



Macadamia

Strategic Agrichemical Review Process
(SARP)

September 2024

Hort Innovation
Project – MT23001

Hort Innovation Project Number:

MT23001 – Strategic Agrichemical Review Process (SARP) - Updates

SARP Service Provider:

AGK Services

Purpose of the report:

This report was funded by Hort Innovation to investigate the pest problem, agrichemical usage and pest management alternatives for the macadamia 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 2024

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Communications Manager
Hort Innovation
Level 7, 141 Walker Street
North Sydney NSW 2060
Australia
Email: communications@horticulture.com.au
Phone: 02 8295 2300

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FUND**

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1. Summary

The strategic levy investment project Strategic Agrichemical Review Process (SARP) - Updates (MT23001) is part of the Hort Innovation Macadamia Fund. A Strategic Agrichemical Review Process (SARP), through the process of a desktop audit and industry liaison;

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

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

Alternative pesticides should ideally be selected for benefits of:

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

The results of this process will provide the Macadamia 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:

Disease	Priority
Husk Spot (<i>Pseudocercospora macadamiae</i>)	H
Flower Blight / Dry Flower (<i>Pestalotiopsis</i> spp., <i>Neopestalotiopsis</i> spp.)	H

1.2 Insects and other pests

The high priority insects and other pests are:

Insects and Other Pests	Priority
Fruit Spotting Bug (<i>Amblypelta nitida</i>)	H
Banana Spotting Bug (<i>Amblypelta lutescens</i>)	H
Lace Bug (<i>Ulonemia</i> spp.)	H
Macadamia Nutborer (<i>Cryptophlebia ombrodelta</i>)	H
Macadamia Seed Weevil / Sigastus Weevil (<i>Kuschelorhynchus macadamiae</i>)	H

1.3 Weeds

The high priority weeds are:

Weeds	Priority
Flaxleaf Fleabane (<i>Conyza bonariensis</i>)	H
Blackberry Nightshade (<i>Solanum nigrum</i>)	H

1.4 Plant Growth Regulators

There were no high priority Plant Growth Regulator issues identified, but the following were identified as moderate issues:

PGR Issue	Priority
Promote uniform nut fall	M
Restriction of vegetative growth	M

2. The Australian Macadamia Industry

Most macadamia production in Australia occurs in northern NSW and Bundaberg, although growing regions extend along the east coast from Far North Queensland to the NSW mid north coast, as well as the Margaret River region in WA. The industry has a strong export focus, with 75 percent of Australian macadamias export bound.

Production for the year ending June 2023 was 48,400 tonnes (in-shell) or equivalent to 15,972 tonnes (kernel). The value of production was worth \$104 million. Macadamia production area is growing in recent years, but production volumes are relatively stable with market values falling due to downward pressures on farmgate prices.

Fresh Macadamia Seasonality by State¹

State	22/23 Tonnes	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Queensland	34,154												
New South Wales	14,246												
Availability Legend				Harvest			End of Harvest					None	

Macadamia exports are a mix of both in-shell and kernel. For the year ending June 2023, Australia exported 24,542 tonnes of in-shell macadamias and 10,438 tonnes of kernel macadamias. The major export destinations are China (55%), Vietnam (11%), Japan (9%), South Korea (7%) and USA (6%).

¹ Hort Innovation (2024). Australian Horticulture Statistics Handbook 2022/23. [online] Available at: <https://www.horticulture.com.au/growers/help-your-business-grow/research-reports-publications-fact-sheets-and-more/australian-horticulture-statistics-handbook/>

3. Introduction

3.1 Background

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

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

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

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

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

Exotic plant pests, not present in Australia, are not addressed in this document. Biosecurity plans have been developed for the Macadamia Industry in consultation with industry, government and scientists. The Biosecurity Plan outlines key threats to the industry, risk mitigation plans, identification and categorisation of exotic pests and contingency plans. High priority exotic pests have been assessed based on their potential to enter, establish, and spread in Australia (e.g. environmental factors, host range, vectors) and the cost to industry of control measures. More information is available at this link².

² <https://www.planthealthaustralia.com.au/industries/>

3.2 Minor use permits and registration

From a pesticide access perspective, the APVMA classifies macadamias as a major crop. They fit within the APVMA Crop Group 022: Tree nuts. Access to minor use permits can be achieved as long as a reasonable justification is provided in accordance to the APVMA's minor use guidance³. 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 macadamia industry is for manufacturers to register new pesticides uses in the crop.

3.3 Methods

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

Process of Review	Activity / Date
Industry survey	Preparation and circulation of online industry survey to update priority pests and identify priority control gaps. Survey released: 6 November 2023 Survey closed: 29 February 2024
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 <https://apvma.gov.au/node/10931>

3.4 Results and discussions

3.4.1 Detail

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

3.4.2 Appendices

Refer to additional information in the appendices:

Appendix 1. Products available for disease control in macadamia

Appendix 2. Products available for control of insects and other pests in macadamia

Appendix 3. Products available for weed control in macadamia

Appendix 4. Plant Growth Regulators available in macadamia

Appendix 5. Current permits for use in macadamia

Appendix 6. Macadamia Maximum Residue Limits (MRLs)

Appendix 7. Macadamia regulatory risk assessment

4. Diseases, pests and weeds of Macadamias

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 website⁴.

Information on regulatory risk derived from project MT20007 (Chapter 4) - Regulatory support and coordination (Appendix 7) has been incorporated. Some of the suggested options have no overseas MRLs (see Appendix 6). If treated fruit is to be exported nil residues at harvest would be needed for these options. While care has been taken to ensure the accuracy of the information provided in this document the APVMA registered label and where relevant the APVMA approved permit must always be followed.

⁴ <https://www.croplife.org.au/resources/programs/resistance-management/>

4.1 Diseases of Macadamias

4.1.1 Disease priorities

Disease	Priority
Husk Spot (<i>Pseudocercospora macadamiae</i>)	H
Flower Blight / Dry Flower (<i>Pestalotiopsis</i> spp., <i>Neopestalotiopsis</i> spp.)	H
Phytophthora Root Rot (<i>Phytophthora cinnamomi</i>)	M
Trunk Canker (<i>Phytophthora cinnamomi</i>)	M
Husk Rot (<i>Phomopsis</i> spp.)	M
Botryosphaeria Dieback (<i>Botryosphaeria</i> spp.)	M
Grey Mould / Blossom Blight (<i>Botrytis cinerea</i>)	M
Green Mould / Cladosporium Blight (<i>Cladosporium gloeosporioides</i>)	L
Husk Rot / Anthracnose (<i>Colletotrichum gloeosporioides</i>)	L

Husk Spot and Flower Blight / Dry Flower were identified as high priority disease in our industry consultation. Phytophthora Root Rot, Trunk Canker, Husk Rot / Anthracnose, Botryosphaeria Dieback and Grey Mould / Blossom Blight were identified as moderate priority.

Disease control is a major focus in macadamia orchards. It is recommended that an Integrated Disease Management Strategy is implemented, including a range of cultural practices to support fungicides, and potentially reduce the reliance on fungicides for disease control.

Cultural controls include:

- Biosecurity measures to prevent importing infections from other farms.
- Promoting good drainage and avoid waterlogging through irrigation.
- Canopy management to promote airflow.
- Plantation hygiene – remove dead plant material that could contain disease inoculum.
- Avoid tree stress through good nutrition and water management.

In controlling fungal and bacterial diseases, the industry should be mindful of resistance management. In addition to cultural controls, it is important to include a range of fungicide groups in a foliar spray program, including the use of protectant fungicides. Fungicide programs should be planned at the start of the season to ensure that effective disease control is achieved in conjunction with appropriate product rotation.

CropLife Australia have a resistance management strategy specifically related to the control of Husk Spot⁵ in macadamias, and users must refer to this before using any product.

⁵ <https://www.croplife.org.au/resources/programs/resistance-management/macadamia-husk-spot/>

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 - a possible candidate to pursue for registration or permit	R2	Medium-term: Maintaining access of significant concern
P-A	Potential, already approved in the crop for another use	R3	Long-term: Potential issues associated with use - Monitoring required
Withholding Period (WHP) – Number of days from last treatment to harvest (H) or Grazing (G)			
Harvest	H	Not Required when used as directed	NR
Grazing	G	No Grazing Permitted	NG

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Husk Spot (<i>Pseudocercospora macadamiae</i>) Priority: High							
Rated as a high priority in NSW and as a moderate priority in QLD. Most varieties are prone to husk spot, but it is more prevalent in varieties with sticktight husks. Rain splash easily spreads fungal spores from diseased sticktight to developing nuts. Infections at the beginning of the season, at the 'match-head' stage of nut development are the most critical that may result in significant premature nut drop. A combination of cultural and chemical controls is required to manage the disease. Incessant wet weather conditions significantly increase the risk of Husk Spot and premature nut drop.							
Azoxystrobin + Tebuconazole (Custodia) Adama	11+3	Protectant & Curative	15	A	ALL	Registered in macadamias for control of Husk Spot (<i>Pseudocercospora macadamiae</i>). Apply as a foliar spray commencing from match head stage. Use a retreatment interval of 14-28 days. Maximum of 2 treatments per season.	R3
Carbendazim	1	Protectant & Curative	14 G:28	A	ALL	Registered in macadamias for control of Husk Spot (<i>Pseudocercospora macadamiae</i>). Apply as a foliar spray at 5 and 8 weeks after main flowering. Remove any fallen nuts from under trees prior to spraying. Maximum of 2 treatments per season.	R2
Copper as Copper Hydroxide / Copper Oxychloride / Cuprous Oxide	M1	Protectant	1	A	QLD, NT & NSW	Registered in macadamias for control of Husk Spot (<i>Pseudocercospora macadamiae</i>), Anthracnose (<i>Colletotrichum</i> spp.) & Pink Limb Blight (<i>Corticium salmonicolor</i>). Apply as a foliar spray from nut set (late September) to December. Use a retreatment interval of 21-28 days, applying at least 3 treatments.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Copper as Copper Ammonium Acetate Complex					QLD, NSW, WA & NT	Registered in macadamias for control of Husk Spot (<i>Pseudocercospora</i> spp.) Apply as a foliar spray from nut set (late September) to December. Use a retreatment interval of 21-28 days, applying at least 3 treatments.	
Difenoconazole (Score)	3	Protectant & Curative	NR	A	QLD, NSW & NT	Registered in macadamias for control of Husk Spot (<i>Pseudocercospora macadamiae</i>). Apply as a foliar spray commencing at nut set and continuing until late December. Use a retreatment interval of 21-28 days. Maximum of 2 treatments per season.	R3
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant & Curative	NR NG	A	ALL	Registered in macadamias for control of Husk Spot & Botrytis Blight. Apply as a foliar application commencing when nuts reach match head stage. Use a retreatment interval of 21-28 days. Maximum of 2 treatments per season.	R3
Fluxapyroxad + Pyraclostrobin (Merivon) BASF	7+11	Protectant & Curative	21	A	ALL	Registered in macadamias for control of Husk Spot (<i>Pseudocercospora macadamiae</i>) & Flower Blight / Dry Flower (<i>Pestalotiopsis</i> spp., <i>Neopestalotiopsis</i> spp., <i>Botrytis cinerea</i> , <i>Cladosporium</i> spp.) Apply as a foliar spray commencing at match head stage. Use a retreatment interval of 21 days. Maximum of 3 treatments per season, with no more than 2 consecutive treatments.	-
Mefentrifluconazole (Belanty) BASF	3	Protectant & Curative	14 NG	A	ALL	Registered in macadamia for control of Husk Spot (<i>Pseudocercospora macadamiae</i>). Apply as a foliar spray commencing at match head stage. Use a retreatment interval of 21 days. Maximum of 3 treatments per season, with no more than 2 consecutive treatments.	-
Penthiopyrad (Fontelis) Corteva	7	Protectant	14 NG	A	ALL	Registered in macadamias for control of Husk Spot (<i>Pseudocercospora macadamiae</i>). Apply as a foliar spray commencing at match head stage. Use a retreatment interval of 14-28 days. Maximum of 3 treatments per season, with no more than 2 consecutive treatments.	-
Pyraclostrobin (Cabrio)	11	Protectant & Curative	NR	A	ALL	Registered in macadamias for control of Husk Spot (<i>Pseudocercospora macadamiae</i>). Apply as a foliar spray commencing at match head stage. Use a retreatment interval of 14-28 days. Maximum of 2 treatments per season.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Florypicoxamid (Verpixo Adavelt) Corteva	21	Protectant		P		Registered for control of Powdery Mildew in cucurbits and fruiting vegetables, control of Sclerotinia Rot in lettuce, and control of Grey Mould and Powdery Mildew in strawberries. Also has activity on various foliar pathogens, including Septoria, Anthracnose, Alternaria, Scab, Monilinia, Rust and <i>Mycosphaerella</i> spp. Activity on <i>Pseudocercospora</i> sp. is unknown.	-
Pydiflumetofen + Fludioxonil (Miravis Prime) Syngenta	7+12	Protectant & Curative		P		Registered for control of Grey Mould in berries, Grey Mould and Powdery Mildew in strawberries and grapes, and Grey Mould and Sclerotinia in lettuce and leafy vegetables. US registration for control of Pseudocercospora sp. in grape & small fruit climbing subgroup (except Fuzzy Kiwifruit).	R3
Flower Blight / Dry Flower (<i>Pestalotiopsis</i> spp., <i>Neopestalotiopsis</i> spp.) Priority: High							
<p>Rated as a high priority in NSW & QLD. Flower Blight is favoured by dry, warm conditions. It impacts yield by reducing flowering and nut set. No chemical controls are available although growers anecdotally report some impact on disease and yield increases from existing fungicides used in macadamia. Can be confused with Botrytis Blight, with diseased flowers turning dark brown and remaining attached to the rachis. Cultural practices to prevent Flower Blight are under investigation. An open, well-ventilated canopy is generally less prone to infection.</p>							
Fluxapyroxad + Pyraclostrobin (Merivon) BASF	7+11	Protectant & Curative	21	A	ALL	Registered in macadamias for control of Husk Spot (<i>Pseudocercospora macadamiae</i>) & Flower Blight / Dry Flower (<i>Pestalotiopsis</i> spp., <i>Neopestalotiopsis</i> spp., <i>Botrytis cinerea</i> , <i>Cladosporium</i> spp.) Apply as a foliar spray prior to flowering stage 1. Under high pressure, follow up with a second application at stage 3 (fully open white flower). Maximum of 3 treatments per season, with no more than 2 consecutive treatments.	-
Florypicoxamid (Verpixo Adavelt) Corteva	21	Protectant		P		Registered for control of Powdery Mildew in cucurbits and fruiting vegetables, control of Sclerotinia Rot in lettuce, and control of Grey Mould and Powdery Mildew in strawberries. Also has activity on various foliar pathogens, including Septoria, Anthracnose, Alternaria, Scab, Monilinia, Rust and <i>Mycosphaerella</i> spp. Activity on <i>Pestalotiopsis</i> sp. is unknown.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Phytophthora Root Rot (<i>Phytophthora cinnamomi</i>) Trunk Canker (<i>Phytophthora cinnamomi</i>) Priority: Moderate Rated as a moderate priority in NSW & QLD. Phytophthora is a major pathogen in macadamia plantations that can produce different symptoms throughout the macadamia tree, often seen as trunk (stem) canker or root decay and eventuating as loss of the tree. Present in all regions, Phytophthora can cause significant impacts on tree health in wet years. Phytophthora infections are best managed through cultural controls. The most important of these is to ensure trees are planted in sites with good drainage. Chemical controls should be used to assist in managing the disease during times of high disease risk. Due to the multiple paths of infection, having different application methods available provides more effective control.							
Copper as Tribasic Copper Sulfate / Cuprous Oxide	M1	Protectant	1	A	ALL	Registered in macadamias for control of Phytophthora Stem Canker . Apply as a mixture with water or water-based paint to stems of trees wherever cankers appear, after removing dead tissue. Retreatment interval not specified. Maximum of 5 treatments per season.	-
Copper as Copper Ammonium Acetate Complex					QLD & WA		
Metalaxyl-M (Ridomil Gold 25G)	4	Protectant & Curative	28	A	QLD & NSW	Registered in macadamia nuts for control of Phytophthora Root Rot & Trunk Canker . Preventative treatment: Use as a soil application at the beginning of summer wet season and repeat at 3-6 month intervals. Apply in alternate years only. Curative treatment: Apply as a soil treatment to the entire area under the tree canopy. Apply at the beginning of summer wet season and again 8-12 weeks later. Apply further treatments at 6 month intervals until trees have recovered.	-
Metalaxyl-M + Copper (Ridomil Gold Plus)	4+M1	Protectant & Curative	28	A	QLD & NSW	Registered in macadamia nuts for control of Phytophthora Trunk Canker, Root Rot . Apply to affected trunk and limbs, and as a soil drench to approximately 1 m ² around the base of the tree. Apply at the beginning of summer wet season and again 8-12 weeks later.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Phosphorous Acid	33	Protectant & Curative	14	A	NSW, QLD & WA	Registered in macadamias for control of Phytophthora Root Rot (<i>Phytophthora</i> spp.) & Trunk/Stem Canker (<i>Phytophthora cinnamomi</i>). Foliar application: Apply to affected trees at mature leaf flush during spring and autumn. Apply to each flush if disease persists during the production season. Do not apply to young leaf flush. Retreatment interval not specified. Maximum of 2 treatments per season. Trunk application: Apply to affected trees at root flush and 28 days after root flush. Maximum of 2 treatments per season.	-
<i>Bacillus amyloliquefaciens</i> Strain QST 713 (Serenade Prime Soil Ameliorant and Biofungicide) Bayer	BM01	Biological	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 and it is also registered as a biofungicide for control of Yellow Sigatoka in bananas as a foliar spray.	-
Mandipropamid (Revus) Syngenta	40	Curative / Protectant		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.	-
Oxathiopiprolin (Zorvec Enicade) Corteva	49	Protectant & Curative		P		Registered for control of Downy Mildew in bulb vegetables, brassicas, cucurbits, leafy vegetables and poppies. Permitted for control of Phytophthora Root Rot in raspberries and blackberries. US registration for control of Phytophthora Canker and Brown Rot in citrus.	-
Husk Rot (<i>Phomopsis</i> spp.)							
Priority: Moderate							
Rated as a moderate priority in NSW, and as a low priority in QLD. Husk Rot is a sporadic disease, but its incidence has been increasing in recent seasons. Significant yield losses (>30%) can occur in affected varieties such as cv344. Specific treatment may be required with severe infections that occur close to kernel maturity.							
Copper	M1	Protectant	1	P-A	QLD, NT & NSW	Registered in macadamias for control of Husk Spot (<i>Pseudocercospora macadamiae</i>), Anthracnose (<i>Colletotrichum</i> spp.) & Pink Limb Blight (<i>Corticium salmonicolor</i>). Registered for control of Phomopsis spp. in olives.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant & Curative	NR NG	P-A	ALL	Registered in macadamias for control of Husk Spot & Botrytis Blight. US registration for control of Phomopsis in grapes.	-
<i>Aureobasidium pullulans</i> Strain DSM 14940 & DSM 14941 (Botector) Nufarm	-	Biological / Protectant	NR	P		Registered for control of Phomopsis spp. in berries.	-
Fluazinam	29	Protectant		P		Registered for control of Phomopsis spp. in grapes.	-
Botryosphaeria Dieback (<i>Botryosphaeria</i> spp.)							
Priority: Moderate							
Rated as a moderate priority in NSW & QLD. Branch Dieback is an emerging problem for macadamias. It is favoured in dry seasons or at other times when trees are experiencing stress. No specific fungicide controls are available. Diseased branches should be removed and destroyed to limit the spread of infection.							
Mefentrifluconazole (Belanty) BASF	3	Protectant & Curative	14 NG	P-A	ALL	Registered in macadamia for control of Husk Spot (<i>Pseudocercospora macadamiae</i>). US registration for control of Panicle and Shoot Blight (Botryosphaeria dothidea) in tree nuts, and Black Rot (Botryosphaeria obtusa) and White Rot (Botryosphaeria dothidea) in pome fruit.	-
<i>Bacillus amyloliquefaciens</i> (Serifel) BASF	BM02	Biological	NR	P		Registered for control of Grey Mould in grapevines, strawberries and other berries. US registration for control of Botryosphaeria Dieback and Macrophomina Rot (Botryosphaeria dothidea) in grapes and Bot Rot (Botryosphaeria dothidea) in pome fruit.	-
<i>Bacillus amyloliquefaciens</i> Strain QST 713 (Serenade Opti) Bayer	BM02	Biological	NR	P		Registered for suppression of Stem End Rot (Botryosphaeria spp.) in avocado. US registration for control of Bot Rot (Botryosphaeria dothidea) in pome fruit.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Pydiflumetofen + Fludioxonil (Miravis Prime) Syngenta	7+12	Protectant / Curative		P		Registered for control of Grey Mould in berries, Grey Mould & Powdery Mildew in strawberries and grapes, Grey Mould & White Mould in lettuce and Leafy Vegetables, and White Mould, Grey Mould and Early Blight in potatoes. US registration for control of Botryosphaeria Blight (<i>Botryosphaeria</i> spp.) in pistachio.	R3
Grey Mould / Blossom Blight (<i>Botrytis cinerea</i>)							
Priority: Moderate							
Rated as a moderate priority in NSW & QLD. Botrytis can be a major issue in wet seasons, especially when warm, moist conditions prevail at flowering time. Its incidence is sporadic with favourable conditions at the late flowering stage presenting greatest risk. Fungicide control can be difficult to achieve.							
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant & Curative	NR NG	A	ALL	Registered in macadamias for control of Husk Spot & Botrytis Blight . Apply as a foliar application commencing at flower bloom and prior to disease development. Use a retreatment interval of 20-22 days. Maximum of 2 treatments per season.	R3
Iprodione (Rovral)	2	Protectant & Curative	NR	A	ALL	Registered in macadamias for control of Botrytis Blight . Apply as a cover spray to flower racemes when they are open. Retreatment may be required 7 days later if wet conditions persist during flowering. Remove nuts under trees prior to spraying. Maximum number of treatments not specified.	R2
Copper	M1	Protectant	1	P-A	QLD, NT & NSW	Registered in macadamias for control of Husk Spot (<i>Pseudocercospora macadamiae</i>), Anthracnose (<i>Colletotrichum</i> spp.) & Pink Limb Blight (<i>Corticium salmonicolor</i>). Registered for control of Botrytis cinerea in beans and strawberries.	-
Penthiopyrad (Fontelis) Corteva	7	Protectant	14 NG	P-A	ALL	Registered in macadamias for control of Husk Spot (<i>Pseudocercospora macadamiae</i>). Registered for control of Botrytis cinerea in strawberry, onions, shallots, spring onions, cucurbits, fruiting vegetables and leafy vegetables.	-
Azoxystrobin (Amistar)	11	Protectant / Curative		P		Registered for control of Botrytis cinerea in grapes, nursery stock & ornamentals, Rubus spp., Snow Peas, Sugar Snap Peas and Garden Peas.	-
<i>Bacillus amyloliquefaciens</i> (Serifel) BASF	BM02	Biological	NR	P		Registered for control of Grey Mould in grapevines, strawberries and other berries.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
<i>Bacillus amyloliquefaciens</i> Strain QST 713 (Serenade Opti) Bayer	BM02	Biological	NR	P		Registered for control of <i>Botrytis cinerea</i> in grapevines and strawberries.	-
BLAD (ProBlad Plus)	BM 01	Biological	NR	P		Registered for control of Brown Rot and Blossom Blight in stone fruit. US registration for control of <i>Botrytis</i> in fruiting vegetables, grapes, strawberries and ornamentals.	-
Cyprodinil + Fludioxonil (Switch) Syngenta	9+12	Protectant / Curative		P		Registered for control of <i>Botrytis cinerea</i> in capsicum, cut flowers, grapes, lettuce, onions and strawberries.	R3
Eugenol + Geraniol + Thymol (Novellus) Eden Research PLC	1	Protectant & Curative		P		Registered for control of <i>Botrytis</i> in grapes.	-
Fenpyrazamine (Prolectus) Sumitomo	17	Protectant & Curative		P		Registered for control of <i>Botrytis</i> in grapes. US registration for control of <i>Botrytis</i> in almonds, berries, lettuce, pistachios and ornamentals.	-
Florypicoxamid (Verpixo Adavelt) Corteva	21	Protectant		P		Registered for control of <i>Botrytis cinerea</i> in strawberries.	-
Ipflufenquin (Migiwa Kinoprol) AgNova	52	Protectant		P		Registered for control of <i>Botrytis cinerea</i> in strawberries.	-
Isofetamid (Kenja) AgNova	7	Protectant		P		Registered for control of <i>Botrytis cinerea</i> in low growing berries.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Polyoxin D Zinc Salt (Intervene) Nufarm	19	Protectant		P		Registered for control of Botrytis cinerea in almonds, berries and grapes.	-
Pydiflumetofen + Fludioxonil (Miravis Prime) Syngenta	7+12	Protectant & Curative		P		Registered for control of Grey Mould in berries, Grey Mould and Powdery Mildew in strawberries and grapes, and Grey Mould and Sclerotinia in lettuce and leafy vegetables.	R3
Green Mould / Cladosporium Blight (<i>Cladosporium gloeosporioides</i>)							
Priority: Low							
Rated as a low priority in NSW & QLD. Green Mould results in olive grey patches appearing on the flowers, occurring near the end of the pollination period in wet conditions. Control is not generally warranted.							
Copper (Cu)	M1	Protectant	1	P-A	ALL	Registered in macadamias for control of Husk Spot (<i>Pseudocercospora macadamiae</i>), Anthracnose (<i>Colletotrichum</i> spp.) & Pink Limb Blight (<i>Corticium salmonicolor</i>). Registered for control of Cladosporium in stone fruit.	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant & Curative	14 NG	P-A	ALL	Registered in macadamias for control of Husk Spot & Botrytis Blight. US registration for control of Scab in almonds.	R3
Fluxapyroxad + Pyraclostrobin (Merivon) BASF	7+11	Protectant & Curative	21	P-A	ALL	Registered in macadamias for control of Husk Spot (<i>Pseudocercospora macadamiae</i>) & Flower Blight / Dry Flower (<i>Pestalotiopsis</i> spp., <i>Neopestalotiopsis</i> spp., <i>Botrytis cinerea</i> , <i>Cladosporium</i> spp.) Registered for control of Cladosporium in almonds.	-
Mefentrifluconazole (Belanty) BASF	3	Protectant & Curative	14 NG	P-A	ALL	Registered in macadamia for control of Husk Spot (<i>Pseudocercospora macadamiae</i>). US registration for control of Scab in tree nuts.	-
Azoxystrobin (Amistar)	11	Protectant / Curative		P		Registered for control of Cladosporium in passionfruit and rubus.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
<i>Bacillus amyloliquefaciens</i> Strain QST 713 (Serenade Opti) Bayer	BM02	Biological	NR	P		Registered for control of Botrytis in grapevines and strawberries, suppression of Bacterial Spot in tomatoes, capsicums and chillies, and control of Anthracnose and suppression of Stem End Rot in avocado and other tropical fruit (excluding banana). US registration for control of Cladosporium sp. in grapes.	-
Florypicoxamid (Verpixo Adavelt) Corteva	21	Protectant		P		Registered for control of Powdery Mildew in cucurbits and fruiting vegetables, control of Sclerotinia Rot in lettuce, and control of Grey Mould and Powdery Mildew in strawberries. Also has activity on Septoria, Anthracnose, Alternaria, Scab , Monilinia, Rust and <i>Mycosphaerella</i> spp.	-
Isopyrazam (Seguris) Syngenta	7	Protectant		P		Registered for control of Scab in almonds.	-
Husk Rot / Anthracnose (<i>Colletotrichum gloeosporioides</i>)							
Priority: Low							
Rated as a moderate priority in NSW, and as a low priority in QLD. Occurrence is sporadic and yield losses are uncommon with Anthracnose. Specific treatment is rarely required although incidental control is often obtained through regular fungicide program used for control of Husk Spot.							
Copper as Copper Hydroxide / Copper Oxychloride / Cuprous Oxide	M1	Protectant	1	A	QLD, NT & NSW	Registered in macadamias for control of Husk Spot (<i>Pseudocercospora macadamiae</i>), Anthracnose (<i>Colletotrichum</i> spp.) & Pink Limb Blight (<i>Corticium salmonicolor</i>). Apply as a foliar spray early summer to May at monthly intervals. Maximum number of treatments per season not specified.	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant & Curative	NR NG	P-A	ALL	Registered in macadamias for control of Husk Spot & Botrytis Blight. US registration for control of Anthracnose in almonds.	-
Fluxapyroxad + Pyraclostrobin (Merivon) BASF	7+11	Protectant & Curative	21	P-A	ALL	Registered in macadamias for control of Husk Spot (<i>Pseudocercospora macadamiae</i>) & Flower Blight / Dry Flower (<i>Pestalotiopsis</i> spp., <i>Neopestalotiopsis</i> spp., <i>Botrytis cinerea</i> , <i>Cladosporium</i> spp.) Registered for control of Anthracnose in almonds.	-
Azoxystrobin (Amistar)	11	Protectant & Curative		P		Registered for control of Anthracnose in almonds, avocados, mangoes, olives, pistachio and rubus.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Isopyrazam (Seguris) Syngenta	7	Protectant		P		Registered for suppression of Anthracnose in almonds.	-
<i>Aureobasidium pullulans</i> (Botector) Nufarm	UN	Biological / Protectant	NR	P		Registered for suppression of Anthracnose in berries and grapes.	-
<i>Bacillus amyloliquefaciens</i> Strain QST 713 (Serenade Opti) Bayer	BM 02	Biological / Protectant	NR	P		Registered for control of Anthracnose in avocado and mango. US registration for control of Anthracnose in tree nuts.	-
BLAD (Problad Plus)	BM 01	Biological	NR	P		Registered for suppression of Brown Rot in stone fruit. US registration for control of Brown Rot / Blossom Blight in almonds and control of Anthracnose in grapes and strawberries.	-
Cyprodinil + Fludioxonil (Switch) Syngenta	9+12	Protectant		P		Registered for control of Anthracnose in nursery stock, ornamentals and strawberries. US registration for control of Anthracnose in berries, citrus and tropical fruit.	R3
Florypicoxamid (Verpixo Adavelt) Corteva	21	Protectant		P		Registered for control of Powdery Mildew in cucurbits and fruiting vegetables, control of Sclerotinia Rot in lettuce, and control of Grey Mould and Powdery Mildew in strawberries. Also has activity on Septoria, Anthracnose , Alternaria, Scab, Monilinia, Rust and <i>Mycosphaerella</i> spp.	-
Pydiflumetofen + Fludioxonil (Miravis Prime) Syngenta	7+12	Curative / Protectant		P		Registered for control of Grey Mould in berries, Grey Mould and Powdery Mildew in strawberries and grapes, and Grey Mould and Sclerotinia in lettuce and leafy vegetables. US registration for control of Anthracnose in almonds, bushberries, grapes & small fruit vine climbing (except Fuzzy Kiwifruit), lemon, lime, low-growing berries and specific tree nuts.	R3

4.2 Insect and other pests of Macadamias

4.2.1 Insect and other pest priorities

Insects and Other Pests	Priority
Fruit Spotting Bug (<i>Amblypelta nitida</i>)	H
Banana Spotting Bug (<i>Amblypelta lutescens</i>)	H
Lace Bug (<i>Ulonemia</i> spp.)	H
Macadamia Nutborer (<i>Cryptophlebia ombrodelta</i>)	H
Macadamia Seed Weevil / Sigastus Weevil (<i>Kuschelorrhynchus macadamiae</i>)	H
Leptocoris Bug (<i>Leptocoris</i> spp.)	M
Bark Beetle / Scolytid beetles (<i>Hypothenemus</i> spp., <i>Cryphalus</i> spp.)	M
Thrips (<i>Scirtothrips</i> spp.)	M
Macadamia Flower Caterpillar (<i>Homoeosoma vagella</i> , <i>Xanthodes congenita</i>)	M
Banana Fruit Caterpillar (<i>Tiracola plagiata</i>)	M
Macadamia Kernel Grub (<i>Assara seminivale</i>)	M
Green Vegetable Bug (<i>Nezara viridula</i>)	M
Red-Shouldered Leaf Beetle (<i>Monolepta australis</i>)	L
Broad Mites (<i>Brevipalpus</i> spp.)	L
Flat Mites (<i>Polyphagotarsonemus</i> spp.)	L
Macadamia Felted Coccid (<i>Eriococcus ironsidei</i>)	L
Macadamia Leafminer (<i>Acrocercops chionosema</i>)	L
Macadamia Twig Girdler (<i>Xylorycta luteotactella</i>)	L
Orange Fruitborer (<i>Isotenes miserana</i>)	L
Pinhole Borer (<i>Xyleborus perforans</i>)	L
Latania Scale (<i>Hemiberlesia lataniae</i>)	L
White Scale (<i>Pseudaulacaspis brimblecombei</i>)	L

Macadamias are impacted by a wide variety of insect and other pests, with Fruit Spotting Bug, Banana Spotting Bug, Lace Bug, Macadamia Nutborer, and Macadamia Seed Weevil / Sigastus Weevil rated as high priority pests.

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

The diverse range of insect and mite pests in macadamias necessitates careful planning with resistance management. Growers should refer to resistance management strategies listed on the CropLife website⁶ when planning their pest management programs.

⁶ <https://www.croplife.org.au/resources/programs/resistance-management/>

4.2.2 Available and potential products for priority insects and other pests

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

Availability		Regulatory risk (refer to Appendix 7)	
A	Available via either registration or permit approval	R1	Short-term: Critical concern over retaining access
P	Potential - a possible candidate to pursue for registration or permit	R2	Medium-term: Maintaining access of significant concern
P-A	Potential, already approved in the crop for another use	R3	Long-term: Potential issues associated with use - Monitoring required
Withholding Period (WHP) – Number of days from last treatment to harvest (H) or Grazing (G)			
Harvest	H	Not Required when used as directed	NR
Grazing	G	No Grazing Permitted	NG
IPM – indicative overall impact on beneficials (based on the Cotton Pest Management Guide 2019-20 and cotton use patterns)			
VL – Very low; L – Low; M – Moderate; H – High; VH – Very High; - not specified			

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Fruit Spotting Bug (<i>Amblyopelta nitida</i>) Banana Spotting Bug (<i>Amblyopelta lutescens</i>) Priority: High								
Fruit Spotting Bug is rated as a high priority in NSW, & QLD, and Banana Spotting Bug is rated as a low priority in NSW and as a moderate priority in QLD. An Integrated Pest Management (IPM) approach is recommended, including reducing tree height and density, use of cover crops in the inter-row, promotion of beneficials such as egg parasitoids and predators and minimising the use of broad-spectrum insecticides through effective pest monitoring and adopting a strategic approach to product selection. The main infestations generally occur between October to February depending on the crop and location. Research shows that late spotting bug damage is consistently the primary reason for nuts being rejected at factory stage. The economic impact of spotting bug damage can be significant with 10% yield losses estimated at ten percent. Damage to immature nuts will generally cause premature nut fall. More mature nuts do not drop when attacked but can become unmarketable.								
Acephate (Orthene)	1B	Contact	NR	A	QLD, WA & NT	Registered in macadamias for control of Red Shouldered Leaf Beetle, Macadamia Leaf Miner, Banana Spotting Bug & Flower Thrips. Apply as a foliar spray at early flowering. Use a retreatment interval of 14-21 days. Maximum number of treatments not specified.	H Bee:H	R3
					NSW, WA, QLD & NT	Registered in macadamias for control of Flower Eating Caterpillar and Fruit Spotting Bug . Apply as a foliar spray at early flowering. Use a retreatment interval of 14-21 days. Maximum number of treatments not specified.		

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Acetamiprid + Pyriproxyfen (Trivior) Adama	4A+7C	Contact & Ingestion	14 NG	A	ALL	Registered in macadamias for control of Fruit Spotting Bug (<i>Amblypelta nitida</i> , <i>Amblypelta lutescens</i>), Pink Wax Scale <i>Ceroplastes rubens</i> , Soft Brown Scale (<i>Coccus hesperidum</i>), Citrus Mealybug (<i>Planococcus citri</i>) & Long Tailed Mealybug (<i>Pseudococcus longispinus</i>). Apply as a foliar spray post-flowering when monitoring indicates pests are becoming active in crop. Use a minimum 14 day retreatment interval and always apply in alternation with a product from a different mode-of-action group. Maximum of 3 treatments per season.	M Bee:H	R2
Betacyfluthrin (Bulldock)	3A	Contact	7	A	QLD, NSW, ACT & WA	Registered in macadamia for suppression of Macadamia Nut Borer & Fruit Spotting Bug . Apply as a foliar spray when pest numbers indicate. Use a retreatment interval of 14-21 days. Maximum number of treatments per season not specified.	VH Bee:H	-
Betacyfluthrin + Piperonyl Butoxide (Cyborg) Imtrade	3A	Contact	7	A	QLD, NSW, ACT & WA	Registered in macadamia for control of Macadamia Nut Borer & Fruit Spotting Bug . Apply as a foliar spray when pest numbers indicate. Use a retreatment interval of 14-21 days. Maximum number of treatments per season not specified.	VH Bee:H	-
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact & Ingestion	20 NG	A	ALL	Registered in macadamias for control of Macadamia Lace Bug (<i>Ulonemia concava</i> , <i>Ulonemia decoris</i>), Fruit Spotting Bug (<i>Amblypelta nitida</i>) & Banana Spotting Bug (<i>Amblypelta lutescens</i>) and for suppression of Scirtothrips (<i>Scirtothrips dorsalis</i>). Apply as a foliar spray from early nut set onwards, when monitoring indicates pest numbers exceed threshold. Maximum of 1 treatment per season.	L Bee:L	-
Sulfoxaflor (Transform) Corteva	4C	Contact & Ingestion	NR	A	ALL	Registered in macadamia for control of Banana Spotting Bug, Fruit Spotting Bug , Lace Bug and Macadamia Felted Coccid. Apply as a foliar spray when the pest is active in the crop. Use a minimum retreatment interval of 7 days. Maximum of 2 applications per season.	M Bee:H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Trichlorfon	1B	Contact	2	A	QLD, NSW & NT	Registered in macadamia for control of Fruit Spotting Bug & Macadamia Flower Caterpillar. Apply as a foliar spray when premature nut fall is evident. A second application 14 days later may be necessary.	H Bee:H	R2
					QLD & NT	Registered in macadamia for control of Banana Spotting Bug . Apply as a foliar spray when premature nut fall is evident. A second application 14 days later may be necessary.		
Trichlorfon PER13689	1B	Contact	2	A	NSW & QLD	Permitted in macadamia for control of Macadamia Lace Bug, Fruit Spotting Bug , Banana Spotting Bug & Green Vegetable Bug. Apply as a foliar spray once local thresholds are reached. Use a retreatment interval of 14 days. Maximum of 4 applications per season. Do not apply to plants in flower, while bees are foraging.	H Bee:H	R2
Lace Bug (<i>Ulonemia</i> spp.) Priority: High Rated as a high priority in NSW, and as a low priority in QLD. Lace Bug attacks the flowers and will result in flower death if left unchecked. Production losses can exceed 90 percent. Numbers build up over successive seasons as they overwinter in the bark of trees. Early detection and management are vital to preventing crop damage. Damage is worse when multiple flowerings extend throughout the season.								
Diazinon PER14276	1B	Contact	14 G:14	A	NSW, QLD & WA	Permitted in macadamia plantations for control of Macadamia Lace Bug (<i>Ulonemia concava</i> and <i>Physatochelia</i> spp.) Apply as a foliar spray immediately prior to main flower opening. Repeat treatment (if required) prior to second flower opening. Maximum of 2 treatments per season.	H Bee:H	R1
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact & Ingestion	20 NG	A	ALL	Registered in macadamias for control of Macadamia Lace Bug (<i>Ulonemia concava</i> , <i>Ulonemia decoris</i>), Fruit Spotting Bug (<i>Amblypelta nitida</i>) & Banana Spotting Bug (<i>Amblypelta lutescens</i>) and for suppression of Scirtothrips (<i>Scirtothrips dorsalis</i>). Apply as a foliar spray from early flowering onwards, when monitoring indicates pest numbers exceed threshold. Maximum of 1 treatment per season.	L Bee:L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Sulfoxaflor (Transform) Corteva	4C	Contact & Ingestion	NR	A	ALL	Registered in macadamia for control of Banana Spotting Bug, Fruit Spotting Bug, Lace Bug and Macadamia Felted Coccid. Apply as a foliar spray as soon as the pest is detected. Retreatment interval not specified. Maximum of 2 applications per season.	M Bee:H	-
Trichlorfon PER13689	1B	Contact	2	A	NSW & QLD	Permitted in macadamia for control of Macadamia Lace Bug , Fruit Spotting Bug, Banana Spotting Bug & Green Vegetable Bug. Apply as a foliar spray once local thresholds are reached. Use a retreatment interval of 14 days. Maximum of 4 applications per season. Do not apply to plants in flower, while bees are foraging.	H Bee:H	R2
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C	Contact & Ingestion	14 NG	P-A	ALL	Registered in macadamias for control of Fruit Spotting Bug (<i>Amblypelta nitida</i> , <i>Amblypelta lutescens</i>), Pink Wax Scale <i>Ceroplastes rubens</i> , Soft Brown Scale (<i>Coccus hesperidum</i>), Citrus Mealybug (<i>Planococcus citri</i>) & Long Tailed Mealybug (<i>Pseudococcus longispinus</i>).	M Bee:H	R2
Macadamia Nutborer (<i>Cryptophlebia ombrodelta</i>)								
Priority: High								
Rated as a high priority in NSW and as a moderate priority in QLD. Nut Borer is the most significant Lepidopteran pest of macadamias. They can cause substantial damage to the nuts and can continue to cause problems such as premature nut drop after shell hardening. Removing fallen nuts and the use of parasitoid wasps form part of an integrated approach to managing the pest.								
Acephate (Orthene)	1B	Contact	NR	A	NSW & WA	Registered in macadamias for control of Macadamia Nut Borer & Leafminer. Apply as a foliar spray when pest activity is first observed. Use a retreatment interval of 14-21 days. Maximum number of treatments not specified.	H Bee:H	R3
Betacyfluthrin (Bulldock)	3A	Contact	7	A	QLD, NSW, ACT & WA	Registered in macadamia for suppression of Macadamia Nut Borer & Fruit Spotting Bug. Apply as a foliar spray when pest numbers indicate. Use a retreatment interval of 14-21 days. Maximum number of treatments per season not specified.	VH Bee:H	-
Betacyfluthrin + Piperonyl Butoxide (Cyborg) Imtrade	3A	Contact	7	A	QLD, NSW, ACT & WA	Registered in macadamia for control of Macadamia Nut Borer & Fruit Spotting Bug. Apply as a foliar spray when pest numbers indicate. Use a retreatment interval of 14-21 days. Maximum number of treatments per season not specified.	VH Bee:H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Carbaryl	1A	Contact	NR	A	ALL	Registered in macadamia for control of Macadamia Nut Borer & Macadamia Twig Girdler. Apply as a foliar spray directed at nut clusters during late November to February. Use a retreatment interval of 14-21 days. Maximum number of treatments not specified.	H Bee:H	R2
Methoxyfenozide (Prodigy)	18	Ingestion / IGR	28 NG	A	ALL	Registered in macadamia for control of Macadamia Flower Caterpillar & Macadamia Nut Borer . Apply as a foliar spray to cover nuts when pest numbers exceed threshold. Target applications against eggs and early instar larvae. Retreatment interval not specified. Maximum of 3 treatments per season.	VL Bee:VL	-
Spinetoram (Success Neo) Corteva	5	Ingestion	7	A	ALL	Registered in macadamia for control of Macadamia Nut Borer , Thrips (including Red-Banded Thrips), Flower-Eating Caterpillar, Twig Girdler & Yellow Peach Moth. Apply as a foliar spray when pest numbers reach local threshold, ensuring complete coverage of nuts and nutlets. Use a retreatment interval of 10-14 days if pests are still active. Maximum of 4 treatments per season.	M Bee:VH	-
Tebufenozide (Mimic)	18	Ingestion / IGR	28	A	ALL	Registered in macadamia for control of Macadamia Flower Caterpillar & Macadamia Nut Borer . Apply as a foliar spray to cover nuts when pest numbers exceed threshold. Retreatment interval not specified. Maximum number of treatments per season not specified.	L Bee:L	-
<i>Bacillus thuringiensis</i> Berliner Subsp Aizawai (Bacchus WG)	11C	Biological	NR	P-A	ALL	Registered in macadamias for control of 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 (<i>Chrysodeixis</i> spp., <i>Ectropis excursaria</i> , <i>Thysanoplusia orichalcea</i>), Light Brown Apple Moth (<i>Epiphyas postvittana</i>) and Vine Moth (<i>Phalaenoides glycinae</i> , <i>Agarista agricola</i>).	VL Bee:L	-
Indoxacarb (Avatar eVo) FMC	22A	Ingestion	14	P-A	ALL	Registered in macadamia for control of Macadamia Seed Weevil (<i>Kushelorrhynchus macadamiae</i>). Also has activity on lepidopteran pests.	M Bee:H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion	10 NG	P-A	ALL	Registered in macadamias for control of Macadamia Seed Weevil (<i>Kuschelorhynchus macadamiae</i>). Also has activity on lepidopteran pests.	L-M Bee:VH	-
Amorphous Silica (Abrade)	-	Contact		P		Registered for control of various caterpillar pests in cotton, brassica vegetables, capsicums, canola and mustard.	-	-
Emamectin (Proclaim Opti) Syngenta	6	Ingestion		P		Registered for control of various lepidopteran pests in brassica vegetables, root & tuber vegetables (except potatoes), leafy vegetables, brassica leafy vegetables, sweet corn, strawberries, lettuce, legume vegetables, fruiting vegetables and grapes.	M Bee:H	-
Isocycloseram (Simodis) Syngenta	30	Ingestion		P		Registered for control of Diamond Back Moth, Cabbage White Butterfly and suppression of Heliothis in brassica vegetables and brassica leafy vegetables, suppression of Onion Thrips and Plague Thrips in bulb vegetables, control of Two Spotted Mite and Cucumber Moth and suppression of Broad Mite, Bean Red Spider Mite, Western Flower Thrips, Tomato Thrips, Melon Thrips, Plague Thrips and Heliothis in cucurbits, and control of Two Spotted Mite and Broad Mite and suppression of Tomato Russet Mite, Western Flower Thrips, Tomato Thrips, Melon Thrips, Plague Thrips and Heliothis in fruiting vegetables.	H Bee:VH	-
Spinosad (Entrust Organic) Corteva	5	Contact & Ingestion		P		Registered for control of lepidopteran pests in various fruit, vegetable, tree and vine crops.	L Bee:H	-
Macadamia Seed Weevil / Sigastus Weevil (<i>Kuschelorhynchus macadamiae</i>)								
Priority: High								
Rated as a high priority in NSW, and as a low priority in QLD. Macadamia Seed Weevil relies on out-of-season flowering and small soft-shell nuts for egg laying. Keeping orchard floors clean is critical for controlling this pest. Best results have been achieved with a combination of good hygiene (removing infested nuts) and targeted spraying during spring at match head stage.								
Indoxacarb (Avatar eVo) FMC	22A	Ingestion	14	A	ALL	Registered in macadamia for control of Macadamia Seed Weevil (<i>Kuschelorhynchus macadamiae</i>). Apply as a foliar spray at the beginning of nut set when nuts are pea sized. Use a retreatment interval of 10-14 days. Maximum of 2 treatments per season.	M Bee:H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Indoxacarb (Avatar/Steward) PER86827	22A	Ingestion	42 NG	A	NSW & QLD	Permitted in macadamia for control of Macadamia Seed Weevil (<i>Kushelorrhynchus macadamiae</i>). Apply as a foliar spray at the beginning of nut set when nuts are pea sized. Use a retreatment interval of 10-14 days. Maximum of 2 treatments per season.	M Bee:H	-
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion	10 NG	A	ALL	Registered in macadamias for control of Macadamia Seed Weevil (<i>Kushelorrhynchus macadamiae</i>). Apply as a foliar spray, commencing when weevils are active and after petal fall. Use a retreatment interval of 14-28 days. Maximum of 3 treatments per season.	L-M Bee:VH	-
Leptocoris Bug (<i>Leptocoris</i> spp.)								
Priority: Moderate								
Rated as a moderate priority in NSW & QLD. Leptocoris are an increasing problem in macadamia. Large infestations can cause significant crop losses by feeding damage on the young developing nuts. Damage is similar to that caused by fruit spotting bugs.								
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C	Contact & Ingestion	14 NG	P-A	ALL	Registered in macadamias for control of Fruit Spotting Bug (<i>Amblypelta nitida</i> , <i>Amblypelta lutescens</i>), Pink Wax Scale <i>Ceroplastes rubens</i> , Soft Brown Scale (<i>Coccus hesperidum</i>), Citrus Mealybug (<i>Planococcus citri</i>) & Long Tailed Mealybug (<i>Pseudococcus longispinus</i>).	M Bee:H	R2
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact & Ingestion	20 NG	P-A	ALL	Registered in macadamias for control of Macadamia Lace Bug (<i>Ulonemia concava</i> , <i>Ulonemia decoris</i>), Fruit Spotting Bug (<i>Amblypelta nitida</i>) & Banana Spotting Bug (<i>Amblypelta lutescens</i>) and for suppression of Scirtothrips (<i>Scirtothrips dorsalis</i>).	L Bee:L	-
Sulfoxaflor (Transform) Corteva	4C	Contact & Ingestion	NR	P-A	ALL	Registered in macadamia for control of Banana Spotting Bug, Fruit Spotting Bug, Lace Bug and Macadamia Felted Coccid.	M Bee:H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Bark Beetle / Scolytid beetles (<i>Hypothenemus</i> spp., <i>Cryphalus</i> spp.)								
Priority: Moderate								
Rated as a moderate priority in NSW & QLD. Bark beetles can infect the nut in shell, potentially impacting on harvest quality. Damage is influenced by shell thickness. Maintaining tree health and general orchard hygiene is critical, particularly reducing the number of fallen nuts left on the ground after harvest.								
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion	10 NG	P-A	ALL	Registered in macadamias for control of Macadamia Seed Weevil (<i>Kushelorrhynchus macadamiae</i>).	L-M Bee:VH	-
Thrips (<i>Scirtothrips</i> spp.)								
Priority: Moderate								
Rated as a moderate priority in NSW & QLD. Scirtothrips can cause significant damage, especially at flowering but also with new vegetative flushes. Timely control is important. Until recently they were regarded as relatively insignificant pests of macadamia nuts but in recent years there has been an increase in the number of damaged blocks recorded as a result of this pest. Economic damage with this pest has been recorded during the vegetative stage of macadamia with larvae and adults feeding on soft new leaves. Heavily infested leaves may be stunted and deformed, and severely damaged young shoots may turn black and fall off. The loss of these shoots affects production in the subsequent season as fewer branches are available for flowering.								
Abamectin PER87510	6	Contact & Ingestion	28 G:14	A	ALL (excl. VIC)	Permitted in macadamias for control of Thrips (<i>Scirtothrips</i> spp.) Broad Mites (<i>Brevipalpus</i> spp.) & Flat Mites (<i>Polyphagotarsonemus</i> spp.) Apply as a foliar spray in July as protection for the spring flush, or in December as protection for the summer flush. Maximum of 1 treatment per season, and do not apply in 2 consecutive seasons without a product from an alternative mode-of-action group being used in between.	M Bee:H	-
Acephate (Orthene)	1B	Contact	NR	A	QLD, WA & NT	Registered in macadamias for control of Red Shouldered Leaf Beetle, Macadamia Leaf Miner, Banana Spotting Bug & Flower Thrips . Apply as a foliar spray at early flowering if pests evident. Use a retreatment interval of 14-21 days. Maximum number of treatments not specified.	H Bee:H	R3
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact & Ingestion	20 NG	A	ALL	Registered in macadamias for control of Macadamia Lace Bug (<i>Ulonemia concava</i> , <i>Ulonemia decoris</i>), Fruit Spotting Bug (<i>Amblypelta nitida</i>) & Banana Spotting Bug (<i>Amblypelta lutescens</i>) and for suppression of Scirtothrips (<i>Scirtothrips dorsalis</i>). Apply as a foliar spray after flowering, when monitoring indicates pest numbers exceed threshold. Maximum of 1 treatment per season.	L Bee:L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Potassium Salts of Fatty Acid (Natrasoap)	-	Contact	NR	A	ALL	Registered in nut trees for control of Aphids, Thrips , Mealybug, Two-Spotted Mite, Spider Mite & Whitefly. Apply as a cover spray when pests are evident. Retreatment interval and maximum number of treatments per season not specified.	L Bee:L	-
Spinetoram (Success Neo) Corteva	5	Ingestion	7	A	ALL	Registered in macadamia for control of Macadamia Nut Borer, Thrips (including Red-Banded Thrips), Flower-Eating Caterpillar, Twig Girdler & Yellow Peach Moth. Apply as a foliar spray when pest numbers reach local threshold, ensuring complete coverage of nuts and nutlets. Use a retreatment interval of 10-14 days if pests are still active. Maximum of 4 treatments per season.	M Bee:VH	-
Cyantranilprole (Benevia) FMC	28	Ingestion		P		Registered for suppression of various Thrips in bulb vegetables, fruiting vegetables, cucurbits, potatoes and strawberries.	L-M Bee:VH	-
Isocycloseram (Simodis) Syngenta	30	Ingestion		P		Registered for control of Diamond Back Moth, Cabbage White Butterfly and suppression of Heliothis in brassica vegetables and brassica leafy vegetables, suppression of Onion Thrips and Plague Thrips in bulb vegetables, control of Two Spotted Mite and Cucumber Moth and suppression of Broad Mite, Bean Red Spider Mite, Western Flower Thrips, Tomato Thrips, Melon Thrips, Plague Thrips and Heliothis in cucurbits, and control of Two Spotted Mite and Broad Mite and suppression of Tomato Russet Mite, Western Flower Thrips, Tomato Thrips, Melon Thrips, Plague Thrips and Heliothis in fruiting vegetables.	H Bee:VH	-
Spinosad (Entrust Organic) Corteva	5	Contact & Ingestion		P		Registered for control of various thrips species in banana, brassica vegetables, cucurbits, fruiting vegetables, leafy vegetables, legume vegetables, ornamentals, berryfruit, pome fruit, stone fruit and tropical & sub-tropical fruit crops (inedible peel).	L Bee:H	-
Spirotetramat (Movento) Bayer	23	Ingestion		P		Registered for control of various Thrips in green beans, celery, rhubarb, fruiting vegetables, herbs, lettuce, bulb onions, bulb vegetables, citrus and grapes.	M Bee:L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Spirotetramat + Imidacloprid (Movento Energy) Bayer	23+4A	Contact & Ingestion		P		Registered for control of Banana Rust Thrips in banana.	M Bee:M	R3
<p>Macadamia Flower Caterpillar (<i>Homoeosoma vagella</i>, <i>Xanthodes congenita</i>) Banana Fruit Caterpillar (<i>Tiracola plagiata</i>) Macadamia Kernel Grub (<i>Assara seminivale</i>) Priority: Moderate</p> <p>Rated as a low priority in NSW and as a moderate priority in QLD. Larval feeding by Macadamia Flower Caterpillar destroys buds and flowers, leaving the raceme covered by webbing. Flower Caterpillars can severely reduce a nut crop if not controlled. Banana Fruit Caterpillars feed during nut set. Larvae hide in leaf litter during the day and move up to feed in the tree at night. Macadamia Kernel Grub lay eggs on nuts prior to harvest, and can become a larger issue as grubs hatch and infest nuts in storage post-harvest.</p>								
Acephate (Orthene)	1B	Contact	NR	A	NSW, WA, QLD & NT	Registered in macadamias for control of Flower Eating Caterpillar and Fruit Spotting Bug. Apply as a foliar spray at early flowering if pests evident. Retreatment interval and maximum number of treatments not specified.	H Bee:H	R3
Methomyl PER90592	1A	Contact	NR	A	QLD	Permitted in macadamias for control of Banana Fruit Caterpillar (<i>Tiracola plagiata</i>). Apply as a ground surface treatment up to the tree lines. Apply one application only during late flowering / early fruit development.	H Bee:H	R2
Methoxyfenozide (Prodigy)	18	Ingestion / IGR	28 NG	A	ALL	Registered in macadamia for control of Macadamia Flower Caterpillar & Macadamia Nut Borer. Monitor for eggs and very small larvae on flowers and apply as a foliar spray at a threshold of 50-80% racemes infested. Retreatment interval not specified. Maximum of 3 treatments per season.	VL Bee:VL	-
Spinetoram (Success Neo) Corteva	5	Ingestion	7	A	ALL	Registered in macadamia for control of Macadamia Nut Borer, Thrips (including Red-Banded Thrips), Flower-Eating Caterpillar , Twig Girdler & Yellow Peach Moth. Apply as a foliar spray when pest numbers reach local threshold, ensuring complete coverage of nuts and nutlets. Use a retreatment interval of 10-14 days if pests are still active. Maximum of 4 treatments per season.	M Bee:VH	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Tebufenozide (Mimic)	18	Ingestion / IGR	28	A	ALL	Registered in macadamia for control of Macadamia Flower Caterpillar & Macadamia Nut Borer. Apply as a foliar spray to cover nuts when pest numbers exceed threshold. Retreatment interval not specified. Maximum number of treatments per season not specified.	L Bee:L	-
Trichlorfon	1B	Contact	2	A	QLD, NSW & NT	Registered in macadamia for control of Fruit Spotting Bug & Macadamia Flower Caterpillar . Apply as a foliar spray when damage levels of the pest occur. Retreatment interval and maximum number of treatments per season not specified.	H Bee:H	R2
<i>Bacillus thuringiensis</i> Berliner Subsp Aizawai (Bacchus WG)	11C	Biological	NR	P-A	ALL	Registered in macadamias for control of 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 (<i>Chrysodeixis</i> spp., <i>Ectropis excursaria</i> , <i>Thysanoplusia orichalcea</i>), Light Brown Apple Moth (<i>Epiphyas postvittana</i>) and Vine Moth (<i>Phalaenoides glycinae</i> , <i>Agarista agricola</i>).	VL Bee:L	-
Indoxacarb (Avatar eVo) FMC	22A	Ingestion	14	P-A	ALL	Registered in macadamia for control of Macadamia Seed Weevil (<i>Kushelorrhynchus macadamiae</i>). Also has activity on lepidopteran pests.	M Bee:H	-
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion	10 NG	P-A	ALL	Registered in macadamias for control of Macadamia Seed Weevil (<i>Kushelorrhynchus macadamiae</i>). Also has activity on lepidopteran pests.	L-M Bee:VH	-
Amorphous Silica (Abrade)	-	Contact		P		Registered for control of various caterpillar pests in cotton, brassica vegetables, capsicums, canola and mustard.	-	-
Emamectin (Proclaim Opti) Syngenta	6	Ingestion		P		Registered for control of various lepidopteran pests in brassica vegetables, root & tuber vegetables (except potatoes), leafy vegetables, brassica leafy vegetables, sweet corn, strawberries, lettuce, legume vegetables, fruiting vegetables and grapes.	M Bee:H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Isocycloseram (Simodis) Syngenta	30	Ingestion		P		Registered for control of Diamond Back Moth, Cabbage White Butterfly and suppression of Heliothis in brassica vegetables and brassica leafy vegetables, suppression of Onion Thrips and Plague Thrips in bulb vegetables, control of Two Spotted Mite and Cucumber Moth and suppression of Broad Mite, Bean Red Spider Mite, Western Flower Thrips, Tomato Thrips, Melon Thrips, Plague Thrips and Heliothis in cucurbits, and control of Two Spotted Mite and Broad Mite and suppression of Tomato Russet Mite, Western Flower Thrips, Tomato Thrips, Melon Thrips, Plague Thrips and Heliothis in fruiting vegetables.	H Bee:VH	-
Spinosad (Entrust Organic) Corteva	5	Contact & Ingestion		P		Registered for control of lepidopteran pests in various fruit, vegetable, tree and vine crops.	L Bee:H	-
Green Vegetable Bug (<i>Nezara viridula</i>)								
Priority: Moderate								
Rated as a low priority in NSW and as a moderate priority in QLD. Green Vegetable Bug are a sporadic pest with surrounding weed and crop hosts (eg soybeans) often a source of infestation. Adults and nymphs will feed on nuts at all stages and the damage is similar to that caused by fruit spotting bugs. They are often controlled incidentally by insecticides used for treatment of fruit spotting bugs.								
Trichlorfon PER13689	1B	Contact	2	A	NSW & QLD	Permitted in macadamia for control of Macadamia Lace Bug, Fruit Spotting Bug, Banana Spotting Bug & Green Vegetable Bug . Apply as a foliar spray once local thresholds are reached. Use a retreatment interval of 14 days. Maximum of 4 applications per season. Do not apply to plants in flower, while bees are foraging.	H Bee:H	R2
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C	Contact & Ingestion	14 NG	P-A	ALL	Registered in macadamias for control of Fruit Spotting Bug (<i>Amblypelta nitida</i> , <i>Amblypelta lutescens</i>), Pink Wax Scale <i>Ceroplastes rubens</i> , Soft Brown Scale (<i>Coccus hesperidum</i>), Citrus Mealybug (<i>Planococcus citri</i>) & Long Tailed Mealybug (<i>Pseudococcus longispinus</i>).	M Bee:H	R2

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	20 NG	P-A	ALL	Registered in macadamias for control of Macadamia Lace Bug (<i>Ulonemia concava</i> , <i>Ulonemia decoris</i>), Fruit Spotting Bug (<i>Amblypelta nitida</i>) & Banana Spotting Bug (<i>Amblypelta lutescens</i>) and for suppression of Scirtothrips (<i>Scirtothrips dorsalis</i>).	L Bee:L	-
Sulfoxaflor (Transform) Corteva	4C	Contact & Ingestion	NR	P-A	ALL	Registered in macadamia for control of Banana Spotting Bug, Fruit Spotting Bug, Lace Bug and Macadamia Felted Coccid.	M Bee:H	-
Red-Shouldered Leaf Beetle (<i>Monolepta australis</i>)								
Priority: Low								
Rated as a low priority in NSW and as a moderate priority in QLD. Adult beetles will attack flowers and young leaves, often leaving just a network of veins. They tend to come in a swarm generally after a period of rain in spring or summer. Frequent monitoring is required and insecticides should be used to treat hot spots as soon as detected.								
Acephate (Orthene)	1B	Contact	NR	A	QLD, WA & NT	Registered in macadamias for control of Red Shouldered Leaf Beetle , Macadamia Leaf Miner, Banana Spotting Bug & Flower Thrips. Apply as a foliar spray at when pest activity is first observed. Use a retreatment interval of 14-21 days. Maximum number of treatments not specified.	H Bee:H	R3
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion	10 NG	P-A	ALL	Registered in macadamias for control of Macadamia Seed Weevil (<i>Kushelorrhynchus macadamiae</i>).	L-M Bee:VH	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Broad Mites (<i>Brevipalpus</i> spp.) Flat Mites (<i>Polyphagotarsonemus</i> spp.) Priority: Low Broad Mites are rated as a moderate priority in NSW and as a low priority in QLD. Flat Mites are rated as a low priority in NSW & QLD. Mites cause brown, rusty scarring of the husk, but yield and quality are not usually significantly affected.								
Abamectin PER87510	6	Contact & Ingestion	28 G:14	A	ALL (excl. VIC)	Permitted in macadamias for control of Thrips (<i>Scirtothrips</i> spp.) Broad Mites (<i>Brevipalpus</i> spp.) & Flat Mites (<i>Polyphagotarsonemus</i> spp.) Apply as a foliar spray in July as protection for the spring flush, or in December as protection for the summer flush. Maximum of 1 treatment per season, and do not apply in 2 consecutive seasons without a product from an alternative mode-of-action group being used in between.	M Bee:H	-
Clofentezine (Apollo)	10A	IGR / Contact		P		Registered for control of various mites in apples, stone fruit, pears, hops, bananas and ornamentals.	L Bee:L	-
Etoxazole (Paramite)	10B	IGR / Contact		P		Registered for control of various mites in pome fruit, stone fruit (except cherries), almonds, table grapes, wine grapes, citrus, tomatoes, capsicum and bananas.	L Bee:VL	-
Fenbutatin Oxide (Torque)	12A	Contact		P		Registered for control of various mites in apples, pears, peaches, nectarines, hops, avocado, bananas, citrus, strawberries and ornamentals.	L Bee:L	R2
Propargite (Omite)	12C	Contact		P		Registered for control of various mites in stone fruit, apples, pears, strawberries, bananas, passionfruit, beans, tomatoes, hops and ornamentals.	M Bee:L	R3
Pyridaben (Sanmite)	21A	IGR / Contact		P		Registered for control of various mites in apples, pears, stone fruit, bananas, grapes (not wine) and roses.	H Bee:H	-
<i>Beauveria bassiana</i> (Velifer) BASF	UN	Ingestion	NR	P		Biological currently registered in protected vegetables and ornamentals, with activity on mites.	L Bee:L	-
Bifenazate (Acramite) Arysta	20D	Contact & Ingestion		P		Registered for control of various mites in apples, pears, apricots, nectarines, peaches, plums, almonds, fruiting vegetables (excluding sweet corn & mushrooms), cucurbits, papaya and strawberries.	L Bee:H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Cyflumetofen (Danisaraba) BASF	25A	Contact		P		Registered for control of various mites in pome fruit, almonds, citrus, grapes, strawberries, fruiting vegetables and ornamentals.	L Bee:L	-
Isocycloseram (Simodis) Syngenta	30	Ingestion		P		Registered for control of Diamond Back Moth, Cabbage White Butterfly and suppression of Heliothis in brassica vegetables and brassica leafy vegetables, suppression of Onion Thrips and Plague Thrips in bulb vegetables, control of Two Spotted Mite and Cucumber Moth and suppression of Broad Mite, Bean Red Spider Mite, Western Flower Thrips, Tomato Thrips, Melon Thrips, Plague Thrips and Heliothis in cucurbits, and control of Two Spotted Mite and Broad Mite and suppression of Tomato Russet Mite, Western Flower Thrips, Tomato Thrips, Melon Thrips, Plague Thrips and Heliothis in fruiting vegetables.	H Bee:VH	-
Spiromesifen (Oberon) Bayer	23	Ingestion		P		Registration pending for control of mites in various crops. Hort Innovation is undertaking data generation projects across multiple commodities for a new label registration in Australia.	M Bee:VL	-
Macadamia Felted Coccid (<i>Eriococcus ironsidei</i>)								
Priority: Low								
Rated as a low priority in NSW and as a moderate priority in QLD. The Macadamia Felted Coccid is the most prevalent type of scale in macadamia and is generally the only species that will require treatment. Scale will infest trunks, branches, leaves and flowers. Severe infestations lead to honeydew accumulation and growth of sooty mould. Severe infestations can cause significant setback to developing young trees.								
Diazinon	1B	Contact	14 G:14	A	QLD, NSW, ACT & WA	Registered in macadamia nuts for control of Macadamia Felted Coccid . Apply as a foliar spray when pests are evident. Repeat applications monthly as necessary. Apply in the spring and autumn when new flush growth is attacked, or as required. Maximum number of treatments per season not specified.	H Bee:H	R1
Petroleum Oil PER11635	-	Contact	NR	A	QLD & NSW	Permitted in macadamia nut for control of Macadamia Felted Coccid (<i>Eriococcus ironsidei</i>) . Apply as a foliar spray when pest is evident. Retreatment interval and maximum number of treatments per season not specified.	L Bee:L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Sulfoxaflor (Transform) Corteva	4C	Contact & Ingestion	NR	A	ALL	Registered in macadamia for control of Banana Spotting Bug, Fruit Spotting Bug, Lace Bug and Macadamia Felted Coccid . Apply as a foliar spray as soon as the pest is detected. Retreatment interval not specified. Maximum of 2 applications per season.	M Bee:H	-
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C	Contact & Ingestion	14 NG	P-A	ALL	Registered in macadamias for control of Fruit Spotting Bug (<i>Amblypelta nitida</i> , <i>Amblypelta lutescens</i>), Pink Wax Scale <i>Ceroplastes rubens</i> , Soft Brown Scale (<i>Coccus hesperidum</i>), Citrus Mealybug (<i>Planococcus citri</i>) & Long Tailed Mealybug (<i>Pseudococcus longispinus</i>). Registered for control of various species of Scale in avocados, citrus, grapevines, macadamias and mangoes.	M Bee:H	R2
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact & Ingestion	20 NG	P-A	ALL	Registered in macadamias for control of Macadamia Lace Bug (<i>Ulonemia concava</i> , <i>Ulonemia decoris</i>), Fruit Spotting Bug (<i>Amblypelta nitida</i>) & Banana Spotting Bug (<i>Amblypelta lutescens</i>) and for suppression of Scirtothrips (<i>Scirtothrips dorsalis</i>). US registration for control of Scale Insects in citrus, pome fruit and stone fruit.	L Bee:L	-
Buprofezin (Applaud)	16	Ingestion		P		Registered for control of various species of Scale in citrus, custard apples, grapes, mangoes, passionfruit and persimmons.	L Bee:L	-
Fenoxycarb (Insegar) Syngenta	7B	Contact & Ingestion		P		Registered for control of Scale in apples, pears and olives.	L Bee:VL	-
Spirotetramat (Movento) Bayer	23	Ingestion		P		Registered for control of various species of Scale in blueberries, citrus, grapes, mangoes, passionfruit, pome fruit and stone fruit.	M Bee:VL	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
<p>Macadamia Leafminer (<i>Acrocercops chionosema</i>) Macadamia Twig Girdler (<i>Xylorycta luteotactella</i>) Orange Fruitborer (<i>Isotenes miserana</i>) Priority: Low Rated as a low priority in NSW & QLD. These pests are not prevalent and generally cause few issues in macadamias.</p>								
Acephate (Orthene)	1B	Contact	NR	A	NSW & WA	Registered in macadamias for control of Macadamia Nut Borer & Leafminer . Apply as a foliar spray at early flowering if pests evident. Use a retreatment interval of 14-21 days. Maximum number of treatments not specified.	H Bee:H	R3
					QLD, WA & NT	Registered in macadamias for control of Red Shouldered Leaf Beetle, Macadamia Leaf Miner , Banana Spotting Bug & Flower Thrips. Apply as a foliar spray at early flowering if pests evident. Use a retreatment interval of 14-21 days. Maximum number of treatments not specified.		
Carbaryl	1A	Contact	NR	A	ALL	Registered in macadamia for control of Macadamia Nut Borer & Macadamia Twig Girdler . Apply as a foliar spray on appearance of the pest. Apply 2 sprays – one in spring and again in autumn. Do not apply to flowers.	H Bee:H	R2
Spinetoram (Success Neo) Corteva	5	Ingestion	7	A	ALL	Registered in macadamia for control of Macadamia Nut Borer, Thrips (including Red-Banded Thrips), Flower-Eating Caterpillar, Twig Girdler & Yellow Peach Moth. Apply as a foliar spray when pest numbers reach local threshold, ensuring complete coverage of nuts and nutlets. Use a retreatment interval of 10-14 days if pests are still active. Maximum of 4 treatments per season.	M Bee:VH	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
<i>Bacillus thuringiensis</i> Berliner Subsp Aizawai (Bacchus WG)	11C	Biological	NR	P-A	ALL	Registered in macadamias for control of 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 (<i>Chrysodeixis</i> spp., <i>Ectropis excursaria</i> , <i>Thysanoplusia orichalcea</i>), Light Brown Apple Moth (<i>Epiphyas postvittana</i>) and Vine Moth (<i>Phalaenoides glycinae</i> , <i>Agarista agricola</i>).	VL Bee:L	-
Indoxacarb (Avatar eVo) FMC	22A	Ingestion	14	P-A	ALL	Registered in macadamia for control of Macadamia Seed Weevil (<i>Kushelorrhynchus macadamiae</i>). Also has activity on lepidopteran pests.	M Bee:H	-
Methoxyfenozide (Prodigy)	18	Ingestion / IGR	28 NG	P-A	ALL	Registered in macadamia for control of Macadamia Flower Caterpillar & Macadamia Nut Borer.	VL Bee:VL	-
Tebufenozide (Mimic)	18	Ingestion / IGR	28	P-A	ALL	Registered in macadamia for control of Macadamia Flower Caterpillar & Macadamia Nut Borer.	L Bee:L	-
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion	10 NG	P-A	ALL	Registered in macadamias for control of Macadamia Seed Weevil (<i>Kushelorrhynchus macadamiae</i>). Also has activity on lepidopteran pests.	L-M Bee:VH	-
Amorphous Silica (Abrade)	-	Contact		P		Registered for control of various caterpillar pests in cotton, brassica vegetables, capsicums, canola and mustard.	-	-
Emamectin (Proclaim Opti) Syngenta	6	Ingestion		P		Registered for control of various lepidopteran pests in brassica vegetables, root & tuber vegetables (except potatoes), leafy vegetables, brassica leafy vegetables, sweet corn, strawberries, lettuce, legume vegetables, fruiting vegetables and grapes.	M Bee:H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Isocycloseram (Simodis) Syngenta	30	Ingestion		P		Registered for control of Diamond Back Moth, Cabbage White Butterfly and suppression of Heliothis in brassica vegetables and brassica leafy vegetables, suppression of Onion Thrips and Plague Thrips in bulb vegetables, control of Two Spotted Mite and Cucumber Moth and suppression of Broad Mite, Bean Red Spider Mite, Western Flower Thrips, Tomato Thrips, Melon Thrips, Plague Thrips and Heliothis in cucurbits, and control of Two Spotted Mite and Broad Mite and suppression of Tomato Russet Mite, Western Flower Thrips, Tomato Thrips, Melon Thrips, Plague Thrips and Heliothis in fruiting vegetables.	H Bee:VH	-
Spinosad (Entrust Organic) Corteva	5	Contact & Ingestion		P		Registered for control of lepidopteran pests in various fruit, vegetable, tree and vine crops.	L Bee:H	-
Pinhole Borer (<i>Xyleborus perforans</i>)								
Priority: Low								
Rated as a low priority in NSW & QLD. Pinhole Borer is a weevil species that is widely distributed but is not a significant pest of macadamias. Control measures used for Macadamia Seed Weevil would be effective for controlling this pest.								
Indoxacarb (Avatar eVo) FMC	22A	Ingestion	14	P-A	ALL	Registered in macadamia for control of Macadamia Seed Weevil (<i>Kushelorrhynchus macadamiae</i>). Apply as a foliar spray at the beginning of nut set when nuts are pea sized. Use a retreatment interval of 10-14 days. Maximum of 2 treatments per season.	M Bee:H	-
Tetraniliprole (Vayego 200SC) Bayer	28	Ingestion	10 NG	P-A	ALL	Registered in macadamias for control of Macadamia Seed Weevil (<i>Kushelorrhynchus macadamiae</i>). Apply as a foliar spray, commencing when weevils are active and after petal fall. Use a retreatment interval of 14-28 days. Maximum of 3 treatments per season.	L-M Bee:VH	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
<p>Latania Scale (<i>Hemiberlesia lataniae</i>) White Scale (<i>Pseudaulacaspis brimblecombei</i>) Priority: Low</p> <p>Rated as a low priority in NSW & QLD. Scale will infest trunks, branches, leaves and flowers. Severe infestations can lead to honeydew accumulation and growth of sooty mould although these species will generally not require treatment.</p>								
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C	Contact & Ingestion	14 NG	P-A	ALL	Registered in macadamias for control of Fruit Spotting Bug (<i>Amblypelta nitida</i> , <i>Amblypelta lutescens</i>), Pink Wax Scale <i>Ceroplastes rubens</i> , Soft Brown Scale (<i>Coccus hesperidum</i>), Citrus Mealybug (<i>Planococcus citri</i>) & Long Tailed Mealybug (<i>Pseudococcus longispinus</i>). Registered for control of various species of Scale in avocados, citrus, grapevines, macadamias and mangoes.	M Bee:H	R2
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact & Ingestion	20 NG	P-A	ALL	Registered in macadamias for control of Macadamia Lace Bug (<i>Ulonemia concava</i> , <i>Ulonemia decoris</i>), Fruit Spotting Bug (<i>Amblypelta nitida</i>) & Banana Spotting Bug (<i>Amblypelta lutescens</i>) and for suppression of Scirtothrips (<i>Scirtothrips dorsalis</i>). US registration for control of Scale Insects in citrus, pome fruit and stone fruit.	L Bee:L	-
Petroleum Oil PER11635	-	Contact	NR	P-A	QLD & NSW	Permitted in macadamia nut for control of Macadamia Felted Coccid (<i>Eriococcus ironsidei</i>).	L Bee:L	-
Sulfoxaflor (Transform) Corteva	4C	Contact & Ingestion	NR	P-A	ALL	Registered in macadamia for control of Banana Spotting Bug, Fruit Spotting Bug, Lace Bug and Macadamia Felted Coccid. Registered for control of various species of Scale in cane berries, citrus, lychee, mango, papaya, passionfruit, persimmon, pome fruit and nursery stock.	M Bee:H	-
Buprofezin (Applaud)	16	Ingestion		P		Registered for control of various species of Scale in citrus, custard apples, grapes, mangoes, passionfruit and persimmons.	L Bee:L	-
Fenoxycarb (Insegar) Syngenta	7B	Contact & Ingestion		P		Registered for control of Scale in apples, pears and olives.	L Bee:VL	-
Spirotetramat (Movento) Bayer	23	Ingestion		P		Registered for control of various species of Scale in blueberries, citrus, grapes, mangoes, passionfruit, pome fruit and stone fruit.	M Bee:VL	-

4.3 Weeds of Macadamias

4.3.1 Weed priorities

Weeds	Priority
Flaxleaf Fleabane (<i>Conyza bonariensis</i>)	H
Blackberry Nightshade (<i>Solanum nigrum</i>)	H
Summer Grass (<i>Digitaria</i> spp.)	M
Feathertop Rhodes Grass (<i>Chloris virgata</i>)	M
Wandering Jew (<i>Tradescantia albiflora</i>)	M
Lantana (<i>Lantana camara</i>)	M
Crows Foot (<i>Eleusine indica</i>)	M
Chickweed (<i>Stellaria media</i>)	M
Cobbler's Peg (<i>Bidens pilosa</i>)	M

Weed priorities can vary substantially between regions, and weed management generally is guided more by cultural methods than by specific problem weed species. An integrated weed management program incorporating mulch and inter-row grass cover should be used to reduce the need for herbicides in plantations. Our industry consultation identified Flaxleaf Fleabane and Blackberry Nightshade as high priorities. These are both invasive species which are difficult to kill and must be managed using a sustained management program incorporating multiple control measures.

The risk of herbicide resistance should also be considered in devising a weed management program. Specific resistance management strategies for high resistance risk (1 and 2) and moderate resistance risk (3, 4, 6, 9, 10, 12, 13, 14, 15, 18, 19, 22, 23, 27, 29, 30 and 31) herbicide modes of action are available on the CroPLife Australia webpage⁷.

⁷ <https://www.croplife.org.au/resources/programs/resistance-management/>

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
Flaxleaf Fleabane (<i>Conyza bonariensis</i>)							
Priority: High							
Flaxleaf Fleabane is a widespread weed that is difficult to control with herbicides. It seeds prolifically and can germinate year-round. Weed control should be targeted at small, actively growing weeds and usually multiple applications will be required. A combination of residual and knockdown herbicides should form part of an integrated approach to managing Flaxleaf Fleabane.							
Carfentrazone-Ethyl + Glufosinate (Hellcat) AgNova	14** + 10**	Tree Nut Plantations / Directed or Shielded Spray	Registered in tree nuts for control of grass & broadleaf weeds, including Flaxleaf Fleabane . Apply as a directed or shielded spray. Do not allow spray to contact any part of the tree, including the trunk.	NR G:56	A	ALL	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Flumioxazin (Chateau) Sumitomo	14**	Tree Nuts / Directed Spray / Residual Weed Control	Registered in tree nuts for control of grass and broadleaf weeds, including Flaxleaf Fleabane . Apply to bare soil using a directed spray at the base of the bushes. At least 15mm of irrigation or rainfall is required to activate the herbicide. Best application is during the period following final harvest up to bud break. Avoid direct or indirect spray contact to foliage, fruit and green bark. Do not apply to trees established in the orchard for less than 1 year.	H:98 G:28	A	ALL	-
Glufosinate (Basta)	10**	Tree Nut Plantations / Directed or Shielded Spray	Registered in tree nuts for control of grass & broadleaf weeds, including Flaxleaf Fleabane . Apply as a directed or shielded spray.	NR G:56	A	ALL	R3
Glyphosate	9**	Tree Nuts/ Directed Spray, Shielded Spray or Wick Wiper	Registered in tree nuts for control of various grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Paraquat (Gramoxone)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass and broadleaf weeds. Apply as a directed spray or spot spray. Do not allow spray to contact any part of the tree, including the trunk.	NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass & broadleaf weeds. Apply as a directed spray or spot spray. Do not allow spray to contact any part of the tree, including the trunk.	NR G:7	A	ALL	R3
Amitrole	34**		Registered for control of Fleabane in fallow and pine plantations.		P		-
Saflufenacil (Sharpen) BASF	14**		Registered for control of Flaxleaf Fleabane in citrus, pome fruit & almonds.		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
Blackberry Nightshade (<i>Solanum nigrum</i>)							
Priority: High							
Blackberry Nightshade is a competitive weed that is widespread in all regions. Herbicide control is effective but requires timely application and avoidance of seed set over several years to bring the soil seed bank down.							
Flumioxazin (Chateau) Sumitomo	14**	Tree Nuts / Directed Spray / Residual Weed Control	Registered in tree nuts for control of grass and broadleaf weeds, including Blackberry Nightshade . Apply to bare soil using a directed spray at the base of the bushes. At least 15mm of irrigation or rainfall is required to activate the herbicide. Best application is during the period following final harvest up to bud break. Avoid direct or indirect spray contact to foliage, fruit and green bark. Do not apply to trees established in the orchard for less than 1 year.	H:98 G:28	A	ALL	-
Glyphosate	9**	Tree Nuts/ Directed Spray, Shielded Spray or Wick Wiper	Registered in tree nuts for control of various grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Oryzalin	3**	Nuts / Directed Spray	Registered in nuts for control of grass & broadleaf weeds, including Blackberry Nightshade and Silverleaf Nightshade . Apply to bare soil using a directed spray at the base of the trees. Requires at least 15mm of irrigation or rain to activate.	NR	A	ALL	-
Oxyfluorfen (Goal)	14**	Tree Nuts / Directed Spray	Registered in tree nuts for control of grass and broadleaf weeds, including Blackberry Nightshade . If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	NR NG	A	ALL	-
Pendimethalin (Stomp)	3**	Nuts / Directed Spray / Residual Weed Control	Registered in nuts for control of grass and broadleaf weeds. Registered for suppression of Blackberry Nightshade in carrots, processing peas, French beans, cabbage, cauliflower, broccoli and lettuce.	NR	P-A	ALL	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Aclonifen (Emerger) Bayer	32**	Pre-Emergence	Bayer is expected to seek registration for pre-emergent control of grass and broadleaf weeds in various vegetable crops. Registered in Europe for use in potatoes, legume vegetables and cereals. Blackberry Nightshade is listed as moderately susceptible at a high rate.		P		-
Clomazone	13**		Registered for control of broadleaf weeds including Blackberry Nightshade in beans, poppies, potato and tobacco transplants.		P		-
Dimethenamid-P (Outlook) BASF	15**		Registered for control of grass and broadleaf weeds, including Blackberry Nightshade in sweet corn, beans, peas, pumpkins and kabocho.		P		-
Fluroxypyr (Starane) Corteva	4**		Registered for control of Blackberry Nightshade in non-crop areas and pastures.		P		-
Norflurazon (Zoliar)	12**		Registered for control of Blackberry Nightshade in citrus, grapes, almonds, pome fruit and stone fruit.		P		-
Saflufenacil (Sharpen) BASF	14**		Registered for control of Blackberry Nightshade in citrus, pome fruit & almonds.		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
Summer Grass (<i>Digitaria</i> spp.) Priority: Moderate							
Summer Grass is an aggressive annual grass weed that re-establishes each spring from previous season's seed. It is adapted to a wide range of habitats and requires ongoing control measures once it has established in a plantation.							
Carfentrazone-Ethyl + Glufosinate (Hellcat) AgNova	14** + 10**	Tree Nut Plantations / Directed or Shielded Spray	Registered in tree nuts for control of grass & broadleaf weeds, including Summer Grass . Apply as a directed or shielded spray. Do not allow spray to contact any part of the tree, including the trunk.	NR G:56	A	ALL	R3
Flumioxazin (Chateau) Sumitomo	14**	Tree Nuts / Directed Spray / Residual Weed Control	Registered in tree nuts for control of grass and broadleaf weeds, including Summer Grass . Apply to bare soil using a directed spray at the base of the bushes. At least 15mm of irrigation or rainfall is required to activate the herbicide. Best application is during the period following final harvest up to bud break. Avoid direct or indirect spray contact to foliage, fruit and green bark. Do not apply to trees established in the orchard for less than 1 year.	H:98 G:28	A	ALL	-
Glufosinate (Basta)	10**	Tree Nut Plantations / Directed or Shielded Spray	Registered in tree nuts for control of grass & broadleaf weeds, including Summer Grass . Apply as a directed or shielded spray.	NR G:56	A	ALL	R3
Glyphosate	9**	Tree Nuts/ Directed Spray, Shielded Spray or Wick Wiper	Registered in tree nuts for control of various grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Haloxifop (Verdict)	1***	Nut Trees / Directed Spray or Spot Spray	Registered in nut trees for control of grass weeds, including Summer Grass . Apply as a directed spray or spot spray. Treatments per season not limited.	NR	A	ALL	-
Oryzalin	3**	Nuts / Directed Spray	Registered in nuts for control of grass & broadleaf weeds, including Summer Grass . Apply to bare soil using a directed spray at the base of the trees. Requires at least 15mm of irrigation or rain to activate.	NR	A	ALL	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Oxyfluorfen (Goal)	14**	Tree Nuts / Directed Spray	Registered in tree nuts for control of grass and broadleaf weeds, including Summer Grass . 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. Apply as a directed spray or spot spray. Do not allow spray to contact any part of the tree, including the trunk.	NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass & broadleaf weeds. Apply as a directed spray or spot spray. Do not allow spray to contact any part of the tree, including the trunk.	NR G:7	A	ALL	R3
Pendimethalin (Stomp)	3**	Nuts / Directed Spray / Residual Weed Control	Registered in nuts for control of grass and broadleaf weeds, including Summer Grass . Apply to soil surface that is free of weeds, surface litter and clods, and ensure incorporation by a minimum of 5mm of rainfall or spray irrigation within 10 days.	NR	A	ALL	-
Trifluralin	3**	Orchards / Residual Weed Control	Registered in orchards for control of Johnson Grass and Liverseed Grass (Urochloa). Registered for control of Summer Grass in pigeon pea, soybeans, cotton, legume seed crops, lucerne, linseed, peanuts, peas, canola, safflower, sugarcane, sunflowers, lupins, tobacco and various vegetable crops.	NR	P-A	ALL (excl. NSW)	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Feathertop Rhodes Grass (<i>Chloris virgata</i>)							
Priority: Moderate							
Feathertop Rhodes Grass is an aggressive grass weed that is difficult to control with herbicides. Multiple herbicide applications are required.							
Flumioxazin (Chateau) Sumitomo	14**	Tree Nuts / Directed Spray / Residual Weed Control	Registered in tree nuts for control of grass and broadleaf weeds, including Feather Top Rhodes Grass . Apply to bare soil using a directed spray at the base of the bushes. At least 15mm of irrigation or rainfall is required to activate the herbicide. Best application is during the period following final harvest up to bud break. Avoid direct or indirect spray contact to foliage, fruit and green bark. Do not apply to trees established in the orchard for less than 1 year.	H:98 G:28	A	ALL	-
Glyphosate	9**	Tree Nuts/ Directed Spray, Shielded Spray or Wick Wiper	Registered in tree nuts for control of various grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Paraquat (Gramoxone)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass and broadleaf weeds. Apply as a directed spray or spot spray. Do not allow spray to contact any part of the tree, including the trunk.	NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass & broadleaf weeds. Apply as a directed spray or spot spray. Do not allow spray to contact any part of the tree, including the trunk.	NR G:7	A	ALL	R3
Clethodim (Select)	1***		Registered for control of Feathertop Rhodes Grass in beetroot, cabbage, celery, lettuce, potatoes, onions, forestry, non-bearing fruit trees and ornamentals.		P		-
Dichlobenil (Casoran)	29**		Registered for control of Annual Grass & Broadleaf Weeds in orchards, blackcurrants, raspberries and gooseberries.		P		-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
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		-
Wandering Jew (<i>Tradescantia albiflora</i>)							
Priority: Moderate							
Wandering Jew is a perennial, succulent, creeping broadleaf that prefers moist, shady environments. It is difficult to remove because the stems snap off easily and each can regenerate into individual plants. Herbicide control is effective but requires ongoing treatment to prevent regrowth.							
Glyphosate	9**	Tree Nuts/ Directed Spray, Shielded Spray or Wick Wiper	Registered in tree nuts for control of various grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Paraquat (Gramoxone)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass and broadleaf weeds. Apply as a directed spray or spot spray. Do not allow spray to contact any part of the tree, including the trunk.	NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass & broadleaf weeds. Apply as a directed spray or spot spray. Do not allow spray to contact any part of the tree, including the trunk.	NR G:7	A	ALL	R3
Pendimethalin (Stomp)	3**	Nuts / Directed Spray / Residual Weed Control	Registered in nuts for control of grass and broadleaf weeds. Registered for control of Wandering Jew in cotton, sunflowers and maize.	NR	P-A	ALL	-
Fluroxypyr (Starane) Corteva	4**		Registered for control of Wandering Jew in sorghum, maize, millet and sweet corn.		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. Registered for control of Wandering Jew in cotton, maize, sweet corn, peanuts, soybeans, sunflower and sorghum.		P		-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Lantana (<i>Lantana camara</i>) Priority: Moderate							
Lantana is broadleaf perennial that can grow in compact clumps, dense thickets or as a climbing vine. It can flower year-round and is readily spread by fruit-eating birds and mammals. A combination of mechanical controls in conjunction with multiple herbicide applications are required to manage lantana.							
Glyphosate	9**	Tree Nuts/ Directed Spray, Shielded Spray or Wick Wiper	Registered in tree nuts for control of various grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Crows Foot (<i>Eleusine indica</i>) Priority: Moderate							
Coarse perennial grass weed that has a wide geographic distribution. It has a vigorous growth habit and it can germinate and spread in a wide variety of environmental conditions.							
Carfentrazone-Ethyl + Glufosinate (Hellcat) AgNova	14** + 10**	Tree Nut Plantations / Directed or Shielded Spray	Registered in tree nuts for control of grass & broadleaf weeds, including Crows Foot . Apply as a directed or shielded spray. Do not allow spray to contact any part of the tree, including the trunk.	NR G:56	A	ALL	R3
Flumioxazin (Chateau) Sumitomo	14**	Tree Nuts / Directed Spray / Residual Weed Control	Registered in tree nuts for control of grass and broadleaf weeds, including Crows Foot . Apply to bare soil using a directed spray at the base of the bushes. At least 15mm of irrigation or rainfall is required to activate the herbicide. Best application is during the period following final harvest up to bud break. Avoid direct or indirect spray contact to foliage, fruit and green bark. Do not apply to trees established in the orchard for less than 1 year.	H:98 G:28	A	ALL	-
Glufosinate (Basta)	10**	Tree Nut Plantations / Directed or Shielded Spray	Registered in tree nuts for control of grass & broadleaf weeds, including Crows Foot . Apply as a directed or shielded spray.	NR G:56	A	ALL	R3
Glyphosate	9**	Tree Nuts/ Directed Spray, Shielded Spray or Wick Wiper	Registered in tree nuts for control of various grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Haloxypop (Verdict)	1***	Nut Trees / Directed Spray or Spot Spray	Registered in nut trees for control of grass weeds, including Crows Foot . Apply as a directed spray or spot spray. Treatments per season not limited.	NR	A	ALL	-
Oxyfluorfen (Goal)	14**	Tree Nuts / Directed Spray	Registered in tree nuts for control of grass and broadleaf weeds, including Crows Foot . 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. Apply as a directed spray or spot spray. Do not allow spray to contact any part of the tree, including the trunk.	NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass & broadleaf weeds. Apply as a directed spray or spot spray. Do not allow spray to contact any part of the tree, including the trunk.	NR G:7	A	ALL	R3
Pendimethalin (Stomp)	3**	Nuts / Directed Spray / Residual Weed Control	Registered in nuts for control of grass and broadleaf weeds, including Crows Foot . Apply to soil surface that is free of weeds, surface litter and clods, and ensure incorporation by a minimum of 5mm of rainfall or spray irrigation within 10 days.	NR	A	ALL	-
Chickweed (<i>Stellaria media</i>)							
Priority: Moderate							
Chickweed is a low growing, winter annual weed that can continue growing all through summer. Targeting weed control prior to their flowering is critical.							
Carfentrazone	14**	Tree Nuts/ Directed spray	Registered in tree nuts for control of broadleaf weeds, including Chickweed . If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	NR G:14	A	ALL	-
Carfentrazone-Ethyl + Glufosinate (Hellcat) AgNova	14** + 10**	Tree Nut Plantations / Directed or Shielded Spray	Registered in tree nuts for control of grass & broadleaf weeds, including Chickweed . Apply as a directed or shielded spray. Do not allow spray to contact any part of the tree, including the trunk.	NR G:56	A	ALL	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Carfentrazone-Ethyl + Glyphosate (Broadway)	14** + 9**	Tree Nuts / Directed or Shielded Spray	Registered in tree nuts for control of broadleaf weeds, including Chickweed . Apply as a directed spray or spot spray.	NR G:14	A	ALL	R3
Glyphosate	9**	Tree Nuts/ Directed Spray, Shielded Spray or Wick Wiper	Registered in tree nuts for control of various grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Isoxaben (Gallery) Corteva	29**	Nut Orchards / Non-Bearing / Residual Weed Control	Registered in non-bearing nut orchards for control of broadleaf weeds, including Chickweed . Apply to bare soil prior to weed emergence. Rainfall or irrigation is required within 21 days to activate the herbicide.	NR	A	ALL	-
Oxyfluorfen (Goal)	14**	Tree Nuts / Directed Spray	Registered in tree nuts for control of grass and broadleaf weeds, including Chickweed . 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. Apply as a directed spray or spot spray. Do not allow spray to contact any part of the tree, including the trunk.	NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass & broadleaf weeds. Apply as a directed spray or spot spray. Do not allow spray to contact any part of the tree, including the trunk.	NR G:7	A	ALL	R3
Pendimethalin (Stomp)	3**	Nuts / Directed Spray / Residual Weed Control	Registered in nuts for control of grass and broadleaf weeds, including Chickweed . Apply to soil surface that is free of weeds, surface litter and clods, and ensure incorporation by a minimum of 5mm of rainfall or spray irrigation within 10 days.	NR	A	ALL	-
Norflurazon (Zoliar)	12**		Registered for control of Chickweed in citrus, grapes, almonds, pome fruit and stone fruit.		P		-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Saflufenacil (Sharpen) BASF	14**		Registered for control of Chickweed in fallows.		P		-
Simazine	5**		Registered for control of Chickweed in asparagus, berries, citrus, gladioli, hops, apples, pears, roses, vineyards, strawberries & leeks.		P		R3
S-Metolachlor (Dual Gold) Syngenta	15**		Registered for control of grass and broadleaf weeds, including Chickweed in Brassica vegetables.		P		-
Cobbler's Peg (<i>Bidens pilosa</i>)							
Priority: Moderate							
Cobbler's Peg is an annual broadleaf weed with an erect habit. It is fast growing and produces multiple barbed seeds that readily attach to humans and machinery. It can flower at any time of year but mainly in summer and autumn.							
Carfentrazone-Ethyl + Glufosinate (Hellcat) AgNova	14** + 10**	Tree Nut Plantations / Directed or Shielded Spray	Registered in tree nuts for control of grass & broadleaf weeds, including Cobbler's Peg . Apply as a directed or shielded spray. Do not allow spray to contact any part of the tree, including the trunk.	NR G:56	A	ALL	R3
Glyphosate	9**	Tree Nuts/ Directed Spray, Shielded Spray or Wick Wiper	Registered in tree nuts for control of various grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Paraquat (Gramoxone)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass and broadleaf weeds. Apply as a directed spray or spot spray. Do not allow spray to contact any part of the tree, including the trunk.	NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass & broadleaf weeds. Apply as a directed spray or spot spray. Do not allow spray to contact any part of the tree, including the trunk.	NR G:7	A	ALL	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Pendimethalin (Stomp)	3**	Nuts / Directed Spray / Residual Weed Control	Registered in nuts for control of grass and broadleaf weeds, including Cobbler's Peg . Apply to soil surface that is free of weeds, surface litter and clods, and ensure incorporation by a minimum of 5mm of rainfall or spray irrigation within 10 days.	NR	A	ALL	-
Fluroxypyr (Starane) Corteva	4**		Registered for control of Cobblers Peg in non-crop areas and pastures.		P		-

4.4 Plant Growth Regulators in Macadamias

4.4.1 Plant Growth Regulator Priorities

PGR Issue	Priority
Promote uniform nut fall	M
Restriction of vegetative growth	M

Ethephon can be used to promote nut fall in macadamias. It is not regularly used in NSW, but it is becoming more common in Queensland. It is applied when the nuts are mature and have started to drop naturally. Nuts are harvested after the nuts drop to the ground, and the nuts will drop over several months if left to natural processes. Ethephon shortens the harvest period which enables more efficient harvesting. It also assists in maintaining orchard hygiene by allowing timely removal of unharvested nuts and sticktight nuts. There is some concern that ethephon can cause stress and reduce sap flow, which can leave trees more susceptible to attack from borers.

There are currently no PGRs available for restricting vegetative growth in macadamias. There are practical advantages in maintaining tree size and avoiding dense canopies, particularly in managing pests and diseases. An open canopy will allow improved airflow and reduce the incidence of disease in trees. Smaller trees with open canopies also assist in achieving optimal spray coverage with insecticides and fungicides. Restricting vegetative growth may also enhance yield by allowing more resources to be diverted to the nuts. Mechanical pruning is used to manage tree height and canopy density. The availability of a PGR to reduce vegetative growth would be particularly desirable for use in high density plantings.

4.4.2 Available and Potential Plant Growth Regulators

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

Availability		Regulatory risk (refer to Appendix 7)	
A	Available via either registration or permit approval	R1	Short-term: Critical concern over retaining access
P	Potential - a possible candidate to pursue for registration or permit	R2	Medium-term: Maintaining access of significant concern
P-A	Potential, already approved in the crop for another use	R3	Long-term: Potential issues associated with use - Monitoring required
Withholding Period (WHP) – Number of days from last treatment to harvest (H) or Grazing (G)			
Harvest	H	Not Required when used as directed	NR
Grazing	G	No Grazing Permitted	NG

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Promote uniform nut fall							
Priority: Moderate							
Uniform nut fall is desirable because it shortens the harvest period which enables more efficient harvesting. It also assists in maintaining orchard hygiene by allowing timely removal of unharvested nuts and sticktight nuts.							
Ethephon	PGR	Macadamia Nuts / Do not use on Teddington variety	Registered in macadamia nuts to aid harvesting by promoting uniform nut fall. Apply late March to early May when nuts are very mature. Nuts will be stimulated to fall within 10-14 days after spraying. Mechanical shaking may be used 7-10 days after spraying.	7	A	NSW & WA	-
Ethephon PER11462	PGR	Macadamias / Do not use on Teddington variety	Permitted in macadamias to promote nut fall after maturity reached. Spray at the first sign of natural nut drop. Applications should be made before the end of May.	7	A	NSW, QLD, NT & WA	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Restriction of vegetative growth Priority: Moderate							
Restricting vegetative growth assists with keeping trees to a manageable height and density, which reduces disease risk, assists with effective spray application and other plantation operations.							
Paclobutrazol	PGR		Registered for reduction of vegetative growth in mango, stone fruit and apples.		P		-
Uniconazole-P	PGR		Registered for reduction of vegetative growth in avocados.		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/F2023L01350/latest/text
APVMA Permit search	Agricultural And Veterinary Permits Search - portal.apvma.gov.au
APVMA Product search	Public Chemical Registration Information System Search - portal.apvma.gov.au
Codex MRL database	http://www.fao.org/fao-who-codexalimentarius/codex-texts/dbs/pestres/en/
Cotton Pest Management Guide 2023-24	https://www.cottoninfo.com.au/publications/cotton-pest-management-guide
CropLife Australia	https://www.croplife.org.au/
Hort Innovation	www.horticulture.com.au

5.2 Abbreviations and Definitions:

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

5.3 Acknowledgements:

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

6. Appendices

Appendix 1. Products available for disease control in macadamia

Appendix 2. Products available for control of insects and other pests in macadamia

Appendix 3. Products available for weed control in macadamia

Appendix 4. Plant Growth Regulators available in macadamia

Appendix 5. Current permits for use in macadamia

Appendix 6. Macadamia Maximum Residue Limits (MRLs)

Appendix 7. Macadamia regulatory risk assessment

Appendix 1. Products available for disease control in macadamias

Active Ingredient (Trade Name)	Chemical Group	Situation	Diseases / Comments	States	WHP Days	Regulatory Risk
Azoxystrobin + Tebuconazole (Custodia) Adama	11+3	Macadamias	Husk Spot (<i>Pseudocercospora macadamiae</i>)	ALL	15	R3
Bromo Chloro Dimethyl Hydatoin (BCDMH)	-	Sanitiser / Post-Harvest Treatment	External Rot Causing Organisms	ALL	NR	-
Carbendazim	1	Macadamia Nuts	Husk Spot (<i>Pseudocercospora macadamiae</i>)	ALL	14 G:28	R2
Chlorine	-	Sanitiser / Post-Harvest Treatment	Bacteria and Fungi	ALL	NR	-
Chloropicrin + 1,3-Dichloropropene	8B	Nut Crops / Soil Fumigant	Soil-borne diseases (including <i>Fusarium</i> & <i>Verticillium</i> Wilts, <i>Rhizoctonia</i> , <i>Pythium</i>)	ALL	NR	-
Copper as Copper Hydroxide / Copper Oxychloride / Cuprous Oxide	M1	Macadamias	Husk Spot (<i>Pseudocercospora macadamiae</i>) Anthracnose (<i>Colletotrichum</i> spp.) Pink Limb Blight (<i>Corticium salmonicolor</i>)	QLD, NT & NSW	1	-
Copper as Tribasic Copper Sulfate / Cuprous Oxide			Phytophthora Stem Canker	ALL		
Copper as Copper Ammonium Acetate Complex			Phytophthora Stem Canker	QLD & WA		
			Husk Spot (<i>Pseudocercospora</i> spp.)	QLD, NSW, WA & NT		
Difenoconazole (Score)	3	Macadamia Nuts	Husk Spot (<i>Pseudocercospora macadamiae</i>)	QLD, NSW & NT	NR	R3
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Macadamias	Husk Spot Botrytis Blight	ALL	NR NG	R3

Active Ingredient (Trade Name)	Chemical Group	Situation	Diseases / Comments	States	WHP Days	Regulatory Risk
Fluxapyroxad + Pyraclostrobin (Merivon) BASF	7+11	Macadamia	Husk Spot (<i>Pseudocercospora macadamiae</i>) Flower Blight / Dry Flower (<i>Pestalotiopsis</i> spp., <i>Neopestalotiopsis</i> spp., <i>Botrytis cinerea</i> , <i>Cladosporium</i> spp.)	ALL	21	-
Iprodione (Rovral)	2	Macadamias	Botrytis Blight	ALL	NR	R2
Mefentrifluconazole (Belanty) BASF	3	Macadamia	Husk Spot (<i>Pseudocercospora macadamiae</i>)	ALL	14 NG	-
Metalaxyl-M (Ridomil Gold 25G)	4	Macadamia Nuts	Phytophthora Root Rot & Trunk Canker	QLD & NSW	28	-
Metalaxyl-M + Copper (Ridomil Gold Plus)	4+M1	Macadamia Nuts	Phytophthora Trunk Canker, Root Rot	QLD & NSW	28	-
Penthiopyrad (Fontelis) Corteva	7	Macadamias	Husk Spot (<i>Pseudocercospora macadamiae</i>)	ALL	14 NG	-
Peroxyacetic Acid	-	Sanitiser / Post-Harvest Treatment	Bacteria	ALL	NR	-
Phosphorous Acid	33	Macadamias	Phytophthora Root Rot (<i>Phytophthora</i> spp.) Trunk/Stem Canker (<i>Phytophthora cinnamomi</i>)	NSW, QLD & WA	14	-
Pyraclostrobin (Cabrio)	11	Macadamia	Husk Spot (<i>Pseudocercospora macadamiae</i>)	ALL	NR	-

Appendix 2. Products available for control of insects and other pests in macadamias

Active Ingredient (Trade Name)	Chemical group	Situation	Pests / Comments	States	WHP Days	Regulatory Risk
1,3-Dichloropropene	-	Nut Crops / Soil Fumigant	Plant parasitic nematodes	ALL	NR	-
Abamectin PER87510	6	Macadamias	Thrips (<i>Scirtothrips</i> spp.) Broad Mites (<i>Brevipalpus</i> spp.) Flat Mites (<i>Polyphagotarsonemus</i> spp.)	ALL (excl. VIC)	28 G:14	-
Acephate (Orthene)	1B	Macadamias	Macadamia Nut Borer Leafminer	NSW & WA	NR	R3
			Red Shouldered Leaf Beetle Macadamia Leaf Miner Banana Spotting Bug Flower Thrips	QLD, WA & NT		
			Flower Eating Caterpillar Fruit Spotting Bug	NSW, WA, QLD & NT		
Acetamiprid + Pyriproxyfen (Trivor) Adama	4A+7C	Macadamias	Fruit Spotting Bug (<i>Amblypelta nitida</i> , <i>Amblypelta lutescens</i>) Pink Wax Scale (<i>Ceroplastes rubens</i>) Soft Brown Scale (<i>Coccus hesperidum</i>) Citrus Mealybug (<i>Planococcus citri</i>) Long Tailed Mealybug (<i>Pseudococcus longispinus</i>)	ALL	14 NG	R2
<i>Bacillus thuringiensis</i> Berliner Subsp Aizawai (Bacchus WG)	11C	Macadamias	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 (<i>Chrysodeixis</i> spp., <i>Ectropis excursaria</i> , <i>Thysanoplusia orichalcea</i>) Light Brown Apple Moth (<i>Epiphyas postvittana</i>) Vine Moth (<i>Phalaenoides glycinae</i> , <i>Agarista agricola</i>)	ALL	NR	-

Active Ingredient (Trade Name)	Chemical group	Situation	Pests / Comments	States	WHP Days	Regulatory Risk
Betacyfluthrin (Bulldock)	3A	Macadamia	Suppression of: Macadamia Nut Borer Fruit Spotting Bug	QLD, NSW, ACT & WA	7	-
Betacyfluthrin + Piperonyl Butoxide (Cyborg) Intrade	3A	Macadamia	Macadamia Nut Borer Fruit Spotting Bug	QLD, NSW, ACT & WA	7	-
Carbaryl	1A	Macadamias	Macadamia Nut Borer Macadamia Twig Girdler	ALL	NR	R2
Chloropicrin + 1,3- Dichloropropene	-	Nut Crops / Soil Fumigant	Plant Parasitic Nematodes Symphylans Wireworms	ALL	NR	-
Chlorpyrifos PER13642	1B	Tree Nuts	Australian Plague Locust (<i>Chortoicetes terminifera</i>)	ALL (excl. VIC)	30 G:2	R1
Diazinon	1B	Macadamia Nuts	Macadamia Felted Coccid	QLD, NSW, ACT & WA	14 G:14	R1
			Macadamia Leaf Miner	NSW, ACT & WA		
Diazinon PER14276	1B	Macadamia plantations	Macadamia Lace Bug (<i>Ulonemia concava</i> and <i>Physatochelia</i> spp.)	NSW, QLD & WA	14 G:14	R1
Flupyradifurone (Sivanto Prime) Bayer	4D	Macadamias	Macadamia Lace Bug (<i>Ulonemia concava</i> , <i>Ulonemia decoris</i>) Fruit Spotting Bug (<i>Amblypelta nitida</i>) Banana Spotting Bug (<i>Amblypelta lutescens</i>) Suppression of: Scirtothrips (<i>Scirtothrips dorsalis</i>)	ALL	20 NG	-
Indoxacarb (Avatar eVo) FMC	22A	Macadamia	Macadamia Seed Weevil (<i>Kushelohynchus macadamiae</i>)	ALL	14	-

Active Ingredient (Trade Name)	Chemical group	Situation	Pests / Comments	States	WHP Days	Regulatory Risk
Indoxacarb (Avatar/Steward) PER86827	22A	Macadamia	Macadamia Seed Weevil (<i>Kushelorrhynchus macadamiae</i>)	NSW & QLD	42 NG	-
Malathion PER13642	1B	Tree Nuts	Australian Plague Locust (<i>Chortoicetes terminifera</i>)	ALL (excl. VIC)	NR G:2	R3
Metaldehyde	-	Horticultural Crops	Snails & Slugs	ALL	7	-
Methomyl PER90592	1A	Macadamia	Banana Fruit Caterpillar (<i>Tiracola plagiata</i>)	QLD	NR	R2
Methoxyfenozide (Prodigy)	18	Macadamia	Macadamia Flower Caterpillar Macadamia Nut Borer	ALL	28 NG	-
Petroleum Oil PER11635	-	Macadamia Nut	Macadamia Felted Coccid (<i>Eriococcus ironsidei</i>)	QLD & NSW	NR	-
Potassium Salts of Fatty Acid (Natrasoap)	-	Nut Trees	Aphids Thrips Mealybug Two-Spotted Mite Spider Mite Whitefly	ALL	NR	-
Pyriproxyfen (Distance Ant Bait) Sumitomo	7C	Nut Tree / Ant Bait	Invasive and Nuisance Ants	ALL	NR	-
Spinetoram (Success Neo) Corteva	5	Macadamias	Macadamia Nut Borer Thrips including Red-Banded Thrips Flower-Eating Caterpillar Twig Girdler Yellow Peach Moth	ALL	7	-
Spinosad (Naturalure) Corteva	5	Tree, Fruit, Nut, Vine & Vegetable Crops / Fruit Fly Bait	Queensland Fruit Fly (<i>Bactrocera tryoni</i>) Mediterranean Fruit Fly (<i>Ceratitidis capitata</i>)	ALL	NR	-

Active Ingredient (Trade Name)	Chemical group	Situation	Pests / Comments	States	WHP Days	Regulatory Risk
Sulfoxaflor (Transform) Corteva	4C	Macadamia	Banana Spotting Bug Fruit Spotting Bug Lace Bug Macadamia Felted Coccid	ALL	NR	-
Tebufozide (Mimic)	18	Macadamia	Macadamia Flower Caterpillar Macadamia Nut Borer	ALL	28	-
Tetraniliprole (Vayego 200SC) Bayer	28	Macadamias	Sigastus Weevil / Macadamia Seed Weevil (<i>Kushelorrhynchus macadamiae</i>)	ALL	10 NG	-
Trichlorfon	1B	Macadamia	Fruit Spotting Bug Macadamia Flower Caterpillar	QLD, NSW & NT	2	R2
			Banana Spotting Bug	QLD & NT		
Trichlorfon PER13689	1B	Macadamia	Macadamia Lace Bug Fruit Spotting Bug Banana Spotting Bug Green Vegetable Bug	NSW & QLD	2	R2

Appendix 3. Products available for weed control in macadamias

Active ingredient (Trade Name)	Chemical Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory Risk
Carfentrazone	14**	Tree Nuts	Broadleaf Weeds	NR G:14	ALL	-
Carfentrazone-Ethyl + Glufosinate (Hellcat) AgNova	14** + 10**	Tree Nut Plantations / Directed or Shielded Spray	Grass & Broadleaf Weeds	NR G:56	ALL	R3
Carfentrazone-Ethyl + Glyphosate (Broadway)	14** + 9**	Tree Nuts / Directed or Shielded Spray	Broadleaf Weeds	NR G:14	ALL	R3
Flumioxazin (Chateau)	14**	Tree Nuts / Directed Spray / Residual Weed Control	Grass and broadleaf weeds	98 G:28	ALL	-
Glufosinate (Basta)	10**	Tree Nut Plantations / Directed or Shielded Spray	Grass and broadleaf weeds	NR G:56	ALL	R3
Glyphosate (Roundup)	9**	Tree Nuts / Directed Spray, Shielded Spray or Wick Wiper	Grass and broadleaf weeds	NR	ALL	R3
Haloxypop (Verdict)	1***	Nut Trees / Directed Spray or Spot Spray	Grass weeds	NR	ALL	-
Isoxaben (Gallery) Corteva	29**	Nut Orchards / Residual Weed Control	Broadleaf weeds	NR	ALL	-
Oryzalin	3**	Nuts / Directed Spray	Grass and broadleaf weeds	NR	ALL	-
Oxyfluorfen (Goal)	14**	Tree Nuts / Directed Spray	Grass and broadleaf weeds	NR NG	ALL	-
Paraquat (Gramoxone)	22**	Orchards / Directed Spray	Grass and broadleaf weeds	NR G:1	ALL	R3

Active ingredient (Trade Name)	Chemical Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory Risk
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Grass and broadleaf weeds	NR G:7	ALL	R3
Pendimethalin (Stomp)	3**	Macadamia Nut / Directed Spray, Requires Incorporation	Grass and broadleaf weeds	NR	ALL	-
Trifluralin	3**	Orchards / Residual Weed Control	Johnson Grass Liverseed Grass (Urochloa)	NR	ALL (excl. NSW)	-

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

Appendix 4. Plant Growth Regulators available in macadamias

Active ingredient (Trade Name)	Chemical Group	Situation	Comment / Use	WHP (days)	States	Regulatory risk
Ethephon	PGR	Macadamia Nuts / Do not use on Teddington variety	Aid harvesting by promoting uniform nut fall	7	NSW & WA	-
Ethephon PER11462	PGR	Macadamias / Do not use on Teddington variety	Promote nut fall after maturity reached	7	NSW, QLD, NT & WA	-

Appendix 5. Current permits for use in macadamias

Permit ID	Description	Date Issued	Expiry Date	Permit holder
PER11635 Version 3	Petroleum Oil / Macadamia / Macadamia Felted Coccid	01-Jul-10	30-Jun-25	Hort Innovation
PER11462 Version 3	Ethephon / Macadamias / Promote Nutfall	07-May-09	30-Jun-25	Hort Innovation
PER13642 Version 2	Chlorpyrifos & Maldison / Tree Nuts / Australian Plague Locust	1-Sep-12	30-Jun-25	Hort Innovation
PER14276 Version 4	Diazinon / Macadamia / Macadamia Lace Bug	01-Dec-13	31-Aug-25	Hort Innovation
PER86827 Version 2	Indoxacarb (Avatar) / Macadamia / Macadamia Seed Weevil, Sigastus Weevil	13-Sep-18	31-Mar-26	Hort Innovation
PER90592	Methomyl / Macadamia / Banana Caterpillar	09-Apr-21	30-Apr-26	Hort Innovation
PER13689 Version 5	Trichlorfon / Macadamia Nuts / Fruit-Spotting Bug Banana Bug, Green Vegetable Bug	14-May-13	28-Feb-27	Hort Innovation
PER87510 Version 2	Abamectin / Macadamia / Thrips, Broad Mites and Flat Mites	17-Jun-19	28-Feb-29	Hort Innovation

Appendix 6. Macadamia Maximum Residue Limits (MRLs)

CODEX commodity groupings of macadamia and subgroups:

	Nuts and Seeds
TN 0085	Tree nuts
TN 0669	Macadamia nuts
TN 4695	Queensland nut

Note: The industry has a strong export focus, with 75 percent of Australian macadamias export bound. The major export destinations are China (55%), Vietnam (11%), Japan (9%), South Korea (7%) and USA (6%). Available information indicates that in the absence of specific limits in legislation, that some countries defer to Codex, followed by EU MRL standards, or apply a 0.01ppm default value. Food exported to New Zealand from Australia may be legally sold if it complies with Australian requirements. MRLs and legislation are subject to change; the values presented should not be relied on.

Chemical	Codex Code	Description	APVMA MRL mg/kg	Codex MRL mg/kg
2,4-D	TN 0085	Tree Nuts	-	0.2
Abamectin	TN 0669	Macadamia nuts	T*0.01	-
	TN 0085	Tree Nuts	-	*0.005
Acephate	TN 0669	Macadamia nuts	*0.1	-
Acetamiprid	TN 0085	Tree Nuts {except pistachio nut}	-	0.06
	TN 0669	Macadamia nuts	*0.01	-
Afidopyropen	TN 0085	Tree Nuts	-	*0.01
Azoxystrobin	TN 0669	Macadamia nuts	*0.01	-
	TN 0085	Tree Nuts	-	0.01
Bifenazate	TN 0085	Tree Nuts	-	0.2
Bifenthrin	TN 0085	Tree Nuts	-	0.05
Boscalid	TN 0085	Tree Nuts {except pistachio nut}	-	*0.05
Buprofezin	TN 0085	Tree Nuts	-	*0.05
Captan	TN 0085	Tree Nuts {except almonds}	3	-
Carbaryl	TN 0085	Tree Nuts	-	1
	TN 0669	Macadamia nuts	2	-
Carbendazim	TN 0085	Tree Nuts	-	*0.1
	TN 0669	Macadamia nuts	0.1	-
Carfentrazone-ethyl	TN 0085	Tree Nuts	*0.05	-
Chlorantraniliprole	TN 0085	Tree Nuts	0.1	0.02
Chlorpyrifos	TN 0085	Tree Nuts	T0.05	-
Clofentezine	TN 0085	Tree Nuts	-	0.5
Cyantraniliprole	TN 0085	Tree Nuts	-	0.04
	TN 0669	Macadamia nuts	T*0.01	-
Cyclaniliprole	TN 0085	Tree Nuts	*0.01	-
Cyflumetofen	TN 0085	Tree Nuts	-	*0.01
Cyfluthrin	TN 0669	Macadamia nuts	0.05	-
Cyhalothrin	TN 0085	Tree Nuts	-	*0.01
Cypermethrins	TN 0085	Tree Nuts	-	*0.05

Chemical	Codex Code	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Cyprodinil	TN 0085	Tree Nuts {except almond and pistachio}	-	0.04
Diazinon	TN 0085	Tree Nuts	0.1	-
Difenoconazole	TN 0085	Tree Nuts	-	0.03
	TN 0669	Macadamia nuts	*0.01	-
Diflubenzuron	TN 0085	Tree Nuts	-	0.2
Diquat	TN 0085	Tree Nuts	*0.05	-
Emamectin Benzoate	TN 0085	Tree Nuts	-	*0.001
Ethephon	TN 0669	Macadamia nuts	*0.1	-
Etoxazole	TN 0085	Tree Nuts	-	*0.01
Fenazaquin	TN 0085	Tree Nuts	-	0.02
Fenbuconazole	TN 0085	Tree Nuts	-	*0.01
Fenpropathrin	TN 0085	Tree Nuts	-	0.15
Fenpyroximate	TN 0085	Tree Nuts	-	*0.05
Flubendiamide	TN 0085	Tree Nuts	-	0.1
Fludioxonil	TN 0085	Tree Nuts {except Canarium nut, Chilean hazelnut and pistachios}	-	0.3
Fluensulfone	TN 0085	Tree Nuts	-	*0.02
Fluindapyr	TN 0085	Tree Nuts	-	0.04
Flumioxazin	TN 0085	Tree Nuts	*0.02	*0.02
Fluopyram	TN 0669	Macadamia nuts	0.2	-
	TN 0085	Tree Nuts	-	0.04
Flupyradifurone	TN 0669	Macadamia nuts	*0.01	-
Fluxapyroxad	TN 0085	Tree Nuts	0.07	0.04
Fosetyl Al	TN 0085	Tree Nuts	-	400
Glufosinate and Glufosinate-ammonium	TN 0085	Tree Nuts	0.1	0.1
Glyphosate	TN 0085	Tree Nuts	0.2	-
Haloxypop	TN 0085	Tree Nuts	*0.05	-
Hexythiazox	TN 0085	Tree Nuts	-	*0.05
Hydrogen Phosphide	TN 0085	Tree Nuts	-	Po0.01
Imidacloprid	TN 0085	Tree Nuts	-	0.01
Indoxacarb	TN 0085	Tree Nuts	-	0.07
	TN 0669	Macadamia nuts	0.03	-
Iprodione	TN 0669	Macadamia nuts	*0.01	-
Isocycloseram	TN 0669	Macadamia nuts	*0.01	-
Isoxaben	TN 0085	Tree Nuts	*0.01	-
Malathion / Maldison	TN 0085	Tree Nuts	8	-
Mefentrifluconazole	TN 0669	Macadamia nuts	*0.01	-
	TN 0085	Tree Nuts	-	0.06
Mesotrione	TN 0085	Tree Nuts	-	*0.01
Metalaxyl	TN 0669	Macadamia nuts	1	-
Metconazole	TN 0085	Tree Nuts	-	*0.04
Methomyl	TN 0669	Macadamia nuts	T1	-
Methoxyfenozide	TN 0669	Macadamia nuts	0.05	-
	TN 0085	Tree Nuts	-	0.1

Chemical	Codex Code	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Methyl bromide	TN 0085	Tree Nuts	-	Po*0.01
Norflurazon	TN 0085	Tree Nuts	*0.2	-
Oryzalin	TN 0085	Tree Nuts	0.1	-
Oxyfluorfen	TN 0085	Tree Nuts	0.05	-
Paraquat	TN 0085	Tree Nuts	*0.05	0.05
Pendimethalin	TN 0085	Tree Nuts	*0.05	0.05
Penthiopyrad	TN 0085	Tree Nuts	0.1	0.05
Phosmet	TN 0085	Tree Nuts	-	0.2
Phosphine	TN 0085	Tree Nuts	*0.01	-
Phosphorous Acid	TN 0085	Tree Nuts	3000	-
Piperonyl butoxide	TN 0085	Tree Nuts	8	-
Pirimicarb	TN 0085	Tree Nuts {except almonds}	T*0.05	-
Propiconazole	TN 0085	Tree Nuts {except almonds}	T0.2	-
Pydiflumetofen	TN 0085	Tree Nuts	-	0.05
Pyraclostrobin	TN 0085	Tree Nuts {except pistachio nut; walnut}	0.07	-
	TN 0085	Tree Nuts {except pistachio nuts}	-	*0.02
Pyrethrins	TN 0085	Tree Nuts	1	Po*0.5
Pyriproxyfen	TN 0669	Macadamia nuts	*0.01	-
Saflufenacil	TN 0085	Tree Nuts	*0.03	0.01
Simazine	TN 0085	Tree Nuts	*0.1	-
Spinetoram	TN 0085	Tree Nuts {except almonds}	0.02	-
	TN 0085	Tree Nuts	-	0.01
Spinosad	TN 0085	Tree Nuts	T*0.01	0.07
Spirodiclofen	TN 0085	Tree Nuts	-	0.05
Spirotetramat	TN 0085	Tree Nuts	-	0.5
Sulfoxaflor	TN 0669	Macadamia nuts	*0.01	-
	TN 0085	Tree Nuts	-	0.03
Sulfuryl Flouride	TN 0085	Tree Nuts	7	Po3
Tebuconazole	TN 0669	Macadamia nuts	*0.01	-
	TN 0085	Tree Nuts	-	*0.05
Tebufenozide	TN 0669	Macadamia nuts	0.05	-
Tetraniliprole	TN 0669	Macadamia nuts	*0.01	-
	TN 0085	Tree Nuts	-	0.03
Thiacloprid	TN 0085	Tree Nuts	-	0.02
Trichlorfon	TN 0669	Macadamia nuts	0.1	-
Trifloxystrobin	TN 0085	Tree Nuts	-	*0.02

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

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

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

T = Temporary MRL

E = The MRL is based on extraneous residues

Po = The MRL accommodates post-harvest treatment of the commodity

Sources:

APVMA MRLs: Agricultural and Veterinary Chemicals Code (MRL Standard) Instrument 2023. Compilation 4. Prepared 6 July 2024.

CODEX MRLs: CODEX Alimentarius International Food Standards database (January 2024), <http://www.fao.org/fao-who-codexalimentarius/codex-texts/dbs/pestres/en/>

Appendix 7. Macadamia regulatory risk assessment

Macadamia Agrichemical Regulatory Risk Assessment

March 2024

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

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

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

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

Macadamia 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	Comments
INSECT AND OTHER PESTS			
Abamectin	6	Broad mite (PER87510)	EU: Restricted use to permanent greenhouses
		Flat mites (PER87510)	
		Flower thrips (PER87510)	
Acephate	1B	Banana-spotting bug	APVMA: nominated for review Canada: Reviewed, continued use with risk mitigation EU/UK: No authorisation in place
		Flower thrips	
		Fruit-spotting bug	
		Macadamia flower caterpillar	
		Macadamia leafminer	
		Macadamia nutborer	
		Red shouldered leaf beetle	
Acetamiprid + pyriproxifen	4A + 7C	Banana-spotting bug	Acetamiprid APVMA: Under review EU: Under review
		Citrus mealybug	
		Fruit-spotting bug	
		Longtailed mealybug	
		Pink wax scale	
<i>Bacillus thuringiensis</i>	11A	Caterpillars	EU: Under review for authorisation renewal
		Helicoverpa	
		Painted vine moth	
		Armyworms	
		Light brown apple moth	
		Looper caterpillars	

Macadamia Agrichemical Regulatory Risk Assessment

Active Constituents	Chemical group	Problem	Comments
Beta-cyfluthrin	3A	Fruit-spotting bug Macadamia nutborer Yellow peach moth	EU/UK: No authorisation in place
Carbaryl	1A	Cornelian Macadamia cup moth Macadamia nutborer Macadamia twig-girdler Red shouldered leaf beetle Wingless grasshopper Yellow peach moth	Canada: Reviewed, large number of uses deleted Codex: Review scheduled, support uncertain EU/UK: No authorisation in place USA: Under review
Chlorpyrifos	1B	Australian plague locust (PER13642)	APVMA: Proposed deletion of uses Codex: All MRLs revoked Canada: Cancellation of all uses. EU/UK: No authorisation in place USA: EPA decision to cancel use on food crops
Diazinon	1B	Macadamia felted coccid Macadamia leafminer Macadamia lace bug (PER14276)	APVMA: Proposed deletion of uses EU/UK: No authorisation in place Codex: MRLs deleted
Fatty acids - K salt	UNE	Spider mites	
Fipronil + S-methoprene	2B+7A	Yellow crazy ants	<u>Fipronil</u> APVMA: Under review Codex: Re-evaluation underway EU/UK: No authorisation in place <u>S-methoprene</u> EU/UK: No authorisation in place
Flupyradifurone	4D	Banana-spotting bug Fruit-spotting bug Macadamia lace bug Scirtothrips	EU: Under review

Macadamia Agrichemical Regulatory Risk Assessment

Active Constituents	Chemical group	Problem	Comments
Indoxacarb	22A	Fire ants	Canada: No authorisation EU/UK: No authorisation in place
		Sigastus weevil /Macadamia seed weevil (PER86827)	
Malathion/Maldison	1B	Australian plague locust (PER13642)	APVMA: Under review Codex: Re-evaluation scheduled for 2025/26 EU: Restricted use to permanent greenhouses
		Wingless grasshopper	
Methomyl	1A	Banana fruit caterpillar(PER90592)	APVMA: nominated for review Canada: Re-evaluation completed. Majority of uses removed EU/UK: No authorisation in place USA: Under review
Methoxyfenozide	18	Macadamia flower caterpillar	EU: Proposed restricted authorisation & Candidate for substitution
		Macadamia nutborer	
Petroleum oil	UNM	Macadamia felted coccid(PER11635)	
Pyriproxyfen	7C	Fire ants	
S-methoprene	7A	Fire ants	EU/UK: No authorisation in place
Spinetoram	5	Macadamia nutborer	Codex: Tree nut MRL set at 0.01 mg/kg EU: Authorisation expires June 2024
		Macadamia twig-girdler	
		Yellow peach moth	
		Yellow peach moth	
Sulfoxaflor	4C	Aphids	USA: Pollinator concerns EU: Restricted to permanent glasshouses only
		Banana-spotting bug	
		Black citrus aphid	
		Fruit-spotting bug	
Tebufenozide	18	Macadamia flower caterpillar	
		Macadamia nutborer	

Macadamia Agrichemical Regulatory Risk Assessment

Active Constituents	Chemical group	Problem	Comments
Tetraniliprole	28	Sigastus weevil /Macadamia seed weevil	Codex: Tree nut MRL set at 0.03 mg/kg EU/UK: No authorisation in place
Trichlorfon	1B	Macadamia flower caterpillar	APVMA: nominated for review Codex: No MRLs EU/UK: No authorisation in place USA: No MRLs
		Macadamia lace bug	
		Banana-spotting bug(PER13689)	
		Fruit-spotting bug(PER13689)	
		Green vegetable bug(PER13689)	
Cholecalciferol	Rodents		EU/UK: No authorisation in place
Coumatetralyl			APVMA: Under review EU/UK: No authorisation in place
Zinc phosphide			

Macadamia Agrichemical Regulatory Risk Assessment

Active Constituents	Chemical group	Problem	Comments
DISEASES			
Azoxystrobin + tebuconazole	11 + 3	Husk spot	<u>Azoxystrobin</u> Canada: Review proposed <u>Tebuconazole</u> APVMA: nominated for review Canada: Under review EU: Candidate for substitution USA: Under review
Carbendazim	1	Husk spot	Codex: JMPR recommend withdrawal of Tree nut MRL EU/UK: No authorisation in place
Copper	M1	Anthracnose Husk spot Phomopsis husk rot & canker Phytophthora root rot Phytophthora Stem rot	EU: Candidates for substitution
Difenoconazole	3	Husk spot	APVMA: nominated for review EU: Candidate for substitution USA: Under review
Iprodione	2	Botrytis blight Raceme blight (Grey mould)	Canada: Majority of food crop uses deleted Codex: Review scheduled EU/UK: No authorisation in place USA: Proposed deletion or restriction of uses
Mefentrifluconazole	3	Husk spot	
Metalaxyl/ metalaxyl-M	4	Trunk (stem) canker	<u>Metalaxyl</u> EU: Candidate for substitution <u>Metalaxyl-M</u> EU: Restricted use approval
Penthiopyrad	7	Husk spot	
Phosphorous acid	33	Trunk (stem) canker(PER84766)	
Pyraclostrobin	11	Husk spot	Canada: Review initiated
Pyraclostrobin + fluxapyroxad	11 + 7	Husk spot	

Macadamia Agrichemical Regulatory Risk Assessment

Active Constituents	Chemical Group	Comments
WEEDS		
Carfentrazone-methyl	14	
Diquat	22	APVMA: Currently under review EU/UK: No authorisation in place
Flumioxazin	14	EU: Candidate for substitution
Glufosinate	10	Canada: Review proposed EU/UK: No authorisation in place
Glyphosate	9	Ongoing issues internationally EU: Under review
Haloxyfop-P	1	EU/UK: No authorisation in place
Isoxaben	29	
Oryzalin	3	EU/UK: No authorisation in place
Oxyfluorfen	14	EU: Candidate for substitution USA: Interim review decision Label amendments proposed
Paraquat	22	APVMA: Currently under review Canada: Review initiated EU/UK: No authorisation in place Rotterdam Convention - nomination
Pendimethalin	3	EU: Candidate for substitution
PLANT GROWTH REGULATOR		
Ethephon (PER11462)	-	

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Macadamia Agrichemical Regulatory Risk Assessment

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Communications Manager

Hort Innovation

Level 7, 141 Walker Street

North Sydney NSW 2060

Australia

Email: communications@horticulture.com.au

Phone: 02 8295 2300