: Low**								
Seasonal pest that can develop into large infestations. Potential to reduce fruit set and cause direct feeding damage to developing fruit. Rated moderate priority in South QLD and NSW and low priority in other regions.								
Acetamiprid + Pyriproxyfen (Trivor)	4A+7C	Ingestion / IGR	28	P-A	ALL	Registered in avocados for control of Fruit Spotting Bugs, Oleander Scale, Pink Wax Scale, Mediterranean Fruit Fly and Queensland Fruit Fly.	M Bee H	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Beta-Cyfluthrin (Bulldock)	3A	Contact	7	P-A	ALL	Registered in avocados for control of Fruit Spotting Bug. Spray when numbers exceed threshold. Apply a maximum of 4 sprays with a minimum of 21 days between consecutive applications.	VH Bee H	-
Sulfoxaflor (Transform)	4C	Contact & Ingestion	7	P-A	ALL	Registered in avocados for control of Banana Spotting Bug and Fruit Spotting Bug. Apply as part of a season long spray programme targeting pests when active in the crop. DO NOT use more than 4 applications per season. DO NOT reapply before 21 days after each application.	M Bee VH	-
Flupyradifurone (Sivanto Prime) Bayer	4D	Ingestion / Systemic		P		Current AU registration for control of Fruit Spotting Bug in macadamia. Studies to commence June 2020 for label extension to include control of Fruit Spotting Bug and Banana Spotting Bug in Tropical and Subtropical Fruit (Inedible Peel) group.	L Bee L	-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.		-
Swarming Leaf Beetle *(Rhyparida spp)* **Priority: Low**								
Rated as low priority in all regions. Commonly observed in tropical areas although they tend not to cause extensive damage to avocados. Swarms of the pest can damage the terminals during growth flushes.								
Indoxacarb (Avatar) FMC	22A	Contact & Ingestion		P		Registered in pome and stone fruit for control of Curculio Beetle and control of various weevils in asparagus, celery, grapes, pome and stone fruit and strawberries. AU MRL 0.05mg/kg, No Codex MRL in place.	L-M Bee H	R3
NUL3445 Nufarm	TBC			P		New active in development from Nufarm with activity on Lepidoptera and various beetles.		-
Tetraniliprole (Vayego) Bayer	28	Ingestion		P		Registered for control of Carpophilus Beetle in almonds, Macadamia Seed Weevil in macadamia, Weevils, Codling Moth and Light Brown Apple Moth in pome fruit and Dried Fruit Beetle, Oriental Fruit Moth, Mediterranean Fruit Fly and Weevils in stone fruit. Hort Innovation has several projects underway towards assisting registration in minor crops. Data generation project to assess the efficacy on various pests in avocado due for completion November 2020.	L-M Bee VH	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Garden Weevil *(Phlyctinus callosus)* **Priority: Low**								
Rated as low priority in all regions. Found in avocados in WA but does not cause extensive damage.								
Indoxacarb (Avatar) FMC	22A	Contact / Ingestion		P		Registered in pome and stone fruit for control of Curculio Beetle and control of various weevils in asparagus, celery, grapes, pome and stone fruit and strawberries. AU MRL 0.05mg/kg, No Codex MRL in place.	L-M Bee H	R3
NUL3445 Nufarm	TBC			P		New active in development from Nufarm with activity on Lepidoptera and various beetles.		-
Tetraniliprole (Vayego) Bayer	28	Ingestion		P		Registered for control of Carpophilus Beetle in almonds, Macadamia Seed Weevil in macadamia, Weevils, Codling Moth and Light Brown Apple Moth in pome fruit and Dried Fruit Beetle, Oriental Fruit Moth, Mediterranean Fruit Fly and Weevils in stone fruit. Hort Innovation has several projects underway towards assisting registration in minor crops. Data generation project to assess the efficacy on various pests in avocado due for completion November 2020.	L-M Bee VH	-
Silverleaf Whitefly *(Bemisia tabaci)* **Greenhouse Whitefly** *(Trialeurodes vaporariorum)* **Priority: Low**								
Whitefly are a seasonal pest that can create honeydew on leaves and fruit, but do not generally cause economic damage. Rated as low priority in all regions.								
Potassium Salts of Fatty Acid (Natrasoap)		Contact	NR	A	ALL	Soft option registered in fruit trees for control of Aphids, Thrips, Mealybug, Two-Spotted Mite, Spider Mite and **Whitefly**. Apply as a cover spray. Treatments per season not limited.	L Bee L	-
Beauveria bassiana (Velifer) BASF	UN			P		Registered for suppression of Onion Thrips and Western Flower Thrips in protected vegetables and ornamentals and has activity on Thrips, Aphids, Whitefly and Mites. No MRLs required for a biological product.	L Bee L	-
Flupyradifurone (Sivanto Prime) Bayer	4D	Ingestion / Systemic		P		Current AU registration for control of Fruit Spotting Bug in macadamia. Studies to commence June 2020 for label extension to include control of Fruit Spotting Bug and Banana Spotting Bug in Tropical and Subtropical Fruit (Inedible Peel) group. US registration for control of whitefly in various crops.	L Bee L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Yellow Peach Moth *(Conogethes punctiferalis)* **Priority: Low**								
Rated as low priority in all regions. Larvae will feed directly on fruit although do not commonly cause economic damage. Controlled incidentally with insecticides targeting loopers and Avocado Leafroller.								
Chlorantraniliprole (Altacor) (PER81560)	28	Ingestion	3	A	NSW, QLD & WA	Permitted in avocados for control of **Lepidopteran Pests**, including Ectropis Looper and Avocado Leaf Roller. Apply at first sign of insect pest infestation. Apply a maximum of 3 applications per season, with a 21 – 28 day interval between consecutive foliar treatments.	L Bee VL	-
Methoxyfenozide (Prodigy)	18	Ingestion	14	P-A	ALL	Registered in avocados for control of Avocado Leafroller. Registered for control of Yellow Peach Moth in custard apple.	VL Bee VL	-
Spinetoram (Success Neo)	5	Ingestion	NR	P-A	ALL	Registered in avocados for control of Avocado Leafroller, Ivy Leafroller, Light Brown Apple Moth and Loopers. Registered for control of Yellow Peach Moth in tropical fruit and macadamia.	M Bee VH	-
Bacillus thuringiensis subsp Kurstaki Strain Hd-1	11	Ingestion		P		Registered for control of various Lepidoptera in various crops. No MRLs required for biological product.	VL Bee VL	-
Indoxacarb + Novaluron (Plemax) Adama	22A+15	Ingestion		P		Registration pending for control of various Lepidoptera in avocados.	M Bee H	R3
NUL3445 Nufarm	TBC			P		New active in development from Nufarm with activity on Lepidoptera and various beetles.		-
Spinosad (Entrust Organic) Corteva	5	Ingestion		P		Registration pending in AU, suitable for organic growers.	L Bee L	-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for various pests including Thrips, Bugs, Mites and Caterpillars.		-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Tetraniliprole (Vayego) Bayer	28	Ingestion		P		Registered for control of Carpophilus Beetle in almonds, Macadamia Seed Weevil in macadamia, Weevils, Codling Moth and Light Brown Apple Moth in pome fruit and Dried Fruit Beetle, Oriental Fruit Moth, Mediterranean Fruit Fly and Weevils in stone fruit. Hort Innovation has several projects underway towards assisting registration in minor crops. Data generation project to assess the efficacy on various pests in avocado due for completion November 2020.	L-M Bee VH	-
Green Tree Ant *(Oecophylla smaragdina)* **Priority: Low**								
Rated as low priority in all regions. Ants can be a nuisance in orchards. The ants do not cause damage to trees.								
Pyriproxyfen (Distance Ant Bait)	7C	IGR / Bait	NR	A	ALL	Registered in Tropical Fruit Plantations for control of invasive and nuisance **ants**. Apply baits in early spring or summer at first sign of ant activity. DO NOT exceed 3 applications per year and a minimum of 3 months between each treatment.	VL Bee L	-
Metaflumizone (Siesta Ant Bait) BASF	22B	Ingestion		P		Registration pending in AU.	-	-
Leafminers (*Lyriomyza* spp.) **Priority: Low**								
Rated as low priority in all regions. *Lyriomyza* larvae feed inside the leaves causing minor damage to the tree's foliage.								
Abamectin (PER14618)	6	Contact & Ingestion	H:14 NG	P-A	ALL (excl. VIC)	Permitted in avocados for control of Tea Red Spider Mite. US registrations for *Lyriomyza* Leafminers in various crops.	M Bee H	-
Chlorantraniliprole (Altacor) (PER81560)	28	Ingestion	3	P-A	NSW, QLD & WA	Permitted in avocados for control of **Lepidopteran Pests**. Chlorantraniliprole is registered for control of Cabbage Leafminer (*Liriomyza brassicae*) in brassica vegetables and brassica leafy vegetables.	L Bee VL	-
Diafenthiuron + Cyantraniliprole (Minecto Forte) Syngenta	12A+28	Ingestion & Contact		P		Registration progressing for control of various Lepidoptera, Aphids and Mites in fruiting vegetables and cucurbits. No MRLs in place for AU or Codex.	M Bee VH	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Tetraniliprole (Vayego) Bayer	28	Ingestion		P		Registered for control of Carpophilus Beetle in almonds, Macadamia Seed Weevil in macadamia, Weevils, Codling Moth and Light Brown Apple Moth in pome fruit and Dried Fruit Beetle, Oriental Fruit Moth, Mediterranean Fruit Fly and Weevils in stone fruit. Hort Innovation has several projects underway towards assisting registration in minor crops. Data generation project to assess the efficacy on various pests in avocado due for completion November 2020.	L-M Bee VH	-
Fall Armyworm *(Spodoptera frugiperda)* **Priority: Unknown**								
Fall Armyworm has recently been detected in Australia for the first time. It has not been seen in avocado crops and the potential impact is currently unknown.								
Chlorantraniliprole (Coragen / Altacor) PER89281	28	Ingestion	3	A	ALL (excl. VIC)	Permitted in avocados for control of **Fall Armyworm**. Target sprays against eggs and newly hatched larvae before they become entrenched. Apply a maximum of 3 applications per crop.	L Bee VL	-
Methomyl (Lannate) (PER89293)	1A	Contact	3	A	ALL	Permitted in avocados for control of **Fall Armyworm**. Apply as a foliar spray. Target sprays against eggs and newly hatched larvae (prior to third instar stage) before they become entrenched. Treatments per season not limited.	H Bee H	R2
Spinetoram (Success Neo) (PER89241)	5	Ingestion	NR	A	ALL (excl. VIC)	Permitted in avocados for control of **Fall Armyworm**. Target sprays against mature eggs and newly-hatched larvae when numbers exceed spray threshold. Apply repeat applications at 7-14 day intervals as new infestations occur. Do not make more than 4 applications per season.	M Bee VH	-
Indoxacarb (Avatar)	22A	Ingestion		P		Registered in various crops for control of *Spodoptera litura*. AU MRL 0.05mg/kg, No Codex MRL in place.	L-M Bee H	R3
Spinosad (Entrust Organic) Corteva	5	Ingestion		P		Registration pending in AU, suitable for organic growers.	L Bee L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Tetraniliprole (Vayego) Bayer	28	Ingestion		P		Registered for control of Carpophilus Beetle in almonds, Macadamia Seed Weevil in macadamia, Weevils, Codling Moth and Light Brown Apple Moth in pome fruit and Dried Fruit Beetle, Oriental Fruit Moth, Mediterranean Fruit Fly and Weevils in stone fruit. Hort Innovation has several projects underway towards assisting registration in minor crops. Data generation project to assess the efficacy on various pests in avocado due for completion November 2020.	L-M Bee VH	-

4.3 Weeds in avocados

4.3.1 Weed priorities

Common Name	Scientific Name
High	
Flaxleaf Fleabane	*Conyza bonariensis*
Moderate	
Blackberry Nightshade	*Solanum nigrum*
Nutgrass	*Cyperus rotundus*

Flaxleaf Fleabane was nominated as being of high priority by growers. Blackberry Nightshade and Nutgrass were of moderate priority. Avocados have numerous surface roots that are prone to damage from herbicide contact. An integrated weed management program incorporating mulch and inter-row grass cover should reduce the need for reliance on herbicides in most orchards.

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 high priority in QLD and low priority in other regions. Flaxleaf Fleabane seeds prolifically and can germinate year-round. It is difficult to control with herbicides and a continuous program is required to manage it in the orchard.							
Flumioxazin (Chateau)	G**	Avocado / Directed Spray / Residual Weed Control	Registered in avocados for control of various grass and broadleaf weeds, including **Flaxleaf Fleabane**.	H:98 G:28	A	ALL	-
Glufosinate (Basta)	N**	Avocado / directed or shielded spray	Registered in avocados for control of various grass and broadleaf weeds, including **Flaxleaf Fleabane**. Do not allow spray to contact any part of the tree, including the trunk.	H:NR G:56	A	ALL	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Blackberry Nightshade *(Solanum nigrum)* **Priority: Moderate**							
Rated as moderate priority in all regions except Far North QLD, where it is rated low priority. Blackberry Nightshade is a prolific and widespread weed. Strategic use of herbicides along with cultural control measures are needed to manage this weed.							
Flumioxazin (Chateau)	G**	Avocado / Directed Spray / Residual Weed Control	Registered in avocados for control of various grass and broadleaf weeds, including **Blackberry Nightshade**.	H:98 G:28	A	ALL	-
Oxyfluorfen (Goal)	G**	Avocado / Directed Spray	Registered in avocadoes for control of various 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	-
Paraquat + Diquat (SpraySeed)	L**	Avocado / Directed Spray or Spot Spray	Registered in avocados for control of most grass and broadleaf weeds.	G:1	A	ALL	R3
Pendimethalin (Stomp)	D**	Avocado / Directed Spray / Residual Weed Control	Registered in avocados for control of various grass and broadleaf weeds and registered for suppression of Blackberry Nightshade in several crops.	NR	P-A	ALL	-
Nutgrass *(Cyperus rotunda)* **Priority: Moderate**							
Rated as high priority in Southern QLD and low priority in all other regions. Few options available for controlling nutgrass. Keep good ground cover and improve drainage.							
Glyphosate (Roundup)	M**	Avocado / directed spray, shielded spray or wick wiper	Registered in avocados for control of various grass and broadleaf weeds and **nutgrass**. Do not allow spray to contact any part of the tree, including the trunk. Time application to flowering nutgrass. Multiple applications will be required.	NR	A	ALL	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
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**	Avocado / directed spray	Registered in avocados 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	-
Fluazifop-P (Fusilade)	A***	Avocado / directed spray	Registered in avocados for control of **grass weeds**. Apply as a directed spray.	NR	A	NSW, QLD, NT & WA	-
Flumioxazin (Chateau)	G**	Avocado / directed spray / residual weed control	Registered in avocados for control of various **grass and broadleaf weeds**. Apply as a directed spray.	H:96 G:28	A	ALL	-
Glufosinate (Basta)	N**	Avocado / directed or shielded spray	Registered in avocados for control of various **grass and broadleaf weeds**. Do not allow spray to contact any part of the tree, including the trunk.	H:NR G:56	A	ALL	R3
Glyphosate (Roundup)	M**	Avocado / directed spray, shielded spray or wick wiper	Registered in avocados for control of various **grass and broadleaf weeds**. Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Haloxyfop (Verdiict)	A***	Avocado / directed spray or spot spray	Registered in avocados for control of **grass weeds**. Apply as a directed spray.	NR	A	ALL	-
Oryzalin	D**	Avocado / Non-Bearing Fruit / directed spray	Registered in non-fruit bearing avocado for control of various **grass and broadleaf weeds**. Apply as a directed spray.	NR	A	ALL	-
Oxyflourfen (Goal)	G**	Avocado / directed spray	Registered in avocadoes for control of various **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 various annual **grass and broadleaf weeds**. Do not allow spray to contact any part of the tree, including the trunk.	H:1 G:7	A	ALL	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Paraquat + Diquat (SpraySeed)	L**	Avocado / directed spray or spot spray	Registered in avocados for control of various annual **grass and broadleaf weeds**. Do not allow spray to contact any part of the tree, including the trunk.	G:1	A	ALL	R3
Pendimethalin (Stomp)	D**	Avocado / directed spray / residual weed control	Registered in avocados for control of various **grass and broadleaf weeds**. Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	-

4.4 Plant Growth Regulators in Avocados

4.4.1 Plant Growth Regulator Priorities

Priority
High
Fruit Drop Control
Control of Vegetative Growth
Moderate
Initiation of Flowering
Low
Promote Fruit Ripening

Plant Growth Regulators (PGRs) play an important role in managing avocado orchards. Avocados will experience rapid growth during vegetative flushes that occur during the warmer months. The first spring flush occurs shortly after flowering and fruit set. Competition between the newly set fruit and developing leaf flush has been suggested as being involved in poor fruit set. The use of PGRs is common to limit the spring flush and promote trees to retain and grow the fruit.

The avocado industry identified Fruit Drop Control and Control of Vegetative Growth as high priorities for PGRs. These two priorities are linked and addressed using similar strategies. PGRs are not the only management technique available to limit vegetative growth. Delaying or reducing nitrogen application during flowering, removing the apical bud and girdling are also used in orchards.

Initiation of Flowering was nominated as moderate priority and Promotion of Fruit Ripening was low priority. There are currently no PGRs available for these uses although irrigation, nutrition and canopy management are all critical measures for managing these issues.

4.4.2 Available and Potential Plant Growth Regulators

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Fruit Drop Control **Priority: High**							
The highest risk of fruit drop is usually during spring when trees are experiencing vegetative growth flushes. The use of Plant Growth Regulators can assist to reduce the vegetative growth and promote fruit retention.							
Paclobutrazol		Avocado	Registered in avocados for Vegetative Growth Control and **Fruit Drop Control**. For the control of vigorous growth, application is best done when in full flower. To assist fruit retention, application is best at fruit set. Do not apply when mature fruit are on the tree. Apply as a foliar spray. In some cases, control of growth may persist for more than one year. Retreat tress when normal growth resumes. Use the interval between the first treatment and resumption of normal growth as a guide for retreatment in subsequent seasons.	90	A	ALL	
Uniconazole (Sunny)		Avocados	Registered in avocados to enhance fruit shape, increase fruit size and **reduce vegetative growth**. Apply as a foliar spray at mid bloom.	14	A	ALL	
Control of Vegetative Growth **Priority: High**							
It is desirable to limit growth flushes as they divert resources away from fruit production and increase the need for mechanical pruning post-harvest. Limiting the first spring flush of foliar growth is believed to promote better fruit retention and fruit growth.							
Paclobutrazol		Avocado	Registered in avocados for **Vegetative Growth Control** and Fruit Drop Control. For the control of vigorous growth, application is best done when in full flower. To assist fruit retention, application is best at fruit set. Do not apply when mature fruit are on the tree. Apply as a foliar spray. In some cases, control of growth may persist for more than one year. Retreat tress when normal growth resumes. Use the interval between the first treatment and resumption of normal growth as a guide for retreatment in subsequent seasons.	90	A	ALL	

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Paclobutrazol PER85877		Avocado Orchards / High Density Plantings Only	Permitted in avocados for vegetative growth management. Apply to trees less than 2.5m high as a soil drench around the base of each tree trunk. Apply in spring or early summer, or at an early vegetative flush state. Control of growth may persist for more than one year. Only retreat when necessary (e.g. when excessive vegetative growth resumes).	NR NG	A	ALL (excl. VIC)	

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 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/pesticides/en/
Cotton Pest Management Guide 2018-19	https://www.cottoninfo.com.au/publications/cotton-pest-management-guide
CropLife Australia	https://www.croplife.org.au/
Growcom – Infopest Database	www.infopest.com.au
Hort Innovation	www.horticulture.com.au

5.2 Abbreviations and Definitions:

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

5.3 Acknowledgements:

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

Appendix 1. Products available for disease control in avocados

Active Ingredient (Trade Name)	Chemical group	Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Azoxystrobin (Amistar)	11	Avocado	Anthracnose Stem End Rot	ALL	7	
Bacillus amyloliquefaciens Strain QST 713 (Serenade Opti)	44	Avocado	Anthracnose Stem End Rot	ALL	NR	
Bacillus amyloliquefaciens Strain QST 713 (Serenade Prime)	44	Tree Crops	For soil application to improve bioavailability of soil resources for horticultural crops	ALL	NR	
Bromo Chloro Dimethyl Hydatoin (BCDMH)		Sanitiser / Post-Harvest Treatment	External Rot Causing Organisms	ALL	NR	
Chlorine		Sanitiser / Post-Harvest Treatment	Bacteria and Fungi	ALL	NR	
Copper (Cu) Present as Copper Ammonium Acetate	M1	Avocado	Anthracnose Cercospora Spot Sooty Blotch Phytophthora Stem Canker	ALL	1	
Copper (Cu) present as copper oxychloride	M1	Avocado	Anthracnose	ALL	1	
Copper (Cu) present as cuprous oxide	M1	Avocado	Anthracnose Phytophthora Stem Canker	ALL	1	
Copper (Cu) Present as Cupric Hydroxide	M1	Avocado	Anthracnose Phytophthora Stem Canker	ALL	1	
Copper (Cu) Present as Tribasic Copper Sulphate	M1	Avocado	Leaf Curl	ALL	1	
Didecyl dimethyl ammonium chloride (DDAC)		Sanitiser / Post-Harvest Treatment	Control of post-harvest decay	ALL	NR	

Active Ingredient (Trade Name)	Chemical group	Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Fludioxonil + Azoxystrobin (Graduate A+)	12+11	Avocado / Post-harvest dip, drench or spray	Anthracnose Stem End Rot	ALL	NR	
Fosetyl Aluminium (Aliette)	33	Avocado	Phytophthora Root Rot	QLD, NSW, SA, VIC & WA	1	
Metalaxyl-M (Ridomil Gold)	4	Avocado	Phytophthora Root Rot	QLD, NSW, SA & WA	7	
Peroxyacetic Acid		Sanitiser / Post-Harvest Treatment	Bacteria	ALL	NR	
Phosphorous (Phosphonic) Acid as Mono-Di K Phosphonate	33	Avocado	Phytophthora Root Rot	QLD, NSW, SA, Vic & WA	G:14	
Prochloraz (Sportak)	3	Avocado / Post-Harvest	Anthracnose Stem End Rot	QLD, NSW, WA & NT	NR	
Thiram	M3	Avocado	Anthracnose Stem End Rot	ALL	7	R2

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

Active Ingredient (Trade Name)	Chemical group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Abamectin	6	Avocado	Tea Red Spider Mite	ALL	H:14 NG	
Abamectin PER14618	6	Avocado	Tea Red Spider Mite Six Spotted Mite	ALL (excl. VIC)	H:14 NG	
Acetamiprid + Pyriproxyfen (Trivor)	4A+7C	Avocado	Banana Spotting Bug Fruit Spotting Bug Oleander Scale Pink Wax Scale Queensland Fruit Fly Mediterranean Fruit Fly	ALL	28	R2
Beta-Cyfluthrin (Bulldock)	3A	Avocado	Fruit Spotting Bug	ALL	7	
Carbaryl (Bugmaster)	1A	Avocado	Redshouldered Leaf Beetle Wingless Grasshoppers	ALL	3	
Chlorantraniliprole (Altacor) PER81560	28	Avocado	Lepidopteran Pests including: Ectropis looper Avocado leaf roller	NSW, QLD & WA	3	
Chlorantraniliprole (Coragen / Altacor) PER89281	28	Avocado	Fall Armyworm	ALL (excl. VIC)	3	
Chlorpyrifos (Lorsban)	1B	Avocado	Avocado Leafroller Ivy Leafroller Latania Scale Hairy Caterpillars Light Brown Apple Moth Redshouldered Leaf Beetle Queensland Fruit Fly	QLD & NSW	7	R1
Dimethoate	1B	Avocado	Queensland Fruit Fly	QLD & WA	7	R1

Active Ingredient (Trade Name)	Chemical group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Dimethoate	1B	Avocado / Post-harvest Dip	Queensland Fruit Fly	NSW & WA	NR	R1
Etoxazole (Paramite) PER85167	10B	Avocado	Six Spotted Mite	WA	H:14 NG	
Fenbutatin Oxide (Torque)	12A	Avocado	Tea Red Spider Mite Six Spotted Mite	QLD, NSW & WA	14	R2
Methidathion (Suprathion) **Note: Suprathion Registration Cancelled by ADAMA and the use of Suprathion will not be permitted after 4-Feb-21.**	1B	Avocado	Banana Spotting Bug Fruit Spotting Bug Monolepta Beetle Latania Scale Red Banded Thrips Mealy Bug	QLD & WA	7	R1
Methomyl (Lannate) PER14597	1A	Avocado	Ectropis Looper	NSW &QLD	3	R2
Methomyl (Lannate) PER89293	1A	Avocado	Fall Armyworm	ALL	3	R2
Methoxyfenozide (Prodigy)	18	Avocado	Avocado Leafroller	ALL	14	
Petroleum Oil		Avocado	Scale Insects	QLD, NSW & WA	1	
Potassium Salts of Fatty Acid (Natrasoap)		Fruit Trees	Aphids Thrips Mealybug Two-Spotted Mite Spider Mite Whitefly	ALL	NR	
Pyrethrins (Pyganic)	3A	Avocado	Greenhouse Thrips	ALL	NR	

Active Ingredient (Trade Name)	Chemical group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Pyriproxyfen (Distance Ant Bait)	7C	Tropical Fruit Plantation / Ant Bait	Invasive and Nuisance Ants	ALL	NR	
Spinetoram (Success Neo)	5	Avocado	Avocado Leafroller Ivy Leafroller Light Brown Apple Moth Loopers	ALL	NR	
		Tropical & Sub-Tropical Fruit Crops (inedible peel)	Flower Eating Caterpillars Leafrollers & Loopers Yellow Peach Moth Red-Banded Thrips Sorghum Head Caterpillar			
Spinetoram (Success Neo) PER89241	5	Tropical & Sub-Tropical Fruit Crops (inedible peel)	Fall Armyworm	ALL (excl. VIC)	NR	
Sulfoxaflor (Transform)	4C	Avocado	Banana Spotting Bug Fruit Spotting Bug	ALL	7	
Tebufenozide (Mimic)	16A	Avocado	Avocado Leafroller	ALL	14	
Trichlorfon (Lepidex)	1B	Avocado	Fruit Spotting Bug Monolepta Beetle	QLD, NSW & NT	2	R2
Trichlorfon (Lepidex) PER12450	1B	Specified Fruit Crops / Avocado	Queensland Fruit Fly Mediterranean Fruit Fly	ACT, NSW, NT, QLD, SA & WA	7	R2

Appendix 3. Products available for weed control in avocados

Active ingredient (Trade Name)	Chemical Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Carfentrazone-Ethyl (Spotlight)	G	Avocado / directed spray or spot spray	If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	NR	ALL	
Fluazifop-P (Fusilade)	A	Avocado / directed spray	Grass Weeds	NR	NSW, QLD, NT & WA	
Flumioxazin (Chateau)	G	Avocado / directed spray / Residual Weed Control	Grass and Broadleaf Weeds	H:98 G:28	ALL	
Glyphosate (Roundup)	M	Avocado / 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
Glufosinate (Basta)	N	Avocado / 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
Haloxyfop (Verdict)	A	Avocado / directed spray or spot spray	Grass weeds	NR	ALL	
Oryzalin	D	Avocado / Non-Bearing Fruit / directed spray	Grass and broadleaf weeds	NR	ALL	
Oxyfluorfen (Goal)	G	Avocado / 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 + Diquat (SpraySeed)	L	Avocado / directed spray or spot spray	Grass and Broadleaf Weeds	G:1	ALL	R3
Pendimethalin (Stomp)	D	Avocado / 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	

Appendix 4. Plant Growth Regulators available in avocado

Active ingredient (Trade Name)	Chemical Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Paclobutrazol		Avocado	Vegetative Growth Control Fruit Drop Control	90	ALL	
Paclobutrazol PER85877		Avocado orchards / High Density Plantings Only	Vegetative Growth Management	NR NG	ALL (excl. VIC)	
Uniconazole-P (Sunny)		Avocados	Enhance Fruit Shape and Increase Fruit Size Reduce Vegetative Growth	14	ALL	

Appendix 5. Current permits for use in avocados

Permit ID	Description	Date Issued	Expiry Date	Permit holder
PER12450 Version 6	Trichlorfon / Specified Fruit crops / Fruit fly	06-Oct-11	31-Jan-21	Growcom
PER87164 Version 2	Dimethoate / Specified Citrus and Tropical & Sub-Tropical Inedible Peel Fruit commodities - post-harvest dip or flood spray / Various Fruit Fly species	1-Mar-19	31-Mar-24	Hort Innovation
PER14597 Version 2	Methomyl / Avocado / Ectropis looper. NSW & QLD only	01-Apr-14	31-Mar-22	Hort Innovation
PER14618 Version 4	Abamectin / Avocado / Tea Red Spider Mite	09-Feb-15	30-Jun-25	Hort Innovation
PER13859	Dimethoate / Orchard clean-up - fruit fly host crops following harvest / Fruit Fly	9-Feb-15	31-Jul-24	Growcom
PER81560	Chlorantraniliprole (Dupont Altacor Hort Insecticide) / Avocado / Lepidopteran pests including Ectropis looper & Avocado leaf roller	13-May-16	30-Apr-21	AAL
PER85167 Version 2	Etoxazole / Avocados / Six-spotted mite (WA only)	26-Sep-17	30-Sep-21	AAL C/Hort Innovation
PER85877	Paclobutrazol (soil drench application) / Avocado orchards (high density plantings only) / Vegetative growth management	29-Aug-18	31-Aug-23	AAL C/Hort Innovation
PER89241	Spinetoram / Various including Avocado / Fall Armyworm	6-Mar-20	31-Mar-23	Hort Innovation
PER89281	Chlorantraniliprole (Coragen/Altacor Hort Insecticide) / Avocado / Fall Armyworm (*Spodoptera frugiperda*)	13-Mar-20	31-Mar-23	Hort Innovation
PER89293	Methomyl / Avocado / Fall Armyworm (Spodoptera frugiperda)	10-Apr-20	30-Apr-23	Hort Innovation

Appendix 6. Avocado Maximum Residue Limits (MRLs)

CODEX commodity groupings of Avocadoes and subgroups:

FI 0326 Avocado
AO2 0002 Fruits
FI 0030 Tropical - inedible peel

Note: Major export markets for avocados include Malaysia and Singapore. Available information indicates that in the absence of specific limits in legislation, that most countries defer to Codex, followed by EU MRL standards, or apply a 0.01ppm default value. Food exported to New Zealand from Australia may be legally sold if it complies with Australian requirements. MRLs and legislation are subject to change; the values presented should not be relied on.

Chemical	Codex Code	Description	APVMA MRL mg/kg	Codex MRL mg/kg
2,2-DPA	FI 0326	Avocado	*0.1	-
Abamectin	FI 0326	Avocado	T0.05	0.01
Acetamiprid	FI 0326	Avocado	0.05	-
Aldrin and Dieldrin		Fruits	E0.05	-
Amitrole	FI 0326	Avocado	*0.01	-
Azoxystrobin	FI 0326	Avocado	3	-
Bifenthrin	FI 0326	Avocado	T0.1	-
Bromide Ion	FI 0326	Avocado	-	75
	AO2 0002	Fruits	-	20
Buprofezin	FI 0326	Avocado	-	0.1
Carbaryl	FI 0326	Avocado	2	-
Carfentrazone-ethyl	FI 0030	Tropical - inedible peel	*0.05	-
Chlorantraniliprole	FI 0326	Avocado	T2	-
Chlorpyrifos	FI 0326	Avocado	0.5	-
Clothianidin	FI 0326	Avocado	-	0.03
Cyfluthrin	FI 0326	Avocado	0.1	-
Cypermethrin	FI 0326	Avocado	T0.2	-
Cyprodinil	FI 0326	Avocado	-	1
DDT		Fruits	E1	-
Diazinon		Fruits	0.5	-
Dicofol		Fruits	5	-
Didecyl dimethyl ammonium chloride (DDAC)	FI 0030	Tropical - inedible peel	20	-
Difenoconazole	FI 0326	Avocado	0.5	0.6
Dimethoate see also Omethoate	FI 0326	Avocado	3	-
Diquat		Fruits	*0.05	-
Dithianon		Fruits	2	-
Dithiocarbamates (mancozeb, metham, metiram, thiram, zineb and ziram)	FI 0326	Avocado	7	-
Endosulfan	FI 0326	Avocado	-	0.5
Epoxiconazole	FI 0326	Avocado	0.5	-

Chemical	Codex Code	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Etoxazole	FI 0326	Avocado	T0.1	-
Fenbutatin oxide	FI 0030	Tropical - inedible peel	5	-
Fenpyroximate	FI 0326	Avocado	-	0.2
Fluazifop-p-butyl	FI 0326	Avocado	*0.02	-
Fludioxonil	FI 0326	Avocado	2	1.5
Flumioxazin	FI 0326	Avocado	*0.02	-
Fluopyram	FI 0030	Tropical - inedible peel	T2	-
Fosetyl	FI 0326	Avocado	5	-
Fosetyl Al	FI 0326	Avocado	-	20
Glufosinate and Glufosinate ammonium	FI 0030	Tropical - inedible peel	0.2	-
Glufosinate-Ammonium	FI 0030	Tropical - inedible peel	-	0.1
Glyphosate	FI 0326	Avocado	*0.05	-
Haloxyfop	FI 0030	Tropical - inedible peel	*0.05	-
Inorganic bromide	FI 0326	Avocado	75	-
Isoxaben	FI 0030	Tropical - inedible peel	*0.01	-
Lindane		Fruits	E0.5	-
Maldison		Fruits	2	-
Metalaxyl	FI 0326	Avocado	0.5	0.2
Metaldehyde		Fruits	1	-
Methidathion	FI 0326	Avocado	0.5	-
Methiocarb		Fruits	T0.1	-
Methomyl see also Thiodicarb	FI 0326	Avocado	*0.1	-
Methoxyfenozide	FI 0326	Avocado	0.5	0.7
Methyl bromide		Fruits	*T0.05	-
Omethoate		Fruits	2	-
Oryzalin		Fruits	0.1	-
Oxyfluorfen	FI 0030	Tropical - inedible peel	*0.01	-
Paclobutrazol	FI 0326	Avocado	0.1	-
Paraquat		Fruits	*0.05	-
	FI 0030	Tropical - inedible peel		*0.01
Pendimethalin	FI 0030	Tropical - inedible peel	*0.05	-
Phosphine	FI 0030	Tropical - inedible peel	*T0.01	-
Phosphorous acid	FI 0326	Avocado	500	-
Piperonyl butoxide		Fruits	8	-
Pirimicarb		Fruits	0.5	-
Prochloraz	FI 0326	Avocado	5	-
	FI 0030	Tropical - inedible peel	-	Po7
Propiconazole	FI 0326	Avocado	*0.02	-
Pyraclostrobin	FI 0326	Avocado	-	0.2
Pyrethrins		Fruits	1	-
Pyriproxyfen	FI 0326	Avocado	0.05	-
Simazine		Fruits	*0.1	-
Spinetoram	FI 0030	Tropical - inedible peel	0.3	-

Chemical	Codex Code	Description	APVMA MRL mg/kg	Codex MRL mg/kg
	FI 0326	Avocado	-	0.3
Spinosad	FI 0030	Tropical - inedible peel	0.3	-
Spirodiclofen	FI 0326	Avocado	-	0.9
Spirotetramat	FI 0326	Avocado	-	0.4
Sulfoxaflor	FI 0326	Avocado	0.3	-
Tebuconazole	FI 0326	Avocado	0.2	-
Tebufenozide	FI 0326	Avocado	0.5	1
Thiabendazole	FI 0326	Avocado	-	Po15
Thiamethoxam	FI 0326	Avocado	-	0.5
Trichlorfon	FI 0030	Tropical - inedible peel	T3	-
Trifloxystrobin	FI 0030	Tropical - inedible peel	T2	-
Trifluralin		Fruits	*0.05	-
Uniconazole-p	Fl 0326	Avocado	0.5	-

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 "Assorted tropical and sub-tropical fruits - inedible peel" and "Fruits" listed above, (avocado) crop group exclusions (if any) have not been specified.

* 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 7. Avocado regulatory risk assessment

Avocado
Agrichemical Regulatory
Risk assessment

July 2019

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 avocados as well as current initiatives aimed at addressing identified pest management deficiencies.

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.

Avocado 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				
Beetles				
Red shouldered leaf beetle	Carbaryl	**1A**	Canada – Review recently completed, use acceptable Europe – deregistered	**Note: Suprathion Registration Cancelled by ADAMA and the use of Suprathion will not be permitted after 4-Feb-21.**
	Chlorpyrifos	**1B**	APVMA: Currently under review,outcome uncertain. Potential issues w.r.t. environmental loading and dietary exposure. EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
	Methidathion	**1B**	Use will not be permitted in AU after 4 February 2021. Registrant will remove from sale and all authorisations will be cancelled. Europe – Deregistered USA - Deregistered	
	Trichlorfon	**1B**	APVMA – nominated for review Codex – No MRLs Europe – Deregistered US – No MRLs	

Avocado regulatory risk assessment

Problem	Active Constituents	Chemical Group	Comment	Activities
Lepidoptera				
Avocado leafroller	Chlorantraniliprole (PER81560)	**28**		NEW- Bayer Tetraniliprole (Vayego) Label registration Hort Innovation project – ST17000 Assorted tropical fruits- inedible peel / Lepidoptera including avocado leafrollers loopers & flower eating caterpillar
	Chlorpyrifos	**1B**	APVMA: Currently under review,outcome uncertain. Potential issues w.r.t. environmental loading and dietary exposure. EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
	Methoxyfenozide	**18**		
	Spinetoram	**5**		
Caterpillars	Chlorantraniliprole (PER81560)	**28**		
Ectropis looper	Chlorantraniliprole (PER81560)	**28**		
	Methomyl (PER14597)	**1A**	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed	
	Spinetoram	**5**		
Flower eating caterpillars	Spinetoram	**5**		
Hairy leaf eating caterpillar	Chlorpyrifos	**1B**	APVMA: Currently under review,outcome uncertain. Potential issues w.r.t. environmental loading and dietary exposure. EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
Ivy leafroller	Chlorpyrifos	**1B**		
	Spinetoram	**5**		
Leafroller (Tortrix) caterpillars	Spinetoram	**5**		
	Tebufenozide	**18**		
Leafroller moths	Spinetoram	**5**		

Problem	Active Constituents	Chemical Group	Comment	Activities
Lightbrown apple moth	Chlorpyrifos	**1B**	APVMA: Currently under review,outcome uncertain. Potential issues w.r.t. environmental loading and dietary exposure. EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
	Spinetoram	**5**		
Loopers	Spinetoram	**5**		
Sorghum head caterpillar	Spinetoram	**5**		
Yellow peach moth	Spinetoram	**5**		
Fruit fly				
Lesser Queensland fruit fly	Dimethoate	**1B**	Codex: MRL deletion recommended. EU proposing to set all MRLs to < 0.01 mg/kg	
Mediterranean fruit fly	Acetamiprid + pyriproxyfen	**4A + 7C**	APVMA announced review in December 2019	
	Dimethoate	**1B**	Codex: MRL deletion recommended. EU proposing to set all MRLs to < 0.01 mg/kg	
	Trichlorfon (PER12450)	**1B**	APVMA – nominated for review Codex – No MRLs Europe – deregistered US – No MRLs	
Northern Territory fruit fly	Dimethoate	**1B**	Codex: MRL deletion recommended. EU proposing to set all MRLs to < 0.01 mg/kg	
Queensland fruit fly	Acetamiprid + pyriproxyfen	**4A + 7C**	APVMA announced review in December 2019	
	Chlorpyrifos	**1B**	APVMA: Currently under review,outcome uncertain. Potential issues w.r.t. environmental loading and dietary exposure. EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
	Trichlorfon (PER12450)	**1B**	APVMA – nominated for review Codex – No MRLs Europe – deregistered US – No MRLs	

Avocado regulatory risk assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
Mites				
Six-spotted mite	Etoxazole (PER85167)	**10B**	EU: Being phased-out	Hort Innovation project MT17012 to support six-spotted mite and tea red spider mite permits and a new permit for bifenazate for both mite species in all States
	Fenbutatin oxide	**12B**	APVMA – Nominated for review Codex – To be reviewed in 2021 (Registrant support uncertain) Europe deregistered	
Tea red spider mite	Abamectin (PER14618)	**6**		
	Fenbutatin oxide	**12B**	APVMA – Nominated for review Codex – To be reviewed in 2021 (Registrant support uncertain) Europe deregistered	
Plant bugs				
Banana-spotting bug	Acetamiprid + pyriproxyfen	**4A + 7C**	APVMA announced review in December 2019	SYNFOI21 (Syngenta) New MOA under development for a Registration for Fruit Spotting Bugs and various other pests. New Label Registration Bayer DC-154 (Sivanto) Flupyradiforone Group 4D (Bayer) **Note: Suprathion Registration Cancelled by ADAMA and the use of Suprathion will not be permitted after 4-Feb-21.**
	Methidathion	**1B**	Use will not be permitted in AU after 4 February 2021. Registrant will remove from sale and all authorisations will be cancelled. Europe – Deregistered USA - Deregistered	
	Sulfoxaflor	**4C**	USA – Pollinator concerns	
Fruit spotting bug	Acetamiprid + pyriproxyfen	**4A + 7C**	APVMA announced review in December 2019	
	Beta-cyfluthrin	**3A**	EU: No authorisation in place	
	Methidathion	**1B**	Use will not be permitted in AU after 4 February 2021. Registrant will remove from sale and all authorisations will be cancelled. Europe – Deregistered USA - Deregistered	
	Sulfoxaflor	**4C**	USA – Pollinator concerns	
	Trichlorfon	**1B**	APVMA – nominated for review Codex – No MRLs Europe – deregistered US – No MRLs Registrant support uncertain	

Avocado regulatory risk assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
Scale insects				
Scale insects	Paraffinic/petroleum oil	-		**Note: Suprathion Registration Cancelled by ADAMA and the use of Suprathion will not be permitted after 4-Feb-21.**
Fiorinia scale	Chlorpyrifos	**1B**	APVMA: Currently under review,outcome uncertain. Potential issues w.r.t. environmental loading and dietary exposure. EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
Latania scale	Chlorpyrifos	**1B**		
Latania scale	Methidathion	**1B**	Use will not be permitted in AU after 4 February 2021. Registrant will remove from sale and all authorisations will be cancelled. Europe – Deregistered USA - Deregistered	
Oleander scale	Acetamiprid + pyriproxyfen	**4A + 7C**	APVMA announced review in December 2019	
Pink wax scale	Acetamiprid + pyriproxyfen	**4A + 7C**	APVMA announced review in December 2019	
Thrips				
Greenhouse thrips	Pyrethrins	**3A**		SYNFOI21 (Syngenta) New MOA under development in Assorted tropical and sub-tropical fruits - inedible peel Label Registration for Fruit Spotting Bugs and various other pests.
Redbanded thrips	Methidathion	**1B**	Use will not be permitted in AU after 4 February 2021. Registrant will remove from sale and all authorisations will be cancelled. Europe – Deregistered USA - Deregistered	
	Spinetoram	**5**		
Other				
Wingless grasshopper	Carbaryl	**1A**	Canada – Review recently completed, use acceptable Europe – deregistered	

Problem	Active Constituents	Chemical Group	Comment	Actions
DISEASES				
Anthracnose	Azoxystrobin	**11**		Luna Experience under development by Bayer
	B. amyloliquefaciens Strain QST 713	**44**		
	Fludioxonil	**12**		
	Copper	**M1**		
	Prochloraz	**3**		
	Thiram	**M3**	APVMA - Nominated for review Canada – Proposed cancelling of all foliar uses Codex - To be reviewed 2020/21 Europe – To be deregistered	
Cercospora spot	Copper	**M1**		
Phytophthora root rot	Fosetyl-Al	**33**		
	Metalaxyl/metalaxyl-M	**4**		
	Phosphorous acid	**33**		
	Copper	**M1**		
Sanitizer	Didecyl dimethyl NH_4Cl	**-**		
Sooty blotch	Copper	**M1**		
Stem-end rot	Azoxystrobin	**11**		
	B. amyloliquefaciens Strain QST 713	**44**		
	Fludioxonil	**12**		
	Prochloraz	**3**		
	Thiram	**M3**	APVMA - Nominated for review Canada – Proposed cancelling of all foliar uses Codex - To be reviewed 2020/21 Europe – Being deregistered, in phase-out	
Trunk (Stem) canker	Copper	**M1**		
Vegetative growth control	Uniconazole-P	**3**	Europe – No authorisation in place	

Avocado regulatory risk assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
WEEDS				
Broadleaf & Grass weeds	Diquat	**L**	APVMA - Currently under review Europe – deregistered	
	Flumioxazin	**G**		
	Glufosinate	**N**	Europe – deregistered	
	Glyphosate	**M**	Ongoing issues internationally	
	Oryzalin	**D**		
	Oxyfluorfen	**G**		
	Paraquat	**L**	APVMA - Currently under review Europe – deregistered Rotterdam Convention - nominated	
	Pendimethalin	**D**		
Grass weeds	Fluazifop	**A**		
	Haloxyfop-P	**A**		
Plant growth regulators				
Plant growth regulators	1-methylcyclopropene (Po)	-		
	Paclobutrazol (PER85877)			

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