



The Spruce / K. Dave

Mangoes

Strategic Agrichemical Review Process
(SARP)

September 2022

Hort Innovation
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Purpose of the report:

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

Date of report:

September 2022

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1. Summary

A Strategic Agrichemical Review Process (SARP), through the process of a desktop audit and industry liaison;

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

Alternative pesticides should ideally be selected for benefits of:

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

The results of this process will provide the mango 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
Anthracnose / Blossom Blight	<i>Colletotrichum</i> spp.
Stem End Rot	<i>Botryosphaeria</i> spp.

1.2 Insects and mites

The high priority insect and mite pests are:

Common Name	Scientific Name
Fruit Spotting Bug	<i>Amblypelta nitida</i>
Banana Spotting Bug	<i>Amblypelta lutescens</i>
Queensland Fruit Fly	<i>Bactrocera tryoni</i>
Flower Eating Caterpillars	<i>Homoeosoma vagella</i> , <i>Xanthodes congenita</i>
Giant Northern Termite	<i>Mastotermes darwiniensis</i>

1.3 Weeds

There were no high priority weeds identified, but the moderate priority weeds are:

Common name	Scientific name
Feather Top Rhodes Grass	<i>Chloris virgata</i>
Flaxleaf Fleabane	<i>Conyza bonariensis</i>

1.4 Plant Growth Regulators

The high priority Plant Growth Regulator issues are:

Issue
Control of Vegetative Growth

2. The Australian Mango Industry

Mangoes are a tropical fruit with harvest occurring in the summer months and most of the production in northern Australia.

Total production for the year ending June 2021 was 51,528 tonnes¹. Wholesale value of fresh supply was \$172 m, with \$142 m distributed into retail and \$30.5 m into food service.

The major mango growing states are Queensland and Northern Territory. The production window is relatively narrow and domestic consumption follows this seasonal pattern. Mango import volumes are relatively small.

Mango production for the fresh market is dominated by four varieties, Kensington Pride, Calypso, R2E2 and Honey Gold.

Mango Seasonality by State

State	20/21 t	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
New South Wales	559												
Queensland	22,415												
Western Australia	927												
Northern Territory	27,627												
Availability legend			High		Medium		Low						None

Australia is a net exporter of fresh mangoes, with 9% of total production exported in 2020/21. Exports have been growing strongly in recent years with the international destinations being New Zealand, Singapore, Hong Kong, UAE and South Korea.

¹ Hort Innovation (2021). Australian Horticulture Statistics Handbook 2020/21. [online] Available at: <https://www.horticulture.com.au/growers/help-your-business-grow/research-reports-publications-fact-sheets-and-more/grower-resources/ha18002-assets/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 mango 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 mango industry regarding pesticide access, Hort Innovation undertook a review of the pesticide requirements via a Strategic Agrichemical Review Process (SARP) in 2013. 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 mango 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 mango 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 mangoes but attempts to prioritise the major problems.

Exotic plant pests, not present in Australia, are not addressed in this document.

3.2 Minor use permits and registration

From a pesticide access perspective, the APVMA classifies mangoes as a major crop. Mangoes fit within the APVMA crop group 006: Assorted Tropical and Sub-Tropical Fruits – Inedible Peel, Subgroup 006B: Assorted Tropical and Sub-Tropical Fruits, Inedible Smooth Peel - Large. Therefore, access to minor use permits can be relatively difficult unless a reasonable justification is provided in accordance with the APVMA's minor use guidance².

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

² <https://apvma.gov.au/node/10931>

3.3 Methods

The current update of the Mango Strategic Agrichemical Review Process (SARP), which was last updated in 2017, was conducted by desktop audit using industry information gathered during 2021-2022. The process included gathering, collating and confirming information:

Process of Review	Activity
Industry survey	Preparation and circulation of online industry survey to update priority pests and identify priority control gaps. Survey released: 17 November 2021 Survey closed: 28 February 2022
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 MT20007
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 mangoes

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

Appendix 3. Products available for weed control in mangoes

Appendix 4. Plant growth regulators available in mangoes

Appendix 5. Current permits for use in mangoes

Appendix 6. Mango Maximum Residue Limits (MRLs)

Appendix 7. Mango Agrichemical Regulatory Risk Assessment

4. Diseases, Pests and Weeds of Mangoes

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 website³.

In Chapter 4 information on regulatory risk derived from project MT20007 (Regulatory support and coordination) has been incorporated.

Some of the suggested options have no overseas MRLs (see Appendix 6).

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.

³ <https://www.croplife.org.au/resources/programs/resistance-management/>

4.1 Diseases of mangoes

4.1.1 Disease priorities

Common name	Scientific name
High	
Anthracnose / Blossom Blight	<i>Colletotrichum</i> spp.
Stem End Rot	<i>Botryosphaeria</i> spp.
Moderate	
Dendritic Spot / Spike	<i>Colletotrichum gloeosporioides</i> , <i>Botryosphaeria</i> spp.
Bacterial Black Spot	<i>Xanthomonas campestris</i>
Low	
Powdery Mildew	<i>Oidium mangiferae</i>
Mango Scab	<i>Elsinoe mangiferae</i>
Apical Bud Necrosis	<i>Pseudomonas syringae</i>
Alternaria Fruit Rot	<i>Alternaria</i> spp.
Phytophthora Fruit Rot	<i>Phytophthora</i> spp.
Trunk and Stem Canker	<i>Phytophthora</i> spp.

The high priority diseases identified based on the feedback received were Anthracnose / Blossom Blight and Stem End Rot. A planned disease management strategy is critical to ensure control of these diseases across the whole production cycle. Anthracnose is the most significant post-harvest disease of mangoes, but it needs to be managed in-crop when the initial infection occurs, as well as requiring post-harvest treatments to preserve fruit quality during transportation and storage. There are several post-harvest diseases that affect mangoes, and management of hygiene and temperature in the packing, storage and transportation of mangoes is important for preserving fruit quality. Available and potential products for control of diseases are listed in Section 4.1.2.

Fungicides should be supplemented by cultural practices to increase airflow and minimise moisture in the plant canopy. This can include planting configuration and irrigation management. Other cultural controls include the use of disease-free seed and/or transplants, resistant varieties, and general farm hygiene including removal of crop residues and controlling weeds in and around crops.

Resistance Management

Resistance by fungal pathogens to fungicides usually evolves following the intensive use of fungicides for disease control. In any fungal population there are likely to be individuals that have some degree of natural resistance, and which are less susceptible to fungicides, even

before the chemicals are used. Resistance arises mainly through the incorrect use of fungicides, which selects for the resistant individuals. Continued use of a fungicide or fungicide chemical group can result in a significant build-up of resistant individuals in the fungal population – to the point where that particular product, or other products from the same chemical group, is no longer effective. In some cases, removal of the selection pressure can result in the fungal population regaining its sensitivity to the fungicide group, but this is not always the case. The risk of fungicide resistance developing varies between different chemical groups and different fungal pathogens, such that specific strategies are recommended for those situations considered to carry the highest risk⁴. Refer to the CropLife Resistance Management Strategy for Anthracnose in Mango⁵.

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

⁵ <https://croplife.org.au/resources/programs/resistance-management/avocado-and-mango-anthracnose-colletotrichum-spp>

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 7)	
A	Available via either registration or permit approval	R1	Short-term: Critical concern over retaining access
P	Potential - 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
Anthracnose / Blossom Blight (<i>Colletotrichum</i> spp.)							
Priority: High							
Rated as a high priority in NT, QLD and WA. Infections are seen as small, black, irregular spots that cause death and shedding of flowers, leading to poor fruit set. Disease outbreaks in crop will also lead to carry-over infection and post-harvest rots. In-crop and post-harvest control measures are required, including good orchard hygiene and fungicide cover sprays. Nutrition management, especially calcium, is also important for managing anthracnose. Anthracnose infections will have serious impacts on fruit quality if not controlled. Post-harvest management includes fungicide treatments, keeping fruit cool and minimising delays in the supply chain. Refer to the CropLife Resistance Management Strategy for Anthracnose in Mango ⁶							
Azoxystrobin (Amistar)	11	Protectant & Curative	3	A	ALL	Registered in mangoes for control of Stem End Rot and Anthracnose . Apply 1-2 applications at flowering and early fruit set. Apply a maximum of 3 applications per season, with no more than 2 consecutive applications. Minimum re-treatment interval 14 days.	-

⁶ <https://croplife.org.au/resources/programs/resistance-management/avocado-and-mango-anthracnose-colletotrichum-spp>

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
<i>Bacillus amyloquefaciens</i> strain QST 713 (Serenade Opti) Bayer	BM 01	Biological	NR	A	ALL	Registered in mangoes for control of Anthracnose and suppression of Stem End Rot. Begin applications as soon as crop development has reached susceptible stages for anthracnose infections to occur. Maximum number of treatments not specified. Re-treatment interval 7-21 days.	-
Chlorothalonil (Bravo) PER14830	M5	Protectant	NR	A	NSW, QLD, WA & NT	Permitted in mangoes for control of Anthracnose . Target applications during bud burst to late flowering only. Do not apply to fruit at any stage. Apply a maximum of 4 foliar applications per crop with a 7-14 day interval between consecutive sprays.	R3
Copper as Copper Hydroxide, Tribasic Copper Sulfate, Copper Ammonium Acetate, Cupric Oxide	M1	Protectant	1	A	NSW, QLD, SA, WA & NT	Registered in mangoes for control of Anthracnose and Bacterial Black Spot. Spray every 4 weeks from the end of flowering to harvest. During extended wet weather, apply every 14 days. Maximum number of treatments not specified.	-
Fluopyram + Trifloxystrobin (Luna Sensation) Bayer	7+11	Protectant & Curative	3 NG	A	ALL	Registered in tropical and sub-tropical fruit (inedible peel) for control of Anthracnose and Stem End Rot. Apply as part of a preventative fungicide program using spray intervals of 14-21 days. Maximum of 3 treatments per season.	-
Mancozeb	M3	Protectant	1	A	ALL	Registered in mangoes for control of Anthracnose . Apply at weekly intervals during flowering and then monthly intervals until harvest. Maximum number of treatments not specified.	R2
Metiram (Polyram) BASF	M3	Protectant	1	A	ALL	Registered in mangoes for control of Anthracnose . Apply at weekly intervals during flowering and then monthly intervals until harvest. Maximum number of treatments not specified.	R2
Metiram + Pyraclostrobin (Aero) BASF	M3+11	Protectant & Curative	14 NG	A	ALL	Registered in mangoes for control of Anthracnose , Stem End Rot and Powdery Mildew. Apply as part of protectant fungicide program. A maximum of 2 sprays can be applied. For best results these should be targeted at early fruit set and 14 days prior to harvest.	R2

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
Prochloraz as Manganese Chloride Complex (Octave)	3	Protectant & Curative	NR NG	A	QLD, NSW & WA	Registered in mangoes for control of Anthracnose / Blossom Blight . Apply as a cover spray on a 3-4 week schedule throughout the flowering period. Maximum number of treatments not specified.	R3
Thiram	M3	Protectant	14	A	ALL	Registered in mangoes for control of Anthracnose . Apply at weekly intervals during flowering and then at 14-28 day intervals until 14 days before harvest. Maximum number of treatments not specified.	R2
Bromo Chloro Dimethyl Hydantoin (BCDMH)	-	Sanitiser / Post-Harvest Treatment	NR	A	ALL	Registered in fruit as a post-harvest treatment for control of External Rot Causing Organisms. Post-harvest spray or dip. Minimum contact time 60 seconds. Can also be used as a general disinfectant for equipment.	-
Didecyl Dimethyl Ammonium Chloride (Sporekill)	-	Sanitiser / Post-Harvest Treatment	NR	A	ALL	Registered in tropical & sub-tropical fruit (inedible peel) as a post-harvest treatment for control of bacteria and fungi. Dip fruit for 3 minutes.	-
Fludioxonil (Scholar)	12	Protectant / Post-Harvest Treatment	NR	A	ALL	Registered in mangoes as a post-harvest treatment for control of Anthracnose , Stem End Rot and Dendritic Spot. Apply as a hot dip or flood spray. Time of exposure: 5 minutes at 52°C.	R3
Iodine	M	Protectant / Post Harvest Dip	NR	A	ALL	Registered in tropical and sub-tropical fruit as a post-harvest dip for control of bacteria and fungi. Dip the fruit for a minimum of 1 minute.	-
Prochloraz (Sportak)	3	Protectant / Post-Harvest Treatment	NR	A	QLD, NSW, WA & NT	Registered in mangoes as a post-harvest treatment for control of Anthracnose and Alternaria Rot. Apply as a flood spray for a minimum of 30 seconds.	R3

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
Fluxapyroxad + Pyraclostrobin (Merivon) BASF	7+11	Protectant & Curative		P		Hort Innovation project ST16006 generated data to support registration for the control of Anthracnose and Powdery Mildew in mangoes. BASF made a submission to the APVMA Feb-22 and the label extension is expected by early 2023. Registered for control of Alternaria Leaf Spot, Black Spot, Brown Rot Nut Scab, Shot Hole and Rust in almond, Brown Rot in cherries and Husk Spot in macadamia. US registration for control of Anthracnose in cucurbits, leafy vegetables, stone fruit, strawberries and tree nuts.	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant & Curative		P		Hort Innovation project ST16006 generated data to support Luna Experience and Luna Sensation registration for the control of Anthracnose in tropical and sub-tropical fruit (inedible peel). Bayer have submitted data to the APVMA in support of a Tropical Crop Group Registration and is pending approval late 2022.	R3
<i>Aureobasidium pullulans</i> (Botector) Nufarm	BM 01	Biological	NR	P		Registered in grapes and berries for control of Botrytis and suppression of several other fungal pathogens (Anthracnose , Phomopsis and Rhizopus) in berries. US registration for control of Anthracnose in berries, stone fruit, almonds, fruiting vegetables, cucurbits, leafy vegetables, ornamentals and hops.	-
<i>Bacillus amyloliquefaciens</i> strain MBI 600 (Serifel) BASF	BM 02	Biological	NR	P		Registered for control of Botrytis in grapevines and strawberries. US registration for control of Anthracnose in artichoke, asparagus, berries, citrus, cucurbits, fruiting vegetables, pome fruit, stone fruit, tobacco, root and tuber vegetables (except sugar beet) and tree nuts.	-
BLAD (Problad Plus)	BM 01	Biological	NR	P		Registered in stone fruit for suppression of Brown Rot. US registration for control of Anthracnose in grapes and strawberries.	-
Boscalid + Pyraclostrobin (Pristine) BASF	7+11	Protectant & Curative		P		Permitted for control of Anthracnose in blueberries.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
Florylpicoxamid (Adavelt) Corteva	21	Protectant & Curative		P		New active in development from Corteva with activity on Septoria, Powdery Mildew, Botrytis, Anthracnose , Alternaria, Scab, Monilinia, Rust and <i>Mycosphaerella</i> spp. Scheduled for JMPR evaluation in 2023.	-
Pydiflumetofen + Difenconazole (Miravis Duo) Syngenta	7+3	Protectant & Curative		P		Submitted for registration in June 2021 for control of various diseases in fruiting vegetables, cucurbits, root vegetables, celery and peanuts. US registration for control of Anthracnose in almonds, stone fruit and tree nuts and Canadian registration for control of Anthracnose in fruiting vegetables and cucurbits.	R3
Pydiflumetofen + Fludioxonil (Miravis Prime) Syngenta	7+12	Protectant & Curative		P		Registered for control of <i>Botrytis</i> in berries, grapes and strawberries and control of <i>Botrytis</i> and <i>Sclerotinia</i> in leafy vegetables, lettuce and potatoes. US registration for control of Anthracnose in berries and grape and small fruit vine climbing (except fuzzy Kiwifruit) and suppression of Anthracnose in lemon and lime.	R3
Fludioxonil + Azoxystrobin (Graduate A+) Syngenta	12+11	Protectant / Post-Harvest Treatment		P		Registered as a post-harvest dip, drench or flood spray for control of Side Rot caused by Anthracnose and Stem End Rot in avocado.	R3
Stem End Rot (<i>Botryosphaeria</i> spp.)							
Priority: High							
Rated as a high priority in NT, QLD and WA. In drier areas, Stem End Rot can be a more serious post-harvest disease than Anthracnose. A dark rot develops from the stem end as fruit ripens after harvest. The rot produces dark streaking of the water-conducting tissues in the fruit. Management of irrigation and the orchard canopy are important control measures, as well as avoiding the harvest of immature fruit and cooling fruit immediately after harvest.							
Azoxystrobin (Amistar)	11	Protectant & Curative	3	A	ALL	Registered in mangoes for control of Stem End Rot and Anthracnose. Apply 1-2 applications at flowering and early fruit set. Apply a maximum of 3 applications per season, with no more than 2 consecutive applications. Minimum re-treatment interval 14 days.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
<i>Bacillus amyloquefaciens</i> strain QST 713 (Serenade Opti) Bayer	BM 01	Biological	NR	A	ALL	Registered in mangoes for control of Anthracnose and suppression of Stem End Rot . Begin applications as soon as crop development has reached susceptible stages for anthracnose infections to occur. Maximum number of treatments not specified. Re-treatment interval 7-21 days.	-
Fluopyram + Trifloxystrobin (Luna Sensation) Bayer	7+11	Protectant & Curative	3 NG	A	ALL	Registered in tropical and sub-tropical fruit (inedible peel) for control of Anthracnose and Stem End Rot . Apply as part of a preventative fungicide program using spray intervals of 14-21 days. Maximum of 3 treatments per season.	-
Metiram + Pyraclostrobin (Aero) BASF	M3+11	Protectant & Curative	14 NG	A	ALL	Registered in mangoes for control of Anthracnose, Stem End Rot and Powdery Mildew. Apply as part of protectant fungicide program. A maximum of 2 sprays can be applied. For best results these should be targeted at early fruit set and 14 days prior to harvest.	R2
Bromo Chloro Dimethyl Hydantoin (BCDMH)	-	Sanitiser / Post-Harvest Treatment	NR	A	ALL	Registered in fruit as a post-harvest treatment for control of 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 in fruit as a post-harvest treatment for control of 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.	-
Didecyl Dimethyl Ammonium Chloride (Sporekill)	-	Sanitiser / Post-Harvest Treatment	NR	A	ALL	Registered in tropical & sub-tropical fruit (inedible peel) as a post-harvest treatment for control of bacteria and fungi. Dip fruit for 3 minutes.	-
Fludioxonil (Scholar)	12	Protectant / Post-Harvest Treatment	NR	A	ALL	Registered in mangoes as a post-harvest treatment for control of Anthracnose, Stem End Rot and Dendritic Spot. Apply as a hot dip or flood spray. Time of exposure: 5 minutes at 52°C.	R3
Iodine	M	Protectant / Post Harvest Dip	NR	A	ALL	Registered in tropical and sub-tropical fruit as a post-harvest dip for control of bacteria and fungi. Dip the fruit for a minimum of 1 minute.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
Fludioxonil + Azoxystrobin (Graduate A+) Syngenta	12+11	Protectant / Post-Harvest Treatment		P		Registered as a post-harvest dip, drench or flood spray for control of Side Rot caused by Anthracnose and Stem End Rot in avocado.	R3
Thiabendazole (Tecto) Syngenta	1	Protectant / Post-Harvest Treatment		P		Registered as a post-harvest treatment for control of Stem End Rot in citrus.	-
Dendritic Spot / Spike (<i>Colletotrichum gloeosporioides</i> , <i>Botryosphaeria</i> spp.)							
Priority: Moderate							
Rated as a moderate priority in NT, and as a low priority in QLD and WA. Post-harvest disease that has becoming increasingly important in recent years. Results in small, dark, irregular, superficial spots that appear on the fruit only when it ripens. Control measures are similar to Stem End Rot, with good irrigation and canopy management practices as well as post-harvest management and treatments.							
Bromo Chloro Dimethyl Hydantoin (BCDMH)	-	Sanitiser / Post-Harvest Treatment	NR	A	ALL	Registered in fruit as a post-harvest treatment for control of 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 in fruit as a post-harvest treatment for control of 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.	-
Didecyl Dimethyl Ammonium Chloride (Sporekill)	-	Sanitiser / Post-Harvest Treatment	NR	A	ALL	Registered in tropical & sub-tropical fruit (inedible peel) as a post-harvest treatment for control of bacteria and fungi. Dip fruit for 3 minutes.	-
Fludioxonil (Scholar)	12	Protectant / Post-Harvest Treatment	NR	A	ALL	Registered in mangoes as a post-harvest treatment for control of Anthracnose, Stem End Rot and Dendritic Spot . Apply as a hot dip or flood spray. Time of exposure: 5 minutes at 52°C.	R3
Iodine	M	Protectant / Post Harvest Dip	NR	A	ALL	Registered in tropical and sub-tropical fruit as a post-harvest dip for control of bacteria and fungi. Dip the fruit for a minimum of 1 minute.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
Fludioxonil + Azoxystrobin (Graduate A+) Syngenta	12+11	Protectant / Post-Harvest Treatment		P		Registered as a post-harvest dip, drench or flood spray for control of Side Rot caused by Anthracnose and Stem End Rot in avocado.	R3
Bacterial Black Spot (<i>Xanthomonas campestris</i>)							
Priority: Moderate							
Rated as a high priority in NT, a moderate priority in QLD, and as a low priority in WA. Favoured by unseasonable wet conditions during fruit development, symptoms appear as black, scabby lesions on foliage, stems and fruit. Control measures include pruning off affected stem cankers and budwood which can act as reservoirs for the disease.							
Copper as Copper Hydroxide, Tribasic Copper Sulfate, Copper Ammonium Acetate, Cupric Oxide	M1	Protectant	1	A	NSW, QLD, SA, WA & NT	Registered in mangoes for control of Anthracnose and Bacterial Black Spot . Apply as a preventative spray at 10-14 day intervals while weather conditions favour disease development. Maximum number of treatments not specified.	-
Copper as Copper Oxychloride	M1	Protectant	1	A	QLD, NT, ACT, NSW & WA	Registered in mangoes for control of Anthracnose and Bacterial Black Spot . Apply as a preventative spray at 10-14 day intervals while weather conditions favour disease development. Maximum number of treatments not specified.	-
<i>Bacillus amyloquefaciens</i> strain QST 713 (Serenade Opti) Bayer	BM 01	Biological	NR	P-A	ALL	Registered in mangoes for control of Anthracnose and suppression of Stem End Rot. Registered for suppression of Bacterial Spot (<i>Xanthomonas spp.</i>) in tomatoes, capsicums and chillies.	-
Acibenzolar-S-Methyl (Actigard Plant Activator) Syngenta	P01	Protectant		P		Registered for the suppression of Bacterial Spot (<i>Xanthomonas campestris</i>) in tomatoes.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
<i>Bacillus amyloliquefaciens</i> strain MBI 600 (Serifel) BASF	BM 02	Biological	NR	P		Registered for control of <i>Botrytis</i> in grapes and strawberries. US registration for control of <i>Xanthomonas spp.</i> in brassica leafy vegetables, citrus, fruiting vegetables, leafy vegetables, stone fruit, strawberries, root and tuber vegetables and tree nuts.	-
Powdery Mildew (<i>Oidium mangiferae</i>)							
Priority: Low							
Rated as a low priority in NT, QLD and WA. Powdery Mildew is a relatively minor problem in mangoes, usually resulting in superficial fungal growth on leaves and stems. Severe infections can cause poor fruit set through loss of flowers. Generally, the use of good cultural controls is sufficient to manage Powdery Mildew, with good orchard hygiene, canopy management and avoiding excessive nitrogen applications important control measures.							
Metiram + Pyraclostrobin (Aero) BASF	M3+11	Protectant & Curative	14 NG	A	ALL	Registered in mangoes for control of Anthracnose, Stem End Rot and Powdery Mildew . Apply as part of protectant fungicide program. A maximum of 2 sprays can be applied. For best results these should be targeted at early fruit set and 14 days prior to harvest.	R2
Fluxapyroxad + Pyraclostrobin (Merivon) BASF	7+11	Protectant & Curative		P		Hort Innovation project ST16006 generated data to support registration for the control of Anthracnose and Powdery Mildew in mangoes. BASF made a submission to the APVMA Feb-22 and the label extension is expected by early 2023. Registered for control of Alternaria Leaf Spot, Black Spot, Brown Rot Nut Scab, Shot Hole and Rust in almond, Brown Rot in cherries and Husk Spot in macadamia. US registration for control of Anthracnose in cucurbits, leafy vegetables, stone fruit, strawberries and tree nuts.	-
<i>Bacillus amyloquefaciens</i> strain QST 713 (Serenade Opti) Bayer	BM 01	Biological	NR	P-A	ALL	Registered in mangoes for control of Anthracnose and suppression of Stem End Rot. Registered for suppression of Bacterial Spot (<i>Xanthomonas spp.</i>) in tomatoes, capsicums and chillies.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
Florylpicoxamid (Adavelt) Corteva	21	Protectant & Curative		P		New active in development from Corteva with activity on Septoria, Powdery Mildew , Botrytis, Anthracnose, Alternaria, Scab, Monilinia, Rust and Mycosphaerella spp. Scheduled for JMPR evaluation in 2023.	-
Fluopyram + Trifloxystrobin (Luna Sensation) Bayer	7+11	Protectant & Curative	3 NG	P-A	ALL	Registered in tropical and sub-tropical fruit (inedible peel) for control of Anthracnose and Stem End Rot. Registered for control of Powdery Mildew in apples.	-
Penthiopyrad (Fontelis) Corteva	7	Protectant		P		Registered for control of Powdery Mildew in strawberry, pome fruit, cucurbits, fruiting vegetables, leafy vegetables and root and tuber vegetables.	-
Polyoxin D Zinc Salt (Intervene) Nufarm	19	Chitin synthase inhibitor prevents cell wall formation		P		Registered for control of Grey Mould and Powdery Mildew in grapes and berries, and control of Powdery Mildew and Alternaria in Apples. Nufarm are planning a label extension to include use in fruiting vegetables, almonds, stone fruit and avocado.	-
Mango Scab (<i>Elsinoe mangiferae</i>)							
Priority: Low							
Rated as a low priority in NT, QLD and WA. Disease is favoured by high humidity during flowering and fruit set. Causes small, dark brown spots on leaves and young fruit. Cultural and fungicide controls used for management of other diseases will usually keep Mango Scab in check.							
Azoxystrobin (Amistar)	11	Protectant & Curative	3	P-A	ALL	Registered in mangoes for control of Stem End Rot and Anthracnose. Registered for control of Anthracnose (<i>Elsinoe veneta</i>) in <i>Rubus</i> spp.	-
Copper	M1	Protectant	1	P-A	NSW, QLD, SA, WA & NT	Registered in mangoes for control of Anthracnose and Bacterial Black Spot. Registered for control of Anthracnose (<i>Elsinoe veneta</i>) in raspberries.	-
Florylpicoxamid (Adavelt) Corteva	21	Protectant & Curative		P		New active in development from Corteva with activity on Septoria, Powdery Mildew, Botrytis, Anthracnose, Alternaria, Scab, Monilinia, Rust and Mycosphaerella spp. Scheduled for JMPR evaluation in 2023.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
Apical Bud Necrosis (<i>Pseudomonas syringae</i>)							
Priority: Low							
Rated as a low priority in NT, QLD and WA. Infections are rare in Australia and can affect all plant parts. Cultural controls are key to managing this disease.							
<i>Bacillus amyloquefaciens</i> strain QST 713 (Serenade Opti) Bayer	BM 01	Biological	NR	P-A	ALL	Registered in mangoes for control of Anthracnose and suppression of Stem End Rot. US registration for control of <i>Pseudomonas spp.</i> in berry fruit, cucurbits, fruiting vegetables and stone fruit.	-
Copper	M1	Protectant	1	P-A	NSW, QLD, SA, WA & NT	Registered in mangoes for control of Anthracnose and Bacterial Black Spot. Registered for control of <i>Pseudomonas spp.</i> in apricots, cherries, beans, brassicas, cucurbits, tomatoes and tobacco seed beds.	-
Acibenzolar-S-Methyl (Actigard Plant Activator) Syngenta	P01	Protectant		P		Registered for the suppression of Bacterial Speck, Bacterial Spot, Bacterial Canker and Powdery Mildew in tomatoes.	-
<i>Aureobasidium pullulans</i> (Botector) Nufarm	BM 02	Biological	NR	P		Registered for control of Botrytis and suppression of Anthracnose, Phomopsis and Rhizopus in berries, control of Botrytis and suppression of Sclerotinia in fruiting vegetables and cucurbits, and control of Botrytis in grapes.	-
<i>Bacillus amyloliquefaciens</i> strain MBI 600 (Serifel) BASF	BM 02	Biological	NR	P		Registered for control of <i>Botrytis</i> in grapes and strawberries. US registration for control of <i>Pseudomonas spp.</i> in berries, fruiting vegetables, leafy vegetables, stone fruit, tobacco and tree nuts.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
Alternaria Fruit Rot (<i>Alternaria</i> spp.)							
Priority: Low							
Rated as a low priority in NT, QLD and WA. Causes black spots and post-harvest fruit rots during storage. Infection occurs in-crop, but the symptoms do not appear in fruit until after harvest. Orchard hygiene practices such as management of leaf litter, in-crop fungicides and post-harvest management are important to avoid fruit disease development.							
Bromo Chloro Dimethyl Hydantoin (BCDMH)	-	Sanitiser / Post-Harvest Treatment	NR	A	ALL	Registered in fruit as a post-harvest treatment for control of 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 in fruit as a post-harvest treatment for control of 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.	-
Didecyl Dimethyl Ammonium Chloride (Sporekill)	-	Sanitiser / Post-Harvest Treatment	NR	A	ALL	Registered in tropical & sub-tropical fruit (inedible peel) as a post-harvest treatment for control of bacteria and fungi. Dip fruit for 3 minutes.	-
Iodine	M	Protectant / Post Harvest Dip	NR	A	ALL	Registered in tropical and sub-tropical fruit as a post-harvest dip for control of bacteria and fungi. Dip the fruit for a minimum of 1 minute.	-
Prochloraz (Sportak)	3	Protectant / Post-Harvest Treatment	NR	A	QLD, WA & NT	Registered in mangoes as a post-harvest treatment for control of Anthracnose and Alternaria Rot . Apply as a flood spray for a minimum of 30 seconds.	R3
Azoxystrobin (Amistar)	11	Protectant & Curative	3	P-A	ALL	Registered in mangoes for control of Stem End Rot and Anthracnose. Registered for control of Alternaria spp. in citrus, passionfruit, pistachio, brassica vegetables, carrots, nursery stock and ornamentals, potatoes and tomatoes.	-
Copper	M1	Protectant	1	P-A	NSW, QLD, SA, WA & NT	Registered in mangoes for control of Anthracnose and Bacterial Black Spot. Registered for control of Alternaria spp. in carrots and potatoes.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
Fluxapyroxad + Pyraclostrobin (Merivon) BASF	7+11	Protectant & Curative		P		Hort Innovation project ST16006 generated data to support registration for the control of Anthracnose and Powdery Mildew in mangoes. BASF made a submission to the APVMA Feb-22 and the label extension is expected by early 2023. Registered for control of Alternaria Leaf Spot, Black Spot, Brown Rot Nut Scab, Shot Hole and Rust in almond, Brown Rot in cherries and Husk Spot in macadamia.	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant & Curative		P		Hort Innovation project ST16006 generated data to support Luna Experience and Luna Sensation registration for the control of Anthracnose in tropical and sub-tropical fruit (inedible peel). Bayer have submitted data to the APVMA in support of a Tropical Crop Group Registration and is pending approval late 2022.	R3
Florylpicoxamid (Adavelt) Corteva	21	Protectant & Curative		P		New active in development from Corteva with activity on Septoria, Powdery Mildew, Botrytis, Anthracnose, Alternaria, Scab, Monilinia, Rust and Mycosphaerella spp. Scheduled for JMPR evaluation in 2023.	-
Polyoxin D Zinc Salt (Intervene) Nufarm	19	Chitin synthase inhibitor prevents cell wall formation		P		Registered for control of Grey Mould and Powdery Mildew in grapes and berries, and control of Powdery Mildew and Alternaria in Apples. Nufarm are planning a label extension to include use in fruiting vegetables, almonds, stone fruit and avocado.	-
Phytophthora Fruit Rot (<i>Phytophthora</i> spp.)							
Priority: Low							
Rated as a low priority in NT, QLD and WA. This is a soil-borne pathogen, but the spores can infect fruit via rain splash. Warm, wet weather favours infection and disease development. Well drained orchards will have less incidence of the pathogen and good hygiene will reduce spread of the disease if conditions are favourable.							
<i>Bacillus amyloliquefaciens</i> Strain QST 713 (Serenade Prime) Bayer	BM 02	Biological Soil Ameliorant	NR	P-A	ALL	Available in tree crops for application to soil to improve bioavailability of soil resources to horticultural crops. Registered for suppression of soil-borne diseases such as Black Scurf in potatoes and Pineapple Disease in sugarcane.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
Copper	M1	Protectant	1	P-A	NSW, QLD, SA, WA & NT	Registered in mangoes for control of Anthracnose and Bacterial Black Spot. Registered for control of <i>Pseudomonas spp.</i> in apricots, cherries, beans, brassicas, cucurbits, tomatoes and tobacco seed beds.	-
Mandipropamid (Revus) Syngenta	40	Protectant & Curative		P		Registered for control of Downy Mildew in grapes, lettuce, leafy vegetables and oilseed poppies. US registration for control of Phytophthora in various crops, including as a foliar application for protection of citrus from Phytophthora Root Rot .	-
Metalaxyl-M (Ridomil Gold 25G) Syngenta	4	Protectant & Curative		P		Registered for control of Phytophthora Root Rot in avocado, macadamia and peaches.	-
Oxathiapiprolin (Zorvec Enicade) Corteva	49	Protectant & Curative		P		Registered for control of Downy Mildew in bulb vegetables, brassica vegetables, cucurbits, leafy vegetables, brassica leafy vegetables and poppies. US registration for control of Phytophthora Canker and Brown Rot in citrus.	-
Phosphorous Acid	33	Protectant & Curative		P		Registered for control of Phytophthora in almonds, avocado, chestnut, citrus, macadamias, walnuts, ornamentals and pineapples.	-
<i>Streptomyces lydicus</i> (Actinovate)	BM 02	Biological	NR	P		Registered in strawberries for the suppression of Powdery Mildew and Phytophthora .	-
Trunk and Stem Canker (<i>Phytophthora</i> spp.)							
Priority: Low							
Rated as a low priority in NT, QLD and WA. Infection is rare in mangoes and requires spores to be splashed from the soil into a damaged area of the trunk or stem. Best control is achieved through ensuring low levels of the pathogen in the soil through good drainage and orchard hygiene and by avoiding physical damage to trees.							
Copper	M1	Protectant	1	A	QLD & NSW	Registered in tropical fruit for control of Phytophthora Stem Canker . Apply mixture to stems of trees where cankers appear, after removing dead tissue. Repeat applications up to a maximum of 5 per season until natural healing is commenced.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
<i>Bacillus amyloliquefaciens</i> Strain QST 713 (Serenade Prime) Bayer	BM 02	Biological Soil Ameliorant	NR	P-A	ALL	Available in tree crops for application to soil to improve bioavailability of soil resources to horticultural crops. Registered for suppression of soil-borne diseases such as Black Scurf in potatoes and Pineapple Disease in sugarcane.	-
Mandipropamid (Revus) Syngenta	40	Protectant & Curative		P		Registered for control of Downy Mildew in grapes, lettuce, leafy vegetables and oilseed poppies. US registration for control of Phytophthora in various crops, including as a foliar application for protection of citrus from Phytophthora Root Rot .	-
Metalaxyl-M (Ridomil Gold 25G) Syngenta	4	Protectant & Curative		P		Registered for control of Phytophthora Root Rot in avocado, macadamia and peaches.	-
Oxathiapiprolin (Zorvec Enicade) Corteva	49	Protectant & Curative		P		Registered for control of Downy Mildew in bulb vegetables, brassica vegetables, cucurbits, leafy vegetables, brassica leafy vegetables and poppies. US registration for control of Phytophthora Canker and Brown Rot in citrus.	-
Phosphorous Acid	33	Protectant & Curative		P		Registered for control of Phytophthora in almonds, avocado, chestnut, citrus, macadamias, walnuts, ornamentals and pineapples.	-
<i>Streptomyces lydicus</i> (Actinovate)	BM 02	Biological	NR	P		Registered in strawberries for the suppression of Powdery Mildew and Phytophthora .	-

4.2 Insect and mite pests of mangoes

4.2.1 Insect and mite pest priorities

Common name	Scientific name
High	
Fruit Spotting Bug	<i>Amblypelta nitida</i>
Banana Spotting Bug	<i>Amblypelta lutescens</i>
Queensland Fruit Fly	<i>Bactrocera tryoni</i>
Flower Eating Caterpillars	<i>Homoeosoma vagella, Xanthodes congenita</i>
Giant Northern Termite	<i>Mastotermes darwiniensis</i>
Moderate	
Lesser Queensland Fruit Fly	<i>Bactrocera neohumeralis</i>
Northern Territory Fruit Fly	<i>Bactrocera aquilonis</i>
Apple Dimpling Bug	<i>Campylomma liebknechti</i>
Tea Mosquito Bug	<i>Helopeltis pernicialis</i>
Mango Leafhopper	<i>Idioscopus clypealis, Idioscopus nitidulus</i>
Mango Planthopper	<i>Colgaroides acuminata</i>
Mango Tip Borer / Mango Shoot Caterpillar	<i>Penicillaria jocosatrix</i>
Red Banded Mango Caterpillar	<i>Deanolis sublimbalis</i>
Mango Leafminer	<i>Acrocercops</i> spp.
Leafroller Moth	<i>Tortricidae</i> spp.
Tea Red Spider Mite	<i>Oligonychus coffeae</i>
False Mango Scale	<i>Pseudaulacaspis nr. cockerelli</i>
White / Common Mango Scale	<i>Aulacaspis tubercularis</i>
Pink Wax Scale	<i>Ceroplastes rubens</i>
Mango Seed Weevil	<i>Sternochetus mangiferae</i>
Long-Tailed Mealybug	<i>Pseudococcus longispinus</i>
Citrus Mealybug	<i>Planococcus citri</i>
Western Flower Thrips	<i>Frankliniella occidentalis</i>
Mango Shoot Looper	<i>Perixera cf. illepidaria</i>

Common name	Scientific name
Low	
Mediterranean Fruit Fly	<i>Ceratitis capitata</i>
Fig Leafhopper	<i>Dialecticopteryx australica</i>
Mango Fruit Borer	<i>Citripestis eutraphera</i>
Two Spotted Mite	<i>Tetranychus urticae</i>
Mango Bud Mite	<i>Aceria mangiferae</i>
Nigra Scale	<i>Parasaissetia nigra</i>
Black Scale	<i>Saisettia oleae</i>
White Wax Scale	<i>Ceroplastes destructor</i>
Mussel Scale	<i>Lepidosaphes beckii</i>
Green Coffee Scale	<i>Coccus viridis</i>
Latania Scale	<i>Hemiberlisia lataniae</i>
Long Soft Scale	<i>Coccus longulus</i>
San Jose Scale	<i>Diaspidiotus perniciosus</i>
Mango Pulp Weevil	<i>Sternochetus frigidus</i>
Tomato Thrips	<i>Frankliniella schultzei</i>
Red-Banded Thrips	<i>Selenothrips rubrocinctus</i>
Banana Flower Thrips	<i>Thrips hawaiiensis</i>
Chilli Thrips	<i>Scirtothrips dorsalis</i>
Ants	Formicidae
Lychee Stink Bug	<i>Lynamorpha rosea</i>
Green Vegetable Bug	<i>Nezara viridula</i>
Graptostethus Bug	<i>Graptostethus</i> spp.
Red-Shouldered Leaf Beetle	<i>Monolepta australis</i>
Swarming Leaf Beetle	<i>Rhyparida</i> spp.
Elephant Beetle	<i>Xylotrupes ulysses</i>
Hairy Leafeating Caterpillar	<i>Xanthodes congenita</i>
Macadamia Nut Borer	<i>Cryptophlebia ombrodelta</i>
Sorghum Head Caterpillar	<i>Cryptoblabes adoceta</i>
Yellow Peach Moth	<i>Conogethes punctiferalis</i>
Fall Armyworm	<i>Spodoptera frugiperda</i>
Mango Stem Miner	<i>Spulerina isonoma</i>

The high priority insect pests identified by the survey were Fruit Spotting Bug, Banana Spotting Bug, Queensland Fruit Fly, Flower-Eating Caterpillars and Giant Northern Termite. Available and potential products for insect, mite and other pests are listed in Section 4.2.2.

The broad range of insect and mite pests in mangoes increases the importance of adopting an Integrated Pest Management approach. Pest management strategies should aim to use multiple methods of control, including cultural, biological and chemical measures.

Resistance Management

Insecticide resistance is a risk to effective control for some insect groups, particularly if there is an over-reliance on a limited number of insecticides. Growers should adhere to the resistance management strategies outlined on the CropLife website⁷. Growers should not exceed the maximum number of applications permitted on the insecticide label.

⁷ www.croplife.org.au/resources/programs/resistance-management/

4.2.2 Available and potential products for priority insects and mites

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

Availability		Regulatory risk (refer to Appendix 7)	
A	Available via either registration or permit approval	R1	Short-term: Critical concern over retaining access
P	Potential - 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
Fruit Spotting Bug (<i>Amblyopelta nitida</i>) Banana Spotting Bug (<i>Amblyopelta lutescens</i>) Priority: High Rated as a high priority in QLD and WA, and as a moderate priority in NT. These are serious pests which sting the fruit at all stages from fruit set until picking. Damage caused affects the marketability of fruit. Nymphs and adults suck sap from shoots and young fruit. Young shoots should be monitored for black lesions at least once a week particularly during periods of new leaf growth.								
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C	Contact & Ingestion	28 NG	A	ALL	Registered in mangoes for control of Fruit Spotting Bug , Pink Wax Scale, Mango Scale, Mediterranean Fruit Fly and Queensland Fruit Fly. Apply post-flowering when monitoring indicates that Fruit Spotting Bugs are becoming active in the crop. Maximum of 3 applications per season with a minimum re-treatment interval of 14 days.	M Bee:M	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Beta-Cyfluthrin (Bulldock) PER80374	3A	Contact	7	A	NSW, NT, QLD, SA & WA	Permitted in mangoes for control of Fruit Spotting Bug, Banana Spotting Bug , Elephant or Rhino Beetle, Red-Shouldered Leaf Beetle, Swarming Leaf Beetle, Longicorn Trunk Borer, Macadamia Nut Borer, Mango Tip Borer, Flatid Planthopper, Green Vegetable Bug, Lychee Stink Bug and Yellow Peach Moth. Do not use at flowering. Do not use more than 4 applications per year with a minimum of 21 days between consecutive sprays.	VH Bee:H	-
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact & Ingestion	3 NG	A	ALL	Registered in mangoes for control of Banana Spotting Bug, Fruit Spotting Bug , Mango Planthopper and Green Planthopper. Apply when monitoring indicates that local thresholds are reached. Maximum of 2 applications per season with a minimum re-treatment interval of 14 days between consecutive sprays. Do not use more than 1 application during flowering.	L Bee:L	-
Sulfoxaflor (Transform) Corteva PER85397	4C	Contact & Ingestion	7	A	NSW, NT, QLD & WA	Permitted in mangoes for control of Fruit Spotting Bug and Banana Spotting Bug . Apply when monitoring indicates that the pest is present and active in sufficient numbers to cause economic damage. Maximum of 2 applications per season with a minimum re-treatment interval of 14 days between consecutive sprays. Data generated under projects ST16006 and ST17000 has been submitted to the APVMA in support a label registration in tropical and sub-tropical fruits for various pests and the label extension is pending Nov-2022	M Bee:H	-
Trichlorfon PER14743	1B	Contact	7	A	ALL (excl. VIC)	Permitted in mangoes for control of Flatid Planthopper, Flower-Eating Caterpillar, Loopers and Yellow Peach Moth and for suppression of Fruit Spotting Bug, Banana Spotting Bug , Green Vegetable Bug and Lychee Stink Bug. Maximum of 6 applications per crop with a minimum re-treatment interval of 7-10 days between consecutive applications.	H Bee:H	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Isocycloseram (Simodis) Syngenta	30	Ingestion		P		Hort Innovation project ST20006 is generating data to support a label registration for control of Apple Dimpling Bug and Red Shouldered Leaf Beetle in mangoes. First global application is proposed for 2023 for Thrips, Bugs, Mites and Caterpillars . Registration submitted May 2021 for Simodis to control Mites, Thrips and Helicoverpa in fruiting vegetables. Possible activity against Fruit spotting bugs	-	-
<p>Queensland Fruit Fly (<i>Bactrocera tryoni</i>) Lesser Queensland Fruit Fly (<i>Bactrocera neohumeralis</i>) Northern Territory Fruit Fly (<i>Bactrocera aquilonis</i>) Mediterranean Fruit Fly (<i>Ceratitis capitata</i>) Priority: High</p> <p>Queensland Fruit Fly are rated as a high priority in NT, a moderate priority in QLD and as a low priority in WA. Lesser Queensland Fruit Fly is rated as a moderate priority in NT and QLD, and as a low priority in WA. Northern Territory Fruit Fly is rated as a moderate priority in NT, and as a low priority in QLD and WA. Mediterranean Fruit Fly is rated as a moderate priority in WA, and as a low priority in NT and QLD. Fruit Fly lay eggs in ripening fruit, subsequently hatching maggots that cause feeding damage to the flesh. A range of control measures should be implemented in order to control the pest and avoid fruit damage.</p>								
4-(P-Acetoxyphenyl) -2-Butanone + Malathion	1B	Contact	NR	A	ALL	Registered in fruit trees for use as a trap for Queensland Fruit Fly . Used to detect the presence of Fruit Fly in the orchard to assist with making decisions about control.	H Bee:H	R3
4-(P-Acetoxyphenyl) -2-Butanone + Fipronil	2B	Contact	NR	A	ALL	Registered in fruit crops for population reduction and population monitoring of Queensland Fruit Fly and Lesser Queensland Fruit Fly . Single stations can be used for population monitoring. Control of fruit fly required placement of 16 stations per hectare and should be used in conjunction with regular insecticide cover sprays.	M Bee:VH	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C	Contact & Ingestion	28 NG	A	ALL	Registered in mangoes for control of Fruit Spotting Bug, Pink Wax Scale, Mango Scale, Mediterranean Fruit Fly and Queensland Fruit Fly . Apply as part of a broader fruit fly management program when monitoring indicates fruit fly activity. Apply in rotation with insecticides from a different mode of action using a 7 day interval. Maximum of 2 applications per season.	M Bee:M	R2
Clothianidin (Shield) PER83944	4A	Contact & Ingestion	7 NG	A	NSW, QLD, WA & NT	Permitted in mangoes for control of Fruit Fly . Apply immediately after flowering has finished. Apply 3 consecutive foliar sprays 7 days apart when monitoring indicates fruit fly activity.	M Bee:VH	R2
Dimethoate	1B	Contact	NR	A	NSW & WA	Registered in mangoes as a post-harvest dip for control of Queensland Fruit Fly . Dip the fruit for 1 minute and allow to drain before packing.	H Bee:H	R1
Dimethoate PER13859	1B	Contact	NR	A	ALL	Permitted in non-bearing fruit fly host crops for control of Fruit Fly . Apply as a foliar and/or ground cover spray to both fallen and retained fruit after final harvest. Do not use more than 2 applications per season. Produce treated must not be harvested, collected or supplied for human or animal consumption.	H Bee:H	R1
Dimethoate PER87164	1B	Contact	NR	A	ALL	Permitted in tropical & sub-tropical fruit (inedible peel) as a post-harvest treatment for control of Fruit Fly . Fruit dip for minimum of 1 minute or flood spray to provide complete coverage of fruit for a minimum of 10 seconds after which the fruit must remain wet for not less than 60 seconds.	H Bee:H	R1
Maldison (Fyfanon)	1B	Contact / Bait	3	A	ALL	Registered in fruit trees for control of all Fruit Fly species excluding Mediterranean Fruit Fly. Mix with a protein lure and apply to the foliage, starting 6 weeks before normal ripening of the tree and repeat at 4-10 day intervals while fruit remains on the tree. Avoid contact of the bait with the fruit. Treatments per season not limited.	H Bee:H	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Spinosad (Naturalure) Corteva	5	Ingestion	NR	A	ALL	Registered in tree crops as a bait application for the control of Queensland Fruit Fly and Mediterranean Fruit Fly . Apply as a band or a spot spray every 7 days. Maximum number of applications not specified.	L Bee:L	-
Trichlorfon PER12450	1B	Contact	7 G:7	A	ALL (excl. VIC, TAS)	Permitted in mangoes for control of Queensland Fruit Fly and Mediterranean Fruit Fly . Apply a maximum of 4 applications per season with a retreatment interval of 7-10 days.	H Bee:H	R2
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact & Ingestion	3 NG	P-A	ALL	Registered in mangoes for control of Banana Spotting Bug, Fruit Spotting Bug, Mango Planthopper and Green Planthopper. Possible activity against Fruit Fly.	L Bee:L	-
Tetraniliprole (Vayego) Bayer	28	Ingestion	3 NG	P-A	NSW, NT & QLD	Permitted in mangoes for control of Mango Seed Weevil (PER90367) and Mango Shoot Looper (PER92133). Hort Innovation project ST17000 is generating data to support registration for control of various pests in tropical & sub-tropical fruit (inedible peel) including Mango tip borer in mangoes. Bayer label registration pending in Mangoes for Mango seed weevil end of 2022/ early 2023.	L-M Bee:VH	-
Etofenprox (Trebon) Sipcam	3A	Contact		P		Registered for control of Queensland Fruit Fly and Mediterranean Fruit Fly in stone fruit.	VH Bee:H	-
Fipronil (Amulet) BASF	2B	Contact		P		Registered for control of Queensland Fruit Fly in stone fruit.	M Bee:VH	R3
Thiacloprid (Calypso) Bayer	4A	Contact & Ingestion		P		Permitted for control of Mediterranean Fruit Fly in stone fruit (excluding peaches).	M Bee:L	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Flower Eating Caterpillars (<i>Homoeosoma vagella</i> , <i>Xanthodes congenita</i>)								
Priority: High								
Rated as a high priority in NT, and as a moderate priority in QLD and WA. Caterpillars hatch from eggs that are laid in the flowers, and as they feed, they web flowers together forming matted silk and debris where they eventually pupate. They can also feed on leaves and young fruit. Regular monitoring should be undertaken during flowering to monitor for larvae and webbing damage. Insecticide control should be targeted at newly hatched larvae.								
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in fruit trees for control of Ants, Aphids, Caterpillars, Earwigs , Whitefly, Thrips and Leafhopper. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH Bee:H	-
Spinetoram (Success Neo) Corteva	5	Ingestion	NR NG	A	ALL	Registered in mangoes for control of Flower-Eating Caterpillars , Small Mango Tip Borer and Large Mango Tip Borer. Maximum 4 applications per season with a re-treatment interval of 7-14 days.	M Bee:H	-
Spinetoram (Success Neo) Corteva	5	Ingestion	NR NG	A	ALL	Registered in tropical & sub-tropical fruit (inedible peel) for control of Flower-Eating Caterpillars , Leafrollers, Loopers, Yellow Peach Moth, Red-Banded Thrips and Sorghum Head Caterpillar. Maximum 4 applications per season with a re-treatment interval of 7-14 days.	M Bee:H	-
Spinosad (Entrust Organic) Corteva	5	Ingestion	NR G:14	A	ALL	Registered in mangoes for control of Flower-Eating Caterpillars , Small Mango Tip Borer and Large Mango Tip Borer. Maximum 4 applications per season with a re-treatment interval of 7-14 days.	L Bee:L	-
Spinosad (Entrust Organic) Corteva	5	Ingestion	NR G:14	A	ALL	Registered in tropical & sub-tropical fruit (inedible peel) for control of Flower-Eating Caterpillars , Leafrollers, Loopers, Yellow Peach Moth, Red-Banded Thrips and Sorghum Head Caterpillar. Maximum 4 applications per season with a re-treatment interval of 7-14 days.	L Bee:L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Trichlorfon PER14743	1B	Contact	7	A	ALL (excl. VIC)	Permitted in mangoes for control of Flatid Planthopper, Flower-Eating Caterpillar , Loopers and Yellow Peach Moth and for suppression of Fruit Spotting Bug, Banana Spotting Bug, Green Vegetable Bug and Lychee Stink Bug. Maximum of 6 applications per crop with a minimum re-treatment interval of 7-10 days between consecutive applications.	H Bee:H	R2
Methoxyfenozide (Prodigy) PER91798	18	Ingestion	14 NG	P-A	NSW, NT, QLD & WA	Permitted in mango for control of Mango Shoot Looper.	VL Bee:VL	-
Tetraniliprole (Vayego) Bayer	28	Ingestion	3 NG	P-A	NSW, NT & QLD	Permitted in mangoes for control of Mango Seed Weevil (PER90367) and Mango Shoot Looper (PER92133). Hort Innovation project ST17000 is generating data to support registration for control of various pests in tropical & sub-tropical fruit (inedible peel) including Mango tip borer in mangoes. Bayer label registration pending in Mangoes for Mango seed weevil end of 2022/ early 2023.	L-M Bee:VH	-
Isocycloseram (Simodis) Syngenta	30	Ingestion		P		Hort Innovation AgVet Grant project ST20006 is generating data to support a label registration for control of Apple Dimpling Bug and Red Shouldered Leaf Beetle in mangoes. First global application is proposed for 2023 for Thrips, Bugs, Mites and Caterpillars. Registration submitted May 2021 for Simodis to control Mites, Thrips and Helicoverpa in fruiting vegetables.	-	-
Broflanilide (Vedira) BASF	30	Contact & Ingestion		P		Registration as an ant bait in non-crop situations in 2020. It also has potential uses as a seed treatment for the control of Wireworms, and a foliar treatment for the control of chewing pests in various crops.	H Bee:VH	-
Chlorantraniliprole (Altacor) FMC	28	Ingestion		P		Registered for control of various caterpillar pests in almonds, pome fruit, stone fruit and grapes.	L Bee:VL	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Chlorfenapyr (Phantom) BASF	13	Contact / IGR		P		Registered for control of Diamondback Moth and Cabbage White Butterfly in Brassica vegetables.	H Bee:H	-
Indoxacarb (Avatar eVo) FMC	22A	Ingestion		P		Registered for control of various caterpillar pests in various vegetables crops, berries, pome fruit, stone fruit and grapes.	L Bee:H	R3
Tebufenozide (Mimic)	18	Ingestion		P		Registered for control of Light Brown Apple Moth in pome fruit, citrus, grapevines and kiwifruit, control of Leafroller in avocado, and control of Loopers in pears.	L Bee:L	-
Giant Northern Termite (<i>Mastotermes darwiniensis</i>)								
Priority: High								
Rated as a high priority in NT and WA, and as a low priority in QLD. Termites have subterranean colonies and bore into trees from underground. Early symptoms of attack are wilting and drying of leaves followed by death of shoot tips or whole branches. Monitoring and treatment of affected trees is critical to prevent spread within the orchard.								
Fipronil PER13996	2B	Contact	60	A	NT	Permitted in mango trees for control of Giant Termite . Treatment can be applied by direct trunk injection, soil injection around the base of affected trees, or the aggregation drum method.	M Bee:VH	R3
Fipronil PER92765	2B	Contact	56	A	QLD & WA	Permitted in mango trees for control of Giant Termite . Treatment can be applied by direct trunk injection, soil injection around the base of affected trees, or the aggregation drum method.	M Bee:VH	R3
Pyriproxifen (Distance Ant Bait) Sumitomo	7C	Ingestion	NR	P-A	ALL	Registered in tropical fruit plantations as a bait for control of Invasive and Nuisance Ants.	VL Bee:L	-
Broflanilide (Vedira) BASF	30	Contact & Ingestion		P		Registered in and around domestic, commercial and industrial buildings and other non-crop areas.	H Bee:VH	-
Metaflumizone (Siesta Ant Bait) BASF	22B	Ingestion		P		Registered for the control of various ants in non-crop land and non-crop situations.	M Bee:M	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Apple Dimpling Bug (<i>Campylomma liebknechti</i>) Tea Mosquito Bug (<i>Helopeltis perniciosa</i>) Priority: Moderate								
Apple Dimpling Bug are rated as a moderate priority in NT and WA, and as a low priority in QLD. Tea Mosquito Bug are rated as a moderate priority in NT, and as a low priority in QLD and WA. Apple Dimpling Bug adults and nymphs suck sap from flowers and developing fruit which initially causes slight pitting and pimpling and may cause dimpling in the later stages of fruit development. Tea Mosquito Bug nymphs and adults produce black necrotic lesions on soft leaves, young shoots, flower panicles and developing fruit. Damage tends to be localised.								
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C	Contact & Ingestion	28 NG	P-A	ALL	Registered in mangoes for control of Fruit Spotting Bug, Pink Wax Scale, Mango Scale, Mediterranean Fruit Fly and Queensland Fruit Fly.	M Bee:M	R2
Beta-Cyfluthrin (Bulldock) PER80374	3A	Contact	7	P-A	NSW, NT, QLD, SA & WA	Permitted in mangoes for control of Fruit Spotting Bug, Banana Spotting Bug, Elephant or Rhino Beetle, Red-Shouldered Leaf Beetle, Swarming Leaf Beetle, Longicorn Trunk Borer, Macadamia Nut Borer, Mango Tip Borer, Flatid Planthopper, Green Vegetable Bug, Lychee Stink Bug and Yellow Peach Moth.	VH Bee:H	-
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact & Ingestion	3 NG	P-A	ALL	Registered in mangoes for control of Banana Spotting Bug, Fruit Spotting Bug, Mango Planthopper and Green Planthopper.	L Bee:L	-
Sulfoxaflor (Transform) Corteva PER85397	4C	Contact & Ingestion	7	P-A	NSW, NT, QLD & WA	Permitted in mangoes for control of Fruit Spotting Bug and Banana Spotting Bug. Data generated under projects ST16006 and ST17000 has been submitted to the APVMA in support a label registration in tropical and sub-tropical fruits for various pests and the label extension is pending Nov-2022	M Bee:H	-
Trichlorfon PER14743	1B	Contact	7	P-A	ALL (excl. VIC)	Permitted in mangoes for control of Flatid Planthopper, Flower-Eating Caterpillar, Loopers and Yellow Peach Moth and for suppression of Fruit Spotting Bug, Banana Spotting Bug, Green Vegetable Bug and Lychee Stink Bug.	H Bee:H	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Isocycloseram (Simodis) Syngenta	30	Ingestion		P		Hort Innovation AgVet Grant project ST20006 is generating data to support a label registration for control of Apple Dimpling Bug and Red Shouldered Leaf Beetle in mangoes. First global application is proposed for 2023 for Thrips, Bugs, Mites and Caterpillars. Registration submitted May 2021 for Simodis to control Mites, Thrips and Helicoverpa in fruiting vegetables.	-	-
<p>Mango Leafhopper (<i>Idioscopus clypealis</i>, <i>Idioscopus nitidulus</i>) Mango Planthopper (<i>Colgaroides acuminata</i>) Fig Leafhopper (<i>Dialecticopteryx australica</i>) Priority: Moderate</p> <p>Mango Leaf Hopper and Mango Planthopper are rated as a moderate priority in NT and QLD, and as a low priority in WA. Fig Leafhopper is rated as a low priority in NT, QLD and WA. Mango Leafhopper adults and nymphs are sap suckers that cause curling and distortion damage to vegetative flush. Severe infestations will generate large amounts of honeydew which promotes growth of sooty mould. Monitoring and control are required during and just prior to flowering. Mango Planthoppers are often seen along the mid-rib of leaves or on the fruit stalk. Feeding on the fruit stalk may cause sap to impact on the fruit and cause sap burn. Sooty Mould and sap burn can affect the marketability of fruit.</p>								
Beta-Cyfluthrin (Bulldock) PER80374	3A	Contact	7	A	NSW, NT, QLD, SA & WA	Permitted in mangoes for control of Fruit Spotting Bug, Banana Spotting Bug, Elephant or Rhino Beetle, Red-Shouldered Leaf Beetle, Swarming Leaf Beetle, Longicorn Trunk Borer, Macadamia Nut Borer, Mango Tip Borer, Flatid Planthopper , Green Vegetable Bug, Lychee Stink Bug and Yellow Peach Moth. Do not use at flowering. Do not use more than 4 applications per year with a minimum of 21 days between consecutive sprays.	VH Bee:H	-
Carbaryl	1A	Contact	7	A	ALL	Registered in mangoes for control of Flattids , Pink Wax Scale and Fig Leafhoppers . Maximum 3 applications per season.	H Bee:H	R3
Carbaryl PER13484	1A	Contact	NR	A	QLD	Permitted in mangoes for control of Mango Leafhoppers . Do not apply to trees after flowering commences. Maximum 2 applications per crop.	H Bee:H	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact & Ingestion	3 NG	A	ALL	Registered in mangoes for control of Banana Spotting Bug, Fruit Spotting Bug, Mango Planthopper and Green Planthopper . Apply when monitoring indicates that local thresholds are reached. Maximum of 2 applications per season with a minimum re-treatment interval of 14 days between consecutive sprays. Do not use more than 1 application during flowering.	L Bee:L	-
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in fruit trees for control of Ants, Aphids, Caterpillars, Earwigs, Whitefly, Thrips and Leafhopper . Apply as a foliar spray when pests are present. Re-apply as necessary. Number of treatments not specified.	VH Bee:H	-
Petroleum Oil	UNM	Contact	1	A	QLD, NSW, WA & NT	Registered in mangoes for control of Scale Insects, Wax Scale and Mango Plant Hopper . Do not apply during flowering. Maximum number of treatments and re-treatment interval not specified.	L Bee:L	-
Trichlorfon PER14743	1B	Contact	7	A	ALL (excl. VIC)	Permitted in mangoes for control of Flatid Planthopper , Flower-Eating Caterpillar, Loopers and Yellow Peach Moth and for suppression of Fruit Spotting Bug, Banana Spotting Bug, Green Vegetable Bug and Lychee Stink Bug. Maximum of 6 applications per crop with a minimum re-treatment interval of 7-10 days between consecutive applications.	H Bee:H	R2
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C	Contact & Ingestion	28 NG	P-A	ALL	Registered in mangoes for control of Fruit Spotting Bug, Pink Wax Scale, Mango Scale, Mediterranean Fruit Fly and Queensland Fruit Fly. Hort Innovation project ST16006 generated data for a label extension to control Hoppers and Bugs in <i>Rubus</i> spp.	M Bee:M	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Sulfoxaflor (Transform) Corteva PER85397	4C	Contact & Ingestion	7	P-A	NSW, NT, QLD & WA	Permitted in mangoes for control of Fruit Spotting Bug and Banana Spotting Bug. US registration for control of Leafhoppers in berries, root and tuber vegetables, pome fruit and small fruit vine climbing (except fuzzy kiwifruit). Data generated under projects ST16006 and ST17000 has been submitted to the APVMA in support a label registration in tropical and sub-tropical fruits for various pests and the label extension is pending Nov-2022	M Bee:H	-
<p>Mango Tip Borer / Mango Shoot Caterpillar (<i>Penicillaria jocosatrix</i>) Red Banded Mango Caterpillar (<i>Deanolis sublimbalis</i>) Mango Leafminer (<i>Acrocercops</i> spp.) Leafroller Moth (<i>Tortricidae</i> spp.) Priority: Moderate</p> <p>Mango Tip Borer is rated as a high priority in NT, a moderate priority in QLD, and as a low priority in WA. Red Banded Mango Caterpillar, Mango Leafminer and Leafroller Moth are rated as a moderate priority in NT, and as a low priority in QLD and WA. Mango Tip Borer feed on the new flush and when in high numbers will attack the growing tips of shoots. They may also damage flower panicles and fruitlets. Red Banded Mango Caterpillar feed on the developing fruit. They tunnel through the skin and flesh to feed mainly on the seed, causing fruit to spoil and fall early.</p>								
Beta-Cyfluthrin (Bulldock) PER80374	3A	Contact	7	A	NSW, NT, QLD, SA & WA	Permitted in mangoes for control of Fruit Spotting Bug, Banana Spotting Bug, Elephant or Rhino Beetle, Red-Shouldered Leaf Beetle, Swarming Leaf Beetle, Longicorn Trunk Borer, Macadamia Nut Borer, Mango Tip Borer , Flatid Planthopper, Green Vegetable Bug, Lychee Stink Bug and Yellow Peach Moth. Do not use at flowering. Do not use more than 4 applications per year with a minimum of 21 days between consecutive sprays.	VH Bee:H	-
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in fruit trees for control of Ants, Aphids, Caterpillars , Earwigs, Whitefly, Thrips and Leafhopper. Apply as a foliar spray when pests are present. Re-apply as necessary. Number of treatments not specified.	VH Bee:H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Spinetoram (Success Neo) Corteva	5	Ingestion	NR NG	A	ALL	Registered in mangoes for control of Flower-Eating Caterpillars, Small Mango Tip Borer and Large Mango Tip Borer . Maximum 4 applications per season with a re-treatment interval of 7-14 days.	M Bee:H	-
Spinosad (Entrust Organic) Corteva	5	Ingestion	NR G:14	A	ALL	Registered in mangoes for control of Flower-Eating Caterpillars, Small Mango Tip Borer and Large Mango Tip Borer . Maximum 4 applications per season with a re-treatment interval of 7-14 days.	L Bee:L	-
Methoxyfenozide (Prodigy) PER91798	18	Ingestion	14 NG	P-A	NSW, NT, QLD & WA	Permitted in mango for control of Mango Shoot Looper.	VL Bee:VL	-
Tetraniliprole (Vayego) Bayer	28	Ingestion	3 NG	P-A	NSW, NT & QLD	Permitted in mangoes for control of Mango Seed Weevil (PER90367) and Mango Shoot Looper (PER92133). Hort Innovation project ST17000 is generating data to support registration for control of various pests in tropical & sub-tropical fruit (inedible peel) including Mango tip borer in mangoes. Bayer label registration pending in Mangoes for Mango seed weevil end of 2022/ early 2023.	L-M Bee:VH	-
Isocycloseram (Simodis) Syngenta	30	Ingestion		P		Hort Innovation AgVet Grant project ST20006 is generating data to support a label registration for control of Apple Dimpling Bug and Red Shouldered Leaf Beetle in mangoes. First global application is proposed for 2023 for Thrips, Bugs, Mites and Caterpillars. Registration submitted May 2021 for Simodis to control Mites, Thrips and Helicoverpa in fruiting vegetables.	-	-
Broflanilide (Vedira) BASF	30	Contact & Ingestion		P		Registration as an ant bait in non-crop situations. It also has potential uses as a seed treatment for the control of Wireworms, and a foliar treatment for the control of chewing pests in various crops.	H Bee:VH	-
Tebufenozide (Mimic)	18	Ingestion		P		Registered for control of Light Brown Apple Moth in pome fruit, citrus, grapevines and kiwifruit, control of Leafroller in avocado, and control of Loopers in pears.	L Bee:L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Tea Red Spider Mite (<i>Oligonychus coffeae</i>) Two Spotted Mite (<i>Tetranychus urticae</i>) Mango Bud Mite (<i>Aceria mangiferae</i>) Priority: Moderate								
Tea Red Spider Mite is rated as a moderate priority in NT and QLD, and as a low priority in WA. Two Spotted Mite is rated as a moderate priority in NT, and as a low priority in QLD and WA. Mango Bud Mite is rated as a low priority in NT, QLD and WA. Mites damage the tree by causing leaves to turn brown and fall, leading to reduced yield and fruit quality. Management options include reducing dust in the orchard, promotion or introduction of predatory mites and judicious use of miticides while maintaining beneficial populations. Mango Bud Mites may transmit Mango Malformation Disease.								
Etoxazole (Paramite) PER87232	10B	Contact & Ingestion	21 NG	A	NT, QLD, WA & NSW	Permitted in mangoes for control of Tea Red Spider Mite . Apply 1 foliar spray only at first signs of mite crawlers.	L Bee:VL	-
Potassium Salts of Fatty Acid (Natrasoap)	UNE	Contact	NR	A	ALL	Registered in fruit trees for control of Aphids, Thrips, Mealybug, Two Spotted Mites , Spider Mite , and Whitefly. Do not use during the hot part of the day. Use a retreatment interval of 5-7 days. Maximum number of applications not specified.	L Bee:L	-
Petroleum Oil	UNM	Contact	1	P-A	QLD, NSW, WA & NT	Registered in mangoes for control of Scale Insects, Wax Scale and Mango Plant Hopper. Registered for control of Mites in pome fruit, stone fruit and pecans.	L Bee:L	-
Spiromesifen (Oberon) Bayer	23	Ingestion		P		Hort Innovation AgVet Grant project ST20006 is generating data to support a label registration for control of Mango Bud Mite and Tea Red Spider Mite in mangoes. Project is due for completion by 2023/24.	M Bee:VL	-
Isocycloseram (Simodis) Syngenta	30	Ingestion		P		Hort Innovation AgVet Grant project ST20006 is generating data to support a label registration for control of Apple Dimpling Bug and Red Shouldered Leaf Beetle in mangoes. First global application is proposed for 2023 for Thrips, Bugs, Mites and Caterpillars. Registration submitted May 2021 for Simodis to control Mites, Thrips and Helicoverpa in fruiting vegetables.	-	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Abamectin	6	Contact		P		Registered for control of various mite species in almonds, apples, pears, avocados, berries, citrus, cucurbits, custard apples, duboisia, fruiting vegetables, hops, lettuce, lychees, mushrooms, papaya, passionfruit, rhubarb, spring onions, snow peas, sugar snap peas, sweet corn, strawberries and ornamentals.	M Bee:H	-
<i>Beauveria bassiana</i> (Velifer) BASF	UNF	Biological	NR	P		Registered for suppression of Two Spotted Spider Mite in protected vegetables.	L Bee:L	-
Bifenazate (Acramite) UPL	20D	Contact & Ingestion		P		Registered for control of various Mites in almonds, pome fruit, stone fruit, fruiting vegetables, cucurbits, pawpaw and strawberries.	L Bee:H	-
Clofentezine (Apollo)	10A	IGR / Contact		P		Registered for control of various Mite species in pome fruit, stone fruit, bananas, hops, tomatoes, almonds and ornamentals.	L Bee:L	-
Cyflumetofen (Danisaraba) BASF	25A	Contact		P		Registered for the control of various mite species in pome fruit, citrus, strawberries, grapes, fruiting vegetables, tree nuts and ornamentals. Species controlled are Two Spotted Mite , European Red Mite, Citrus Red Mite, Oriental Spider Mite and Bryobia Mite.	L Bee:L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
<p>False Mango Scale (<i>Pseudaulacaspis nr. cockerelli</i>) White / Common Mango Scale (<i>Aulacaspis tubercularis</i>) Pink Wax Scale (<i>Ceroplastes rubens</i>) Nigra Scale (<i>Parasaissetia nigra</i>) Black Scale (<i>Saisettia oleae</i>) White Wax Scale (<i>Ceroplastes destructor</i>) Mussel Scale (<i>Lepidosaphes beckii</i>) Green Coffee Scale (<i>Coccus viridis</i>) Latania Scale (<i>Hemiberlisia lataniae</i>) Long Soft Scale (<i>Coccus longulus</i>) San Jose Scale (<i>Diaspidiotus perniciosus</i>) Priority: Moderate</p>								
<p>False Mango Scale and Common Mango Scale are rated as a high priority in NT, a moderate priority in QLD, and as a low priority in WA. Pink Wax Scale is rated as a moderate priority in NT, and as a low priority in QLD and WA. All other scales are rated as a low priority in NT, QLD and WA. Management of Scale should focus on preventing infestations and managing populations before they build up. Strategies include the promotion or introduction of beneficials along with judicious use of insecticides.</p>								
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C	Contact & Ingestion	28 NG	A	ALL	Registered in mangoes for control of Fruit Spotting Bug, Pink Wax Scale, Mango Scale , Mediterranean Fruit Fly and Queensland Fruit Fly. Apply post-flowering and when monitoring indicates the onset of crawler release. Maximum of 2 applications per season with a minimum re-treatment interval of 21 days.	M Bee:M	R2
Buprofezin (Applaud)	16	Ingestion	28	A	ALL	Registered in mangoes for control of Mango Scale . Monitor scales and apply when the majority of crawlers have emerged. A repeat application within 14-28 days may be necessary. Maximum 2 applications per season.	L Bee:L	-
Carbaryl	1A	Contact	7	A	ALL	Registered in mangoes for control of Flattids, Pink Wax Scale and Fig Leafhoppers. Maximum 3 applications per season.	H Bee:H	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Chlorpyrifos	1B	Contact	21	A	QLD & WA	Registered in mangoes for control of Common Mango Scale . Apply to coincide with crawler activity. Maximum number of applications and re-treatment interval not specified.	H Bee:H	R1
Petroleum Oil	UNM	Contact	1	A	QLD, NSW, WA & NT	Registered in mangoes for control of Scale Insects, Wax Scale and Mango Leaf Hopper. Apply after pruning in February to April when heavy scale populations occur on stems, foliage and fruit. Repeat application where infestation is severe. Do not apply during flowering. Maximum number of applications and re-treatment interval not specified.	L Bee:L	-
Pyriproxyfen (Admiral)	7C	Ingestion	28	A	ALL	Registered in mangoes for control of Mango Scale and Pink Wax Scale . Apply at the time of crawler release. Maximum 2 applications per season. Re-treatment interval not specified.	VL Bee:L	-
Spirotetramat (Movento) Bayer	23	Ingestion	14	A	ALL	Registered in mangoes (post-flowering application) for control of White Mango Scale and Pink Wax Scale , and suppression of Citrus Mealybug. Commence applications from immediately after flowering coinciding with crawler emergence. Apply a second application 21-35 days after the first application if required. Maximum 2 applications post-flowering per season.	M Bee:VL	-
			NR			Registered in mangoes (post-harvest applications – no fruit) for control of White Mango Scale and Pink Wax Scale . Apply after harvest and pruning if applicable to ensure good scale control on new growth. Maximum number of applications and re-treatment interval not specified.		
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact & Ingestion	3 NG	P-A	ALL	Registered in mangoes for control of Banana Spotting Bug, Fruit Spotting Bug, Mango Planthopper and Green Planthopper. US registration for control of Scale in citrus, pome fruit and stone fruit.	L Bee:L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Sulfoxaflor (Transform) Corteva PER85397	4C	Contact & Ingestion	7	P-A	NSW, NT, QLD & WA	Permitted in mangoes for control of Fruit Spotting Bug and Banana Spotting Bug. Registered for control of Scale in citrus, pome fruit and nursery stock. Data generated under projects ST16006 and ST17000 has been submitted to the APVMA in support a label registration in tropical and sub-tropical fruits for various pests and the label extension is pending Nov-2022	M Bee:H	-
Fenoxycarb (Insegar) Syngenta	7B	Contact & Ingestion		P		Registered for control of Scale in apples, pears and olives.	L Bee:VL	-
Mango Seed Weevil (<i>Sternochetus mangiferae</i>)								
Priority: Moderate								
Rated as a high priority in QLD, a moderate priority in NT, and as a low priority in WA. Larvae hatch from eggs laid on the fruit and proceed to burrow through the flesh and into the seed. Pupation occurs in the seed and the adults emerge after chewing through the seed coat any time up to two months after fruit fall. Considered a minor pest as it causes no significant economic damage to fruit. However, there are quarantine restrictions on the movement of mango fruit with seed weevil into a number of markets.								
Clothianidin (Shield) PER87799	4A	Contact & Ingestion	112 NG	A	NSW, QLD & NT	Permitted in mangoes for suppression of Mango Seed Weevil . Apply as a soil drench via micro-irrigation around the base of the tree immediately after flowering is finished. Maximum 1 application per season.	M Bee:VH	R2
Tetraniliprole (Vayego) Bayer PER90367	28	Ingestion	3 NG	A	NSW, NT & QLD	Permitted in mangoes for control of Mango Seed Weevil . Commence applications at the start of egg laying and repeat if pest activity continues. Do not apply until flowering is complete. Maximum 2 applications per crop and minimum re-treatment interval 10 days. Hort Innovation project ST17000 is generating data to support registration for control of various pests in tropical & sub-tropical fruit (inedible peel) including Mango tip borer in mangoes. Bayer label registration pending in Mangoes for Mango seed weevil end of 2022/ early 2023.	L-M Bee:VH	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Indoxacarb (Avatar eVo) FMC	22A	Ingestion		P		Registered for control of various Weevils in asparagus, celery, pome fruit, stone fruit and grapes.	L Bee:H	R3
<p>Longtailed Mealybug (<i>Pseudococcus longispinus</i>) Citrus Mealybug (<i>Planococcus citri</i>) Priority: Moderate</p> <p>Longtailed Mealybug is rated as a moderate priority in NT, and as a low priority in QLD and WA. Citrus Mealybug is rated as a moderate priority in NT and QLD, and as a low priority in WA. Mealybug can cause cosmetic damage to trees and will excrete honeydew which promotes sooty mould outbreaks. Preserving beneficials will assist with management.</p>								
Potassium Salts of Fatty Acid (Natrasoap)	-	Contact	NR	A	ALL	Registered in fruit trees for control of Aphids, Thrips, Mealybug , Two Spotted Mite, Spider Mite and Whitefly. Apply as a cover spray. Number of treatments not specified.	L Bee:L	-
Spirotetramat (Movento) Bayer	23	Ingestion	14	A	ALL	Registered in mangoes (post-flowering application) for control of White Mango Scale and Pink Wax Scale, and suppression of Citrus Mealybug . Commence applications from immediately after flowering coinciding with crawler emergence. Apply a second application 21-35 days after the first application if required. Maximum 2 applications post-flowering per season.	M Bee:VL	-
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C	Contact & Ingestion	28 NG	P-A	ALL	Registered in mangoes for control of Fruit Spotting Bug, Pink Wax Scale, Mango Scale, Mediterranean Fruit Fly and Queensland Fruit Fly. Registered for control of Mealybug in citrus, grapes and macadamias.	M Bee:M	R2
Buprofezin (Applaud) Corteva	16	Ingestion	28	P-A	ALL	Registered in mangoes for control of Mango Scale . Registered for control of Mealybug in citrus, custard apples, grapes, passionfruit, pears, persimmons and cotton.	L Bee:L	-
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact & Ingestion	3 NG	P-A	ALL	Registered in mangoes for control of Banana Spotting Bug, Fruit Spotting Bug, Mango Planthopper and Green Planthopper. US registration for control of Mealybug in citrus and small fruit vine climbing (except Fuzzy Kiwifruit).	L Bee:L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Sulfoxaflor (Transform) Corteva PER85397	4C	Contact & Ingestion	7	P-A	NSW, NT, QLD & WA	Permitted in mangoes for control of Fruit Spotting Bug and Banana Spotting Bug. Registered for control of Mealybug in citrus, grapes, pome fruit, nursery stock and cotton. Data generated under projects ST16006 and ST17000 has been submitted to the APVMA in support a label registration in tropical and sub-tropical fruits for various pests and the label extension is pending Nov-2022	M Bee:H	-
Fonicamid (Mainman) UPL	29	Ingestion		P		Registered for control of Mealybugs in apples and pears.	M Bee:VL	-
<p>Western Flower Thrips (<i>Frankliniella occidentalis</i>) Tomato Thrips (<i>Frankliniella schultzei</i>) Red-Banded Thrips (<i>Selenothrips rubrocinctus</i>) Banana Flower Thrips (<i>Thrips hawaiiensis</i>) Chilli Thrips (<i>Scirtothrips dorsalis</i>) Priority: Moderate</p> <p>Western Flower Thrips are rated as a moderate priority in QLD, and as a low priority in NT and WA. Red-Banded Thrips are rated as a moderate priority in NT, and as a low priority in QLD and WA. All other thrips are rated as a low priority in NT, QLD and WA. Thrips will cause damage from flowering onwards. The nymphs cause scarring and dimpling damage through feeding on the flowers and developing fruit. Late season damage can be seen as bronzing on the fruit as it ripens although it is uncommon for thrips to cause economic damage in mangoes.</p>								
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in fruit trees for control of Ants, Aphids, Caterpillars, Earwigs, Whitefly, Thrips and Leafhopper. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks. Number of treatments not specified.	VH Bee:H	-
Potassium Salts of Fatty Acid (Natrasoap)	-	Contact	NR	A	ALL	Registered in fruit trees for control of Aphids, Thrips , Mealybug, Two Spotted Mite, Spider Mite and Whitefly. Apply as a cover spray. Number of treatments not specified.	L Bee:L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Spinetoram (Success Neo) Corteva	5	Ingestion	NR NG	A	ALL	Registered in tropical & sub-tropical fruit (inedible peel) for control of Flower-Eating Caterpillars, Leafrollers, Loopers, Yellow Peach Moth, Red-Banded Thrips and Sorghum Head Caterpillar. Maximum 4 applications per season with a re-treatment interval of 7-14 days.	M Bee:H	-
Spinosad (Entrust Organic) Corteva	5	Ingestion	NR G:14	A	ALL	Registered in tropical & sub-tropical fruit (inedible peel) for control of Flower-Eating Caterpillars, Leafrollers, Loopers, Yellow Peach Moth, Red-Banded Thrips and Sorghum Head Caterpillar. Maximum 4 applications per season with a re-treatment interval of 7-14 days.	L Bee:L	-
Acetamiprid + Pyriproxyfen (Trivior) Adama	4A+7C	Contact & Ingestion	28 NG	P-A	ALL	Registered in mangoes for control of Fruit Spotting Bug, Pink Wax Scale, Mango Scale, Mediterranean Fruit Fly and Queensland Fruit Fly. Registered for control of Kellys Citrus Thrips in citrus.	M Bee:M	R2
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact & Ingestion	3 NG	P-A	ALL	Registered in mangoes for control of Banana Spotting Bug, Fruit Spotting Bug, Mango Planthopper and Green Planthopper. Registered for suppression of Thrips in macadamias. US registration for suppression of Thrips in berries, citrus, fruiting vegetables, tropical and subtropical fruit, and control of Leafhoppers, Aphids, Squash Bug and Whitefly in cucurbits.	L Bee:L	-
Spirotetramat (Movento) Bayer	23	Ingestion	14	P-A	ALL	Registered in mangoes (post-flowering application) for control of White Mango Scale and Pink Wax Scale, and suppression of Citrus Mealybug. Registered for control of Western Flower Thrips and Tomato Thrips in green beans, control of Western Flower Thrips, Tomato Thrips and Plague Thrips in celery and rhubarb, herbs, bulb vegetables, and control of Western Flower Thrips in lettuce.	M Bee:VL	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Isocycloseram (Simodis) Syngenta	30	Ingestion		P		Hort Innovation AgVet Grant project ST20006 is generating data to support a label registration for control of Apple Dimpling Bug and Red Shouldered Leaf Beetle in mangoes. First global application is proposed for 2023 for Thrips, Bugs, Mites and Caterpillars. Registration submitted May 2021 for Simodis to control Mites, Thrips and Helicoverpa in fruiting vegetables.	-	-
<i>Beauveria bassiana</i> (Velifer) BASF	UN	Biological	NR	P		Registered for suppression of Onion Thrips and Western Flower Thrips in protected vegetables and ornamentals and has activity on Thrips, Aphids, Whitefly and Mites.	L Bee:L	-
Dimpropridaz (Axalion) BASF	TBC			P		New active in development with BASF to control Whitefly, Aphid and Thrips in leafy vegetables, brassica vegetables, fruiting vegetables and cucurbits.	-	-
Mango Shoot Looper (<i>Perixera cf. illepidaria</i>)								
Priority: Moderate								
Mango Shoot Looper is an emerging pest rated as a moderate priority. The pest has only been detected in North QLD but is likely to spread to other growing regions. The larvae feed voraciously on mango tree leaves – leaving only the midribs and veins. They also feed on tender shoots, flowers and immature fruit, and can severely damage tree canopies.								
Methoxyfenozide (Prodigy) PER91798	18	Ingestion	14 NG	A	NSW, NT, QLD & WA	Permitted in mango for control of Mango Shoot Looper . Best results are achieved by using a schedule of 3 applications pre-fruit set at 14 day intervals.	VL Bee:VL	-
Spinetoram (Success Neo) Corteva	5	Ingestion	NR NG	A	ALL	Registered in tropical & sub-tropical fruit (inedible peel) for control of Flower-Eating Caterpillars, Leafrollers, Loopers , Yellow Peach Moth, Red-Banded Thrips and Sorghum Head Caterpillar. Do not use more than 4 applications per season, using a retreatment interval of 7-14 days.	M Bee:H	-
Spinosad (Entrust Organic) Corteva	5	Ingestion	NR G:14	A	ALL	Registered in tropical & sub-tropical fruit (inedible peel) for control of Flower-Eating Caterpillars, Leafrollers, Loopers , Yellow Peach Moth, Red-Banded Thrips and Sorghum Head Caterpillar. Do not use more than 4 applications per season, using a retreatment interval of 7-14 days.	L Bee:L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Tetraniliprole (Vayego) Bayer PER92133	28	Ingestion	3 NG	A	NSW, NT & QLD	Permitted in mango for control of Mango Shoot Looper . Do not apply before or during flowering. Maximum of 2 applications per crop, with a minimum retreatment interval of 10 days. Hort Innovation project ST17000 is generating data to support registration for control of various pests in tropical & sub-tropical fruit (inedible peel) including Mango tip borer in mangoes. Bayer label registration pending in Mangoes for Mango seed weevil end of 2022/ early 2023.	L-M Bee:VH	-
Trichlorfon PER14743	1B	Contact	7	A	ALL (excl. VIC)	Permitted in mangoes for control of Flatid Planthopper, Flower-Eating Caterpillar, Loopers and Yellow Peach Moth and for suppression of Fruit Spotting Bug, Banana Spotting Bug, Green Vegetable Bug and Lychee Stink Bug. Maximum of 6 applications per crop with a minimum re-treatment interval of 7-10 days between consecutive applications.	H Bee:H	R2
Isocycloseram (Simodis) Syngenta	30	Ingestion		P		Hort Innovation AgVet Grant project ST20006 is generating data to support a label registration for control of Apple Dimpling Bug and Red Shouldered Leaf Beetle in mangoes. First global application is proposed for 2023 for Thrips, Bugs, Mites and Caterpillars. Registration submitted May 2021 for Simodis to control Mites, Thrips and Helicoverpa in fruiting vegetables.	-	-
Broflanilide (Vedira) BASF	30	Contact & Ingestion		P		Registration as an ant bait in non-crop situations. It also has potential uses as a seed treatment for the control of Wireworms, and a foliar treatment for the control of chewing pests in various crops.	H Bee:VH	-
Tebufenozide (Mimic)	18	Ingestion		P		Registered for control of Light Brown Apple Moth in pome fruit, citrus, grapevines and kiwifruit, control of Leafroller in avocado, and control of Loopers in pears.	L Bee:L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Ants (Formicidae)								
Priority: Low								
Rated as a low priority in NT, QLD and WA. Ants rarely cause damage to the crop, but they can present nuisance value to workers in the orchard.								
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in fruit trees for control of Ants , Aphids, Caterpillars, Earwigs, Whitefly, Thrips and Leafhopper. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks. Number of treatments not specified.	VH Bee:H	-
Pyriproxifen (Distance Ant Bait)	7C	Ingestion	NR	A	ALL	Registered in tropical fruit plantations as a bait for control of Invasive and Nuisance Ants . Do not exceed 3 applications per year and a minimum of 3 months between each treatment.	VL Bee:L	-
Broflanilide (Vedira) BASF	30	Contact & Ingestion		P		Registration as an ant bait in non-crop situations in 2020.	H Bee:VH	-
Metaflumizone (Siesta Ant Bait) BASF	22B	Ingestion		P		Registration as an ant bait in non-crop situations in 2020.	M Bee:M	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Lychee Stink Bug (<i>Lyamorpha rosea</i>) Green Vegetable Bug (<i>Nezara viridula</i>) Graptostethus Bug (<i>Graptostethus</i> spp.) Priority: Low Rated as a low priority in NT, QLD and WA. Can cause minor cosmetic damage to fruit but rarely warrant control.								
Beta-Cyfluthrin (Bulldock) PER80374	3A	Contact	7	A	NSW, NT, QLD, SA & WA	Permitted in mangoes for control of Fruit Spotting Bug, Banana Spotting Bug, Elephant or Rhino Beetle, Red-Shouldered Leaf Beetle, Swarming Leaf Beetle, Longicorn Trunk Borer, Macadamia Nut Borer, Mango Tip Borer, Flatid Planthopper, Green Vegetable Bug , Lychee Stink Bug and Yellow Peach Moth. Do not use at flowering. Do not use more than 4 applications per year with a minimum of 21 days between consecutive sprays.	VH Bee:H	-
Trichlorfon PER14743	1B	Contact	7	A	ALL (excl. VIC)	Permitted in mangoes for control of Flatid Planthopper, Flower-Eating Caterpillar, Loopers and Yellow Peach Moth and for suppression of Fruit Spotting Bug, Banana Spotting Bug, Green Vegetable Bug and Lychee Stink Bug . Maximum of 6 applications per crop with a minimum re-treatment interval of 7-10 days between consecutive applications.	H Bee:H	R2
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C	Contact & Ingestion	28 NG	P-A	ALL	Registered in mangoes for control of Fruit Spotting Bug, Pink Wax Scale, Mango Scale, Mediterranean Fruit Fly and Queensland Fruit Fly.	M Bee:M	R2
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact & Ingestion	3 NG	P-A	ALL	Registered in mangoes for control of Banana Spotting Bug, Fruit Spotting Bug, Mango Planthopper and Green Planthopper.	L Bee:L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Sulfoxaflor (Transform) Corteva PER85397	4C	Contact & Ingestion	7	P-A	NSW, NT, QLD & WA	Permitted in mangoes for control of Fruit Spotting Bug and Banana Spotting Bug. Data generated under projects ST16006 and ST17000 has been submitted to the APVMA in support a label registration in tropical and sub-tropical fruits for various pests and the label extension is pending Nov-2022	M Bee:H	-
<p>Red Shouldered Leaf Beetle (<i>Monolepta australis</i>) Swarming Leaf Beetle (<i>Rhyparida</i> spp.) Elephant Beetle (<i>Xylotrupes ulysses</i>) Priority: Low Rated as a low priority in NT, QLD and WA. Mainly feed on foliage and even large outbreaks will rarely warrant control.</p>								
Beta-Cyfluthrin (Bulldock) PER80374	3A	Contact	7	A	NSW, NT, QLD, SA & WA	Permitted in mangoes for control of Fruit Spotting Bug, Banana Spotting Bug, Elephant or Rhino Beetle, Red-Shouldered Leaf Beetle, Swarming Leaf Beetle , Longicorn Trunk Borer, Macadamia Nut Borer, Mango Tip Borer, Flatid Planthopper, Green Vegetable Bug, Lychee Stink Bug and Yellow Peach Moth. Do not use at flowering. Do not use more than 4 applications per year with a minimum of 21 days between consecutive sprays.	VH Bee:H	-
Clothianidin (Shield) PER83944	4A	Contact & Ingestion	7 NG	P-A	NSW, QLD, WA & NT	Permitted in mangoes for control of Fruit Fly. Registered for control of Carpophilus Beetle in almonds and stone fruit.	M Bee:VH	R2
Tetraniliprole (Vayego) Bayer	28	Ingestion	3 NG	P-A	NSW, NT & QLD	Permitted in mangoes for control of Mango Seed Weevil (PER90367) and Mango Shoot Looper (PER92133). Hort Innovation project ST17000 is generating data to support registration for control of various pests in tropical & sub-tropical fruit (inedible peel) including Mango tip borer in mangoes. Bayer label registration pending in Mangoes for Mango seed weevil end of 2022/ early 2023.	L-M Bee:VH	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Isocycloseram (Simodis) Syngenta	30	Ingestion		P		Hort Innovation AgVet Grant project ST20006 is generating data to support a label registration for control of Apple Dimpling Bug and Red Shouldered Leaf Beetle in mangoes. First global application is proposed for 2023 for Thrips, Bugs, Mites and Caterpillars. Registration submitted May 2021 for Simodis to control Mites, Thrips and Helicoverpa in fruiting vegetables.	-	-
<p>Hairy Leafeating Caterpillar (<i>Xanthodes congenita</i>) Macadamia Nut Borer (<i>Cryptophlebia ombrodelta</i>) Sorghum Head Caterpillar (<i>Cryptoblabes adoceta</i>) Yellow Peach Moth (<i>Conogethes punctiferalis</i>) Priority: Low Rated as a low priority in NT, QLD and WA. Control generally not warranted.</p>								
Beta-Cyfluthrin (Bulldock) PER80374	3A	Contact	7	A	NSW, NT, QLD, SA & WA	Permitted in mangoes for control of Fruit Spotting Bug, Banana Spotting Bug, Elephant or Rhino Beetle, Red-Shouldered Leaf Beetle, Swarming Leaf Beetle, Longicorn Trunk Borer, Macadamia Nut Borer , Mango Tip Borer, Flatid Planthopper, Green Vegetable Bug, Lychee Stink Bug and Yellow Peach Moth . Do not use at flowering. Do not use more than 4 applications per year with a minimum of 21 days between consecutive sprays.	VH Bee:H	-
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in fruit trees for control of Ants, Aphids, Caterpillars , Earwigs, Whitefly, Thrips and Leafhopper. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks. Number of treatments not specified.	VH Bee:H	-
Spinetoram (Success Neo) Corteva	5	Ingestion	NR NG	A	ALL	Registered in tropical & sub-tropical fruit (inedible peel) for control of Flower-Eating Caterpillars, Leafrollers, Loopers, Yellow Peach Moth , Red-Banded Thrips and Sorghum Head Caterpillar . Maximum 4 applications per season with a re-treatment interval of 7-14 days.	M Bee:H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Spinosad (Entrust Organic) Corteva	5	Ingestion	NR G:14	A	ALL	Registered in tropical & sub-tropical fruit (inedible peel) for control of Flower-Eating Caterpillars, Leafrollers, Loopers, Yellow Peach Moth , Red-Banded Thrips and Sorghum Head Caterpillar . Maximum 4 applications per season with a re-treatment interval of 7-14 days.	L Bee:L	-
Trichlorfon PER14743	1B	Contact	7	A	ALL (excl. VIC)	Permitted in mangoes for control of Flatid Planthopper, Flower-Eating Caterpillar, Loopers and Yellow Peach Moth and for suppression of Fruit Spotting Bug, Banana Spotting Bug, Green Vegetable Bug and Lychee Stink Bug. Maximum of 6 applications per crop with a minimum re-treatment interval of 7-10 days between consecutive applications.	H Bee:H	R2
Tetraniliprole (Vayego) Bayer	28	Ingestion	3 NG	P-A	NSW, NT & QLD	Permitted in mangoes for control of Mango Seed Weevil (PER90367) and Mango Shoot Looper (PER92133). Hort Innovation project ST17000 is generating data to support registration for control of various pests in tropical & sub-tropical fruit (inedible peel) including Mango tip borer in mangoes. Bayer label registration pending in Mangoes for Mango seed weevil end of 2022/ early 2023.	L-M Bee:VH	-
Isocycloseram (Simodis) Syngenta	30	Ingestion		P		Hort Innovation AgVet Grant project ST20006 is generating data to support a label registration for control of Apple Dimpling Bug and Red Shouldered Leaf Beetle in mangoes. First global application is proposed for 2023 for Thrips, Bugs, Mites and Caterpillars. Registration submitted May 2021 for Simodis to control Mites, Thrips and Helicoverpa in fruiting vegetables.	-	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Fall Armyworm (<i>Spodoptera frugiperda</i>) Priority: Low								
Rated as a low priority in NT, QLD and WA. Fall Armyworm is an exotic pest that can reproduce prolifically, especially in warm weather. It is important to monitor crops for eggs and larvae of pest species by regular field scouting. Target sprays against mature eggs and newly hatched larvae before pests become entrenched. Note: Emergency use permits currently in place for Fall Armyworm will not be renewed in mangoes								
<i>Bacillus thuringiensis subsp Kurstaki</i> Strain HD-1	11	Ingestion	NR	A	ALL	Registered in fruit for control of Armyworm , Cotton Bollworm, Native Budworm, Cabbage Moth, Cabbage White Butterfly, Loopers, Light Brown Apple Moth and Vine Moth. Apply to newly hatched larvae, late in the afternoon or early evening. Apply a minimum of 2 sprays separated by no more than 3 days initially, and then reapply at 3-5 day intervals. Maximum number of applications not specified.	VL Bee:L	-
Methomyl (Lannate) PER89293	1A	Contact	NR	A	ALL	Permitted in mangoes for control of Fall Armyworm . Do not apply after early fruit set. Maximum 3 applications per season with a re-treatment interval of 10-14 days.	H Bee:H	R2
Spinetoram (Success Neo) Corteva PER89241	5	Ingestion	NR NG	A	ALL (excl. VIC)	Permitted in tropical & sub-tropical fruit (inedible peel) for control of Fall Armyworm . Maximum 4 applications per season with a re-treatment interval of 7-14 days.	M Bee:H	-
Spinosad (Entrust Organic) Corteva PER89870	5	Ingestion	NR G:14	A	ALL (excl. VIC)	Permitted in tropical & sub-tropical fruit (inedible peel) for control of Fall Armyworm . Maximum 4 applications per season with a re-treatment interval of 7-14 days.	L Bee:L	-
Tetraniliprole (Vayego) Bayer	28	Ingestion	3 NG	P-A	NSW, NT & QLD	Permitted in mangoes for control of Mango Seed Weevil (PER90367) and Mango Shoot Looper (PER92133). Hort Innovation project ST17000 is generating data to support registration for control of various pests in tropical & sub-tropical fruit (inedible peel) including Mango tip borer in mangoes. Bayer label registration pending in Mangoes for Mango seed weevil end of 2022/ early 2023.	L-M Bee:VH	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Isocycloseram (Simodis) Syngenta	30	Ingestion		P		Hort Innovation AgVet Grant project ST20006 is generating data to support a label registration for control of Apple Dimpling Bug and Red Shouldered Leaf Beetle in mangoes. First global application is proposed for 2023 for Thrips, Bugs, Mites and Caterpillars. Registration submitted May 2021 for Simodis to control Mites, Thrips and Helicoverpa in fruiting vegetables.	-	-
Mango Stem Miner (<i>Spulerina isonoma</i>)								
Priority: Low								
Rated as a low priority in NT, QLD and WA. A white-grey coloured papery blister is formed on the stem of new shoots as the larva feeds under the epidermis. Control measures rarely warranted. Coverage with insecticides is difficult to achieve when the larvae are entrenched in the stems.								
Spinetoram (Success Neo) Corteva	5	Ingestion	NR NG	P-A	ALL	Registered in mangoes for control of Flower-Eating Caterpillars, Small Mango Tip Borer and Large Mango Tip Borer.	M Bee:H	-
Spinosad (Entrust Organic) Corteva	5	Ingestion	NR G:14	P-A	ALL	Registered in mangoes for control of Flower-Eating Caterpillars, Small Mango Tip Borer and Large Mango Tip Borer.	L Bee:L	-
Tetraniliprole (Vayego) Bayer	28	Ingestion	3 NG	P-A	NSW, NT & QLD	Permitted in mangoes for control of Mango Seed Weevil (PER90367) and Mango Shoot Looper (PER92133). Hort Innovation project ST17000 is generating data to support registration for control of various pests in tropical & sub-tropical fruit (inedible peel) including Mango tip borer in mangoes. Bayer label registration pending in Mangoes for Mango seed weevil end of 2022/ early 2023.	L-M Bee:VH	-
Isocycloseram (Simodis) Syngenta	30	Ingestion		P		Hort Innovation AgVet Grant project ST20006 is generating data to support a label registration for control of Apple Dimpling Bug and Red Shouldered Leaf Beetle in mangoes. First global application is proposed for 2023 for Thrips, Bugs, Mites and Caterpillars. Registration submitted May 2021 for Simodis to control Mites, Thrips and Helicoverpa in fruiting vegetables.	-	-

4.3 Weeds in mangoes

4.3.1 Weed priorities

Common Name	Scientific Name
Moderate	
Feather Top Rhodes Grass	<i>Chloris virgata</i>
Flaxleaf Fleabane	<i>Conyza bonariensis</i>
Low	
Ryegrass	<i>Lolium</i> spp.
Couch Grass	<i>Cynodon dactylon</i>
Flannel Weed	<i>Sida cordifolia</i>
Dock	<i>Rumex</i> spp.
Blackberry Nightshade	<i>Solanum nigrum</i>
Willow Weed	<i>Persicaria maculosa</i>
Fat Hen	<i>Chenopodium album</i>
Marshmallow	<i>Malva parviflora</i>

There were no high priority weeds identified in the feedback, but Feather Top Rhodes Grass and Flaxleaf Fleabane were rated as a moderate priority. An integrated weed management program incorporating mulch and inter-row grass cover should be used to reduce reliance on herbicides in orchards.

Resistance management

There are confirmed cases of resistance in Australia for Awnless Barnyard Grass (Group 9 at more than 200 sites), Feather Top Rhodes Grass (Group 9 at 4 sites) and Blackberry Nightshade (Group 22 at 2 sites).

Specific resistance management strategies for high resistance risk (1 and 2) and moderate resistance risk (0, 3, 4, 5, 9, 10, 12, 14, 15, 22, 27 and 34) herbicide modes of action are available on the CropLife Australia webpage⁸.

⁸ <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 7)	
		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
Feather Top Rhodes Grass (<i>Chloris virgata</i>)							
Priority: Moderate							
Rated as a moderate priority in NT and WA, and as a low priority in QLD. Feathertop Rhodes Grass is an aggressive grass weed that is difficult to control with herbicides. Multiple applications are required.							
Clethodim (Select)	1***	Non-Bearing Fruit Trees	Registered in non-bearing fruit trees for control of annual and perennial grass weeds, including Feather Top Rhodes Grass . Apply after trees have recovered from transplant shock and are showing signs of active growth. Do not apply to bearing trees.	NR	A	ALL	R3
Dichlobenil (Casoran)	29**	Orchards / Residual Weed Control	Registered in orchards for residual weed control of annual grass and broadleaf weeds.	NR	A	ALL	-
Fluazifop-P (Fusilade)	1***	Mangoes / Directed Spray	Registered in mangoes as a directed spray for the control of grass weeds, including Feather Top Rhodes Grass .	14	A	NSW, QLD, NT & WA	-

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory Risk
Glufosinate (Basta)	10**	Non-Bearing Fruit Trees / Directed or Shielded Spray	Registered in non-bearing fruit trees for control of various grass and broadleaf weeds, including Feather Top Rhodes Grass . Apply treatment along the sides of crops and between rows of crops.	NR G:56	A	ALL	R3
Glyphosate (Roundup)	9**	Mangoes / Over 3 Years Old / Directed Spray, Shielded Spray or Wick Wiper	Registered in mangoes for control of various grass and broadleaf weeds, including Feather Top Rhodes Grass . Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Haloxypop (Verdict)	1***	Mangoes / Directed Spray or Spot Spray	Registered in mangoes for control of grass weeds, including Feather Top Rhodes Grass . Apply as a directed spray.	NR	A	ALL	-
Paraquat (Gramoxone)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass and broadleaf weeds, including Feather Top Rhodes Grass . Do not allow spray to contact any part of the tree, including the trunk.	H:1 G:7	A	ALL	R3
Paraquat + Amitrole (Guerrilla)	22** + 34**	Orchards / Directed Spray	Registered in orchards for control of annual weeds, including Feather Top Rhodes Grass . Avoid contact with crop foliage.	H:NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of various annual grass and broadleaf weeds, including Feather Top Rhodes Grass . Do not allow spray to contact any part of the tree, including the trunk.	G:1	A	ALL	R3
Flumioxazin (Chateau)	14**		Registered in grapes, pome fruit, stone fruit, citrus, tree nuts, olives, avocados and blueberries as a directed spray for residual control of grass and broadleaf weeds, including Feather Top Rhodes Grass .		P		-
S-Metolachlor (Dual Gold) Syngenta	15**		Registered for control of grass and broadleaf weeds in Brassica vegetables, Brassica leafy vegetables, sweet potatoes, spring onions, shallots, spinach, silverbeet, rhubarb, culinary herbs and beans.		P		-

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory Risk
Flaxleaf Fleabane (<i>Coryza bonariensis</i>)							
Priority: Moderate							
Rated as a moderate priority in NT and QLD, and as a low priority in WA. 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.							
Dichlobenil (Casoran)	29**	Orchards / Residual Weed Control	Registered in orchards for residual weed control of annual grass and broadleaf weeds.	NR	A	ALL	-
Glufosinate (Basta)	10**	Non-Bearing Fruit Trees / Directed or Shielded Spray	Registered in non-bearing fruit trees for control of various grass and broadleaf weeds, including Flaxleaf Fleabane . Apply treatment along the sides of crops and between rows of crops.	NR G:56	A	ALL	R3
Glyphosate (Roundup)	9**	Mangoes / Over 3 Years Old / Directed Spray, Shielded Spray or Wick Wiper	Registered in mangoes 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.	NR	A	ALL	R3
Paraquat (Gramoxone)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass and broadleaf weeds, including Flaxleaf Fleabane . Do not allow spray to contact any part of the tree, including the trunk.	H:1 G:7	A	ALL	R3
Paraquat + Amitrole (Guerrilla)	22** + 34**	Orchards / Directed Spray	Registered in orchards for control of annual weeds, including Flaxleaf Fleabane . Avoid contact with crop foliage.	H:NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of various annual grass and broadleaf weeds, including Flaxleaf Fleabane . Do not allow spray to contact any part of the tree, including the trunk.	G:1	A	ALL	R3
Flumioxazin (Chateau)	14**		Registered in grapes, pome fruit, stone fruit, citrus, tree nuts, olives, avocados and blueberries as a directed spray for residual control of grass and broadleaf weeds, including Flaxleaf Fleabane .		P		-

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory Risk
Ryegrass (<i>Lolium</i> spp.)							
Priority: Low							
Rated as a low priority in NT, QLD and WA. The most serious grass weed of southern Australia with distribution that is gradually extending north. Populations are prone to herbicide resistance so integrated weed management and rotation of herbicide modes of action are important aspects of a long-term control strategy.							
Amitrole	34**	Orchards / Directed Spray	Registered in orchards as a directed spray for the control of grass and broadleaf weeds, including Ryegrass .	56	A	ALL	-
Clethodim (Select)	1***	Non-Bearing Fruit Trees	Registered in non-bearing fruit trees for control of annual and perennial grass weeds, including Ryegrass . Apply after trees have recovered from transplant shock and are showing signs of active growth. Do not apply to bearing trees.	NR	A	ALL	R3
Dichlobenil (Casoran)	29**	Orchards / Residual Weed Control	Registered in orchards for residual weed control of annual grass and broadleaf weeds.	NR	A	ALL	-
Fluazifop-P (Fusilade)	1***	Mangoes / Directed Spray	Registered in mangoes as a directed spray for the control of grass weeds, including Ryegrass .	14	A	NSW, QLD, NT & WA	-
Glufosinate (Basta)	10**	Non-Bearing Fruit Trees / Directed or Shielded Spray	Registered in non-bearing fruit trees for control of various grass and broadleaf weeds, including Ryegrass . Apply treatment along the sides of crops and between rows of crops.	NR G:56	A	ALL	R3
Glyphosate (Roundup)	9**	Mangoes / Over 3 Years Old / Directed Spray, Shielded Spray or Wick Wiper	Registered in mangoes for control of various grass and broadleaf weeds, including Annual Ryegrass . Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Haloxifop (Verdict)	1***	Mangoes / Directed Spray or Spot Spray	Registered in mangoes for control of grass weeds, including Annual Ryegrass . Apply as a directed spray.	NR	A	ALL	-

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory Risk
Oryzalin	3**	Fruit Trees / Non-Bearing Fruit / Directed Spray	Registered in non-bearing fruit trees for control of various grass and broadleaf weeds, including Annual Ryegrass . Apply as a directed spray.	NR	A	ALL	-
Oxyfluorfen (Goal)	14**	Mangoes / Directed Spray / Tank Mix with Glyphosate, Paraquat or Paraquat/Diquat	Registered in mangoes for control of various grass and broadleaf weeds, including Annual Ryegrass . If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	NR NG	A	ALL	-
Paraquat (Gramoxone)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass and broadleaf weeds, including Ryegrass . Do not allow spray to contact any part of the tree, including the trunk.	H:1 G:7	A	ALL	R3
Paraquat + Amitrole (Guerrilla)	22** + 34**	Orchards / Directed Spray	Registered in orchards for control of annual weeds, including Ryegrass . Avoid contact with crop foliage.	H:NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of various annual grass and broadleaf weeds, including Ryegrass . Do not allow spray to contact any part of the tree, including the trunk.	G:1	A	ALL	R3
Pendimethalin (Stomp)	3**	Mangoes / Directed Spray / Residual Weed Control	Registered in mangoes for control of various grass and broadleaf weeds, including Annual Ryegrass . Do not allow spray to contact any part of the tree, including the trunk. Incorporate with at least 5mm of rainfall or spray irrigation as soon as possible but no later than 10 days after treatment.	NR	A	ALL	-
Trifluralin	3**	Orchards / Pre-Plant Residual	Registered in orchards as a pre-plant residual for control of grass and broadleaf weeds, including Ryegrass .	NR	A	QLD, SA, WA, VIC & TAS	-
Flumioxazin (Chateau)	14**		Registered in grapes, pome fruit, stone fruit, citrus, tree nuts, olives, avocados and blueberries as a directed spray for residual control of grass and broadleaf weeds, including Ryegrass .		P		-

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory Risk
Napropamide (Devrinol)	0**		Registered in almonds, grapes, stone fruit and tomatoes for control of various grass and broadleaf weeds, including Ryegrass .		P		-
Norflurazon (Zoliar) AgNova	12**		Registered in citrus, grapes, almonds, pome fruit and stone fruit for control of various grass and broadleaf weeds, including Ryegrass .		P		-
S-Metolachlor (Dual Gold) Syngenta	15**		Registered for control of grass and broadleaf weeds, including Annual Ryegrass in Brassica vegetables, Brassica leafy vegetables, sweet potatoes, spring onions, shallots, spinach, silverbeet, rhubarb, culinary herbs and beans.		P		-
S-Metolachlor+ Prosulfocarb (Boxer Gold) Syngenta	15**		Registered for control of Ryegrass in potatoes.		P		-
Couch Grass (<i>Cynodon dactylon</i>)							
Priority: Low							
Rated as a low priority in NT and QLD, and as a moderate priority in WA. Couch Grass is an aggressive and highly competitive perennial grass that grows year-round in most areas. Herbicide control is effectively provided it is targeted to young, actively growing weeds. Multiple applications are usually required.							
Fluazifop-P (Fusilade)	1***	Mangoes / Directed Spray or Shielded Spray	Registered in mangoes for control of grass weeds. Apply as a directed spray.	NR	A	ALL	-
Glufosinate (Basta)	10**	Non-Bearing Fruit Trees / Directed or Shielded Spray	Registered in non-bearing fruit trees for control of various grass and broadleaf weeds, including Couch Grass . Apply treatment along the sides of crops and between rows of crops.	NR G:56	A	ALL	R3

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory Risk
Glyphosate (Roundup)	9**	Mangoes / Over 3 Years Old / Directed Spray, Shielded Spray or Wick Wiper	Registered in mangoes for control of various grass and broadleaf weeds, including Couch Grass . Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Haloxypop (Verdict)	1***	Mangoes / Directed Spray or Spot Spray	Registered in mangoes for control of grass weeds, including Couch Grass . Apply as a directed spray.	NR	A	ALL	-
S-Metolachlor (Dual Gold) Syngenta	15**		Registered for control of grass and broadleaf weeds in Brassica vegetables, Brassica leafy vegetables, sweet potatoes, spring onions, shallots, spinach, silverbeet, rhubarb, culinary herbs and beans.		P		-
Flannel Weed (<i>Sida cordifolia</i>)							
Priority: Low							
Rated as a low priority in NT, QLD and WA. Perennial broadleaf weed that is difficult to control when plants become established.							
Dichlobenil (Casoran)	29**	Orchards / Residual Weed Control	Registered in orchards for residual weed control of annual grass and broadleaf weeds.	NR	A	ALL	-
Glufosinate (Basta)	10**	Non-Bearing Fruit Trees / Directed or Shielded Spray	Registered in non-bearing fruit trees for control of various grass and broadleaf weeds, including Flannel Weed . Apply treatment along the sides of crops and between rows of crops.	NR G:56	A	ALL	R3
Glyphosate (Roundup)	9**	Mangoes / Directed or Shielded Spray	Registered in mangoes for control of various grass and broadleaf weeds, including Flannel Weed . Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Paraquat (Gramoxone)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass and broadleaf weeds, including Flannel Weed . Do not allow spray to contact any part of the tree, including the trunk.	H:1 G:7	A	ALL	R3
Paraquat + Amitrole (Guerrilla)	22** + 34**	Orchards / Directed Spray	Registered in orchards for control of annual weeds, including Flannel Weed . Avoid contact with crop foliage.	H:NR G:1	A	ALL	R3

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory Risk
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of various annual grass and broadleaf weeds, including Flannel Weed . Do not allow spray to contact any part of the tree, including the trunk.	G:1	A	ALL	R3
Dock (<i>Rumex</i> spp.)							
Priority: Low							
Rated as a low priority in NT, QLD and WA. Widespread species that is prolific and difficult to control when established.							
Dichlobenil (Casoran)	29**	Orchards / Residual Weed Control	Registered in orchards for residual weed control of annual grass and broadleaf weeds.	NR	A	ALL	-
Glufosinate (Basta)	10**	Non-Bearing Fruit Trees / Directed or Shielded Spray	Registered in non-bearing fruit trees for control of various grass and broadleaf weeds, including Dock . Apply treatment along the sides of crops and between rows of crops.	NR G:56	A	ALL	R3
Glyphosate (Roundup)	9**	Mangoes / Directed or Shielded Spray	Registered in mangoes for control of various grass and broadleaf weeds, including Dock . Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Oxyfluorfen (Goal)	14**	Mangoes / Directed Spray / Tank Mix with Glyphosate, Paraquat or Paraquat/Diquat	Registered in mangoes for control of various grass and broadleaf weeds, including Dock . If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	NR NG	A	ALL	-
Paraquat (Gramoxone)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass and broadleaf weeds, including Dock . Do not allow spray to contact any part of the tree, including the trunk.	H:1 G:7	A	ALL	R3
Paraquat + Amitrole (Guerrilla)	22** + 34**	Orchards / Directed Spray	Registered in orchards for control of annual weeds, including Dock . Avoid contact with crop foliage.	H:NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of various annual grass and broadleaf weeds, including Dock . Do not allow spray to contact any part of the tree, including the trunk.	G:1	A	ALL	R3

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory Risk
Blackberry Nightshade (<i>Solanum nigrum</i>)							
Priority: Low							
Rated as a low priority in NT, QLD and WA. Prolific weed that is widely adapted and difficult to eradicate, mainly due to its long-term seed viability.							
Amitrole	34**	Orchards / Directed Spray	Registered in orchards as a directed spray for the control of grass and broadleaf weeds, including Blackberry Nightshade .	56	A	ALL	-
Dichlobenil (Casoran)	29**	Orchards / Residual Weed Control	Registered in orchards for residual weed control of annual grass and broadleaf weeds.	NR	A	ALL	-
Glufosinate (Basta)	10**	Non-Bearing Fruit Trees / Directed or Shielded Spray	Registered in non-bearing fruit trees for control of various grass and broadleaf weeds, including Blackberry Nightshade . Apply treatment along the sides of crops and between rows of crops.	NR G:56	A	ALL	R3
Glyphosate (Roundup)	9**	Stone Fruit / Over 3 Years Old / Directed Spray, Shielded Spray or Wick Wiper	Registered in stone fruit for control of various grass and broadleaf weeds, including Blackberry Nightshade . Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Isoxaben (Gallery) Corteva	29**	Bearing & Non-Bearing Fruit Trees / Residual Weed Control	Registered in bearing and non-bearing fruit trees for control of broadleaf weeds, including Blackberry Nightshade . Apply as a directed spray to weed-free, well prepared soil. Must be activated by at least 12.5mm of rainfall or sprinkler irrigation within 21 days of application.	NR	A	ALL	-
Oxyfluorfen (Goal)	14**	Mangoes / Directed Spray / Tank Mix with Glyphosate, Paraquat or Paraquat/Diquat	Registered in mangoes 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.	NR NG	A	ALL	-

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory Risk
Oryzalin	3**	Fruit Trees / Non-Bearing Fruit / Directed Spray	Registered in non-bearing fruit trees for control of various grass and broadleaf weeds, including Blackberry Nightshade . Apply as a directed spray.	NR	A	ALL	-
Paraquat (Gramoxone)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass and broadleaf weeds, including Blackberry Nightshade . Do not allow spray to contact any part of the tree, including the trunk.	H:1 G:7	A	ALL	R3
Paraquat + Amitrole (Guerrilla)	22** + 34**	Orchards / Directed Spray	Registered in orchards for control of annual weeds, including Blackberry Nightshade . Avoid contact with crop foliage.	H:NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of various annual grass and broadleaf weeds, including Blackberry Nightshade . Do not allow spray to contact any part of the tree, including the trunk.	G:1	A	ALL	R3
Pendimethalin (Stomp)	3**	Mangoes / Directed Spray / Residual Weed Control	Registered in mangoes for control of various grass and broadleaf weeds, including Blackberry Nightshade . Do not allow spray to contact any part of the tree, including the trunk. Incorporate with at least 5mm of rainfall or spray irrigation as soon as possible but no later than 10 days after treatment.	NR	A	ALL	-
Flumioxazin (Chateau)	14**		Registered in grapes, pome fruit, stone fruit, citrus, tree nuts, olives, avocados and blueberries as a directed spray for residual control of grass and broadleaf weeds, including Blackberry Nightshade .		P		-
Norflurazon (Zoliar) AgNova	12**		Registered in citrus, grapes, almonds, pome fruit and stone fruit for control of various grass and broadleaf weeds, including Blackberry Nightshade .		P		-
S-Metolachlor (Dual Gold) Syngenta	15**		Registered for control of grass and broadleaf weeds, including Blackberry Nightshade in Brassica vegetables, Brassica leafy vegetables, sweet potatoes, spring onions, shallots, spinach, silverbeet, rhubarb, culinary herbs and beans.		P		-

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory Risk
Willow Weed (<i>Persicaria maculosa</i>)							
Priority: Low							
Rated as a low priority in NT, QLD and WA.							
Dichlobenil (Casoran)	29**	Orchards / Residual Weed Control	Registered in orchards for residual weed control of annual grass and broadleaf weeds.	NR	A	ALL	-
Glufosinate (Basta)	10**	Non-Bearing Fruit Trees / Directed or Shielded Spray	Registered in non-bearing fruit trees for control of various grass and broadleaf weeds, including Willow Weed . Apply treatment along the sides of crops and between rows of crops.	NR G:56	A	ALL	R3
Glyphosate (Roundup)	9**	Mangoes / Directed or Shielded Spray	Registered in mangoes for control of various grass and broadleaf weeds, including Willow Weed . Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Paraquat (Gramoxone)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass and broadleaf weeds, including Willow Weed . Do not allow spray to contact any part of the tree, including the trunk.	H:1 G:7	A	ALL	R3
Paraquat + Amitrole (Guerrilla)	22** + 34**	Orchards / Directed Spray	Registered in orchards for control of annual weeds, including Willow Weed . Avoid contact with crop foliage.	H:NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of various annual grass and broadleaf weeds, including Willow Weed . Do not allow spray to contact any part of the tree, including the trunk.	G:1	A	ALL	R3
Fat Hen (<i>Chenopodium album</i>)							
Priority: Low							
Rated as a low priority in NT, QLD and WA. Fat Hen is a fast-growing woody annual weed, which can germinate throughout most of the year. Timely herbicide control is critical for managing this weed.							
Dichlobenil (Casoran)	29**	Orchards / Residual Weed Control	Registered in orchards for residual weed control of annual grass and broadleaf weeds.	NR	A	ALL	-

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory Risk
Glufosinate (Basta)	10**	Non-Bearing Fruit Trees / Directed or Shielded Spray	Registered in non-bearing fruit trees for control of various grass and broadleaf weeds, including Fat Hen . Apply treatment along the sides of crops and between rows of crops.	NR G:56	A	ALL	R3
Glyphosate (Roundup)	9**	Mangoes / Directed or Shielded Spray	Registered in mangoes for control of various grass and broadleaf weeds, including Fat Hen . Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Isoxaben (Gallery) Corteva	29**	Bearing & Non-Bearing Fruit Trees / Residual Weed Control	Registered in bearing and non-bearing fruit trees for control of broadleaf weeds, including Fat Hen . Apply as a directed spray to weed-free, well prepared soil. Must be activated by at least 12.5mm of rainfall or sprinkler irrigation within 21 days of application.	NR	A	ALL	-
Oxyfluorfen (Goal)	14**	Mangoes / Directed Spray / Tank Mix with Glyphosate, Paraquat or Paraquat/Diquat	Registered in mangoes for control of various grass and broadleaf weeds, including Fat Hen . If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	NR NG	A	ALL	-
Oryzalin	3**	Fruit Trees / Non-Bearing / Directed Spray	Registered in non-bearing fruit trees for control of various grass and broadleaf weeds, including Fat Hen . Apply as a directed spray.	NR	A	ALL	-
Paraquat (Gramoxone)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass and broadleaf weeds, including Fat Hen . Do not allow spray to contact any part of the tree, including the trunk.	H:1 G:7	A	ALL	R3
Paraquat + Amitrole (Guerrilla)	22** + 34**	Orchards / Directed Spray	Registered in orchards for control of annual weeds, including Fat Hen . Avoid contact with crop foliage.	H:NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of various annual grass and broadleaf weeds, including Fat Hen . Do not allow spray to contact any part of the tree, including the trunk.	G:1	A	ALL	R3

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory Risk
Flumioxazin (Chateau)	14**		Registered in grapes, pome fruit, stone fruit, citrus, tree nuts, olives, avocados and blueberries as a directed spray for residual control of grass and broadleaf weeds, including Fat Hen .		P		-
S-Metolachlor (Dual Gold) Syngenta	15**		Registered for control of grass and broadleaf weeds, including Fat Hen in Brassica vegetables, Brassica leafy vegetables, sweet potatoes, spring onions, shallots, spinach, silverbeet, rhubarb, culinary herbs and beans.		P		-
Marshmallow (<i>Malva parviflora</i>)							
Priority: Low							
Rated as a low priority in NT and QLD, and as a moderate priority in WA. Adapted to a wide variety of environments and highly competitive weed. Control with knockdown herbicides can be unreliable.							
Carfentrazone (Hammer)	14**	Tropical & Sub-Tropical Fruits / Directed Spray or Spot Spray	Registered in tropical and sub-tropical fruits for control of various broadleaf weeds, including Marshmallow . If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	NR	A	ALL	-
Dichlobenil (Casoran)	29**	Orchards / Residual Weed Control	Registered in orchards for residual weed control of annual grass and broadleaf weeds.	NR	A	ALL	-
Glyphosate (Roundup)	9**	Mangoes / Directed or Shielded Spray	Registered in mangoes for control of various grass and broadleaf weeds, including Marshmallow . Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Isoxaben (Gallery) Corteva	29**	Bearing & Non-Bearing Fruit Trees / Residual Weed Control	Registered in bearing and non-bearing fruit trees for control of broadleaf weeds, including Marshmallow . Apply as a directed spray to weed-free, well prepared soil. Must be activated by at least 12.5mm of rainfall or sprinkler irrigation within 21 days of application.	NR	A	ALL	-

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory Risk
Oxyfluorfen (Goal)	14**	Mangoes / Directed Spray / Tank Mix with Glyphosate, Paraquat or Paraquat/Diquat	Registered in mangoes for control of various grass and broadleaf weeds, including Marshmallow . If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	NR NG	A	ALL	-
Paraquat (Gramoxone)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass and broadleaf weeds, including Marshmallow . Do not allow spray to contact any part of the tree, including the trunk.	H:1 G:7	A	ALL	R3
Paraquat + Amitrole (Guerrilla)	22** + 34**	Orchards / Directed Spray	Registered in orchards for control of annual weeds, including Marshmallow . Avoid contact with crop foliage.	H:NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of various annual grass and broadleaf weeds, including Marshmallow . Do not allow spray to contact any part of the tree, including the trunk.	G:1	A	ALL	R3
Flumioxazin (Chateau)	14**		Registered in grapes, pome fruit, stone fruit, citrus, tree nuts, olives, avocados and blueberries as a directed spray for residual control of grass and broadleaf weeds, including Marshmallow .		P		-

4.4 Plant Growth Regulators in mangoes

4.4.1 Plant Growth Regulator priorities

PGR Issue
High
Control of Vegetative Growth
Moderate
Promotion of Early Flowering
Extend Shelf Life
Low
Ageing and Ripening Delay

4.3.2 Available and potential plant growth regulators

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		
Regulatory risk (refer to Appendix 7)			
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		
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	WHP (days)	Availability	States	Regulatory Risk
Control of Vegetative Growth							
Priority: High							
Rated as a high priority in NT, QLD and WA.							
Paclobutrazol	PGR	Mangoes / Collar Drench	Registered in mangoes to reduce vegetative growth. Apply within 4 weeks after harvest or no later than mid-February. Do not treat trees with a canopy of less than 3m diameter.	NR	A	QLD, NT & NSW	-
Ethephon	PGR		Registered for retarding vegetative growth and stimulating flowering of young apple trees. Previous minor use permit expired for use of ethephon to manage seasonal vegetative flushes in mangoes.		P		-
Gibberellins + 6-Benzyladenine (Cytolin)	PGR		Registered for stimulation of lateral growth in red delicious apples and non-bearing cherries.		P		-
Prohexadione-Calcium (Regalis)	PGR		Registered for reduction of shoot growth in apples and cherries.		P		-

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use	WHP (days)	Availability	States	Regulatory Risk
Promotion of Early Flowering							
Priority: Moderate							
Rated as a moderate priority in NT and QLD, and as a high priority in WA.							
Cyanamide (Dormex)	PGR		Registered for regulation of bud dormancy in apples, grapes, kiwi fruit, plums, almonds and walnuts. Early budbreak may not translate to earlier flowering.		P		-
Methyl Esters of Fatty Acids (Waiken)	PGR		Registered to advance budbreak in cherries. Early budbreak may not translate to earlier flowering.		P		-
Extend Shelf Life							
Priority: Moderate							
Rated as a moderate priority in NT, QLD and WA.							
1-Methylcyclopropene (Smartfresh)	PGR	Mangoes / Post-Harvest Treatment	Registered in mangoes for improved quality after shipping, storage and handling . For use in enclosed areas. Should be added to the treatment area containing fruit immediately after harvest, upon entering storage or in transit.	NR	A	ALL	-
Amino Ethoxy Vinyl Glycine (Retain)	PGR		Registered for improved harvest management, fruit quality and enhanced storage potential in apples and stonefruit (except cherries)		P		-

5. References

5.1 Information:

AgChem Access Priority Access Forum	https://www.agrifutures.com.au/national-rural-issues/agvet-chemicals/
Australian Pesticide and Veterinary Medicines Authority	www.apvma.gov.au
APVMA Chemical review	https://apvma.gov.au/chemicals-and-products/chemical-review/listing
APVMA MRLs	www.legislation.gov.au/Details/F2021C00634
APVMA Permit search	https://productsearch.apvma.gov.au/permits
APVMA Product search	https://productsearch.apvma.gov.au/products
Codex MRL database	http://www.fao.org/fao-who-codexalimentarius/codex-texts/dbs/pestres/en/
Cotton Pest Management Guide 2022-23	https://www.cottoninfo.com.au/publications/cotton-pest-management-guide
CropLife Australia (Resistance Management)	https://www.croplife.org.au/resources/programs/resistance-management/
Growcom – Infopest Database	www.infopest.com.au
Hort Innovation	www.horticulture.com.au
Mango Field Guide	https://dpiir.nt.gov.au/data/assets/pdf_file/0006/227832/mango_field_guide.pdf

5.2 Abbreviations and Definitions:

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

5.3 Acknowledgements:

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

6. Appendices:

- Appendix 1. Products available for disease control in mangoes
- Appendix 2. Products available for control of insects and mites in mangoes
- Appendix 3. Products available for weed control in mangoes
- Appendix 4. Plant growth regulators available in mangoes
- Appendix 5. Current permits for use in mangoes
- Appendix 6. Mango Maximum Residue Limits (MRLs)
- Appendix 7. Mango Agrichemical Regulatory Risk Assessment

Appendix 1. Products available for disease control in mangoes

Active Ingredient (Trade Name)	Chem. group	Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Azoxystrobin (Amistar)	11	Mangoes	Stem End Rot Anthracnose	ALL	3	-
<i>Bacillus amyloquefaciens</i> strain QST 713 (Serenade Opti) Bayer	BM 01	Mango	Anthracnose Suppression of Stem End Rot	ALL	NR	-
Bromo Chloro Dimethyl Hydantoin (BCDMH)	-	Sanitiser / Post-Harvest Treatment	External Rot Causing Organisms	ALL	NR	-
Chlorine	-	Sanitiser / Post-Harvest Treatment	Bacteria and Fungi	ALL	NR	-
Chlorothalonil (Bravo) PER14830	M5	Mango	Anthracnose	NSW, QLD, WA & NT	NR	R3
Copper as Copper Hydroxide, Tribasic Copper Sulfate, Copper Ammonium Acetate, Cupric Oxide	M1	Mangoes	Anthracnose Bacterial Black Spot	NSW, QLD, SA, WA & NT	1	-
Copper as Copper Oxychloride	M1	Mangoes	Bacterial Black Spot	QLD, NT, ACT, NSW & WA	1	-
Copper	M1	Tropical Fruit	Phytophthora Stem Canker	QLD & NSW	1	-
Copper PER89693	M1	Tropical Fruit	Diplodia, Pink Disease	NSW, QLD, NT & WA	1 NG	-
Didecyl Dimethyl Ammonium Chloride (Sporekill)	-	Tropical & Sub-Tropical Fruit (Inedible Peel) / Post-Harvest Disinfectant	Bacteria & Fungi	ALL	NR	-

Active Ingredient (Trade Name)	Chem. group	Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Fludioxonil (Scholar)	12	Mangoes / Post-Harvest Treatment	Anthracnose Stem End Rot Dendritic Spot	ALL	NR	R3
Fluopyram + Trifloxystrobin (Luna Sensation) Bayer	7+11	Tropical & Sub-Tropical Fruit (Inedible Peel)	Anthracnose (<i>Colletotrichum</i> spp.) Stem End Rot	ALL	3 NG	-
Iodine	M	Tropical and Sub-Tropical Fruit / Post Harvest Dip	Bacteria & Fungi	ALL	NR	-
Mancozeb	M3	Mangoes	Anthracnose	ALL	1	R2
Metiram (Polyram) BASF	M3	Mangoes	Anthracnose	ALL	1	R2
Metiram + Pyraclostrobin (Aero) BASF	M3+11	Mangoes	Anthracnose Stem End Rots Powdery Mildew	ALL	14 NG	R2
Peroxyacetic Acid	M	Sanitiser / Post-Harvest Treatment	Bacteria	ALL	NR	-
Prochloraz (Sportak)	3	Mangoes / Post-Harvest Treatment	Anthracnose	QLD, NSW, WA & NT	NR	R3
			Alternaria Rot	QLD, WA & NT		
Prochloraz as Manganese Chloride Complex (Octave)	3	Mangoes	Anthracnose / Blossom Blight	QLD, NSW & WA	NR NG	R3
Thiram	M3	Mangoes	Anthracnose	ALL	14	R2

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

Active Ingredient (Trade Name)	Chem. group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
4-(P-Acetoxyphenyl)-2-Butanone + Malathion	1B	Fruit Fly Trap	Queensland Fruit Fly	ALL	NR	R3
4-(P-Acetoxyphenyl) -2-Butanone + Fipronil	2B	Fruit Trees / Fruit Fly Trap	Queensland Fruit Fly (<i>Bactrocera tryoni</i>) Lesser Queensland Fruit Fly (<i>Bactrocera neohumeralis</i>)	ALL	NR	R3
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C	Mangoes	Fruit Spotting Bug Pink Wax Scale Mango Scale Mediterranean Fruit Fly Queensland Fruit Fly	ALL	28 NG	R2
<i>Bacillus thuringiensis subsp Kurstaki</i> Strain HD-1	11	Fruit	Armyworm (<i>Spodoptera</i> spp.) Cotton Bollworm (<i>Helicoverpa armigera</i>) Native Budworm (<i>Helicoverpa punctigera</i>) Cabbage Moth (<i>Plutella xylostella</i>) Cabbage White Butterfly (<i>Pieris rapae</i>) Loopers Light Brown Apple Moth (<i>Epiphyas postvittana</i>) Vine Moth (<i>Agarista agricola</i>)	ALL	NR	-
Beta-Cyfluthrin (Bulldock) PER80374	3A	Mango	Fruit Spotting Bug Banana Spotting Bug Elephant or Rhino Beetle Red-Shouldered Leaf Beetle Swarming Leaf Beetle Longicorn Trunk Borer Macadamia Nut Borer Mango Tip Borer Flatid Planthopper Green Vegetable Bug Lychee Stink Bug Yellow Peach Moth	NSW, NT, QLD, SA & WA	7	-

Active Ingredient (Trade Name)	Chem. group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Buprofezin (Applaud)	16	Mangoes	Mango Scale	ALL	28	-
Carbaryl	1A	Mangoes	Flattids Pink Wax Scale Fig Leafhoppers	ALL	7	R3
Carbaryl PER13484	1A	Mango	Mango Leafhoppers	QLD	NR	R3
Chlorpyrifos	1B	Mango	Common Mango Scale	QLD & WA	21	R1
Clothianidin (Shield) PER83944	4A	Mango	Fruit Fly	NSW, QLD, WA & NT	7 NG	R2
Clothianidin (Shield) PER87799	4A	Mango	Mango Seed Weevil (suppression)	NSW, QLD & NT	112 NG	R2
Dimethoate	1B	Mangoes / Post-Harvest Dip	Queensland Fruit Fly	NSW & WA	NR	R1
Dimethoate PER13859	1B	Fruit Fly Host Crops / Non-Bearing Only	Fruit Fly	ALL	NR	R1
Dimethoate PER87164	1B	Tropical & Sub-Tropical Fruit (Inedible Peel)	Fruit Fly	ALL	NR	R1
Etoxazole (Paramite) PER87232	10B	Mangoes	Tea Red Spider Mite	NT, QLD, WA & NSW	21 NG	-
Fipronil PER13996	2B	Mango Trees	Giant Termite	NT	60	R3
Fipronil PER92765	2B	Mango Trees	Giant Termite	QLD & WA	56	R3
Flupyradifurone (Sivanto Prime) Bayer	4D	Mangoes	Banana Spotting Bug Fruit Spotting Bug Mango Planthopper Green Planthopper	ALL	3 NG	-

Active Ingredient (Trade Name)	Chem. group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Fruit Tree	Suitable for organic growers. Broad spectrum activity including ants, aphids, caterpillars, earwigs, whitefly, thrips and leafhopper.	ALL	1	-
Iron EDTA Complex	-	All plants	Snails & Slugs	ALL	NR	-
Maldison (Fyfanon)	1B	Fruit Tree / Fruit Fly Bait Spray	Fruit Flies	ALL	3	R3
Methomyl (Lannate) PER89293	1A	Mango	Fall Armyworm	ALL	NR	R2
Methoxyfenozide (Prodigy) Corteva PER91798	18	Mango	Mango Shoot Looper	NSW, NT, QLD & WA	14 NG	-
Petroleum Oil	-	Mango	Scale Insects Wax Scale Mango Plant Hopper	QLD, NSW, WA & NT	1	-
Potassium Salts of Fatty Acid (Natrasoap)	-	Fruit Trees	Aphids Thrips Mealybug Two-Spotted Mite Spider Mite Whitefly	ALL	NR	-
Pyriproxyfen (Admiral)	7C	Mango	Mango Scale Pink Wax Scale	ALL	28	-
Pyriproxyfen (Distance Ant Bait)	7C	Tropical Fruit Plantations	Invasive and Nuisance Ants	ALL	NR	-
Spinetoram (Success Neo) Corteva	5	Mango	Flower-Eating Caterpillars Small Mango Tip Borer Large Mango Tip Borer	ALL	NR NG	-

Active Ingredient (Trade Name)	Chem. group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Spinetoram (Success Neo) Corteva	5	Tropical & Sub-Tropical Fruit (Inedible Peel)	Flower-Eating Caterpillars Leafrollers Loopers Yellow Peach Moth Red-Banded Thrips Sorghum Head Caterpillar	ALL	NR NG	-
Spinetoram (Success Neo) Corteva PER89241	5	Tropical & Sub-Tropical Fruit (Inedible Peel)	Fall Armyworm	ALL (excl. VIC)	NR NG	-
Spinosad (Entrust Organic) Corteva	5	Mango	Flower-Eating Caterpillars Small Mango Tip Borer Large Mango Tip Borer	ALL	NR G:14	-
Spinosad (Entrust Organic) Corteva	5	Tropical & Sub-Tropical Fruit (Inedible Peel)	Flower-Eating Caterpillars Leafrollers Loopers Yellow Peach Moth Red-Banded Thrips Sorghum Head Caterpillar	ALL	NR G:14	-
Spinosad (Entrust Organic) Corteva PER89870	5	Tropical & Sub-Tropical Fruit (Inedible Peel)	Fall Armyworm	ALL (excl. VIC)	NR G:14	-
Spinosad (Naturalure) Corteva	5	Tree, Fruit, Nut, Vine & Vegetable Crops / Fruit Fly Bait	Queensland Fruit Fly (<i>Bactrocera tryoni</i>) Mediterranean Fruit Fly (<i>Ceratitis capitata</i>)	ALL	NR	-
Spirotetramat (Movento) Bayer	23	Mangoes / Post- Flowering Application	White Mango Scale Suppression of Citrus Mealybug Pink Wax Scale	ALL	14	-
		Mangoes / Post- Harvest Application (No Fruit)	White Mango Scale Pink Wax Scale		NR	

Active Ingredient (Trade Name)	Chem. group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Sulfoxaflor (Transform) Corteva PER85397	4C	Mango	Fruit Spotting Bug Banana Spotting Bug	NSW, NT, QLD & WA	7	-
Tetraniliprole (Vayego) Bayer PER90367	28	Mangoes	Mango Seed Weevil	NSW, NT & QLD	3 NG	-
Tetraniliprole (Vayego) Bayer PER92133	28	Mango	Mango Shoot Looper	NSW, NT & QLD	3 NG	-
Trichlorfon PER12450	1B	Mango	Queensland Fruit Fly Mediterranean Fruit Fly	ACT, NSW, NT, QLD, SA & WA	7 G:7	R2
Trichlorfon PER14743	1B	Mango	Flatid Planthopper Flower-Eating Caterpillar Loopers Yellow Peach Moth Suppression of: Fruit Spotting Bug Banana Spotting Bug Green Vegetable Bug Lychee Stink Bug	ALL (excl. VIC)	7	R2

Appendix 3. Products available for weed control in mangoes

Active ingredient (Trade Name)	Chem. Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Amitrole	34**	Orchards / Directed Spray	Grass and Broadleaf Weeds	56	ALL	-
Carfentrazone (Hammer)	14**	Tropical & Sub- Tropical Fruits / Tank Mix with Glyphosate	Broadleaf Weeds	NR	ALL	-
Clethodim (Select)	1***	Non-Bearing Fruit Tree	Annual Ryegrass (<i>Lolium rigidum</i>), Annual Phalaris (<i>Phalaris minor</i>), Barley Grass (<i>Hordeum leporinum</i>), Barnyard Grass (<i>Echinochloa</i> spp.), Blown Grass (<i>Agrostis avenacea</i>), Brome Grass (<i>Bromus diandrus</i>), Crowsfoot Grass (<i>Eleusine indica</i>), Feathertop Rhodes Grass (<i>Chloris virgata</i>), Liverseed Grass (<i>Urochloa panicoides</i>), Paradoxa Grass (<i>Phalaris paradoxa</i>), Red Sprangletop Grass (<i>Leptochloa filiformis</i>), Seedling Johnson Grass (<i>Sorghum halepense</i>), Summer Grass (<i>Digitaria</i> spp.), Volunteer Sorghum (<i>Sorghum</i> spp.), Volunteer Wheat (<i>Triticum aestivum</i>), Volunteer Oats (<i>Avena sativa</i>), Volunteer Barley (<i>Hordeum vulgare</i>), Winter Grass (<i>Poa annua</i>) Suppression of: Silver Grass (<i>Vulpia bromoides</i>) (not QLD, WA)	NR	ALL	R3
Dichlobenil (Casoran)	29**	Orchards / Residual Weed Control	Annual Grass and Broadleaf Weeds	NR	ALL	-

Active ingredient (Trade Name)	Chem. Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Fluazifop-P (Fusilade)	1***	Mangoes / Directed Spray or Shielded Spray	Annual Ryegrass, Barley Grass, Barnyard Grass, Brome Grasses, Crowsfoot Grass, Johnson Grass, Liverseed Grass, Prairie Grass, Summer Grass (Crabgrass), Wild Oats, Innocent Weed, Stinkgrass, Pigeon Grass and Foxtail (<i>Setaria</i> spp.) seedlings. Established plants of: Bent Grass, Couch Grass, English Couch (Rope Twitch), Water Couch, Johnson Grass, Kikuyu Grass, Paspalum	14	NSW, QLD, NT & WA	-
Glufosinate (Basta)	10**	Mango / Directed or Shielded Spray	Grass and Broadleaf Weeds	NR G:56	ALL	R3
Glyphosate (Roundup)	9**	Mango / Over 3 Years Old / 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
Haloxypop (Verdict)	1***	Mango / Directed Spray	Couch, Rhodes Grass, Slender Rats Tail Grass, Buffel Grass, Green Panic, Johnson Grass, Kikuyu, Paspalum spp., <i>Setaria</i> spp., Annual Ryegrass, Barley Grass, Barnyard Grass, Brome Grass, Crowsfoot Grass, Lesser Canary Grass, Liverseed Grass, Mossman River Grass, Paradoxa Grass, Summer Grass, Volunteer Cereals, Wild Oats	NR	ALL	-
Isoxaben (Gallery) Corteva	29**	Bearing and Non- Bearing Fruit Tree / Residual Weed Control	Broadleaf Weeds	NR	ALL	-
Oryzalin	3**	Non-Bearing Fruits / Residual Weed Control	Barnyard Grass, Guinea Grass, Love Grass, Paradoxa Grass, Pigeon Grass, Spiny Burr Grass, Summer Grass, Deadnettle, Fathen Fumitory, Pigweed, Sowthistle, Wireweed, Blackberry Nightshade, Caltrop, Paddymelon, Silverleaf Nightshade.	NR	ALL	-

Active ingredient (Trade Name)	Chem. Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Oxyfluorfen (Goal)	14**	Mango / Directed Spray	Grass and broadleaf weeds. If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	NR NG	ALL	-
Paraquat (Gramoxone)	22**	Orchards / Directed Spray or Spot Spray	Annual Grass and broadleaf weeds	1 G:7	ALL	R3
Paraquat + Amitrole (Guerrilla)	22** + 34**	Orchards / Directed Spray	Annual Weeds Capeweed or <i>Erodium</i> spp.	NR G:1	QLD, VIC, SA, WA, TAS and NT	R3
			Annual Weeds Fat Hen Pigweed Flaxleaf Fleabane		NSW	
					ALL	
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray	Grass and Broadleaf Weeds	G:1	ALL	R3
Pendimethalin (Stomp)	3**	Mangoes	Grass and Broadleaf Weeds	NR	ALL	-
Trifluralin	3**	Orchards / Pre-Plant Residual	Grass and Broadleaf Weeds	NR	QLD, SA, WA, VIC & TAS	-

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

Appendix 4. Plant growth regulators available in mangoes

Active ingredient (Trade Name)	Chem. Group	Situation	Comment / Use	WHP (days)	States	Regulatory risk
1-Methylcyclopropene (Smartfresh)	Plant Growth Regulator	Mango / Post-Harvest Treatment	Improved quality after shipping, storage or handling.	NR	ALL	-
Paclobutrazol	Plant Growth Regulator	Mango / Collar Drench	Reduce vegetative growth	NR	QLD, NT, NSW	-

Appendix 5. Current permits for use in mangoes

Permit No.	Description	Issued Date	Expiry Date	Permit Holder
PER80374 Version 3	Beta-Cyfluthrin / Custard Apple, Lychee, Mango, Persimmon / Various Insect Pests	1-Oct-15	31-Aug-25	Hort Innovation
PER13484 Version 3	Carbaryl / Mango / Mango Leafhoppers	1-Jul-12	30-Jun-25	Hort Innovation
PER14830 Version 3	Chlorothalonil (Bravo) / Mango / Anthracnose	4-Feb-15	30-Nov-25	Hort Innovation
PER83944 Version 3	Clothianidin (Shield) / Mango / Fruit Fly	27-Nov-17	31-Mar-24	Hort Innovation
PER87799	Clothianidin (Shield) / Mango / Mango Seed Weevil	6-Jun-19	30-Jun-24	Hort Innovation
PER89693	Copper / Tropical Fruits / Diplodia and Pink Disease	9-Nov-20	30-Nov-22	NT Farmers Association
PER13859 Version 2	Dimethoate / Fruit Fly Host Crops / Fruit Fly	9-Feb-15	31-Jul-24	Hort Innovation
PER87164 Version 2	Dimethoate / Tropical & Sub-Tropical Fruit (Inedible Peel) / Fruit Fly	1-Mar-19	31-Mar-24	Hort Innovation
PER87232 Version 2	Etoxazole (Paramite) / Mangoes / Tea Red Spider Mite	16-Jan-19	30-Nov-26	Hort Innovation
PER13996 Version 2	Fipronil / Mango trees / Giant Termite (NT only)	4-Feb-13	31-Mar-23	NT Farmers Association
PER92765	Fipronil / Mango Trees / Giant Northern Termite (EUP - QLD & WA only)	26-Aug-22	31-Aug-25	Hort Innovation
PER89293	Methomyl (Lannate) / Mango / Fall Armyworm	10-Apr-20	30-Apr-23	Hort Innovation
PER91798	Methoxyfenozide (Prodigy) / Mango, Lychee & Longan / Mango Shoot Looper	18-Nov-21	30-Nov-24	Hort Innovation
PER89241	Spinetoram (Delegate) / Mango / Fall Armyworm	6-Mar-20	31-Mar-23	Hort Innovation
PER89870	Spinosad (Entrust Organic) / Mango / Fall Armyworm	21-Jul-20	31-Jul-23	Hort Innovation
PER85397	Sulfoxaflor (Transform) / Lychee, Mango, Papaya & Passionfruit / Fruit Spotting Bug & Banana Spotting Bug	17-Apr-18	30-Apr-23	Hort Innovation
PER90367	Tetraniliprole (Vayego 200 SC) / Mangoes / Mango Seed Weevil (NSW, NT & QLD)	23-Nov-20	30-Nov-23	Hort Innovation
PER92133	Tetraniliprole (Vayego 200 SC) / Mango & Lychee / Mango Shoot Looper (post-flowering only) (NSW, NT & QLD)	10-Aug-22	31-Aug-25	Hort Innovation

Permit No.	Description	Issued Date	Expiry Date	Permit Holder
PER12450 Version 7	Trichlorfon / Mango / Fruit Fly	6-Oct-11	30-Nov-25	Hort Innovation
PER14743 Version 3	Trichlorfon / Custard Apple, Lychee, Mango & Persimmon / Various Insect Pests	1-Jun-14	30-Jun-25	Hort Innovation

Appendix 6. Mango Maximum Residue Limits (MRLs)

CODEX commodity groupings of tropical & sub-tropical fruits and subgroups:

FI 0030	Tropical & Sub-Tropical Fruits – Inedible Peel
FI 2022	Tropical & Sub-Tropical Fruits, Inedible Smooth Peel - Large
FI 0345	Mango
	Fruit

Note: Australia exported 9% of total production in 2020/21. The main destinations for these mangoes were New Zealand, Singapore, Hong Kong, UAE and South Korea. Available information indicates that in the absence specific limits in legislation that most countries defer to Codex, followed by EU MRL standards or apply a 0.01 ppm default value. Food exported to New Zealand from Australia may be legally sold if it complies with Australian requirements. MRLs and legislation are subject to change; the values presented should not be relied on.

Chemical	Codex	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Abamectin	FI 0345	Mango	-	0.01
Acetamiprid	FI 0030	Tropical & Sub-Tropical Fruits – Inedible Peel	0.2	-
Aldrin and Dieldrin		Fruits	E0.05	-
Azoxystrobin	FI 0345	Mango	0.5	0.7
Bromide Ion		Fruits	-	20
Buprofezin	FI 0345	Mango	0.2	0.1
Carbaryl	FI 0345	Mango	2	-
Carbendazim	FI 0345	Mango	-	5
Carfentrazone-ethyl	FI 0030	Tropical & Sub-Tropical Fruits – Inedible Peel	*0.05	
Chlorothalonil	FI 0345	Mango	T1	-
Chlorpyrifos	FI 0345	Mango	*0.05	-
Clothianidin	FI 0345	Mango	T2	0.04
Cyantraniliprole	FI 0345	Mango	-	0.7
Cyfluthrin	FI 0345	Mango	T0.1	-
Cyhalothrin	FI 0345	Mango	-	0.2
Cypermethrins	FI 0345	Mango	-	0.7
Cyromazine	FI 0345	Mango	-	0.5
DDT		Fruits	E1	-
Diazinon		Fruits {except Citrus fruits; Grapes; Olives; Peach}	0.5	-
Dicofol		Fruits {except Strawberry}	5	-
Didecyl Dimethyl Ammonium Chloride	FI 0030	Tropical & Sub-Tropical Fruits – Inedible Peel	20	-
Difenoconazole	FI 0345	Mango	-	0.07
Dimethoate	FI 0345	Mango	1	Po1
Diphenylamine		Fruits {except Apple; Pear}	0.5	-
Diquat		Fruits	*0.05	-
Dithianon		Fruits {except Blueberries}	2	-
Dithiocarbamates	FI 0345	Mango	7	2
Endosulfan	FI 0345	Mango	-	0.5
Ethephon	FI 0345	Mango	T*0.02	-

Chemical	Codex	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Etoazole	FI 0345	Mango	T0.1	-
Fenbutatin Oxide	FI 0030	Tropical & Sub-Tropical Fruits – Inedible Peel	5	-
Fenvalerate	FI 0345	Mango	1.5	-
Fluazifop-p-butyl	FI 0030	Tropical & Sub-Tropical Fruits – Inedible Peel {except avocado, banana}	0.05	-
Fludioxonil	FI 0345	Mango	3	2
Fluopyram	FI 0030	Tropical & Sub-Tropical Fruits – Inedible Peel {except banana, pineapple}	2	
	FI 0345	Mango	-	1
Flupyradifurone	FI 0345	Mango	0.7	-
Fluxapyroxad	FI 0345	Mango	-	0.6
Glufosinate	FI 0030	Tropical & Sub-Tropical Fruits – Inedible Peel	0.2	0.1
Glyphosate	FI 0345	Mango	*0.05	-
Haloxypop	FI 0030	Tropical & Sub-Tropical Fruits – Inedible Peel	*0.05	-
Imidacloprid	FI 0345	Mango	0.2	0.2
Inorganic Bromide		Fruits {except Avocado; Citrus fruits; Dried fruits; Strawberry}	20	-
Isoxaben	FI 0030	Tropical & Sub-Tropical Fruits – Inedible Peel	*0.01	-
Kresoxim-Methyl	FI 0345	Mango	-	0.1
Metaldehyde		Fruits	1	-
Methiocarb		Fruits {except Citrus fruits; Grapes}	T0.1	-
Methomyl	FI 0345	Mango	T*0.01	-
Methoxyfenozide	FI 0345	Mango	T0.5	-
Methyl Bromide	FI 0345	Mango	*0.05	-
Omethoate	FI 0345	Mango	0.1	-
Oryzalin		Fruits	0.1	-
Oxyfluorfen	FI 0030	Tropical & Sub-Tropical Fruits – Inedible Peel	*0.01	-
Paclobutrazol	FI 0345	Mango	T1	-
Paraquat		Fruits {except Olives}	*0.05	-
	FI 0030	Tropical & Sub-Tropical Fruits – Inedible Peel	-	*0.01
Pendimethalin	FI 0030	Tropical & Sub-Tropical Fruits – Inedible Peel	*0.05	-
Phosphine	FI 0030	Tropical & Sub-Tropical Fruits – Inedible Peel	T*0.01	-
Piperonyl Butoxide		Fruits	8	-
Pirimicarb		Fruits {except Blackberries}	0.5	-
Prochloraz	FI 0345	Mango	5	
	FI 0030	Tropical & Sub-Tropical Fruits – Inedible Peel	-	Po7
Profenofos	FI 0345	Mango	-	0.2
Pyraclostrobin	FI 0345	Mango	0.1	0.6
Pyrethrins		Fruits	1	-

Chemical	Codex	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Pyriproxyfen	FI 0030	Tropical & Sub-Tropical Fruits – Inedible Peel	0.3	-
Simazine		Fruits	*0.1	-
Spinetoram	FI 0030	Tropical & Sub-Tropical Fruits – Inedible Peel	0.3	-
	FI 0345	Mango	-	*0.01
Spinosad	FI 0030	Tropical & Sub-Tropical Fruits – Inedible Peel	0.3	-
Spirotetramat	FI 0345	Mango	0.3	0.3
Sulfoxaflor	FI 0345	Mango	T0.7	-
Tebuconazole	FI 0345	Mango	-	0.05
Tetraniliprole	FI 0345	Mango	T0.2	-
Thiabendazole	FI 0345	Mango	-	Po5
Thiamethoxam	FI 0345	Mango	0.07	0.2
Trichlorfon	FI 0030	Tropical & Sub-Tropical Fruits – Inedible Peel	T3	-
Trifloxystrobin	FI 0030	Tropical & Sub-Tropical Fruits – Inedible Peel {except banana, pineapple}	2	-
Trifluralin		Fruits	*0.05	-

NOTE: MRLs are constantly under review and subject to change. Check for current MRLs and do not rely on the values stated above.

* Indicates that an MRL is at the Limit of Quantitation (LOQ)

T =Temporary MRL

E = The MRL is based on extraneous residues

Sources: APVMA MRLs: Agricultural and Veterinary Chemicals Code (MRL Standard) Instrument 2019. Compilation 28. Prepared 20 August 2022. CODEX MRLs: CODEX Alimentarius International Food Standards database (February 2022), <http://www.fao.org/fao-who-codexalimentarius/codex-texts/dbs/pestres/en/>

Appendix 7. Mango Agrichemical Regulatory Risk Assessment

Mango Agrichemical Regulatory Risk Assessment

March 2022

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

This document was prepared as part of the Hort Innovation funded project MT20007 – Regulatory Support & Response Co-ordination.

Mango Agrichemical Regulatory Risk Assessment

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

Active Constituents	Chemical Group	Problem	Comment
INSECT AND OTHER PESTS			
Acetamiprid + pyriproxyfen	4A + 7C	Banana-spotting bug / Fruit-spotting bug	Acetamiprid APVMA: Under review
		Mango scales	
		Mediterranean fruit fly	
		Pink wax scale	
		Queensland fruit fly	
Beta-cyfluthrin	3A	Banana-spotting bug / Fruit-spotting bug (PER80374)	EU: No authorisation in place
		Elephant/Rhinoceros beetle (PER80374)	
		Fig longicorn/ trunk borer (PER80374)	
		Flatid planthoppers (PER80374)	
		Green vegetable bug (PER80374)	
		Litchi stink bug (PER80374)	
		Macadamia nutborer (PER80374)	
		Mango shoot caterpillar (PER80374)	
		Red shouldered leaf beetle (PER80374)	
		Swarming leaf beetles (PER80374)	
		Yellow peach moth (PER80374)	
Buprofezin	16	Mango scales	EU: MRLs set to limit of quantification
Carbaryl	1A	Fig leafhopper	Canada: Reviewed, large number of uses deleted Codex: Review scheduled, support uncertain EU: Authorisation not renewed
		Flatid planthoppers	
		Pink wax scale	
		White (Common) mango scale	
		Wingless grasshopper	
		Mango leafhopper (PER13484)	

Active Constituents	Chemical Group	Problem	Comment
Chlorpyrifos	1B	Green tree ant	APVMA: Under review Codex: Scheduled for review by JMPR Canada: Cancellation of all uses. EU: No authorisation in place USA: EPA decision to cancel use on food crops
		White (Common) mango scale	
Clothianidin	4A	Mediterranean fruit fly	APVMA: Under review Canada: Field uses cancelled or amended EU: Not authorised USA: Re-registration with new risk mitigation measures
		Queensland fruit fly	
		Fruit flies (PER83944)	
		Mango seed weevil (PER87799)	
Dimethoate	1B	Lesser Qld fruit fly (Cover spray & post-harvest dip)	Codex: MRL deletion recommended. EU: Not authorised
		Mediterranean fruit fly (Cover spray & post-harvest dip)	
		NT fruit fly (Cover spray & post-harvest dip)	
		Queensland fruit fly (Cover spray & post-harvest dip)	
Etoxazole	10B	Tea red spider mite (PER87232)	EU: Only uses on greenhouse ornamentals approved & Candidate for substitution
Fipronil	2B	Ants	APVMA: Under review Codex: Re-evaluation underway EU: No authorisation in place
		Giant termite (PER13996/PER92765)	
Flupyradifurone	4D	Banana-spotting bug / Fruit-spotting bug	
		Green plant hopper	
		Mango plant hopper	
Malathion/Maldison	1B	Mediterranean fruit fly (PER83998)	APVMA: Under review Codex: Re-evaluation scheduled for 2023/24 EU: Restricted use to permanent greenhouses
		Queensland fruit fly (PER83998)	

Active Constituents	Chemical Group	Problem	Comment
Methomyl	1A	Banana flower thrips (PER84427)	APVMA: nominated for review Canada: Re-evaluation completed. Majority of uses removed EU: No authorisations in place
		Chilli thrips (PER84427)	
		Redbanded thrips (PER84427)	
		Tomato thrips (PER84427)	
		Fall armyworm (PER89293)	
Paraffinic oil / petroleum oil	UNM	Mango seed weevil	
		Mango plant hopper	
		Mango scales	
		Mango tip borers	
		Pink wax scale	
		Scale insects	
pyriproxyfen	7C	Mango scales	
		Pink wax scale	
		White (Common) mango scale	
Spinetoram	5	Flower eating caterpillars	
		Leafroller caterpillars	
		Loopers	
		Mango shoot caterpillar	
		Mango tip borers	
		Redbanded thrips	
		Sorghum head caterpillar	
		Yellow peach moth	
		Fall armyworm (PER89241)	
Spinosad	5	Flower eating caterpillars	
		Ivy leaf roller	
		Loopers	
		Mango tip borers	
		Redbanded thrips	
		Sorghum head caterpillar	
		Yellow peach moth	
		Fall armyworm (PER89870)	

Active Constituents	Chemical Group	Problem	Comment
Spirotetramat	23	Citrus mealybug	
		Pink wax scale	
		White (Common) mango scale	
Sulfoxaflor	4C	Banana-spotting bug / Fruit-spotting bug (PER85397)	USA: Pollinator concerns EU: Restricted to permanent glasshouses only
Tetraniliprole	28	Mango seed weevil (PER90367)	EU: Not authorised
Trichlorfon	1B	Mediterranean fruit fly (PER12450)	APVMA: nominated for review
		Queensland fruit fly (PER12450)	Codex: No MRLs
		Banana-spotting bug / Fruit-spotting bug (PER14743)	EU: No authorisations
		Flatid planthoppers (PER14743)	USA: No MRLs
		Flower eating caterpillars (PER14743)	
		Green vegetable bug (PER14743)	
		Litchi stink bug (PER14743)	
		Loopers (PER14743)	
		Yellow peach moth (PER14743)	

Active Constituents	Chemical Group	Problem	Comment
DISEASES			
Azoxystrobin	11	Anthracnose Stem-end rot	
<i>Bacillus amyloliquefaciens</i>	BM02	Anthracnose Stem-end rot	
Chlorothalonil	M5	Anthracnose	APVMA: nominated for review Canada: Proposed cancellation of all uses EU: No authorisation in place
Copper	M1	Anthracnose Bacterial black spot	EU: Candidates for substitution
DDAC		Sanitizer	EU: No authorisation
Fludioxonil	12	Anthracnose Dendritic spot Stem-end rot	EU: Under review & candidate for substitution
Fluopyram + trifloxystrobin	7 + 11	Anthracnose Stem-end rot	
Iodine	M	Bactericide	
Mancozeb	M3	Anthracnose	APVMA: nominated for review Canada: Many uses cancelled Codex: To be reviewed 2023/24 EU: Authorisation not renewed
Metiram	M3	Anthracnose Powdery mildew	APVMA: nominated for review Canada: All foliar uses, except potato, cancelled Codex: To be reviewed 2023/24 EU: Under review

Active Constituents	Chemical Group	Problem	Comment
Prochloraz	3	Alternaria rot	Codex: Periodic re-evaluation scheduled EU: No authorisation
		Anthracnose	
		Blossom blight	
Pyraclostrobin + Metiram	11 + M3	Anthracnose	<u>Metiram</u> APVMA: nominated for review Canada: All foliar uses, except potato, cancelled Codex: To be reviewed 2023/24 EU: Under review
		Powdery mildew	
		Stem-end rot	
Thiram	M3	Anthracnose	APVMA: nominated for review Canada: Cancelled all foliar uses (2021) Codex: To be reviewed 2023/24 EU: No authorisation in place

Active Constituents	Chemical Group	Comment
WEEDS		
Carfentrazone-ethyl	14	
Clethodim (non-bearing)	1	Codex: MRLs proposed for deletion
Diquat	22	APVMA: Currently under review EU: No authorisation
Fluazifop	1	
Glufosinate	10	EU: No authorisation
Glyphosate	9	Ongoing issues internationally
Haloxypop-P	1	EU: No authorisation
Isoxaben (non-bearing)	29	
Oryzalin	3	EU: No authorisation
Oxyfluorfen	14	EU: Candidate for substitution USA: Interim review decision Label amendments proposed
Paraquat	22	APVMA: Currently under review EU: No authorisation Rotterdam Convention: nominated
Pendimethalin	3	EU: Candidate for substitution
PLANT GROWTH REGULATORS		
Ethephon (PER91560)		
Chlorflurenol-Methyl		EU: No authorisation
1-methylcyclopropene		
Paclobutrazol		EU: Candidate for substitution

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