



Chestnut

Strategic Agrichemical Review Process
(SARP)

February 2023

Hort Innovation
Project – MT21005

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Purpose of the report:

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

Date of report:

February 2023

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Innovation**
Strategic levy investment

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1. Summary

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

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

Alternative pesticides should ideally be selected for benefits of:

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

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

1.1 Diseases

The high priority diseases are:

Common Name	Scientific Name
Chestnut Blight	<i>Cryphonectria parasitica</i>
Phytophthora Root & Trunk Rot	<i>Phytophthora cinnamomi</i>
Surface Moulds / Post-Harvest	<i>Cladosporium</i> spp., <i>Alternaria</i> spp., <i>Epicoccum purpurascens</i> , <i>Acrospeira mirabilis</i>
Chestnut Rots	<i>Gnomoniopsis smithogilvyi</i> , <i>Botryosphaeria dothidea</i> , <i>Diaporthe castaneti</i>
Phomopsis Nut Rot	<i>Phomopsis castanaea</i>
Cankers	<i>Gnomoniopsis smithogilvyi</i> , <i>Botryosphaeria dothidea</i>

1.2 Insects and mites

The high priority insect and mite pests are:

Common Name	Scientific Name
Two Spotted Mite	<i>Tetranychus urticae</i>

1.3 Weeds

The high priority weeds identified are:

Common name	Scientific name
Blackberry Nightshade	<i>Solanum nigrum</i>

1.4 Plant Growth Regulators

The high priority Plant Growth Regulator issues are:

Issue
Control of suckers

2. The Australian Chestnut Industry

Chestnuts are grown in the south of Australia, with the majority of production occurring in Victoria. Chestnut production has a strong domestic market focus. Chestnuts are all sold in a fresh in-shell form.

Total production for the year ending June 2021 was 1,221 tonnes¹. The value of production was \$9.3 m while the wholesale value of the supply was \$11 m.

The European Chestnut is the most common variety grown in Australia. Production is expected to increase to 2,000 tonnes by 2025.

Chestnut Harvest Season by State (In Shell)

State	20/21 t	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
New South Wales	183												
Victoria	855												
Western Australia	49												
South Australia	61												
Tasmania	61												
Queensland	12												
Availability legend			Harvest	End of Harvest								None	

Exports of Australian chestnuts are negligible, accounting for less than 1 percent of total production. Imports of fresh chestnuts are banned except from New Zealand due to Chestnut Blight and other exotic pests and diseases.

¹ Hort Innovation (2021). Australian Horticulture Statistics Handbook 2020/21. [online] Available at: <https://www.horticulture.com.au/growers/help-your-business-grow/research-reports-publications-fact-sheets-and-more/grower-resources/ha18002-assets/australian-horticulture-statistics-handbook/>

3. Introduction

3.1 Background

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

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

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

In combination with cultural practices, pesticides are important tools in chestnut 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 chestnut industry regarding pesticide access, Hort Innovation undertook a review of the pesticide requirements via a Strategic Agrichemical Review Process (SARP) in 2013. The current project is to update the SARP with the latest information and progress.

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

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

3.2 Minor use permits and registration

From a pesticide access perspective, chestnuts fit within the APVMA crop group 022: Tree nuts. The APVMA classifies chestnuts as a minor crop. Therefore, access to minor use permits can be relatively straight forward as long as a reasonable justification is provided in accordance with the APVMA's minor use guidance².

Possible justification for future permit applications could be based on:

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

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

² <https://apvma.gov.au/node/10931>

3.3 Methods

The current update of the Chestnut Strategic Agrichemical Review Process (SARP), which was last updated in 2014, was conducted by desktop audit using industry information gathered during 2021-2022. The process included gathering, collating and confirming information:

Process of Review	Activity
Industry survey	Preparation and circulation of online industry survey to update priority pests and identify priority control gaps. Survey released: 17 November 2021 Survey closed: 28 February 2022
SARP data updated via a desktop audit	Updated registrations and permits Updated MRL tables Updated available and potential pesticides against low, moderate and high priority pests, including an assessment of their suitability Included information on regulatory risks from MT20007
Captured industry input	Collated and analysed survey results Consolidated and incorporated industry needs and insights

3.4 Results and discussions

3.4.1 Detail

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

3.4.2 Appendices

Refer to additional information in the appendices:

Appendix 1. Products available for disease control in chestnut

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

Appendix 3. Products available for weed control in chestnut

Appendix 4. Plant growth regulators available in chestnut

Appendix 5. Current permits for use in chestnut

Appendix 6. Chestnut Maximum Residue Limits (MRLs)

Appendix 7. Chestnut Agrichemical Regulatory Risk Assessment

4. Diseases, Pests and Weeds of Chestnut

Resistance management: To manage the risk of resistance development, integrated disease/pest/weed management (IDM/IPM/IWM) strategies should be adopted. The general principle is to integrate diverse chemical and non-chemical strategies; maximise efficacy; not rely on singular tools and rotate between different modes of action. It is always essential to follow all the label instructions. Specific resistance management strategies may apply. These can be found, along with other useful information, on the CropLife Australia website³.

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

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

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

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

4.1 Diseases of chestnut

4.1.1 Disease priorities

Common name	Scientific name
High	
Chestnut Blight	<i>Cryphonectria parasitica</i>
Phytophthora Root & Trunk Rot	<i>Phytophthora cinnamomi</i>
Surface Moulds / Post-Harvest	<i>Cladosporium</i> spp., <i>Alternaria</i> spp., <i>Epicoccum purpurascens</i> , <i>Acrospeira mirabilis</i>
Chestnut Rots	<i>Gnomoniopsis smithogilvyi</i> , <i>Botryosphaeria dothidea</i> , <i>Diaporthe castaneti</i>
Phomopsis Nut Rot	<i>Phomopsis castanaea</i>
Cankers	<i>Gnomoniopsis smithogilvyi</i> , <i>Botryosphaeria dothidea</i>
Moderate	
Brown Rot / Blossom Blight	<i>Monilinia</i> spp.
Low	
Cladosporium	<i>Cladosporium</i> spp.
Alternaria	<i>Alternaria</i> spp.

The high priority diseases identified based on the feedback received were Chestnut Blight, Phytophthora Root & Trunk Rot, Surface Moulds (Post-Harvest), Chestnut Rots, Phomopsis Nut Rot and Cankers. Available and potential products for control of diseases are listed in Section 4.1.2.

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

Resistance Management

Resistance by fungal pathogens to fungicides usually evolves following the intensive use of fungicides for disease control. In any fungal population there are likely to be individuals that have some degree of natural resistance, and which are less susceptible to fungicides, even before the chemicals are used. Resistance arises mainly through the incorrect use of fungicides, which selects for the resistant individuals. Continued use of a fungicide or fungicide chemical group can result in a significant build-up of resistant individuals in the fungal population – to the point where that particular product, or other products from the same chemical group, is no longer effective. In some cases, removal of the selection pressure can result in the fungal population regaining its sensitivity to the fungicide group, but this is not always the case. The

risk of fungicide resistance developing varies between different chemical groups and different fungal pathogens, such that specific strategies are recommended for those situations considered to carry the highest risk. Croplife has resistance management strategies in place for various crops and diseases⁴.

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

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
Chestnut Blight (<i>Cryphonectria parasitica</i>)							
Priority: High							
Rated as a high priority in VIC and as a low priority in NSW. Infections occur underneath the bark, causing cankers that eventually kill the tree. Chestnut Blight is spread via wind, water and rain splash, humans, animals, insects, equipment, clothing and packaging. Infected trees must be destroyed to control spread of the disease.							
Copper	M1	Protectant	1	P-A	ALL	Registered in tree nuts for control of Anthracnose, Pink Limb Blight, Shot Hole, Leaf Curl, Husk Spot and Walnut Blight. Agriculture Victoria recommends spraying infected trees with copper before cutting them down and spraying healthy trees near to or surrounding infected trees ⁵ . Copper will not kill Chestnut Blight within the tree nor slow the infection if it is already present in a tree.	-

⁵ <https://www.chestnutsaustraliainc.com.au/wp-content/uploads/Guide-to-managing-chestnut-blight-accessible-PDF-version-min.pdf>

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
Phytophthora Root & Trunk Rot (<i>Phytophthora cinnamomi</i>) Priority: High Rated as a high priority in VIC and NSW.							
Metalaxyl-M (Ridomil Gold 480SL) PER90388	4	Protectant & Curative	28 NG	A	ALL	Permitted in chestnuts for control of Root & Collar Rot (<i>Phytophthora spp.</i>) Apply at the beginning of summer as a soil drench to a radius 1mm around each tree trunk. Maximum of 2 applications per year, with no less than 3 months between treatments. Ensure application is followed with sufficient irrigation or rainfall within 48 hours of application to wash fungicide into the root zone.	-
Phosphorous Acid	33	Protectant & Curative	28	A	ALL (excl. QLD)	Registered in chestnuts for suppression of Phytophthora Trunk & Root Canker (<i>Phytophthora cinnamomi</i>). Apply as a trunk injection up to 3 times per year, 2 during the production season and 1 post-harvest.	-
Phosphorous Acid PER15259	33	Protectant & Curative	28	A	NSW, SA, TAS & WA	Permitted in chestnuts for suppression of Phytophthora Trunk and Root Canker (<i>Phytophthora cinnamomi</i>) and Phomopsis Nut Rot (<i>Phomopsis castanea</i>). Apply either a maximum of 2 foliar applications per production season, or a trunk injection up to 3 times per year, 2 during the production season and 1 post-harvest. Only 1 application method may be undertaken in any 1 season.	-
<i>Bacillus amyloliquefaciens</i> Strain QST 713 (Serenade Prime) Bayer	BM 02	Biological Soil Ameliorant	NR	P-A	ALL	Available in tree crops for application to soil to improve bioavailability of soil resources to horticultural crops. Registered for suppression of soil-borne diseases such as Black Scurf in potatoes and Pineapple Disease in sugarcane.	-
Copper	M1	Protectant	1	P-A	ALL	Registered in tree nuts for control of Anthracnose, Pink Limb Blight, Shot Hole, Leaf Curl, Husk Spot and Walnut Blight. Registered in nectarines, peaches and plums for control of Phytophthora Stem Canker .	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
Mandipropamid (Revus) Syngenta	40	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.	-
Oxathiapiprolin (Zorvec Enicade) Corteva	49	Protectant		P		Registered for control of Downy Mildew in bulb vegetables, brassicas, cucurbits, leafy vegetables and poppies. US registration for control of Phytophthora Canker and Brown Rot in citrus.	-
Surface Moulds / Post-Harvest (<i>Cladosporium</i> spp., <i>Alternaria</i> spp., <i>Epicoccum purpurascens</i> , <i>Acrospeira mirabilis</i>) Priority: High							
Rated as a high priority in VIC and as a low priority in NSW.							
Fludioxonil (Scholar)	12	Protectant	NR	A	ALL	Registered in chestnuts as a post-harvest treatment for suppression of Surface Moulds & Fungal Rots. Apply as a post-harvest dip or low volume concentrate spray. Use an application time of 1 minute and allow produce to drain and dry prior to storage.	R3
Iprodione (Rovral) PER83636	2	Protectant & Curative	NR	A	ALL (excl. VIC)	Permitted in chestnuts as a post-harvest treatment for suppression of Surface Moulds & Fungal Rots. Apply as a post-harvest dip or low volume concentrate spray. Dip for 1 minute and allow produce to drain and dry thoroughly prior to storage.	R2
Peroxyacetic Acid + Hydrogen Peroxide PER91058	M	Protectant	NR	A	ALL (excl. VIC)	Registered in chestnuts as a post-harvest treatment for control of Surface Moulds . May be applied as a continuous spray onto nuts contained on a suitable table or conveyor, or as a dip. Ensure a minimum of 45 seconds contact times and provide adequate draining time post-treatment.	-
Fludioxonil + Azoxystrobin (Graduate A+) Syngenta	12+11	Protectant / Post-Harvest		P		Registered as a post-harvest treatment for control of Side Rot and Stem End Rot in avocado.	-
Sodium Hypochlorite	-	Sanitiser		P		Previous minor use permit as a post-harvest treatment for control of Surface Moulds in chestnuts. Renewal submitted By Hort Innovation in 2022.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
Triforine	3	Protectant / Post-Harvest		P		Registered as a post-harvest dip for control of Brown Rot in stone fruit.	R3
Chestnut Rots (<i>Gnomoniopsis smithogilvyi</i> , <i>Botryosphaeria dothidea</i> , <i>Diaporthe castaneti</i>) Priority: High Rated as a high priority in VIC and as a moderate priority in NSW.							
Bromo Chloro Dimethyl Hydantoin (BCDMH)	-	Sanitiser	NR	A	ALL	Registered as a sanitiser / post-harvest treatment for control of external rot causing organisms. Post-harvest spray or dip. Minimum contact time 60 seconds. Can also be used as a general disinfectant for equipment.	-
Fludioxonil (Scholar)	12	Protectant	NR	A	ALL	Registered in chestnuts as a post-harvest treatment for suppression of Surface Moulds & Fungal Rots . Apply as a post-harvest dip or low volume concentrate spray. Use an application time of 1 minute and allow produce to drain and dry prior to storage.	R3
Iprodione (Rovral) PER83636	2	Protectant & Curative	NR	A	ALL (excl. VIC)	Permitted in chestnuts as a post-harvest treatment for suppression of Surface Moulds & Fungal Rots . Apply as a post-harvest dip or low volume concentrate spray. Dip for 1 minute and allow produce to drain and dry thoroughly prior to storage.	R2
Fludioxonil + Azoxystrobin (Graduate A+) Syngenta	12+11	Protectant / Post-Harvest		P		Registered as a post-harvest treatment for control of Side Rot and Stem End Rot in avocado.	-
Triforine	3	Protectant / Post-Harvest		P		Registered as a post-harvest dip for control of Brown Rot in stone fruit.	R3

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
Phomopsis Nut Rot (<i>Phomopsis castanaea</i>)							
Priority: High							
Rated as a high priority in VIC and as a moderate priority in NSW.							
Phosphorous Acid PER15259	33	Protectant & Curative	28	A	NSW, SA, TAS & WA	Permitted in chestnuts for suppression of Phytophthora Trunk and Root Canker (<i>Phytophthora cinnamomi</i>) and Phomopsis Nut Rot (<i>Phomopsis castanaea</i>). Apply either a maximum of 2 foliar applications per production season, or a trunk injection up to 3 times per year, 2 during the production season and 1 post-harvest. Only 1 application method may be undertaken in any 1 season.	-
Copper	M1	Protectant	1	P-A	ALL	Registered in tree nuts for control of Anthracnose, Pink Limb Blight, Shot Hole, Leaf Curl, Husk Spot and Walnut Blight. Registered for control of Phomopsis in olives.	-
<i>Aureobasidium pullulans</i> (Botector) Nufarm	BM02	Biological		P		Registered for suppression of Phomopsis in berries.	-
Captan	M4	Protectant		P		Registered for control of Phomopsis Cane and Leaf Blight in grapes.	R3
Dithianon	M9	Protectant		P		Registered for control of Phomopsis Cane & Leaf Spot in grapes.	R3
Fluazinam (Shirlan)	29	Protectant		P		Registered for control of Phomopsis Cane & Leaf Blight in grapevines.	
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant & Curative		P		Registered for control of Yellow Sigatoka, Leaf Speckle and Cordana Leaf Spot in bananas and Grey Mould and Powdery Mildew in grapes. US registration for suppression of Phomopsis in grapes.	R3
Mefentrifluconazole (Belanty) BASF	3	Protectant & Curative		P		Registered for control of Black Spot in apples and Powdery Mildew in grapes. US registration for control of Phomopsis Cane & Leaf Spot in table grapes.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
Metiram (Polyram)	M3	Protectant		P		Registered for control of Phomopsis Cane & Leaf Blight in grapevines.	R2
Cankers (<i>Gnomoniopsis smithogilvyi</i> , <i>Botryosphaeria dothidea</i>) Priority: High Rated as a high priority in VIC and as a low priority in NSW.							
Tebuconazole	3	Protectant		P		Registered for control of Botryosphaeria Dieback in grapevines.	R3
Brown Rot / Blossom Blight (<i>Monilinia</i> spp.) Priority: Moderate Rated as a moderate priority in VIC and as a low priority in NSW.							
Penthiopyrad (Fontelis) Corteva	7	Protectant	14 NG	P	ALL	Registered in chestnuts for control of Brown Rot / Blossom Blight (<i>Monilinia</i> spp.) Begin applications prior to disease development and continue on a 7-14 day interval. Maximum of 3 applications per season and no more than 2 consecutive applications.	-
Copper	M1	Protectant	1	P-A	ALL	Registered in tree nuts for control of Anthracnose, Pink Limb Blight, Shot Hole, Leaf Curl, Husk Spot and Walnut Blight. Registered for control of Blossom Blight in stone fruit.	-
<i>Bacillus amyloquefaciens</i> strain QST 713 (Serenade Opti) Bayer	BM 01	Biological	NR	P		Permitted for the suppression of Blossom Blight/Brown Rot in cherries.	-
BLAD (Problad Plus)	BM 01	Biological	NR	P		Registered for suppression of Brown Rot / Blossom Blight in stone fruit.	-
Captan	M4	Protectant		P		Registered for control of Blossom Blight / Brown Rot in stone fruit (except apricots).	-
Cyprodinil (Chorus) Syngenta	9	Protectant & Curative		P		Registered for control of Blossom Blight / Brown Rot in apricot, nectarine, peach and plum.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
Dodine (Syllit) Campbell	U12	Protectant & Curative		P		Registered for control of Blossom Blight in nectarine and peach.	-
Florylpicoxamid (Adavelt) Corteva	21	Protectant & Curative		P		Registered for control of Septoria in wheat. New active from Corteva with activity on Septoria, Powdery Mildew, Botrytis, Anthracnose, Alternaria, Scab, Monilinia , Rust and <i>Mycosphaerella</i> spp.	-
Fuopyram + Trifloxystrobin (Luna Sensation) Bayer	7+11	Protectant & Curative		P		Registered for control of Blossom Blight in almonds and stone fruit.	-
Fuopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant & Curative		P		Registered for control of Yellow Sigatoka, Leaf Speckle and Cordana Leaf Spot in bananas and Grey Mould and Powdery Mildew in grapes. US registration for control of Blossom Blight / Brown Rot in stone fruit and almonds.	R3
Mefentrifluconazole (Belanty) BASF	3	Protectant & Curative		P		Registered for control of Black Spot in apples and Powdery Mildew in grapes. US registration for control of <i>Alternaria</i> , Monilinia , <i>Tranzschelia</i> and <i>Wilsonomyces</i> in stone fruit.	-
Potassium Silicate + Potassium Bicarbonate (EcoCarb Plus) OCP	M2	Protectant		P		Registered for control of Brown Rot in nectarines.	-
Pydiflumetofen + Fludioxonil (Miravis Prime) Syngenta	7+12	Protectant & Curative		P		Registered for control of various diseases in grapes, berries, leafy vegetables, lettuce and potato. Hort Innovation project ST20005 is generating data to support a label registration for control of Botrytis in stone fruit.	R3
Cladosporium (<i>Cladosporium</i> spp.)							
Priority: Low							
Rated as a low priority in VIC and NSW.							
Copper	M1	Protectant	1	P-A	ALL	Registered in tree nuts for control of Anthracnose, Pink Limb Blight, Shot Hole, Leaf Curl, Husk Spot and Walnut Blight. Registered for control of Freckle in apricots.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
Penthiopyrad (Fontelis) Corteva	7	Protectant	14 NG	P-A	ALL	Registered in chestnuts for control of Brown Rot / Blossom Blight (<i>Monilinia</i> spp.) Registered for control of Scab in stone fruit.	-
<i>Bacillus amyloliquefaciens</i> strain MBI 600 (Serifel) BASF	BM 02	Biological	NR	P		Registered for control of <i>Botrytis</i> in grapes and strawberries. US registration for control of Scab in tree nuts.	-
Florypicoxamid (Adavelt) Corteva	21	Protectant & Curative		P		Registered for control of Septoria in wheat. New active from Corteva with activity on Septoria, Powdery Mildew, Botrytis, Anthracnose, Alternaria, Scab , Monilinia, Rust and <i>Mycosphaerella</i> spp.	-
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant & Curative		P		Registered in bananas for control of Yellow Sigatoka, Leaf Speckle and Cordana Leaf Spot. US registration for control of Scab in stonefruit.	R3
Fluxapyroxad + Pyraclostrobin (Merivon) BASF	7+11	Protectant & Curative		P		Registered in almonds for control of Alternaria Leaf Spot, Black Spot, Brown Rot, Nut Scab , Shot-Hole and Stone Fruit Rust. US registration for control of Scab in stone fruit.	-
Mefentrifluconazole (Belanty) BASF	3	Protectant & Curative		P		Registered for control of Black Spot in apples and Powdery Mildew in grapes. US registration for control of Scab in stone fruit and tree nuts.	-
Pydiflumetofen + Fludioxonil (Miravis Prime) Syngenta	7+12	Protectant & Curative		P		Registered for control of various diseases in grapes, berries, leafy vegetables, lettuce and potato. US registration for control of Scab in cucurbits. Hort Innovation project ST20005 is generating data to support a label registration for control of Botrytis in stone fruit.	R3

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
Alternaria (<i>Alternaria</i> spp.)							
Priority: Low							
Rated as a low priority in VIC and NSW.							
Penthiopyrad (Fontelis) Corteva	7	Protectant	14 NG	P-A	ALL	Registered in chestnuts for control of Brown Rot / Blossom Blight (<i>Monilinia</i> spp.) Registered for control of Alternaria spp. in pome fruit, onions and root & tuber vegetables.	-
Florylpicoxamid (Adavelt) Corteva	21	Protectant & Curative		P		Registered for control of Septoria in wheat. New active from Corteva with activity on Septoria, Powdery Mildew, Botrytis, Anthracnose, Alternaria , Scab, Monilinia, Rust and <i>Mycosphaerella</i> spp.	-
Fluopyram + Trifloxystrobin (Luna Sensation) Bayer	7+11	Protectant & Curative		P		Registered for suppression of Alternaria Leaf Blotch in apples and control of <i>Alternaria passiflorae</i> in passionfruit.	-
Fluxapyroxad + Pyraclostrobin (Merivon) BASF	7+11	Protectant & Curative		P		Registered for control of Alternaria Leaf Spot in almonds.	-
Polyoxin D Zinc Salt (Intervene) Nufarm	19	Chitin synthase inhibitor prevents cell wall formation		P		Registered for control of Grey Mould and Powdery Mildew in grapes and berries, and control of Powdery Mildew and Alternaria in Apples.	-
<i>Bacillus amyloliquefaciens</i> strain MBI 600 (Serifel) BASF	BM 02	Biological	NR	P		Registered for control of <i>Botrytis</i> in grapes and strawberries. US registration for control of Alternaria in artichoke, asparagus, berries, brassica leafy vegetables, bulb vegetables, citrus, cucurbits, pome fruit, stone fruit and tobacco.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory Risk
Fluopyram + Tebuconazole (Luna Experience) Bayer	7+3	Protectant & Curative		P		Registered for control of Yellow Sigatoka, Leaf Speckle and Cordana Leaf Spot in bananas and Grey Mould and Powdery Mildew in grapes. US registration for control of Alternaria in almond, Brassica leafy greens, bulb vegetables, cucurbits, pistachio, tree nuts and sunflower.	R3
Pydiflumetofen + Fludioxonil (Miravis Prime) Syngenta	7+12	Protectant & Curative		P		Registered for control of Alternaria sp. in potato.	R3

4.2 Insect and mite pests of chestnut

4.2.1 Insect and mite pest priorities

Common name	Scientific name
High	
Two Spotted Mite	<i>Tetranychus urticae</i>
Low	
Bryobia Mite	<i>Bryobia praetiosa</i>
Green Peach Aphid	<i>Myzus persicae</i>
Black Peach Aphid	<i>Brachycaudus persicae</i>
Queensland Fruit Fly	<i>Bactrocera tryoni</i>
Mediterranean Fruit Fly	<i>Ceratitis capitata</i>
Australian Plague Locust	<i>Chortoicetes terminifera</i>
Wireworms - True & False Wireworms	Elateridae, Tenebrionidae
Cluster Caterpillar	<i>Spodoptera litura</i>
Light Brown Apple Moth	<i>Epiphyas postvittana</i>
Loopers	<i>Geometridae</i>
Fall Armyworm	<i>Spodoptera frugiperda</i>
Jassids / Leafhoppers	Cicadellidae
Western Flower Thrips	<i>Frankliniella occidentalis</i>
Green Tree Ant / Weaver Ant	<i>Oecophylla smaragdina</i>
Storage Pests	<i>Cydia splendana, Curculio elephas, Curculio sayi</i>

The only high priority insect pest identified by the survey was Two Spotted Mite. Available and potential products for insect, mite and other pests are listed in Section 4.2.2.

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

Resistance Management

Insecticide resistance is a risk to effective control for some insect groups, particularly if there is an over-reliance on a limited number of insecticides. Growers should adhere to the resistance

management strategies outlined on the CropLife website⁶. Growers should not exceed the maximum number of applications permitted on the insecticide label.

⁶ www.croplife.org.au/resources/programs/resistance-management/

4.2.2 Available and potential products for priority insects and mites

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

Availability		Regulatory risk (refer to Appendix 7)	
A	Available via either registration or permit approval	R1	Short-term: Critical concern over retaining access
P	Potential - 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 2022-23 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
Two Spotted Mite (<i>Tetranychus urticae</i>)								
Priority: High								
Rated as a high priority in VIC and as a low priority in NSW. Two Spotted Mites cause leaf yellowing and in severe cases can cause leaf death. Management options include reducing dust in the vineyard, promotion or introduction of predatory mites and judicious use of miticides while maintaining beneficial populations.								
Potassium Salts of Fatty Acid (Natrasoap)	-	Contact	NR	A	ALL	Registered in tree nuts for control of Aphids, Thrips, Mealybug, Two-Spotted Mite , Spider Mite and Whitefly. Apply as a cover spray. Number of treatments not specified.	L Bee:L	-
Acequinocyl (Kanemite) UPL	20B	Contact & Ingestion		P		Registered for control of Two Spotted Mite in pome fruit and stone fruit.	L Bee:L	-
<i>Beauveria bassiana</i> (Velifer) BASF	UNF	Biological		P		Registered for suppression of Two Spotted Mite in protected vegetables and ornamentals.	L Bee:L	-
Chlorfenapyr (Secure) BASF	13	Contact & Ingestion		P		Registered for control of Two Spotted Mite in apples, pears and peaches.	M 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 Two-Spotted Mite 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.	-	-
Spiromesifen (Oberon) Bayer	23	Ingestion		P		Not currently registered in AU but under development with Bayer and Hort Innovation for multiple commodities. US registrations for Mites in various crops.	M Bee:VL	-
Tebufenpyrad (Pyranica) Sipcam	21A	Contact & Ingestion		P		Registered for control of Two Spotted Mite in apples, pears, peaches and ornamentals.	M Bee:H	-
Bryobia Mite (<i>Bryobia praetiosa</i>)								
Priority: Low								
Rated as a low priority in VIC and NSW.								
Potassium Salts of Fatty Acid (Natrasoap)	-	Contact	NR	P-A	ALL	Registered in tree nuts for control of Aphids, Thrips, Mealybug, Two-Spotted Mite, Spider Mite and Whitefly.	L Bee:L	-

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.	-	-
Spiromesifen (Oberon) Bayer	23	Ingestion		P		Not currently registered in AU but under development with Bayer and Hort Innovation for multiple commodities. US registrations for Mites in various crops.	M Bee:VL	-
<p>Green Peach Aphid (<i>Myzus persicae</i>) Black Peach Aphid (<i>Brachycaudus persicae</i>) Priority: Low Rated as a low priority in VIC and NSW.</p>								
Potassium Salts of Fatty Acid (Natrasoap)	-	Contact	NR	A	ALL	Registered in tree nuts for control of Aphids , Thrips, Mealybug, Two-Spotted Mite, Spider Mite and Whitefly. Apply as a cover spray. Number of treatments not specified.	L Bee:L	-
Sulfoxaflor (Transform) Corteva	4C	Contact & Ingestion	7	A	ALL	Registered in tree nuts for control of Green Peach Aphid and Black Peach Aphid . Apply when pest reaches threshold levels. Retreatment interval 14 days, maximum number of applications not specified.	M Bee:VH	-
Acetamiprid + Novaluron (Cormoran) Adama	4A+15	Contact & Ingestion		P		Registered for control of Black Peach Aphid and Green Peach Aphid in stone fruit	M Bee:M	R2
Afidopyropen (Versys) BASF	9D	Ingestion		P		Registered for control of Aphids in various vegetable crops.	L Bee:L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
<i>Beauveria bassiana</i> (Velifer) BASF	UNF	Biological	NR	P		Registered for suppression of Green Peach Aphid , Rose Aphid and Chrysanthemum Aphid in protected vegetables and ornamentals.	L Bee:L	-
Dimpropridaz (Efficon) BASF	UN	Ingestion		P		Registered for control of Green Peach Aphid in brassica vegetables and leafy and brassica leafy vegetables.	-	-
Fonicamid (Mainman) UPL	29	Ingestion		P		Registered for control of Green Peach Aphid in cucurbits, potato and strawberries.	M Bee:VL	-
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact & Ingestion		P		Registered in macadamias for control of Fruit Spotting Bugs, Macadamia Lace Bug and suppression of Scirtothrips, control of Fruit Spotting Bugs and Planthoppers in avocados, mangoes and papaya, control of Whitefly, Green Peach Aphid and Cotton Aphid in cucurbits and fruiting vegetables, and control of Silverleaf Whitefly and Green Peach Aphid in green beans, potatoes and sweet potatoes.	L Bee:L	-
Pymetrozine (Chess) Syngenta	9B	Contact & Ingestion		P	ALL	Registered for control of Black Peach Aphid and Green Peach Aphid in stone fruit, and control of Green Peach Aphid in brassica vegetables, fruiting vegetables, lettuce, leafy vegetables, cucurbits, potatoes, almonds, pistachios, beetroot, cut flowers and nursery stock.	L Bee:VL	R3
Spirotetramat (Movento) Bayer	23	Ingestion		P	ALL	Registered for control of Black Peach Aphid in stone fruit, and for control of Green Peach Aphid in beans, peas, brassica vegetables, brassica leafy vegetables, celery, rhubarb, cucurbits, fruiting vegetables, herbs, leafy vegetables, lettuce, chicory, endive, radicchio, potatoes and sweet potatoes.	M Bee:L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Queensland Fruit Fly (<i>Bactrocera tryoni</i>) Mediterranean Fruit Fly (<i>Ceratitis capitata</i>) Priority: Low Rated as a low priority in VIC and NSW.								
4-(P-Acetoxyphenyl)-2-Butanone + Malathion	1B	Contact	NR	A	ALL	Registered for use as a trap for Queensland Fruit Fly . Used to detect the presence of Fruit Fly in the orchard to assist with making decisions about control.	H Bee:H	R3
4-(P-Acetoxyphenyl)-2-Butanone + Fipronil	2B	Contact	NR	A	ALL	Registered for population reduction and population monitoring of Queensland Fruit Fly and Lesser Queensland Fruit Fly . Single stations can be used for population monitoring. Control of fruit fly required placement of 16 stations per hectare and should be used in conjunction with regular insecticide cover sprays.	M Bee:VH	R3
Dimethoate PER13859	1B	Contact / Post-harvest only	NR	A	ALL	Permitted in fruit fly host crops following the completion of harvest for control of Fruit Fly . Do not apply more than 2 applications per crop following harvest. Apply as a foliar spray to both fallen and retained fruit. Produce treated must not be harvested, collected or supplied for human or animal consumption.	H Bee:H	R1
Spinosad (Naturalure) Corteva	5	Bait / Ingestion	NR	A	ALL	Registered in tree crops as a bait for Queensland Fruit Fly and Mediterranean Fruit Fly . Apply as either a band or a spot spray to the lower canopy of fruiting plants. Begin applications as soon as monitoring traps indicate flies are present and fruit is at a susceptible stage. Repeat applications every 7 days, re-applying sooner if rain washes off the deposit. Avoid spraying the fruit as phytotoxicity may occur.	L Bee:H	-
Acetamiprid + Novaluron (Cormoran) Adama	4A+15	Contact & Ingestion		P		Registered for suppression of Mediterranean Fruit Fly and Queensland Fruit Fly in stone fruit.	M Bee:M	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Spinetoram (Delegate) Corteva	5	Ingestion		P		Permitted for suppression of Queensland Fruit Fly, Lesser Queensland Fruit Fly and Mediterranean Fruit Fly in stone fruit.	M Bee:VH	-
Tetraniliprole (Vayego) Bayer	28	Ingestion		P		Registered for control of Mediterranean Fruit Fly in stone fruit.	L-M Bee:VH	-
Australian Plague Locust (<i>Chortoicetes terminifera</i>)								
Priority: Low								
Rated as a low priority in VIC and NSW.								
Chlorpyrifos PER13642	1B	Contact	30 G:2	A	ALL (excl. VIC)	Permitted in tree nuts for control of Australian Plague Locust (<i>Chortoicetes terminifera</i>) . Apply to pasture, soil, crop edge or interrow only. Do not apply to the orchard floor between the beginning of burr split and end of harvest period. Maximum number of applications and retreatment interval not specified.	H Bee:H	R1
Maldison PER13642	1B	Contact	NR G:2	A	ALL (excl. VIC)	Permitted in tree nuts for control of Australian Plague Locust (<i>Chortoicetes terminifera</i>) . Apply to pasture, soil, crop edge or interrow only. Do not apply to the orchard floor between the beginning of burr split and end of harvest period. Maximum number of applications and retreatment interval not specified.	H Bee:H	R3
Wireworms - True & False Wireworms (Elateridae, Tenebrionidae)								
Priority: Low								
Rated as a low priority in VIC and NSW.								
1,3-dichloropropene + Chloropicrin (Agrocelone)	8B	Fumigant	NR	A	ALL	Registered in fruit nut crops as a soil fumigant for control of Plant Parasitic Nematodes, Symphylans, Wireworms , Soil-Borne Diseases and suppression of weeds. Apply prior to planting new orchards. <i>For use by professional and registered fumigators only.</i>	-	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Broflanilide (Vedira) BASF	30	Contact & Ingestion		P		Registration as an ant bait in non-agricultural situations. It also has potential uses as a seed treatment for the control of Wireworms , and a foliar treatment for the control of chewing pests in various crops.	-	-
Clothianidin + Imidacloprid (Poncho Plus) BASF	4A	Protectant / Seed Treatment		P		Registered for control of Wireworm as a seed treatment in sweet corn, sunflower, canola & forage brassica. Will provide early protection for 3-4 weeks after sowing.	M Bee:VH	R2
Fipronil (Regent) BASF	2B	Contact & stomach		P		Registered for control of Wireworms in potato, sweet potato and sugarcane.	M Bee:VH	R3
Cluster Caterpillar (<i>Spodoptera litura</i>) Light Brown Apple Moth (<i>Epiphyas postvittana</i>) Loopers (Geometridae) Priority: Low Rated as a low priority in VIC and NSW.								
Acetamiprid + Novaluron (Cormoran) Adama	4A+15	Contact & Ingestion		P		Registered for control of Light Brown Apple Moth in pome and stone fruit.	M Bee:M	R2
Chlorantraniliprole (Altacor) FMC	28	Ingestion		P		Registered for control of Light Brown Apple Moth in pome fruit, stone fruit and grapes.	L Bee:VL	-
Indoxacarb (Avatar) FMC	22A	Ingestion		P		Registered for control of Light Brown Apple Moth in celery, blueberries, <i>Rubus</i> spp., pome fruit, stone fruit and grapes, control of Cluster Caterpillar in brassica vegetables, fruiting vegetables and cucurbits, and control of Soybean Looper in fruiting vegetables.	M Bee:H	R3

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.	-	-
Spinetoram (Delegate) Corteva	5	Ingestion		P		Registered for control of Light Brown Apple Moth in citrus, grapes, pome fruit and stone fruit.	M Bee:VH	-
Spinosad (Entrust Organic) Corteva	5	Ingestion		P		Registered for control of Light Brown Apple Moth in culinary herbs, root & tuber vegetables, avocado, berryfruit, citrus, grapes, kiwifruit, pome fruit and stone fruit, and control of Loopers in brassica vegetables, culinary herbs, leafy vegetables, legume vegetables, root & tuber vegetables, avocado, berryfruit, pome fruit and tropical & sub-tropical fruit (inedible peel).	L Bee:H	-
Tetraniliprole (Vayego) Bayer	28	Ingestion		P		Registered for control of Light Brown Apple Moth in pome fruit.	L-M Bee:VH	-
Fall Armyworm (<i>Spodoptera frugiperda</i>)								
Priority: Low								
Rated as a low priority in VIC and NSW. Fall Armyworm is an exotic pest that can reproduce prolifically, especially in warm weather. It is important to monitor crops for any incursions. Permits for control of Fall Armyworm in chestnuts will not be renewed as it has not proven to be a problem pest in chestnuts.								
Chlorantraniliprole (Altacor) FMC PER89353	28	Ingestion	10 NG	A	ALL (excl. VIC)	Permitted in tree nuts for control of Fall Armyworm (<i>Spodoptera frugiperda</i>). Apply as a foliar spray at 7-14 day intervals. Maximum of 3 applications per season with no more than 2 consecutive applications.	L Bee:VL	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Jassids / Leafhoppers (Cicadellidae)								
Priority: Low								
Rated as a low priority in VIC and NSW.								
Sulfoxaflor (Transform) Corteva	4C	Contact & Ingestion	7	P-A	ALL	Registered in tree nuts for control of Green Peach Aphid and Black Peach Aphid. US registration for control of Leafhoppers in berries, pome fruit and root and tuber vegetables.	M Bee:VH	-
Buprofezin (Applaud) Corteva	16	Ingestion		P		Registered for control of Leafhoppers in citrus.	M Bee:L	-
Flupyradifurone (Sivanto Prime) Bayer	4D	Contact & Ingestion		P		Registered in macadamias for control of Fruit Spotting Bugs, Macadamia Lace Bug and suppression of Scirtothrips, control of Fruit Spotting Bugs and Planthoppers in avocados, mangoes and papaya, control of Whitefly, Green Peach Aphid and Cotton Aphid in cucurbits and fruiting vegetables, and control of Silverleaf Whitefly and Green Peach Aphid in green beans, potatoes and sweet potatoes. US registration for control of Leafhoppers in brassica vegetables.	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.	-	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Western Flower Thrips (<i>Frankliniella occidentalis</i>)								
Priority: Low								
Rated as a low priority in VIC and NSW.								
Potassium Salts of Fatty Acid (Natrasoap)	-	Contact	NR	A	ALL	Registered in tree nuts for control of Aphids, Thrips , Mealybug, Two-Spotted Mite, Spider Mite and Whitefly. Apply as a cover spray. Number of treatments not specified.	L Bee:L	-
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.	-	-
<i>Beauveria bassiana</i> (Velifer) BASF	UNF	Biological		P		Registered for suppression of Western Flower Thrips in protected vegetables and ornamentals.	L Bee:L	-
Diafenthiuron + Cyantraniliprole (Minecto Forte) Syngenta	12A+28	Contact & Ingestion		P		Registered for control of various insects and mites, including the suppression of Western Flower Thrips in cucurbits and fruiting vegetables.	M Bee:VH	-
Spinetoram (Delegate) Corteva	5	Ingestion		P		Registered for control of Western Flower Thrips in pome fruit and stone fruit.	M Bee:VH	-
Spinosad (Entrust Organic) Corteva	5	Ingestion		P		Registered for control of Western Flower Thrips in brassica vegetables, cucurbits, fruiting vegetables, leafy vegetables, legume vegetables, ornamentals, berryfruit, pome fruit and stone fruit.	L Bee:H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory Risk
Spirotetramat (Movento) Bayer	23	Ingestion		P		Registered for control of Western Flower Thrips in green beans, celery, rhubarb, fruiting vegetables, herbs, lettuce and bulb vegetables (excluding bulb onions).	M Bee:L	-
Green Tree Ant / Weaver Ant (<i>Oecophylla smaragdina</i>)								
Priority: Low								
Rated as a low priority in VIC and NSW.								
Pyriproxyfen (Distance Ant Bait)	7C	IG / Bait	NR	A	ALL	Registered in tree nuts for control of Invasive & Nuisance Ants . Apply baits in early spring or summer at first sign of ant activity. Do not exceed 3 applications per year and a minimum of 3 months between each treatment.	VL Bee:L	-
Broflanilide (Vedira) BASF	30	Contact & Ingestion		P		Registered as an Ant bait in non-agricultural situations.	-	-
Metaflumizone (Siesta Ant Bait) BASF	22B	Ingestion		P		Pending registration as an Ant bait.	M Bee:M	-
Storage Pests (<i>Cydia splendana</i>, <i>Curculio elephas</i>, <i>Curculio sayi</i>)								
Priority: Low								
Rated as a low priority in VIC and NSW.								
Sulfuryl Fluoride	8C	Fumigant	NR	A	ALL	Registered in chestnut storage facilities as a fumigant for control of Storage Pests . <i>For use by professional and registered fumigators only.</i>	-	-

4.3 Weeds in chestnut

4.3.1 Weed priorities

Common Name	Scientific Name
High	
Blackberry Nightshade	<i>Solanum nigrum</i>
Moderate	
Couch Grass	<i>Cynodon dactylon</i>
Prickly Paddy Melon	<i>Cucumis myriocarpus</i>
Low	
Flaxleaf Fleabane	<i>Conyza bonariensis</i>
Silverleaf Nightshade	<i>Solanum elaeagnifolium</i>
Feather Top Rhodes Grass	<i>Chloris virgata</i>
Ryegrass	<i>Lolium</i> spp.
Caltrop	<i>Tribulus terrestris</i>
Fat Hen	<i>Chenopodium album</i>
Marshmallow	<i>Malva parviflora</i>

Blackberry Nightshade was identified as the high priority weed in the feedback. An integrated weed management program incorporating mulch and inter-row grass cover should be used to reduce reliance on herbicides in orchards.

Resistance management

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

Specific resistance management strategies for high resistance risk (1 and 2) and moderate resistance risk (0, 3, 4, 5, 9, 10, 12, 14, 15, 22, 27 and 34) herbicide modes of action are available on the CropLife Australia webpage⁷.

This report uses the new numerical herbicide mode of action classifications. Refer to the CropLife website⁸ to compare these to the previous alphabetical classifications.

⁷ <https://www.croplife.org.au/resources/programs/resistance-management/herbicide-resistance-management-strategies-2/>

⁸ https://www.croplife.org.au/wp-content/uploads/2021/07/A2-poster_03_FINAL.pdf

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
Blackberry Nightshade (<i>Solanum nigrum</i>)							
Priority: High							
Rated as a high priority in VIC and as a low priority in NSW. Prolific weed that is widely adapted and difficult to eradicate, mainly due to its long-term seed viability.							
Amitrole	34**	Orchards / Directed Spray	Registered in orchards as a directed spray for the control of grass and broadleaf weeds, including Blackberry Nightshade . Apply as a directed spray.	56	A	ALL	-
Dichlobenil (Casoran)	29**	Orchards / Residual Weed Control	Registered in orchards for residual weed control of annual grass and broadleaf weeds.	NR	A	ALL	-
Flumioxazin (Chateau)	14**	Tree Nuts / Directed Spray / Residual Control	Registered in tree nuts as a directed spray for residual control of grass and broadleaf weeds, including Blackberry Nightshade . Apply to bare soil using a directed spray at the base of trees.	98 G:28	A	ALL	-

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

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

Couch Grass (*Cynodon dactylon*)

Priority: Moderate

Rated as a moderate priority in VIC and as a low priority in NSW. Couch Grass is an aggressive and highly competitive perennial grass that grows year-round in most areas. Herbicide control is effectively provided it is targeted to young, actively growing weeds. Multiple applications are usually required.

Amitrole	34**	Orchards / Directed Spray	Registered in orchards as a directed spray for the control of grass and broadleaf weeds. Apply as a directed spray.	56	A	ALL	R3
Dichlobenil (Casoran)	29**	Orchards / Residual Weed Control	Registered in orchards for residual weed control of annual grass and broadleaf weeds.	NR	A	ALL	R3
Glufosinate (Basta)	10**	Tree Nuts / Directed Spray	Registered in tree nuts for control of various grass and broadleaf weeds.	NR G:56	A	ALL	R3

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory Risk
Glyphosate (Roundup)	9**	Nut Trees / Directed Spray, Shielded Spray or Wick Wiper	Registered in nut trees for control of various grass and broadleaf weeds. Do not allow spray to contact any part of the vine, including the trunk.	NR	A	ALL	R3
Haloxypop (Verdict)	1***	Nut Tree / Directed Spray	Registered in nut trees for control of grass weeds, including Couch Grass . Apply as a directed spray.	NR	A	ALL	-
Nonanoic Acid (Beloukha)	-	Orchards / Directed Spray	Registered in orchards for control of grass and broadleaf weeds, including Couch Grass . Apply at early vegetative stage of weeds and repeat after 7 days if required.	NR	A	ALL	-
Paraquat (Gramoxone)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	1 G:7	A	ALL	R3
Paraquat + Amitrole (Guerrilla)	22** + 34**	Orchards / Directed Spray	Registered in orchards for control of annual weeds. Avoid contact with crop foliage.	NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of various annual grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	G:1	A	ALL	R3
Fluazifop-P (Fusilade)	1***		Registered as a directed spray for the control of grass weeds, including Couch Grass in blueberries, hops, peas, citrus and various tree fruits.		P		-
Norflurazon (Zoliar) AgNova	12**		Registered for control of various grass and broadleaf weeds, including Couch Grass in citrus, grapes, almonds, pome fruit and stone fruit.		P		-
Quizalofop-P-Ethyl	1***		Registered for control of various grass weeds, including Couch Grass in various vegetable crops.		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
Prickly Paddy Melon (<i>Cucumis myriocarpus</i>)							
Priority: Moderate							
Rated as a moderate priority in VIC and as a low priority in NSW. Summer growing annual vine that spreads rapidly and is difficult to control with herbicides.							
Amitrole	34**	Orchards / Directed Spray	Registered in orchards as a directed spray for the control of grass and broadleaf weeds. Apply as a directed spray.	56	A	ALL	R3
Dichlobenil (Casoran)	29**	Orchards / Residual Weed Control	Registered in orchards for residual weed control of annual grass and broadleaf weeds.	NR	A	ALL	R3
Glufosinate (Basta)	10**	Tree Nuts / Directed Spray	Registered in tree nuts for control of various grass and broadleaf weeds.	NR G:56	A	ALL	R3
Glyphosate (Roundup)	9**	Nut Trees / Directed Spray, Shielded Spray or Wick Wiper	Registered in nut trees for control of various grass and broadleaf weeds. Do not allow spray to contact any part of the vine, 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. Do not allow spray to contact any part of the tree, including the trunk.	1 G:7	A	ALL	R3
Paraquat + Amitrole (Guerrilla)	22** + 34**	Orchards / Directed Spray	Registered in orchards for control of annual weeds. Avoid contact with crop foliage.	NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass and broadleaf weeds, including Prickly Paddy Melon . Apply as a directed spray or spot spray. Ensure that the spray does not contact any part of the crop.	H:NR G:1	A	ALL	R3
Triclopyr (Garlon)	4**		Registered in sorghum and in fallows for control of Prickly Paddy Melon .		P		-

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory Risk
Flaxleaf Fleabane (<i>Coryza bonariensis</i>)							
Priority: Low							
Rated as a low priority in VIC and NSW. Flaxleaf Fleabane seeds prolifically and can germinate year-round. It is difficult to control with herbicides and a continuous program is required to manage it in the orchard.							
Amitrole	34**	Orchards / Directed Spray	Registered in orchards as a directed spray for the control of grass and broadleaf weeds. Apply as a directed spray.	56	A	ALL	R3
Dichlobenil (Casoran)	29**	Orchards / Residual Weed Control	Registered in orchards for residual weed control of annual grass and broadleaf weeds.	NR	A	ALL	R3
Flumioxazin (Chateau)	14**	Tree Nut / 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 trees.	98 G:28	A	ALL	-
Glufosinate (Basta)	10**	Tree Nuts / Directed Spray	Registered in Tree nuts for control of various grass and broadleaf weeds, including Flaxleaf Fleabane .	NR G:56	A	ALL	R3
Glyphosate (Roundup)	9**	Nut Trees / Directed Spray, Shielded Spray or Wick Wiper	Registered in nut trees for control of various grass and broadleaf weeds. Do not allow spray to contact any part of the vine, 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. Do not allow spray to contact any part of the tree, including the trunk.	1 G:7	A	ALL	R3
Paraquat + Amitrole (Guerrilla)	22** + 34**	Orchards / Directed Spray	Registered in orchards for control of annual weeds, including Flaxleaf Fleabane . Avoid contact with crop foliage.	NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	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. Ensure that the spray does not contact any part of the crop.	H:NR G:1	A	ALL	R3
Saflufenacil (Sharpen) BASF	14**		Registered for control of grass and broadleaf weeds, including Flaxleaf Fleabane , in citrus, pome and almond orchards.		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		-
Silverleaf Nightshade (<i>Solanum elaeagnifolium</i>)							
Priority: Low							
Rated as a low priority in VIC and NSW. Prolific weed that is widely adapted and difficult to eradicate, mainly due to its long-term seed viability.							
Dichlobenil (Casoran)	29**	Orchards / Residual Weed Control	Registered in orchards for residual weed control of annual grass and broadleaf weeds.	NR	A	ALL	-
Glufosinate (Basta)	10**	Tree Nuts / Directed Spray	Registered in tree nuts for control of various grass and broadleaf weeds.	NR G:56	A	ALL	R3
Glyphosate (Roundup)	9**	Nut Tree / Over 3 Years Old / Directed Spray, Shielded Spray or Wick Wiper	Registered in nut trees for control of various grass and broadleaf weeds, including Silverleaf Nightshade . Do not allow spray to contact any part of the tree, including the trunk.	NR	A	ALL	R3
Oryzalin	3**	Nuts / Non-Bearing Fruit / Directed Spray	Registered in nuts for control of various grass and broadleaf weeds, including Silverleaf Nightshade . Apply as a directed spray.	NR	A	ALL	-
Paraquat (Gramoxone)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	H:1 G:7	A	ALL	R3
Paraquat + Amitrole (Guerrilla)	22** + 34**	Orchards / Directed Spray	Registered in orchards for control of annual weeds. Avoid contact with crop foliage.	H:NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of various annual grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	G:1	A	ALL	R3

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory Risk
Pendimethalin (Stomp)	3**	Nuts / Directed Spray / Residual Weed Control	Registered in nuts for control of various grass and broadleaf weeds, including Silverleaf Nightshade . Do not allow spray to contact any part of the tree, including the trunk. Incorporate with at least 5mm of rainfall or spray irrigation as soon as possible but no later than 10 days after treatment.	NR	A	ALL	-
S-Metolachlor (Dual Gold) Syngenta	15**		Registered for control of grass and broadleaf weeds, including Silverleaf Nightshade in Brassica vegetables, Brassica leafy vegetables, sweet potatoes, spring onions, shallots, spinach, silverbeet, rhubarb, culinary herbs and beans.		P		-
Feather Top Rhodes Grass (<i>Chloris virgata</i>)							
Priority: Low							
Rated as a low priority in VIC and NSW. Feathertop Rhodes Grass is an aggressive grass weed that is difficult to control with herbicides. Multiple applications are required.							
Amitrole	34**	Orchards / Directed Spray	Registered in orchards as a directed spray for the control of grass and broadleaf weeds. Apply as a directed spray.	56	A	ALL	R3
Dichlobenil (Casoran)	29**	Orchards / Residual Weed Control	Registered in orchards for residual weed control of annual grass and broadleaf weeds.	NR	A	ALL	-
Flumioxazin (Chateau)	14**	Tree Nuts / Directed Spray / Residual Control	Registered in tree nuts as a directed spray for residual control of grass and broadleaf weeds, including Feather Top Rhodes Grass . Apply to bare soil using a directed spray at the base of trees.	98 G:28	A	ALL	-
Glufosinate (Basta)	10**	Tree Nuts / Directed Spray	Registered in tree nuts for control of various grass and broadleaf weeds.	NR G:56	A	ALL	R3
Glyphosate (Roundup)	9**	Nut Tree / Over 3 Years Old / Directed Spray, Shielded Spray or Wick Wiper	Registered in nut trees 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
Haloxyfop (Verdict)	1***	Nut Tree / Directed Spray	Registered in nut trees for control of grass weeds, including Feather Top Rhodes Grass . Apply as a directed spray.	NR	A	ALL	-
Paraquat (Gramoxone)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	H:1 G:7	A	ALL	R3
Paraquat + Amitrole (Guerrilla)	22** + 34**	Orchards / Directed Spray	Registered in orchards for control of annual weeds. Avoid contact with crop foliage.	H:NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of various annual grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	G:1	A	ALL	R3
Trifluralin	3**	Vineyards / Pre-Plant Residual	Registered in vineyards as a pre-plant residual for control of grass and broadleaf weeds, including Rhodes Grass . Apply to new planting during pre-plant cultivation.	NR	A	QLD, SA, WA, VIC & TAS	-
Fluazifop-P (Fusilade)	1***		Registered as a directed spray for the control of grass weeds, including Feather Top Rhodes Grass in blueberries, hops, peas, citrus and various tree fruits.		P		-
Quizalofop-P-Ethyl	1***		Registered for control of various grass weeds, including Feather Top Rhodes Grass in various vegetable crops.		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		-
Ryegrass (<i>Lolium</i> spp.)							
Priority: Low							
Rated as a low priority in VIC and NSW. The most serious grass weed of southern Australia with distribution that is gradually extending north. Populations are prone to herbicide resistance so integrated weed management and rotation of herbicide modes of action are important aspects of a long-term control strategy.							
Amitrole	34**	Orchards / Directed Spray	Registered in orchards as a directed spray for the control of grass and broadleaf weeds. Apply as a directed spray.	56	A	ALL	R3

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory Risk
Dichlobenil (Casoran)	29**	Orchards / Residual Weed Control	Registered in orchards for residual weed control of annual grass and broadleaf weeds.	NR	A	ALL	-
Flumioxazin (Chateau)	14**	Tree Nuts / Directed Spray / Residual Control	Registered in tree nuts as a directed spray for residual control of grass and broadleaf weeds, including Annual Ryegrass . Apply to bare soil using a directed spray at the base of trees.	98 G:28	A	ALL	-
Glufosinate (Basta)	10**	Tree Nuts / Directed Spray	Registered in tree nuts for control of various grass and broadleaf weeds.	NR G:56	A	ALL	R3
Glyphosate (Roundup)	9**	Nut Tree / Over 3 Years Old / Directed Spray, Shielded Spray or Wick Wiper	Registered in nut trees 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
Haloxypop (Verdict)	1***	Nut Tree / Directed Spray	Registered in nut trees for control of grass weeds, including Annual Ryegrass . Apply as a directed spray.	NR	A	ALL	-
Oryzalin	3**	Nuts / Non-Bearing Fruit / Directed Spray	Registered in nuts for control of various grass and broadleaf weeds, including Annual Ryegrass . Apply as a directed spray.	NR	A	ALL	-
Paraquat (Gramoxone)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	H:1 G:7	A	ALL	R3
Paraquat + Amitrole (Guerrilla)	22** + 34**	Orchards / Directed Spray	Registered in orchards for control of annual weeds. Avoid contact with crop foliage.	H:NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of various annual grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	G:1	A	ALL	R3

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory Risk
Pendimethalin (Stomp)	3**	Nuts / Directed Spray / Residual Weed Control	Registered in nuts for control of various grass and broadleaf weeds, including Annual Ryegrass . Do not allow spray to contact any part of the tree, including the trunk. Incorporate with at least 5mm of rainfall or spray irrigation as soon as possible but no later than 10 days after treatment.	NR	A	ALL	-
Trifluralin	3**	Orchards / Pre-Plant Residual	Registered in orchards for control of grass and broadleaf weeds, including Annual Ryegrass . Apply to new planting during pre-plant cultivation.	NR	A	QLD, SA, WA, VIC & TAS	-
Fluazifop-P (Fusilade)	1***		Registered as a directed spray for the control of grass weeds, including Annual Ryegrass in blueberries, hops, peas, citrus and various tree fruits.		P		-
Napropamide (Devrinol)	0**		Registered for control of various grass and broadleaf weeds, including Annual Ryegrass in almonds, grapevines, stone fruit and tomatoes.		P		-
Norflurazon (Zoliar) AgNova	12**		Registered for control of various grass and broadleaf weeds, including Annual Ryegrass in citrus, grapes, almonds, pome fruit and stone fruit.		P		-
Quizalofop-P-Ethyl	1***		Registered for control of various grass weeds, including Ryegrass in various vegetable crops.		P		-
Saflufenacil (Sharpen) BASF	14**		Registered for control of grass and broadleaf weeds, including Ryegrass , in citrus, pome and almond orchards.		P		-
Simazine	5**		Registered for control of grass and broadleaf weeds, including Annual Ryegrass in asparagus, berries, citrus, hops, pome fruit, vines, almonds, hazelnuts, walnuts, strawberries and leeks.		P		R3
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
Caltrop (<i>Tribulus terrestris</i>)							
Priority: Low							
Rated as a low priority in VIC and NSW. Caltrop is an annual summer-growing vine with sharp spiny burrs.							
Dichlobenil (Casoran)	29**	Orchards / Residual Weed Control	Registered in orchards for residual weed control of annual grass and broadleaf weeds.	NR	A	ALL	-
Glufosinate (Basta)	10**	Tree Nuts / Directed Spray	Registered in tree nuts for control of various grass and broadleaf weeds.	NR G:56	A	ALL	R3
Glyphosate (Roundup)	9**	Nut Tree / Over 3 Years Old / Directed Spray, Shielded Spray or Wick Wiper	Registered in nut trees 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
Oxyfluorfen (Goal)	14**	Tree Nut / Directed Spray / Tank Mix with Glyphosate, Paraquat or Paraquat/Diquat	Registered in tree nuts for control of various grass and broadleaf weeds, including Caltrop . 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. Do not allow spray to contact any part of the tree, including the trunk.	H:1 G:7	A	ALL	R3
Paraquat + Amitrole (Guerrilla)	22** + 34**	Orchards / Directed Spray	Registered in orchards for control of annual weeds. Avoid contact with crop foliage.	H:NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of various annual grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	G:1	A	ALL	R3
Trifluralin	3**	Orchards / Pre-Plant Residual	Registered in orchards for control of grass and broadleaf weeds, including Caltrop . Apply to new planting during pre-plant cultivation.	NR	A	QLD, SA, WA, VIC & TAS	-

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory Risk
Chlorthal-Dimethyl (Dacthal)	D**		Registered for control of grass and broadleaf weeds, including Caltrop , as a pre-emergence application in various vegetable crops.		P		-
Norflurazon (Zoliar) AgNova	F**		Registered for control of grass and broadleaf weeds including Caltrop in asparagus, citrus, grapes, nuts, stone & pome fruits.		P		-
NUL3438 Nufarm	TBC		New active in development, Nufarm claims activity on broadleaf weeds.		P		-
S-Metolachlor (Dual Gold) Syngenta	K**		Registered for control of grass and broadleaf weeds including Caltrop in maize, sweet corn, sorghum and sugar cane.		P		-
Fat Hen (<i>Chenopodium album</i>)							
Priority: Low							
Rated as a low priority in VIC and NSW. Fat Hen is a fast-growing woody annual weed, which can germinate throughout most of the year. Timely herbicide control is critical for managing this weed.							
Amitrole	34**	Orchards / Directed Spray	Registered in orchards as a directed spray for the control of grass and broadleaf weeds. Apply as a directed spray.	56	A	ALL	-
Dichlobenil (Casoran)	29**	Orchards / Residual Weed Control	Registered in orchards for residual weed control of annual grass and broadleaf weeds.	NR	A	ALL	-
Flumioxazin (Chateau)	14**	Tree Nuts / Directed Spray / Residual Control	Registered in tree nuts as a directed spray for residual control of grass and broadleaf weeds, including Fat Hen . Apply to bare soil using a directed spray at the base of trees.	98 G:28	A	ALL	-
Glufosinate (Basta)	10**	Tree Nuts / Directed Spray	Registered in tree nuts for control of various grass and broadleaf weeds.	NR G:56	A	ALL	R3
Glyphosate (Roundup)	9**	Nut Tree / Over 3 Years Old / Directed Spray, Shielded Spray or Wick Wiper	Registered in nut trees 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
Isoxaben (Gallery) Corteva	29**	Nut Trees / Residual Weed Control	Registered in nut trees for control of broadleaf weeds, including Fat Hen . Apply as a directed spray to weed-free, well prepared soil. Must be activated by at least 12.5mm of rainfall or sprinkler irrigation within 21 days of application.	NR	A	ALL	-
Nonanoic Acid (Beloukha)	-	Orchards / Directed Spray	Registered in orchards for control of grass and broadleaf weeds, including Fat Hen . Apply at early vegetative stage of weeds and repeat after 7 days if required.	NR	A	ALL	-
Oryzalin	3**	Nuts / Non-Bearing Fruit / Directed Spray	Registered in nuts for control of various grass and broadleaf weeds, including Fat Hen . Apply as a directed spray.	NR	A	ALL	-
Oxyfluorfen (Goal)	14**	Tree Nut / Directed Spray / Tank Mix with Glyphosate, Paraquat or Paraquat/Diquat	Registered in tree nuts for control of various grass and broadleaf weeds, including Fat Hen . If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	NR NG	A	ALL	-
Paraquat (Gramoxone)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	H:1 G:7	A	ALL	R3
Paraquat + Amitrole (Guerrilla)	22** + 34**	Orchards / Directed Spray	Registered in orchards for control of annual weeds. Avoid contact with crop foliage.	H:NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of various annual grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	G:1	A	ALL	R3
Trifluralin	3**	Orchards / Pre-Plant Residual	Registered in orchards for control of grass and broadleaf weeds, including Fat Hen . Apply to new planting during pre-plant cultivation.	NR	A	QLD, SA, WA, VIC & TAS	-

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 various grass and broadleaf weeds, including Fat Hen . Do not allow spray to contact any part of the tree, including the trunk. Incorporate with at least 5mm of rainfall or spray irrigation as soon as possible but no later than 10 days after treatment.	NR	A	ALL	-
Saflufenacil (Sharpen) BASF	14**		Registered for control of grass and broadleaf weeds, including Fat Hen , in citrus, pome and almond orchards.		P		-
Simazine	5**		Registered for control of grass and broadleaf weeds, including Fat Hen in asparagus, berries, citrus, hops, pome fruit, vines, almonds, hazelnuts, walnuts, strawberries and leeks.		P		R3
S-Metolachlor (Dual Gold) Syngenta	15**		Registered for control of grass and broadleaf weeds, including Fat Hen in Brassica vegetables, Brassica leafy vegetables, sweet potatoes, spring onions, shallots, spinach, silverbeet, rhubarb, culinary herbs and beans.		P		-
Marshmallow (<i>Malva parviflora</i>)							
Priority: Low							
Rated as a low priority in VIC and NSW. Adapted to a wide variety of environments and highly competitive weed. Control with knockdown herbicides can be unreliable.							
Amitrole	34**	Orchards / Directed Spray	Registered in orchards as a directed spray for the control of grass and broadleaf weeds. Apply as a directed spray.	56	A	ALL	-
Carfentrazone (Hammer)	14**	Tree Nuts / Directed Spray or Spot Spray	Registered in tree nuts for control of various broadleaf weeds, including Marshmallow . If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	NR G:14	A	ALL	-
Dichlobenil (Casoran)	29**	Orchards / Residual Weed Control	Registered in orchards for residual weed control of annual grass and broadleaf weeds.	NR	A	ALL	-

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory Risk
Flumioxazin (Chateau)	14**	Tree Nuts / Directed Spray / Residual Control	Registered in tree nuts as a directed spray for residual control of grass and broadleaf weeds, including Marshmallow . Apply to bare soil using a directed spray at the base of trees.	98 G:28	A	ALL	-
Glufosinate (Basta)	10**	Tree Nuts / Directed Spray	Registered in tree nuts for control of various grass and broadleaf weeds.	NR G:56	A	ALL	R3
Glyphosate (Roundup)	9**	Nut Tree / Over 3 Years Old / Directed Spray, Shielded Spray or Wick Wiper	Registered in nut trees 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 Trees / Residual Weed Control	Registered in nut trees for control of broadleaf weeds, including Marshmallow . Apply as a directed spray to weed-free, well prepared soil. Must be activated by at least 12.5mm of rainfall or sprinkler irrigation within 21 days of application.	NR	A	ALL	-
Oxyfluorfen (Goal)	14**	Tree Nut / Directed Spray / Tank Mix with Glyphosate, Paraquat or Paraquat/Diquat	Registered in tree nuts for control of various grass and broadleaf weeds, including Marshmallow . If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	NR NG	A	ALL	-
Paraquat (Gramoxone)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of annual grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	H:1 G:7	A	ALL	R3
Paraquat + Amitrole (Guerrilla)	22** + 34**	Orchards / Directed Spray	Registered in orchards for control of annual weeds. Avoid contact with crop foliage.	H:NR G:1	A	ALL	R3
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray or Spot Spray	Registered in orchards for control of various annual grass and broadleaf weeds. Do not allow spray to contact any part of the tree, including the trunk.	G:1	A	ALL	R3

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory Risk
Saflufenacil (Sharpen) BASF	14**		Registered for control of grass and broadleaf weeds, including Marshmallow , in citrus, pome and almond orchards.		P		-

4.4 Plant Growth Regulators in chestnut

4.4.1 Plant Growth Regulator priorities

PGR Issue
High
Control of suckers
Moderate
Control of Vegetative Growth
Advancement of Maturity

4.3.2 Available and potential plant growth regulators

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

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

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use	WHP (days)	Availability	States	Regulatory Risk
Control of Suckers							
Priority: High							
Rated as a high priority in VIC and as a low priority in NSW.							
2,4-D	4**		Registered for control of banana suckers.		P		R3
Control of Vegetative Growth							
Priority: Moderate							
Rated as a moderate priority in VIC and as a low priority in NSW.							
Paclobutrazol	PGR		Registered to reduce vegetative growth in mango, stone fruit and apples.		P		-
Prohexadione-Calcium (Regalis)	PGR		Registered for reduction of shoot growth in apples and cherries.		P		-

Active Ingredient (Trade Name)	Chemical Group	Crop / Situation	Comment / Use	WHP (days)	Availability	States	Regulatory Risk
Advancement of Maturity							
Priority: Moderate							
Rated as a high priority in VIC and as a low priority in NSW.							
Ethephon	PGR		Registered to promote evenness of maturity and early colour development in pome fruit, table grapes, citrus, cherries, peaches and tomatoes.		P		-
Methyl Esters of Fatty Acids (Waiken)	PGR		Registered to advance budbreak in apples, cherries and grapevines.		P		-
Cyanamide (Dormex) Nufarm	PGR		Registered for regulation of bud dormancy in apples, grapes, kiwi fruit, plums, almonds and walnuts.		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	https://www.legislation.gov.au/Details/F2022C00400
APVMA Permit search	https://productsearch.apvma.gov.au/permits
APVMA Product search	https://productsearch.apvma.gov.au/products
Codex MRL database	http://www.fao.org/fao-who-codexalimentarius/codex-texts/dbs/pestres/en/
Cotton Pest Management Guide 2022-23	https://www.cottoninfo.com.au/publications/cotton-pest-management-guide
CropLife Australia (Resistance Management)	https://www.croplife.org.au/resources/programs/resistance-management/
Growcom – Infopest Database	www.infopest.com.au
Hort Innovation	www.horticulture.com.au

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

Appendix 1. Products available for disease control in chestnut

Active Ingredient (Trade Name)	Chem. group	Situation	Diseases / Comments	States	WHP Days	Regulatory risk
1,3-dichloropropene + Chloropicrin (Agrocelone)	8B	Fruit & Nut Crops / Soil fumigant	Plant parasitic nematodes, symphylans, wireworms, soil borne diseases and suppression of weeds. <i>For use by professional and registered fumigators only.</i>	ALL	NR	-
Bromo Chloro Dimethyl Hydantoin (BCDMH)	-	Sanitiser / Post-Harvest Treatment	External Rot Causing Organisms	ALL	NR	-
Copper	M1	Tree Nuts	Anthracnose (<i>Colletotrichum</i> spp.) Pink Limb Blight (<i>Corticium salmonicolor</i>) Shot Hole (<i>Stigmina carpophila</i>) Leaf Curl (<i>Taphrina deformans</i>) Husk Spot (<i>Pseudocercospora macadamiae</i>) Walnut Blight (<i>Xanthomonas campestris pv juglans</i>)	ALL	1	-
Fludioxonil (Scholar)	12	Chestnuts / Post-Harvest Treatment	Suppression of Surface Moulds and Fungal Rots	ALL	NR	R3
Iprodione (Rovral) PER83636	2	Chestnuts / Post-Harvest Treatment	Suppression of Surface Moulds and Fungal Rots	ALL (excl. VIC)	NR	R2
Metalaxyl-M (Ridomil Gold 480SL) PER90388	4	Chestnuts / Soil Drench	Root & Collar Rot (<i>Phytophthora</i> spp.)	ALL	28 NG	-
Penthiopyrad (Fontelis) Corteva	7	Chestnuts	Brown Rot / Blossom Blight (<i>Monilinia</i> spp.)	ALL	14 NG	-
Peroxyacetic Acid	M	Sanitiser / Post-Harvest Treatment	Bacteria	ALL	NR	-
Peroxyacetic Acid + Hydrogen Peroxide PER91058	M	Chestnuts / Post-Harvest Treatment	Surface Moulds	ALL (excl. VIC)	NR	-

Active Ingredient (Trade Name)	Chem. group	Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Phosphorous Acid	33	Chestnut / Stem Injection	Suppression of Phytophthora Trunk & Root Canker (<i>Phytophthora cinnamomi</i>)	ALL (excl. QLD)	28	-
Phosphorous Acid PER15259	33	Chestnuts / Foliar Spray or Trunk Injection	Suppression of: Phytophthora Trunk & Root Canker (<i>Phytophthora cinnamomi</i>) Phomopsis Nut Rot (<i>Phomopsis castanea</i>)	NSW,SA, TAS & WA	28	-

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

Active Ingredient (Trade Name)	Chem. group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
1,3-dichloropropene + Chloropicrin (Agrocelone)	8B	Fruit & Nut Crops / Soil fumigant	Plant parasitic nematodes, symphylans, wireworms, soil borne diseases and suppression of weeds. <i>For use by professional and registered fumigators only.</i>	ALL	NR	-
4-(P-Acetoxyphenyl)-2-Butanone + Malathion	1B	Fruit Fly Trap	Queensland Fruit Fly	ALL	NR	R3
4-(P-Acetoxyphenyl) -2-Butanone + Fipronil	2B	Fruit Fly Trap	Queensland Fruit Fly (<i>Bactrocera tryoni</i>) Lesser Queensland Fruit Fly (<i>Bactrocera neohumeralis</i>)	ALL	NR	R3
Chlorantraniliprole (Altacor) FMC PER89353	28	Tree Nuts	Fall Armyworm (<i>Spodoptera frugiperda</i>)	ALL (excl. VIC)	10 NG	-
Chlorpyrifos PER13642	1B	Tree Nuts	Australian Plague Locust (<i>Chortoicetes terminifera</i>)	ALL (excl. VIC)	30 G:2	R1
Dimethoate PER13859	1B	Fruit Fly Host Crops / Non-Bearing Only	Fruit Fly	ALL	NR	R1
Maldison PER13642	1B	Tree Nuts	Australian Plague Locust (<i>Chortoicetes terminifera</i>)	ALL (excl. VIC)	NR G:2	R3
Potassium Salts of Fatty Acid (Natrasoap)	-	Nut Trees	Aphids Thrips Mealybug Two-Spotted Mite Spider Mite Whitefly	ALL	NR	-
Pyriproxyfen (Distance Ant Bait)	7C	Tree Nuts	Invasive & Nuisance Ants	ALL	NR	-
Spinosad (Naturalure) Corteva	5	Tree, Fruit, Nut, Vine & Vegetable Crops / Fruit Fly Bait	Queensland Fruit Fly (<i>Bactrocera tryoni</i>) Mediterranean Fruit Fly (<i>Ceratitis capitata</i>)	ALL	NR	-

Active Ingredient (Trade Name)	Chem. group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Sulfoxaflor (Transform) Corteva	4C	Tree Nuts	Green Peach Aphid Black Peach Aphid	ALL	7	-
Sulfuryl Fluoride	8C	Chestnut Storage Structures	Storage Pests	ALL	NR	-

Appendix 3. Products available for weed control in chestnut

Active ingredient (Trade Name)	Chem. Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Amitrole	34**	Orchards / Directed Spray	Grass and Broadleaf Weeds	56	ALL	-
Carfentrazone (Hammer)	14**	Tree Nuts / Directed Spray	Broadleaf Weeds	NR G:14	ALL	-
Dichlobenil (Casoran)	29**	Orchards / Residual Weed Control	Annual Grass and Broadleaf Weeds	NR	ALL	-
Flumioxazin (Chateau) Sumitomo	14**	Tree Nut / Directed Spray / Residual Weed Control	Annual Ryegrass (<i>Lolium rigidum</i>), Barnyard Grass (<i>Echinochloa colona</i>), Blackberry Nightshade (<i>Solanum nigrum</i>), Bluetop (<i>Ageratum houstonianum</i>), Capeweed (<i>Crassula colorata</i>), Creeping Speedwell (<i>Veronica persica</i>), Crowsfoot (<i>Eleusine indica</i>), Dwarf Nettle or Stinging Nettle (<i>Urtica urens</i>), Fat Hen (<i>Chenopodium album</i>), Feathertop Rhodes Grass (<i>Chloris virgata</i>), Fleabane (<i>Conyza bonariensis</i>), Green Summer Grass (<i>Brachiaria subquadripara</i>), Hog Weed (<i>Polygonum aviculare</i>), Marshmallow (<i>Malva parviflora</i>), Milk Thistle (<i>Sonchus oleraceus</i>), Pigweed (<i>Portulaca oleracea</i>), Small Flowered Mallow (<i>Modiola caroliniana</i>), Squirreltail Fescue (<i>Vulpia bromoides</i>), Summer Grass (<i>Digitaria ciliaris</i>), Toadrush (<i>Juncus bufonius</i>), Wild Mustard (<i>Sinapis arvensis</i>), Wild Radish (<i>Raphanus raphanistrum</i>), Wild Rose (<i>Cleome aculeate</i>), Wild Turnip (<i>Brassica tournefortii</i>)	98 G:28	ALL	-
Glufosinate (Basta)	10**	Tree Nut / Directed or Shielded Spray	Do not allow spray to contact any part of the tree, including the trunk. Grass and broadleaf weeds.	NR G:56	ALL	R3

Active ingredient (Trade Name)	Chem. Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Glyphosate (Roundup)	9**	Nut Trees / Over 3 Years Old / Directed Spray, Shielded Spray or Wick Wiper	Do not allow spray to contact any part of the tree, including the trunk. Grass and broadleaf weeds.	NR	ALL	R3
Haloxypop (Verdict)	1***	Nut Tree / Directed Spray	Couch, Rhodes Grass, Slender Rats Tail Grass, Buffel Grass, Green Panic, Johnson Grass, Kikuyu, Paspalum spp., Setaria spp., Annual Ryegrass, Barley Grass, Barnyard Grass, Brome Grass, Crowsfoot Grass, Lesser Canary Grass, Liverseed Grass, Mossman River Grass, Paradoxa Grass, Summer Grass, Volunteer Cereals, Wild Oats	NR	ALL	-
Isoxaben (Gallery) Corteva	29**	Nut Tree / Residual Weed Control	Broadleaf Weeds.	NR	ALL	-
Nonanoic Acid (Beloukha)	-	Orchards	Grass and Broadleaf Weeds	NR	ALL	-
Oryzalin	3**	Nuts / Residual Weed Control	Barnyard Grass, Guinea Grass, Love Grass, Paradoxa Grass, Pigeon Grass, Spiny Burr Grass, Summer Grass, Deadnettle, Fathen Fumitory, Pigweed, Sowthistle, Wireweed, Blackberry Nightshade, Caltrop, Paddymelon, Silverleaf Nightshade.	NR	ALL	-
Oxyfluorfen (Goal)	14**	Tree Nut / Directed Spray	Grass and broadleaf weeds. If weeds are already present, use as a spike in a mixture with glyphosate or paraquat.	NR NG	ALL	-
Paraquat (Gramoxone)	22**	Orchards / Directed Spray or Spot Spray	Annual Grass and broadleaf weeds	1 G:7	ALL	R3

Active ingredient (Trade Name)	Chem. Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Paraquat + Amitrole (Guerrilla)	22** + 34**	Orchards / Directed Spray	Annual Weeds Capeweed or <i>Erodium</i> spp.	NR G:1	QLD, VIC, SA, WA, TAS and NT	R3
			Annual Weeds Fat Hen Pigweed		NSW	
			Flaxleaf Fleabane		ALL	
Paraquat + Diquat (SpraySeed)	22**	Orchards / Directed Spray	Grass and Broadleaf Weeds	G:1	ALL	R3
Pendimethalin (Stomp)	3**	Nuts / Directed Spray / Residual Weed Control	Do not allow spray to contact any part of the tree, including the trunk. Grass and broadleaf weeds.	NR	ALL	-
Trifluralin	3**	Orchards / Pre-Plant Residual	Grass and Broadleaf Weeds	NR	QLD, SA, WA, VIC & TAS	-

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

Appendix 4. Plant growth regulators available in chestnut

Active ingredient (Trade Name)	Chem. Group	Situation	Comment / Use	WHP (days)	States	Regulatory risk
No plant growth regulators currently available.						

Appendix 5. Current permits for use in chestnut

Permit No.	Description	Issued Date	Expiry Date	Permit Holder
PER89353 Version 3	Chlorantraniliprole (Altacor) / Tree Nuts / Fall Armyworm	5-May-20	31-May-23	Hort Innovation
PER13642 Version 2	Chlorpyrifos & Maldison / Tree Nuts / Australian Plague Locust	1-Sep-12	30-Jun-25	ANIC c/-Hort Innovation
PER13859 Version 2	Dimethoate/ Fruit Fly Host Crops / Fruit Fly	09-Feb-15	31-Jul-24	Hort Innovation
PER83636 Version 2	Iprodione (Rovral) / Chestnuts / Surface Moulds & Fungal Rots	31-Mar-17	31-Mar-27	Hort Innovation
PER90388	Metalaxyl-M (Ridomil Gold 480SL) / Chestnut / Root & Collar Rot (<i>Phytophthora</i> spp.)	8-Jun-21	30-Jun-24	Hort Innovation
PER91058	Peroxyacetic Acid + Hydrogen Peroxide / Chestnuts (Post-Harvest) / Surface Moulds	30-Jun-21	30-Jun-26	Hort Innovation
PER15259 Version 2	Phosphorous Acid / Chestnuts / Suppression of Phytophthora & Phomopsis	27-Feb-15	30-Apr-25	Hort Innovation

Appendix 6. Chestnut Maximum Residue Limits (MRLs)

CODEX commodity groupings of tree nuts:

TN 0085 Tree nuts
TN 0664 Chestnuts

Note: Export of Australian chestnuts is negligible and accounts for less than one percent of total production. Most of this small volume currently goes to China, although there is considerable scope to expand exports into North America, Europe and the Middle East. Available information indicates that in the absence specific limits in legislation that most countries defer to Codex, followed by EU MRL standards or apply a 0.01 ppm default value. Food exported to New Zealand from Australia may be legally sold if it complies with Australian requirements. MRLs and legislation are subject to change; the values presented should not be relied on.

Chemical	Codex	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Abamectin	TN 0085	Tree nuts	-	*0.005
Acetamiprid	TN 0085	Tree nuts	-	0.06
Afidopyropen	TN 0085	Tree nuts	-	*0.01
Azoxystrobin	TN 0085	Tree nuts {except almonds; macadamia nuts}	2	-
	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}	-	*0.05
Buprofezin	TN 0085	Tree nuts	-	*0.05
Captan	TN 0085	Tree nuts {except almonds}	3	-
Carbaryl	TN 0085	Tree nuts	-	1
Carbendazim	TN 0085	Tree nuts	-	*0.1
Carfentrazone-ethyl	TN 0085	Tree nuts	*0.05	-
Chlorantraniliprole	TN 0085	Tree nuts	0.1	0.02
Chlorpropham	TN 0085	Tree nuts	T0.05	-
Clofentezine	TN 0085	Tree nuts	-	0.5
Cyantraniliprole	TN 0085	Tree nuts	-	0.04
Cyflumetofen	TN 0085	Tree nuts	-	*0.01
Cyhalothrin	TN 0085	Tree nuts	-	*0.01
Cypermethrins	TN 0085	Tree nuts	-	*0.05
Cyprodinil	TN 0085	Tree nuts {except almond; pistachio}	-	0.04
2,4-D	TN 0085	Tree nuts	-	0.2
Diafenthiuron	TN 0085	Tree nuts	0.1	-
Difenoconazole	TN 0085	Tree nuts	-	0.03
Diflubenzuron	TN 0085	Tree nuts	-	0.2
Diquat	TN 0085	Tree nuts	*0.05	-
Emamectin	TN 0085	Tree nuts	-	*0.0001
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

Chemical	Codex	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Fludioxonil	TN 0664	Chestnuts	1	-
Fluensulfone	TN 0085	Tree nuts	-	*0.02
Flumioxazin	TN 0085	Tree nuts	*0.02	*0.02
Flopyram	TN 0085	Tree nuts	-	0.04
Fluxapyroxad	TN 0085	Tree nuts	0.07	0.04
Fosetyl Al	TN 0085	Tree nuts	-	400
Glufosinate	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
Iprodione	TN 0664	Chestnuts	T10	-
Isoxaben	TN 0085	Tree nuts	*0.01	-
Maldison	TN 0085	Tree nuts	8	-
Mefentriconazole	TN 0085	Tree nuts	0.2	-
Mesotrione	TN 0085	Tree nuts	-	*0.01
Metalaxyl	TN 0664	Chestnuts	T0.05	-
Metconazole	TN 0085	Tree nuts	-	*0.04
Methoxyfenozide	TN 0085	Tree nuts	-	0.1
Methyl Bromide	TN 0085	Tree nuts {point of retail sale}	-	Po*0.01
	TN 0085	Tree nuts {point of entry into country}	-	Po10
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	-
Pyraclostrobin	TN 0085	Tree nuts {except pistachio nut; walnut}	0.07	-
	TN 0085	Tree nuts {except pistachio nut}	-	*0.02
Pyrethrins	TN 0085	Tree nuts	1	Po*0.5
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 0085	Tree nuts {except macadamia nuts}	0.02	-
	TN 0085	Tree nuts	-	0.03
Sulfuryl Flouride	TN 0085	Tree nuts	7	Po3
Tebuconazole	TN 0085	Tree nuts	-	*0.05

Chemical	Codex	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Thiacloprid	TN 0085	Tree nuts	-	0.02
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.

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

T =Temporary MRL

E = The MRL is based on extraneous residues

Sources: APVMA MRLs: Agricultural and Veterinary Chemicals Code (MRL Standard) Instrument 2019. Compilation 29. Prepared 11 November 2022. CODEX MRLs: CODEX Alimentarius International Food Standards database (January 2023), <http://www.fao.org/fao-who-codexalimentarius/codex-texts/dbs/pestres/en/>

Appendix 7. Chestnut Agrichemical Regulatory Risk Assessment

Chestnut Agrichemical Regulatory Risk Assessment

September 2022

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

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

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

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

Chestnut Agrichemical Regulatory Risk Assessment

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

Active Constituents	Chemical group	Problem	Comment
INSECT AND OTHER PESTS			
Chlorantraniliprole	28	Fall armyworm (PER89353)	
Chlorpyrifos (PER13642)	1B	Australian plague locust	APVMA: Under review. Codex: Scheduled for review by JMPR Canada: Cancellation of all uses. EU: No authorisation in place USA: EPA decision to cancel use on food crops
Indoxacarb	22A	Red imported fire ant Tropical fire ant	Canada: No authorisation EU: Authorisation not renewed. Grace period expires 19/9/2022
Maldison	1B	Australian plague locust (PER13642)	APVMA: Under review Codex: Re-evaluation scheduled for 2023/24 EU: Restricted use to permanent greenhouses
Pyriproxyfen	7C	Invasive and nuisance ants Red imported fire ant (PER85163 & PER87728 Qld only)	
S-methoprene	7A	Red imported fire ant (PER14093 & PER85308 Qld only) Yellow crazy ant (PER86559 NSW only)	EU: No authorisations in place
Sulfoxaflor	4C	Aphids Black peach aphid Green peach aphid	USA: Pollinator concerns EU: Restricted to permanent glasshouses only
Sulfuryl fluoride	8C	Storage pests	

Active Constituents	Chemical group	Problem	Comment
DISEASES			
Chlorine / Sodium hypochlorite	M	Surface moulds (PER13640)	
Copper	M1	Leaf curl	EU: Candidates for substitution
		Phytophthora stem canker	
		Chestnut blight (PER84607)	
Fludioxonil	12	Fungal rots	EU: Under review, & candidate for substitution
		Surface moulds	
Hydrogen peroxide +peroxyacetic acid	M	Surface moulds (PER91058)	
Iprodione	2	Fungal rots (PER83636)	Canada: Majority of food crop uses deleted Codex: Review scheduled EU: No authorisation in place USA: Proposed deletion or restriction of uses
		Surface moulds (PER83636)	
Metalaxyl-M	4	Root and collar rot (PER90388)	EU: Restricted use approval
Penthiopyrad	7	Brown rot (Blossom blight)	
Phosphorous acid	33	Phomopsis nut rot (PER15259)	
		Phytophthora Trunk and root canker (PER15259)	

Active Constituents	Chemical Group	Comments
WEEDS		
Carfentrazone-ethyl	14	
Flumioxazin	14	EU: Candidate for substitution
Glufosinate-ammonium	9	Canada: Review proposed EU: No authorisation in place
Glyphosate	10	EU: Under review Ongoing issues internationally
Haloxypop-P	1	EU: Not authorised
Isoxaben	29	
Oryzalin	3	EU: No authorisation in place
Oxyfluorfen	14	EU: Candidate for substitution USA: Interim review decision Label amendments proposed
Pendimethalin	3	EU: Candidate for substitution

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