



Onion

Strategic Agrichemical Review Process
(SARP)

August 2020

Hort Innovation
Project – MT19008

Hort Innovation Project Number:

MT19008 – Strategic Agrichemical Review Process (SARP) - Updates

SARP Service Provider:

AGK Services

Purpose of the report:

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

Date of report:

August 2020

Disclaimer:

Hort Innovation makes no representations and expressly disclaims all warranties (to the extent permitted by law) about the accuracy, completeness, or currency of information in the onion industry SARP Report. Users of this material should take independent action before relying on its accuracy in any way.

Reliance on any information provided by Hort Innovation is entirely at your own risk. Hort Innovation is not responsible for, and will not be liable for, any loss, damage, claim, expense, cost (including legal costs) or other liability arising in any way (including from Hort Innovation or any other person's negligence or otherwise) from your use or non-use of the onion industry SARP Report, or from reliance on information contained in the material or that Hort Innovation provides to you by any other means.

Legal Notice:

Copyright © Horticulture Innovation Australia Limited 2020

Copyright subsists in the Onion SARP. Horticulture Innovation Australia Limited (Hort Innovation) owns the copyright, other than as permitted under the Copyright ACT 1968 (Cth). The Onion SARP (in part or as a whole) cannot be reproduced, published, communicated, or adapted without the prior written consent of Hort Innovation. Any request or enquiry to use the Onion SARP should be addressed to:

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

**Hort
Innovation**
Strategic levy investment

**ONION
FUND**

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

Table of Contents

1. Summary	4
1.1 Diseases	5
1.2 Insects, Mites and Nematode Pests	5
1.3 Weeds.....	5
1.4 Plant Growth Regulators	5
2. The Australian Onion Industry	6
3. Introduction	7
3.1 Background	7
3.2 Minor use permits and registration	8
3.3 Methods	8
3.4 Results and discussions.....	9
3.4.1 Detail.....	9
3.4.2 Appendices	9
4. Diseases, pests and weeds of onions	10
4.1 Diseases of onion	11
4.1.1 Disease priorities	11
4.1.2 Available and potential products for priority diseases	13
4.2 Insects, mites and nematode pests of onions.....	29
4.2.1 Insect, mite and nematode pest priorities	29
4.2.2 Available and potential products for priority insects, mites and nematode pests.....	31
4.3 Weeds in onions.....	47
4.3.1 Weed priorities	47
4.3.2 Available and potential products for weed control	49
4.4 Plant Growth Regulators in Onions.....	70
4.4.1 Plant Growth Regulator Priorities.....	70
4.4.2 Available and Potential Plant Growth Regulators	71
5. References.....	72
5.1 Information:	72
5.2 Abbreviations and Definitions:	72
5.3 Acknowledgements:.....	72
6. Appendices	73
Appendix 1. Products available for disease control in onions	74
Appendix 2. Products available for control of insects, mites and nematode pests in onion.....	78
Appendix 3. Products available for weed control in onions	81
Appendix 4. Plant Growth Regulators available in onion.....	86
Appendix 5. Current permits for use in onions	87
Appendix 6. Onion Maximum Residue Limits (MRLs).....	88
Appendix 7. Onion regulatory risk assessment	91

1. Summary

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

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

Alternative pesticides should ideally be selected for benefits of:

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

The results of this process will provide the onion 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
Downy Mildew	<i>Peronospora destructor</i>
Pink Root	<i>Phoma terrestris</i>
Botrytis Neck and Bulb Rot	<i>Botrytis allii</i> and <i>B. aclada</i>
White Rot	<i>Sclerotium cepivorum</i>
Basal Rot	<i>Fusarium oxysporum</i>

1.2 Insects, Mites and Nematode Pests

The high priority insects, mites and nematode pests of onion are:

Common name	Scientific name
Onion Thrips	<i>Thrips tabaci</i>
Cutworms	<i>Agrostis</i> spp.

1.3 Weeds

The high priority weeds of onion are:

Common name	Scientific name
Wireweed	<i>Polygonum aviculare</i>
Fumitories	<i>Fumaria</i> spp.
Fat-Hen	<i>Chenopodium album</i>
Wild Radish	<i>Raphanus raphanistrum</i>
Annual Ryegrass	<i>Lolium rigidum</i>
Self-Sown Potato	<i>Solanum tuberosum</i>

1.4 Plant Growth Regulators

There were no high priority Plant Growth Regulator issues of onion identified. Inhibition of Sprouting was rated moderate overall but was rated as a high priority in South Australia and Tasmania.

2. The Australian Onion Industry

Onions are grown across most states of Australia, with the majority of production occurring in South Australia and Tasmania. Production for the year ending June 2019 was 258,195 tonnes of onions. The value of production was \$191 m while the wholesale value of the fresh supply was \$189 m. Seven percent of production was sent to processing, 18% to fresh export and the remaining 75% went to fresh supply of the domestic market.

Table 1 Fresh Onion Seasonality by State¹

State	18/19 Tonnes	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
New South Wales	6,604												
Victoria	7,877												
Queensland	27,723												
Western Australia	29,890												
South Australia	124,206												
Tasmania	61,289												
Northern Territory	605												
Availability Legend			High		Medium		Low					None	

There are several onion varieties grown in Australia, with the major varieties and their share of fresh production for the year ending June 2019 being:

- Brown Onions: 79%
- Red Onions: 19%
- White Onions: 1%
- Shallots / Spring Onions: <1%

Domestic consumption of onions is relatively flat, however strong growth in export volumes in recent years has underpinned growth of 4-5% in total production. Exports are sent to a large number of destinations, but the biggest volumes go to South East Asia and European markets.

¹ Hort Innovation (2020). Australian Horticulture Statistics Handbook 2018/19. [online] Available at: <https://www.horticulture.com.au/growers/help-your-business-grow/research-reports-publications-fact-sheets-and-more/australian-horticulture-statistics-handbook/>

3. Introduction

3.1 Background

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

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

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

In combination with cultural practices, pesticides are important tools in Onion 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 Onion industry regarding pesticide access, Hort Innovation undertook a review of the pesticide requirements via a Strategic Agrichemical Review Process (SARP) in 2014. The current project is to update the SARP with the latest information and progress.

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

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

For more information visit: <https://www.planthealthaustralia.com.au/industries/onions/>

3.2 Minor use permits and registration

From a pesticide access perspective, the APVMA classifies onions as a major crop. The crop fits within the APVMA Crop Group 009: Bulb Vegetables, and Subgroup 009A, Bulb Onions. Therefore, access to minor use permits can be relatively difficult. Possible justification for future permit applications could be based on:

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

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

3.3 Methods

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

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

3.4 Results and discussions

3.4.1 Detail

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

3.4.2 Appendices

Refer to additional information in the appendices:

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

4. Diseases, pests and weeds of onions

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

Information on regulatory risk derived from project MT17019 (Chapter 4) - Regulatory support and coordination (Appendix 7) has been incorporated.

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

4.1 Diseases of onion

4.1.1 Disease priorities

Common name	Scientific name
High	
Downy Mildew	<i>Peronospora destructor</i>
Pink Root	<i>Phoma terrestris</i>
Botrytis Neck and Bulb Rot	<i>Botrytis allii</i> and <i>B. aclada</i>
White Rot	<i>Sclerotium cepivorum</i>
Basal Rot	<i>Fusarium oxysporum</i>
Moderate	
Black Mould	<i>Aspergillus niger</i>
Bacterial Rot / Bacterial Blast	<i>Erwinia</i> spp., <i>Pseudomonas</i> spp. and others
Damping-Off	<i>Fusarium</i> spp., <i>Pythium</i> spp., <i>Rhizoctonia solani</i>
Low	
Purple Blotch	<i>Alternaria porri</i>
Bacterial Soft Rot	<i>Dickeya chrysanthemi</i> and <i>Pectobacterium carotovorum</i>
Botrytis Leaf Blight	<i>Botrytis squamosa</i>
Stemphylium Leaf Blight	<i>Stemphylium vesicarium</i>
Onion Stunt Syndrome	<i>Rhizoctonia complex</i>
Sclerotinia Rot	<i>Sclerotinia</i> spp.
Onion Smut	<i>Urocystis colchici</i>
Blue Mould	<i>Penicillium</i> spp.
Anthracnose / Onion Smudge	<i>Colletotrichum circinans</i>

There are several serious disease threats to onion production. Downy Mildew is rated the highest priority as it was in the 2014 Onion SARP Report. The disease is favoured by cool, humid conditions and the spores can survive in plant debris and soil. Cultural controls such as managing irrigation to reduce the duration of leaf wetness and use of crop rotations are important aspects of managing Downy Mildew.

Other high priority diseases are Pink Root, Botrytis Neck and Bulb Rot, White Rot and Basal Rot. All these diseases are soil-borne and can impact directly on the bulb, either in the field or post-harvest. Botrytis Neck Rot and White Rot were rated high priority in the 2014 SARP, Basal Rot has increased in priority from moderate and Pink Root was not mentioned in the 2014 SARP. Pink Root is a soil-borne disease that has received increased grower awareness in recent years due to the availability of varieties with tolerance to the disease. It has also been favoured by dry conditions experienced in recent years.

Black Mould was rated high priority in 2014 and is now rated moderate priority. Post-harvest treatments are critical in reducing the risk of bulb spoilage from Black Mould as well as other storage pathogens in onions.

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

<http://www.croplife.org.au/industry-stewardship/resistance-management>

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

<https://www.croplife.org.au/resources/programs/resistance-management/fungicide-resistance-management-strategies1/fungicide-resistance-management-strategies1-draft/>

4.1.2 Available and potential products for priority diseases

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

Availability		Regulatory risk (refer to Appendix 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
Downy Mildew (<i>Peronospora destructor</i>)							
Priority: High							
Downy Mildew infects onions in all growing regions, although NSW and South Australian regions rate it as moderate. The disease is favoured by mild temperatures and sustained periods of high humidity. Onions plants are weakened by Downy Mildew, but seldom killed.							
Azoxystrobin + Oxathiapiprolin (Orondis Flexi) Syngenta	11+49	Protectant & Curative	H:3 NG	A	ALL	Registered in bulb vegetables for control of Downy Mildew and suppression of White Rot. Apply at the first sign of disease or preferably preventatively when a disease predictive assessment shows conditions favourable to disease development. Apply a program of 2 consecutive sprays at 7-10 day intervals. Do not use more than 3 applications per crop.	-
Chlorothalonil (Bravo)	M5	Protectant	14	A	ALL	Registered in onions for control of Downy Mildew . Make the first application as soon as conditions favour the development of the disease. Repeat at 14 day intervals. Treatments per season not limited.	R3
Copper	M1	Protectant	1	A	ALL	Registered in onions for control of Downy Mildew . Apply when conditions favour disease development and repeat every 10-14 days while conditions favour infection. Treatments per season not limited.	-
Dimethomorph (Acrobat)	40	Protectant & Curative	7	A	ALL	Registered in onions for control of Downy Mildew , Leaf Blight and Purple Blotch. Apply when conditions favour disease development but before disease is evident. Apply 2 consecutive applications at 7-14 days apart, then change to a fungicide with a different mode of action. Do not use more than 4 applications per crop.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Hydrogen Peroxide + Peroxyacetic Acid (Peratec Plus)	M	Protectant	1	A	ALL	Registered in onions for control of Neck & Bulb Rot and Downy Mildew . Apply 2 consecutive applications at 5-7 day intervals. Do not use more than 4 applications per crop.	-
Mancozeb	M3	Protectant	7	A	ALL	Registered in onions for control of Downy Mildew and Purple Blotch. Apply when disease symptoms first appear and then repeat at 7-10 day intervals. Treatments per season not limited.	R2
Mancozeb + Benalaxyl	M3+4	Protectant & Curative	7	A	ALL	Registered in onions for control of Downy Mildew and Purple Blotch. Apply a sequence of 2 sprays at 7-10 day intervals whenever conditions favour disease development. Treatments per season not limited.	R2
Mancozeb + Dimethomorph (Acrobat WDG) BASF	M3+40	Protectant & Curative	7	A	ALL	Registered in onions for control of Downy Mildew and Purple Blotch. Apply when conditions favour disease development but before disease is evident. Apply 2 consecutive applications at 7-14 days apart, then change to a fungicide with a different mode of action. Do not use more than 4 applications per crop.	R2
Mancozeb + Metalaxyl (Ridomil Gold MZ) Syngenta	M3+4	Protectant & Curative	7	A	ALL	Registered in onions for control of Downy Mildew and Purple Blotch. Apply a sequence of 2 sprays at 7-10 day intervals whenever conditions favour disease development. Treatments per season not limited.	R2
Metiram (Polyram)	M3	Protectant	7	A	ALL	Registered in onions for control of Downy Mildew and Purple Blotch. Apply when disease symptoms first appear and then repeat at 7-10 day intervals. Treatments per season not limited.	R2
Oxathiapiprolin (Zorvec Enicade) Corteva	49	Protectant & Curative	10	A	ALL	Registered in onions for control of Downy Mildew . Apply up to 2 consecutive applications at 10-14 days apart. Do not use more than 2 applications per crop.	-
Phosphorous Acid PER13698	33	Protectant & Curative	1	A	ALL (Excl. VIC)	Permitted in bulb onion for suppression of Downy Mildew . Apply as a foliar spray when conditions favour disease development. Treatments per season not limited.	-
Propamocarb Hydrochloride + Fluopicolide (Infinito) Bayer	28+43	Protectant	7	A	ALL	Registered in bulb vegetables for control of Downy Mildew . Apply as a protectant program with a maximum of 3 applications per crop. Commence when conditions favour disease development – humid or wet conditions. Apply before first sign of infection according to mildew infection periods or local warnings and repeat at 7-10 day intervals.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Propineb (Antracol)	M3	Protectant	7	A	ALL	Registered in onions for control of Downy Mildew . Apply at intervals of 7-10 days from early in the lie of the crop. Treatments per season not limited.	R2
Propineb + Oxadixyl (Rebound) Kiwi Rural Products	M3+4	Protectant & Curative	14	A	ALL	Registered in onions for control of Downy Mildew . Apply a sequence of 2 sprays at 7-10 day intervals whenever conditions favour disease development. Treatments per season not limited.	R2
Zineb	M3	Protectant	7	A	NSW, VIC, SA, WA, TAS & QLD	Registered in onions for control of Downy Mildew , Purple Blotch and Blue Mould. Apply when disease threatens and repeat at 7-10 day intervals or as required. Treatments per season not limited.	R2
Cyazofamid (Ranman) ISK/UPL	21	Protectant & Curative		P		Registered for control of Downy Mildew in brassica leafy vegetables. No AU MRL. Codex MRL 1.5 mg/kg.	-
Dimethomorph + Ametoctradin (Zampro) AgNova	40+45	Protectant & Curative		P		Registered for control of Downy Mildew in grapes. Hort Innovation project ST16006, supported by an AgVet grant, is generating residue and efficacy trials to support a label registration for control of Downy Mildew in onions. Label registration extension anticipated in 2021. Dimethomorph: AU and Codex MRL 0.6 mg/kg Ametoctradin: AU and Codex MRL 1.5 mg/kg	-
Pink Root (<i>Phoma terrestris</i>)							
Priority: High							
Pink Root is a widespread soil-borne disease, although it tends to be a bigger issue in warmer growing regions. It causes the roots to turn pink and reduces root mass and vigour. This leads to smaller bulbs and delays in maturity. The fungus can survive in the soil for many years. There are no chemical control options, but tolerant varieties have become available in recent years.							
<i>Bacillus amyloliquefaciens</i> Strain QST 713 (Serenade Prime Soil Ameliorant and Biofungicide) Bayer	44	Biological Fungicide	NR	P-A	ALL	Registered in vegetable crops for application to soil to improve bioavailability of soil resources to horticultural crops. Provides suppression of soil-borne diseases such as Black Scurf in potatoes and Pineapple Disease in sugarcane and is also registered for control of Yellow Sigatoka in bananas as a foliar spray.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Botrytis Neck and Bulb Rot (<i>Botrytis allii</i> and <i>B. aclada</i>) Priority: High							
A high priority disease for all regions, Botrytis will infect the neck directly or through wounded tissue. The infection spreads to the bulb where it causes softness and discolouration of the tissue. The symptoms may not appear until after harvest. The effect on stored onions can be devastating as it can spread within storage bins and causes major marketability issues. The disease should be treated with fungicides in crop to prevent initial infection and post-harvest onions need to be stored in cool, low humidity conditions.							
Boscalid (Filan) BASF	7	Protectant	NR	A	ALL	Registered in onions for control of Neck Rot . Apply between flag leaf and 5 true leaf stage, when conditions favour development. Use a maximum of 2 applications applied 7-10 days apart. Do not apply later than 10 days after the commencement of bulbing.	-
Boscalid (Filan) BASF PER14602	7	Protectant / Onion Seed	NR	A	ALL (excl. VIC)	Permitted in onions for control of Neck Rot . Apply to the seed just prior to planting. Do not store treated onion seed.	-
Bromo Chloro Methyl Hydantoin (BCDMH) Sanitiser	-	Sanitiser / Post-harvest treatment	NR	A	ALL	Registered in vegetables as a post-harvest treatment for external rot causing organisms. Post-harvest spray or dip. Minimum contact time 60 seconds. Can also be used as a general disinfectant for equipment.	-
Chlorine	-	Sanitiser / Post-harvest treatment	NR	A	ALL	Registered in vegetables as a post-harvest treatment for bacteria and fungi. Post-harvest spray. Must make contact with the fruit for at least 30 seconds. Can also be used as a general disinfectant for equipment.	-
Fludioxonil + Cyprodinil (Switch) Syngenta	12+9	Protectant & Curative	7	A	ALL	Registered in onions for control of Neck Rot and suppression of Blue Mould. Apply at key timings for Botrytis control prior to or at onset of disease. Apply a second application 7-14 days after the initial application if conditions continue to remain favourable for disease development. Do not use more than 2 applications per crop.	-
Iodine	M	Sanitiser / Post-harvest dip	NR	A	ALL	Registered in onions as a post-harvest treatment for control of bacteria and fungi. Dip the bulbs for a minimum of 1 minute.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Iprodione (Rovral) + Chlorothalonil (Bravo) PER14602	2+M5	Protectant & Curative	NR	A	ALL (excl. VIC)	Permitted in onions for control of Neck Rot . Apply the 2 products together, with no more than 2 applications per crop at 7-10 days apart. Apply between flag leaf and the 5-true leaf stage or at the commencement of bulbing. Do not apply later than 10 days after the commencement of bulbing.	R2
Hydrogen Peroxide + Peroxyacetic Acid (Peratec Plus)	M	Protectant	1	A	ALL	Registered in allium vegetables for control of Neck & Bulb Rot and Downy Mildew. Apply 2 consecutive applications at 5-7 day intervals. Do not use more than 4 applications per crop.	-
Penthiopyrad (Fontelis) Corteva	7	Protectant & Curative	7	A	ALL	Registered in onions for control of Botrytis Blight, Neck Rot and Purple Blotch. Begin applications prior to disease development and continue on a 7-14 day interval. Do not use more than 2 sequential applications and do not use more than 5.25 L/ha total seasonal use (equivalent to 3 applications).	-
<i>Aureobasidium pullulans</i> (Botector) Nufarm	-	Biological / Protectant		P		Registered for control of Botrytis in grapes and berries. No MRLs required for biological product.	-
<i>Bacillus amyloliquefaciens</i> (Serifel) BASF	44	Biological / Protectant		P		Registered for control of Botrytis in grapes and strawberries. No MRLs required for biological product.	-
<i>Bacillus amyloliquefaciens</i> (strain QST 713) (Serenade Opti) Bayer	44	Biological / Protectant		P		Registered for control of Botrytis in grapes and strawberries. No MRLs required for biological product.	-
DC-126 Bayer	TBC			P		New product from Bayer with Botrytis activity.	-
Fenpyrazamine (Prolectus) Sumitomo	17	Protectant & Curative		P		Registered in AU for Botrytis control in grapes and has registrations for Botrytis control in the US for various crops. No MRL's for AU or Codex.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Florypicoxamid (Adavelt) Corteva	21	Protectant & Curative		P		New Mode of Action fungicide being developed in AU. Corteva claim activity on Botrytis. No MRL's for AU or Codex. Scheduled for JMPR evaluation in 2023.	-
NUL3195 Nufarm	TBC			P		New product from Nufarm with Botrytis activity.	-
SYNCUF29 Syngenta	TBC			P		New product from Syngenta with Botrytis activity.	-
White Rot (<i>Sclerotium cepivorum</i>)							
Priority: High							
White Rot is a serious disease that can cause large production losses in onions. It is rated as high priority in most regions, although SA rates it as low. The infection attacks the roots and base of the plant, causing collapse of foliage and can lead to rotting of the bulb. It is difficult to control with fungicides and the use of crop rotation and farm hygiene are critical aspects of controlling the disease.							
Azoxystrobin + Oxathiapiprolin (Orondis Flexi) Syngenta	11+49	Protectant & Curative	H:3 NG	A	ALL	Registered in bulb vegetables for control of Downy Mildew and suppression of White Rot . Apply at the first sign of disease or preferably preventatively when a disease predictive assessment shows conditions favourable to disease development. Apply a program of 2 consecutive sprays at 7-10 day intervals. Do not use more than 3 applications per crop.	-
Procymidone (Sumisclex)	2	Protectant / Seed Treatment	28	A	VIC, QLD, NSW, SA, TAS & NT	Registered in onions for control of White Rot . Apply to the seed prior to planting. Sow within 14 days of treatment. Seed treatment should be used in conjunction with soil applications to achieve satisfactory control. Treated seed germinates poorly in cold, wet soil. Where these conditions occur, use a soil spray without seed treatment.	-
Procymidone (Sumisclex)	2	Protectant / In-Furrow Application	28	A	VIC, QLD, NSW, SA & TAS	Registered in onions for control of White Rot . Apply with fertiliser in a band no more than 2cm directly below seed. In-furrow treatment must be combined with seed treatment to achieve satisfactory results.	-
Procymidone (Sumisclex)	2	Protectant / Soil Spray	28	A	VIC, QLD, NSW, SA & NT	Registered in onions for control of White Rot . Apply to the soil surface immediately after sowing and repeat application at 10 weeks after sowing. Disease control will be improved if used in conjunction with treated seed. A further soil spray may be necessary if frequent or extended periods of cool moist conditions occur later in the season. Do not spray directly over exposed seed in furrows before covering with soil.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Procymidone (Sumisclex)	2	Protectant / Transplant Dip	28	A	VIC, QLD, NSW & SA	Registered in onions for control of White Rot . Dip seedlings for up to 4 hours in fungicide suspension before transplanting. A supplementary soil spray may be necessary if frequent or extended periods of cool, moist conditions occur later in the season.	-
Tebuconazole	3	Protectant & Curative	NR	A	TAS	Registered in onions for control of White Root Rot . Apply with lime super when sowing onion seed, either mixed in the same box on the drill or placed in different boxes and sown down the same tube. Apply in a bandwidth of 2cm.	R3
Triadimenol (Allitron) FMC	3	Protectant & Curative	28	A	ALL	Registered in onions for control of White Rot . Apply 6-8 weeks after planting, then 2 further applications at 3-4 week intervals. The use of a suitable seed treatment is recommended.	R3
<i>Bacillus amyloliquefaciens</i> Strain QST 713 (Serenade Prime Soil Ameliorant and Biofungicide) Bayer	44	Biological Fungicide	NR	P-A	ALL	Registered in vegetable crops for application to soil to improve bioavailability of soil resources to horticultural crops. Provides suppression of soil-borne diseases such as Black Scurf in potatoes and Pineapple Disease in sugarcane and is also registered for control of Yellow Sigatoka in bananas as a foliar spray.	-
Basal Rot (<i>Fusarium oxysporum</i>)							
Priority: High							
Soil-borne disease that is widespread in most regions but rated as low priority in Qld. Infected roots are dark brown and flattened, and the leaves of affected plants show yellowing, curling and eventually wither and decay as a result of the compromised root system. Can cause discolouration of the bulb. Cultural controls recommended including crop rotation and the use of resistant varieties.							
<i>Bacillus amyloliquefaciens</i> Strain QST 713 (Serenade Prime Soil Ameliorant and Biofungicide) Bayer	44	Biological Fungicide	NR	P-A	ALL	Registered in vegetable crops for application to soil to improve bioavailability of soil resources to horticultural crops. Provides suppression of soil-borne diseases such as Black Scurf in potatoes and Pineapple Disease in sugarcane and is also registered for control of Yellow Sigatoka in bananas as a foliar spray.	-
NUL3163 Nufarm	TBC			P		New active in development from Nufarm with activity on <i>Fusarium</i> .	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Black Mould (<i>Aspergillus niger</i>)							
Priority: Moderate							
Significance varies between regions, with Black Mould being rated high priority in Qld and low in NSW and Tas. The disease causes black discolouration on the outer fleshy bulb scale of harvested onions. Infected tissue develops first as a water-soaked area and over time will dry and shrivel. Post-harvest storage conditions should be cool and dry and bruising of bulb should be avoided.							
Bromo Chloro Methyl Hydantoin (BCDMH) Sanitiser	-	Sanitiser / Post-harvest treatment	NR	A	ALL	Registered in vegetables as a post-harvest treatment for external rot causing organisms. Post-harvest spray or dip. Minimum contact time 60 seconds. Can also be used as a general disinfectant for equipment.	-
Chlorine	-	Sanitiser / Post-harvest treatment	NR	A	ALL	Registered in vegetables as a post-harvest treatment for bacteria and fungi. Post-harvest spray. Must make contact with the fruit for at least 30 seconds. Can also be used as a general disinfectant for equipment.	-
Iodine	M	Sanitiser / Post-harvest dip	NR	A	ALL	Registered in onions as a post-harvest treatment for control of bacteria and fungi. Dip the bulbs for a minimum of 1 minute.	-
<i>Bacillus amyloliquefaciens</i> Strain QST 713 (Serenade Prime Soil Ameliorant and Biofungicide) Bayer	44	Biological Fungicide	NR	P-A	ALL	Registered in vegetable crops for application to soil to improve bioavailability of soil resources to horticultural crops. Provides suppression of soil-borne diseases such as Black Scurf in potatoes and Pineapple Disease in sugarcane and is also registered for control of Yellow Sigatoka in bananas as a foliar spray.	-
Bacterial Rot / Bacterial Blast (<i>Erwinia</i> spp., <i>Pseudomonas</i> spp. and others)							
Priority: Moderate							
A moderate priority in southern growing regions, but not an issue for onion growers in NSW and Qld. Leads to stunting of plants and reduction of bulb size. The use of overhead irrigation should be avoided. Applications of copper may reduce disease spread and infection.							
Bromo Chloro Methyl Hydantoin (BCDMH) Sanitiser	-	Sanitiser / Post-harvest treatment	NR	A	ALL	Registered in vegetables as a post-harvest treatment for external rot causing organisms. Post-harvest spray or dip. Minimum contact time 60 seconds. Can also be used as a general disinfectant for equipment.	-
Chlorine	-	Sanitiser / Post-harvest treatment	NR	A	ALL	Registered in vegetables as a post-harvest treatment for bacteria and fungi. Post-harvest spray. Must make contact with the fruit for at least 30 seconds. Can also be used as a general disinfectant for equipment.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Iodine	M	Sanitiser / Post-harvest dip	NR	A	ALL	Registered in onions as a post-harvest treatment for control of bacteria and fungi. Dip the bulbs for a minimum of 1 minute.	-
Peroxyacetic Acid	M	Sanitiser / Post-Harvest Treatment	NR	A	ALL	Registered in vegetables as a post-harvest treatment for control of bacterial growth. Spray bulbs or submerge them in solution. Ensure a minimum contact time of 45 seconds.	-
<i>Bacillus amyloliquefaciens</i> Strain QST 713 (Serenade Prime Soil Ameliorant and Biofungicide) Bayer	44	Biological Fungicide	NR	P-A	ALL	Registered in vegetable crops for application to soil to improve bioavailability of soil resources to horticultural crops. Provides suppression of soil-borne diseases such as Black Scurf in potatoes and Pineapple Disease in sugarcane and is also registered for control of Yellow Sigatoka in bananas as a foliar spray.	-
Copper	M1	Protectant	1	P-A	ALL	Registered in onions for control of Downy Mildew. Registered in various crops for control of bacterial diseases.	-
Damping-Off (<i>Fusarium</i> spp., <i>Pythium</i> spp., <i>Rhizoctonia</i> spp.)							
Priority: Moderate							
Rated as moderate priority in most regions and high significance in SA. The disease attacks seedlings at the 1-2 leaf stage, causing water-soaked lesions on the stem and roots. Severe infections can cause stunting and yellowing in older crops. No fungicide treatments are registered for control although it is expected that seed treatments will assist, good on-farm sanitation is recommended.							
<i>Bacillus amyloliquefaciens</i> Strain QST 713 (Serenade Prime Soil Ameliorant and Biofungicide) Bayer	44	Biological Fungicide	NR	P-A	ALL	Registered in vegetable crops for application to soil to improve bioavailability of soil resources to horticultural crops. Provides suppression of soil-borne diseases such as Black Scurf in potatoes and Pineapple Disease in sugarcane and is also registered for control of Yellow Sigatoka in bananas as a foliar spray.	-
NUL3163 Nufarm	TBC			P		New active in development from Nufarm with activity on <i>Fusarium</i> , <i>Pythium</i> and <i>Rhizoctonia</i> .	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Purple Blotch (<i>Alternaria porri</i>) Priority: Low							
Purple Blotch is not an issue in most regions, although rated as a moderate priority in Qld. The disease causes leaf lesions which can spread and cause the whole leaf to collapse and die. When bulb infection occurs, it is normally through the neck. The infected area of the bulb first turns bright yellow and then turns red. A protectant fungicide program provides effective control. The use of surface irrigation is recommended rather than sprinklers.							
Dimethomorph (Acrobat) BASF	40	Protectant & Curative	7	A	QLD, NT	Registered in onions for control of Downy Mildew, Leaf Blight and Purple Blotch . Apply when conditions favour disease development but before disease is evident. Apply 2 consecutive applications at 7-14 days apart, then change to a fungicide with a different mode of action. Do not use more than 4 applications per crop.	-
Mancozeb	M3	Protectant	7	A	ALL	Registered in onions for control of Downy Mildew and Purple Blotch . Apply when disease symptoms first appear and then repeat at 7-10 day intervals. Treatments per season not limited.	R2
Mancozeb + Benalaxyl	M3+4	Protectant & Curative	7	A	QLD	Registered in onions for control of Downy Mildew and Purple Blotch . Apply a sequence of 2 sprays at 7-10 day intervals whenever conditions favour disease development. Treatments per season not limited.	R2
Mancozeb + Dimethomorph (Acrobat WDG) BASF	M3+40	Protectant & Curative	7	A	QLD, NT	Registered in onions for control of Downy Mildew and Purple Blotch . Apply when conditions favour disease development but before disease is evident. Apply 2 consecutive applications at 7-14 days apart, then change to a fungicide with a different mode of action. Do not use more than 4 applications per crop.	R2
Mancozeb + Metalaxyl (Ridomil Gold MZ) Syngenta	M3+4	Protectant & Curative	7	A	QLD	Registered in onions for control of Downy Mildew and Purple Blotch . Apply a sequence of 2 sprays at 7-10 day intervals whenever conditions favour disease development. Treatments per season not limited.	R2
Metiram (Polyram)	M3	Protectant	7	A	ALL	Registered in onions for control of Downy Mildew and Purple Blotch . Apply when disease symptoms first appear and then repeat at 7-10 day intervals. Treatments per season not limited.	R2
Penthiopyrad (Fontelis) Corteva	7	Protectant & Curative	7	A	ALL	Registered in onions for control of Botrytis Blight, Neck Rot and Purple Blotch . Begin applications prior to disease development and continue on a 7-14 day interval. Do not use more than 2 sequential applications and do not use more than 5.25 L/ha total seasonal use (equivalent to 3 applications).	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Zineb	M3	Protectant	7	A	NSW, VIC, SA, WA, TAS & QLD	Registered in onions for control of Downy Mildew, Purple Blotch and Blue Mould. Apply when disease threatens and repeat at 7-10 day intervals or as required. Treatments per season not limited.	R2
Florypicoxamid (Adavelt) Corteva	21	Protectant & Curative		P		New active in development from Corteva with activity on <i>Alternaria</i> spp. No MRL's for AU or Codex. Scheduled for JMPR evaluation in 2023.	-
Fluopyram + Trifloxystrobin (Luna Sensation) Bayer	7+11	Protectant & Curative		P		Registered in apples for suppression of Alternaria Leaf Blight. Fluopyram: No AU MRL. Codex MRL 0.07 mg/kg. Trifloxystrobin: No MRL's for AU or Codex.	-
Mefentrifluconazole (Belanty) BASF	3	Protectant & Curative		P		Registered in apples for control of Black Spot and grapes for control of Powdery Mildew. BASF claim activity on <i>Alternaria</i> spp. No MRL's for AU or Codex.	-
NUL3446 Nufarm	TBC			P		New active in development from Nufarm with activity on <i>Alternaria</i> spp.	-
Pyraclostrobin + Fluxapyroxad (Merivon) BASF	11+7	Protectant & Curative		P		Registered in almonds for control of Alternaria Leaf Spot. Pyraclostrobin: AU & Codex MRL 1.5 mg/kg. Fluxapyroxad: AU MRL 1.5 mg/kg. Codex MRL 0.6 mg/kg.	-
Bacterial Soft Rot (<i>Dickeya chrysanthemi</i> and <i>Pectobacterium carotovorum</i>)							
Priority: Low							
Rated as a moderate priority in SA but not an issue in other regions. Infections mainly occur in mature bulbs, resulting in a watery, foul-smelling liquid that can be squeezed from the neck of diseased bulbs. The use of overhead irrigation should be avoided. Applications of copper may reduce disease spread and infection.							
Bromo Chloro Methyl Hydantoin (BCDMH) Sanitiser	-	Sanitiser / Post-harvest treatment	NR	A	ALL	Registered in vegetables as a post-harvest treatment for external rot causing organisms. Post-harvest spray or dip. Minimum contact time 60 seconds. Can also be used as a general disinfectant for equipment.	-
Chlorine	-	Sanitiser / Post-harvest treatment	NR	A	ALL	Registered in vegetables as a post-harvest treatment for bacteria and fungi. Post-harvest spray. Must make contact with the fruit for at least 30 seconds. Can also be used as a general disinfectant for equipment.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Iodine	M	Sanitiser / Post-harvest dip	NR	A	ALL	Registered in onions as a post-harvest treatment for control of bacteria and fungi. Dip the bulbs for a minimum of 1 minute.	-
Peroxyacetic Acid	M	Sanitiser / Post-Harvest Treatment	NR	A	ALL	Registered in vegetables as a post-harvest treatment for control of bacterial growth. Spray bulbs or submerge them in solution. Ensure a minimum contact time of 45 seconds.	-
<i>Bacillus amyloliquefaciens</i> Strain QST 713 (Serenade Prime Soil Ameliorant and Biofungicide) Bayer	44	Biological Fungicide	NR	P-A	ALL	Registered in vegetable crops for application to soil to improve bioavailability of soil resources to horticultural crops. Provides suppression of soil-borne diseases such as Black Scurf in potatoes and Pineapple Disease in sugarcane and is also registered for control of Yellow Sigatoka in bananas as a foliar spray.	-
Copper	M1	Protectant	1	P-A	ALL	Registered in onions for control of Downy Mildew. Registered in various crops for control of bacterial diseases.	-
Botrytis Leaf Blight (<i>Botrytis squamosa</i>)							
Priority: Low							
Botrytis Leaf Blight is only a problem in SA, where growers rate is a high priority. The disease attacks the leaves, causing lesions and dieback of the leaf tips. Severe infections can lead to substantial leaf loss which can cause reduction of bulb size. Protectant fungicides are effective for managing the disease.							
Dimethomorph (Acrobat) BASF	40	Protectant & Curative	7	A	ALL	Registered in onions for control of Downy Mildew, Leaf Blight and Purple Blotch. Apply when conditions favour disease development but before disease is evident. Apply 2 consecutive applications at 7-14 days apart, then change to a fungicide with a different mode of action. Do not use more than 4 applications per crop.	-
Penthiopyrad (Fontelis) Corteva	7	Protectant & Curative	7	A	ALL	Registered in onions for control of Botrytis Blight , Neck Rot and Purple Blotch. Begin applications prior to disease development and continue on a 7-14 day interval. Do not use more than 2 sequential applications and do not use more than 5.25 L/ha total seasonal use (equivalent to 3 applications).	-
<i>Aureobasidium pullulans</i> (Botector) Nufarm	-	Biological / Protectant		P		Registered in various berry crops for control of Botrytis Grey Mould. No MRLs required for biological product.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
<i>Bacillus amyloliquefaciens</i> (Serifel) BASF	44	Biological / Protectant		P		Registered in grapes and strawberries for control of Botrytis. No MRLs required for biological product.	-
<i>Bacillus amyloliquefaciens</i> (strain QST 713) (Serenade Opti) Bayer	44	Biological / Protectant		P		Registered in grapes and strawberries for control of Botrytis. No MRLs required for biological product.	-
DC-126 Bayer	TBC			P		New active in development from Bayer with activity on Botrytis.	-
Fenpyrazamine (Prolectus) Sumitomo	17	Protectant & Curative		P		Registered in AU for Botrytis control in grapes and has registrations for Botrytis control in the US for various crops. No MRL's for AU or Codex.	-
Florypicoxamid (Adavelt) Corteva	21	Protectant & Curative		P		New Mode of Action fungicide being developed in AU. Corteva claim activity on Botrytis. No MRL's for AU or Codex. Schedule for JMPR evaluation in 2023.	-
NUL3195 Nufarm	TBC			P		New product from Nufarm with Botrytis activity.	-
SYNCUF29 Syngenta	TBC			P		New product from Syngenta with Botrytis activity.	-
Stemphylium Leaf Blight (<i>Stemphylium vesicarium</i>)							
Priority: Low							
Rated as a moderate priority in SA but not an issue in other regions. Symptoms are similar to Purple Blotch, with infection causing leaf lesions which can expand and lead to total leaf loss. Bulb size may be reduced in cases of severe leaf loss. Limited label claims available in onions although regular protectants are likely to provide control.							
Dimethomorph (Acrobat) BASF	40	Protectant & Curative	7	A	ALL	Registered in onions for control of Downy Mildew, Leaf Blight and Purple Blotch. Apply when conditions favour disease development but before disease is evident. Apply 2 consecutive applications at 7-14 days apart, then change to a fungicide with a different mode of action. Do not use more than 4 applications per crop.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Onion Stunt Syndrome (<i>Rhizoctonia</i> complex) Priority: Low							
Onion Stunt Syndrome only a problem in SA, where growers rate as a high priority. It occurs in fields which are rotated with cereal crops. The disease causes stunting as a result of a root infection from the soil-borne pathogen. There are no fungicide options available.							
<i>Bacillus amyloliquefaciens</i> Strain QST 713 (Serenade Prime Soil Ameliorant and Biofungicide) Bayer	44	Biological Fungicide	NR	P-A	ALL	Registered in vegetable crops for application to soil to improve bioavailability of soil resources to horticultural crops. Provides suppression of soil-borne diseases such as Black Scurf in potatoes and Pineapple Disease in sugarcane and is also registered for control of Yellow Sigatoka in bananas as a foliar spray.	-
Sedaxane + Fludioxonil (Vibrance Premium) Syngenta	7+12	Protectant & Curative		P		Registered as a seed treatment in potato for control of Black Scurf (<i>Rhizoctonia</i> spp.) Sedaxane: No MRLs for AU or Codex. Fludioxonil: AU MRL 0.2 mg/kg, Codex MRL 0.5 mg/kg.	-
Sclerotinia Rot (<i>Sclerotinia</i> spp.) Priority: Low							
Rated as a moderate priority in SA but not an issue in other regions.							
NUL3446 Nufarm	TBC			P		New active in development from Nufarm with activity on Sclerotinia.	-
Onion Smut (<i>Urocystis colchici</i>) Priority: Low							
Onion Smut is only a problem in SA, where growers rate it as a high priority. A soil-borne disease which attacks crops at the seedling stage.							
<i>Bacillus amyloliquefaciens</i> Strain QST 713 (Serenade Prime Soil Ameliorant and Biofungicide) Bayer	44	Biological Fungicide	NR	P-A	ALL	Registered in vegetable crops for application to soil to improve bioavailability of soil resources to horticultural crops. Provides suppression of soil-borne diseases such as Black Scurf in potatoes and Pineapple Disease in sugarcane and is also registered for control of Yellow Sigatoka in bananas as a foliar spray.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Blue Mould (<i>Penicillium</i> spp.)							
Priority: Low							
Low priority in all regions. Infection typically enters the bulbs through plant wounds. Symptoms usually appear during harvest and storage.							
Bromo Chloro Methyl Hydantoin (BCDMH) Sanitiser	-	Sanitiser / Post-harvest treatment	NR	A	ALL	Registered in vegetables as a post-harvest treatment for external rot causing organisms. Post-harvest spray or dip. Minimum contact time 60 seconds. Can also be used as a general disinfectant for equipment.	-
Chlorine	-	Sanitiser / Post-harvest treatment	NR	A	ALL	Registered in vegetables as a post-harvest treatment for bacteria and fungi. Post-harvest spray. Must make contact with the fruit for at least 30 seconds. Can also be used as a general disinfectant for equipment.	-
Iodine	M	Sanitiser / Post-harvest dip	NR	A	ALL	Registered in onions as a post-harvest treatment for control of bacteria and fungi. Dip the bulbs for a minimum of 1 minute.	-
Peroxyacetic Acid	M	Sanitiser / Post-Harvest Treatment	NR	A	ALL	Registered in vegetables as a post-harvest treatment for control of bacterial growth. Spray bulbs or submerge them in solution. Ensure a minimum contact time of 45 seconds.	-
Zineb	M3	Protectant	7	A	NSW, VIC, SA, WA, TAS & QLD	Registered in onions for control of Downy Mildew, Purple Blotch and Blue Mould . Apply when disease threatens and repeat at 7-10 day intervals or as required. Treatments per season not limited.	R2
Anthracnose / Onion Smudge (<i>Colletotrichum circinans</i>)							
Priority: Low							
Low priority in all regions. Primarily affects white onions at harvest and during storage, causing unsightly damage to the bulbs which can reduce market value. No fungicides are registered for control although it is thought that protectants that target Downy Mildew and Botrytis will have some effect and post-harvest treatments would afford protection as well.							
Bromo Chloro Methyl Hydantoin (BCDMH) Sanitiser	-	Sanitiser / Post-harvest treatment	NR	A	ALL	Registered in vegetables as a post-harvest treatment for external rot causing organisms. Post-harvest spray or dip. Minimum contact time 60 seconds. Can also be used as a general disinfectant for equipment.	-
Chlorine	-	Sanitiser / Post-harvest treatment	NR	A	ALL	Registered in vegetables as a post-harvest treatment for bacteria and fungi. Post-harvest spray. Must make contact with the fruit for at least 30 seconds. Can also be used as a general disinfectant for equipment.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Iodine	M	Sanitiser / Post-harvest dip	NR	A	ALL	Registered in onions as a post-harvest treatment for control of bacteria and fungi. Dip the bulbs for a minimum of 1 minute.	-
Azoxystrobin + Fludioxonil (Graduate A+) Syngenta	11+12	Protectant & Curative		P		Registered in avocado for post-harvest control of Anthracnose Rots. Azoxystrobin: AU MRL 0.2 mg/kg, Codex MRL 10 mg/kg. Fludioxonil: AU MRL 0.2 mg/kg, Codex MRL 0.5 mg/kg.	-

4.2 Insects, mites and nematode pests of onions

4.2.1 Insect, mites and nematode pest priorities

Common name	Scientific name
High	
Onion Thrips	<i>Thrips tabaci</i>
Cutworms	<i>Agrostis</i> spp.
Moderate	
Plague Thrips	<i>Thrips imaginis</i>
Western Flower Thrips	<i>Frankliniella occidentalis</i>
Low	
Onion Maggot	<i>Delia platura</i>
Wireworm	<i>Heteroderes</i> spp.
Root-Knot Nematode	<i>Meloidogyne</i> spp.
Stumpy Root Nematode	<i>Pratylenchus</i> spp.
Whitefringed Weevil	<i>Naupactus leucoloma</i>
Common Blossom Thrips	<i>Frankliniella schultzei</i>
Native Budworm	<i>Helicoverpa punctigera</i>
Cotton Bollworm	<i>Helicoverpa armigera</i>
Cluster Caterpillar	<i>Spodoptera</i> spp.
Earwigs	<i>Dermaptera</i>
Redlegged Earth Mite	<i>Halotydeus destructor</i>
Strawberry Beetle	<i>Coleoptera</i>
Onion Aphid	<i>Neotoxoptera formosana</i>
Jassids / Leafhoppers	<i>Cicadellidae</i>
Rutherglen Bug	<i>Nysius vinitor</i>
Green Vegetable Bug	<i>Nezara viridula</i>
Green Mirid	<i>Creontiades dilutus</i>
Grey Cluster Bug	<i>Nysius clevelandensis</i>
Field Crickets	<i>Gryllidae</i>
Black Field Cricket	<i>Teleogryllus commodus</i>
Mole Crickets	<i>Gryllotalpidae</i>
Wingless Grasshopper	<i>Phaulacridium vittatum</i>
Bulb Mites	<i>Rhizoglyphus callae</i>
Dry Bulb Mite	<i>Aceria tulipae</i>
Two-Spotted Mite	<i>Tetranychus urticae</i>
Vegetable Leafminer	<i>Liriomyza sativae</i>
Vegetable Weevil	<i>Listroderes difficilis</i>

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

Unknown	
Fall Armyworm	<i>Spodoptera frugiperda</i>

Onion Thrips and Cutworms are high priority pests in onions. These two pests were identified as the high priority insect pests in the 2014 Onion SARP Report as well. Onion Thrips are the most widespread of these pests, regularly requiring control in all regions of Australia. Thrips feeding damage on leaves can cause stress and reduced plant growth. Infestation during the bulb enlargement phase will cause the largest impacts on yield, with poor health of the plant tops leading to a reduced bulb growth period. Onion Thrips may also breed in bulbs that have been harvested, causing problems with marketability. The pest is also a vector of Tomato Spotted Wilt Virus and Iris Yellow Spot Virus, which can have potential destructive effects in onions.

Resistance management

CropLife Australia's Resistance Management Strategies provide a guide for crop protection product rotation through product groups. The strategies are useful tools that support farmers adoption of resistance management. Resistance management strategies are particularly important in onions for the control of thrips. CropLife Australia² has a resistance management strategy for Western Flower Thrips and a detailed strategy is also available from NSW Department of Primary Industries³. Resistance in Onion Thrips has been a long-standing issue for the industry, as detailed in the NSW DPI Prime Fact, *Pesticide Resistance in Onion Thrips*⁴

² www.croplife.org.au/resources/programs/resistance-management/various-western-flower-thrips/

³ <http://archive.dpi.nsw.gov.au/content/agriculture/horticulture/pests,-diseases-and-disorders-in-horticultural-crops/wft-resistance>

⁴ <https://www.dpi.nsw.gov.au/agriculture/horticulture/vegetables/diseases-pests-disorders/d-p-d/pests/pesticide-resistance-onion-thrips>

4.2.2 Available and potential products for priority insects, mites and nematode pests

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

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

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Onion Thrips (<i>Thrips tabaci</i>)								
Priority: High								
The most important insect pest in onions, Onion Thrips is reported as high priority in all growing regions except NSW where it is rated moderate. Onion Thrips cause direct feeding damage to foliage by piercing and rasping leaves. This damage can lead to yield loss and reduced bulb size. They are also a vector for plant viruses with Iris Yellow Spot Virus the most serious of these in onions. It is important to use different insecticide modes of action to prevent the development of resistance.								
MT16009 IPM Project Recommends: The use of predatory thrips, mites & bug releases, control flowering weeds, mulch and use of certified seed.								
Alpha-Cypermethrin PER80282	3A	Contact	14	A	ALL (excl. VIC)	Permitted in onions for the control of Onion Thrips . Apply on a 7-10 day schedule while pests are active. Apply a maximum of 3 applications per crop.	VH Bee H	-
Cyantraniliprole (Benevia) FMC	28	Ingestion	7	A	ALL	Registered in onions for suppression of Onion Thrips . Apply to a newly developing infestation. To maximise efficacy apply 3 sequential treatments on a 7 day spray interval. A maximum of 3 applications are to be applied per season.	L-M Bee VH	-
Diazinon PER13119	1B	Contact	14	A	TAS	Permitted in onions for control of Onion Thrips . Spray when thrips are in damaging numbers. Repeat every 10 days as necessary. Treatments per season not limited.	H Bee H	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Dimethoate	1B	Contact	7	A	ALL	Registered in onions for control of Aphids, Jassids, Mites, Leaf Hoppers, Green Vegetable Bug, Thrips and Wingless Grasshoppers. Apply when pests appear and repeat at 3 weekly intervals as required. Treatments per season not limited.	H Bee H	R1
Ethyl Formate	-	Contact / Post-Harvest	NR	A	ALL	Registered in onions for post-harvest fumigation treatment of Onion Thrips . Use only approved fumigation equipment. Treatment chamber must remain completely sealed for 1 hour exposure period.		-
Flonicamid (Mainman) PER89185	29	Ingestion	7	A	ALL (excl. VIC)	Permitted in onions for suppression of Onion Thrips and Western Flower Thrips. Apply as a foliar spray at first signs of infestation. Do not use more than 3 applications per crop, with a minimum 14 day retreatment interval between applications.	M Bee VL	-
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars, Earwigs, Whitefly, Thrips and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH Bee H	-
Lambda-Cyhalothrin (Karate Zeon) Syngenta	3A	Contact	14	A	ALL	Registered in onions for control of Onion Thrips . Apply when thrips first appear. Do not use more than 4 applications per crop with a minimum retreatment interval of 7 days between consecutive applications.	VH Bee H	-
Malathion	1B	Contact	3	A	SA, VIC, WA & NT	Registered in onions for control of Onion Thrips . Apply at first sign of infestation. Repeat every 10 days or as necessary. Treatments per season not limited.	H Bee H	-
Petroleum Oil PER12221	-	Contact	1	A	ALL (excl. VIC)	Permitted in alliums for control of Aphids, Green Mirid, Green Vegetable Bug, Grey Cluster Bug, Leafhoppers, Mites, Rutherglen Bug and Thrips . Apply as a cover spray when pest numbers are low and repeat as necessary. Treatments per season not limited.	L Bee L	-
Phorate (Thimet)	1B	Contact	70	A	ALL	Registered in onions for control of Onion Maggot and Thrips . Apply granules as a band at sowing or to established plants in 5cm band either side of the growing crop. Incorporate into soil where possible or apply when rain is expected, or overhead irrigation can be made. Avoid contact with seed. Treatments per season not limited.	H Bee H	R3
Potassium Salts of Fatty Acid (Natrasoap)		Contact	NR	A	ALL	Soft option registered in vegetables for control of Aphids, Thrips , Mealybug, Spider Mite and Whitefly. Apply as a cover spray.	L Bee L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Spirotetramat (Movento) Bayer	23	Ingestion	7	A	ALL	Registered in bulb onions for control of Onion Thrips . Commence applications when pests appear. Do not use retreatment intervals less than 14 days. Do not apply more than 2 applications per crop.	M Bee L	-
<i>Beauveria bassiana</i> (Velifer) BASF	UN	Biological		P		Registered in protected vegetables and ornamentals for suppression of Onion Thrips. No MRLs required for biological product.		-
NUL3445 Nufarm	TBC			P		New active in development from Nufarm with activity on Thrips.		-
Spinetoram (Success Neo) Corteva	5	Ingestion		P		Registered in various crops for control of various Thrips species. No AU MRL, Codex MRL *0.01 mg/kg.	M Bee VH	-
Spinosad (Entrust Organic) Corteva	5	Ingestion		P		Registered for control of Thrips in various crops. Suitable for organic growers. No AU MRL, Codex MRL 0.1 mg/kg.	L Bee H	-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, Bugs and Caterpillars.		-
Cutworms (<i>Agrotis</i> spp.)								
Priority: High								
A major pest in southern states but rated as low priority in Qld and NSW. Cutworms are caterpillars that attack seedling crops by chewing through leaves and stems at ground level. This frequently results in loss of whole plants which has a significant impact on production. If insecticide control is required, application should be made late afternoon to evening to coincide with when the larvae are feeding. MT16009 IPM Project Recommends: Predatory wasps, rotation, and early insecticide applications.								
Chlorpyrifos (Lorsban)	1B	Contact	NR	A	ALL	Registered in onions for control of Wingless Grasshopper, Cutworm , Field Crickets, Mole Crickets and Vegetable Weevil. Apply immediately infestation is observed. Spray should cover soil out to at least 20cm on both sides of the crop. Treatments per season not limited.	H Bee H	R1
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars , Earwigs, Whitefly, Thrips and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH Bee H	-
NUL3445 Nufarm	TBC			P		New active in development from Nufarm with activity on Lepidoptera and various beetles.		-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Spinetoram (Success Neo) Corteva	5	Ingestion		P		Registered in various crops for control of various Lepidoptera species. No AU MRL, Codex MRL *0.01 mg/kg.	M Bee VH	-
Spinosad (Entrust Organic) Corteva	5	Ingestion		P		Registered for control of Thrips in various crops. Suitable for organic growers. No AU MRL, Codex MRL 0.1 mg/kg.	L Bee H	-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, Bugs and Caterpillars.		-
Tetraniliprole (Vayego) Bayer	28			P		Registered for control of various weevils, beetles and Lepidoptera in almonds, macadamias, pome and stone fruit. Hort Innovation has several projects underway towards assisting registration in minor crops.	L-M Bee VH	-
<p>Plague Thrips (<i>Thrips imaginis</i>) Western Flower Thrips (<i>Frankliniella occidentalis</i>) Priority: Moderate</p> <p>Plague Thrips and Western Flower Thrips occur less frequently than Onion Thrips. Their significance varies by region, with growers rating them as high priority in SA and low priority in NSW and Tas. Damage caused and management required is similar to Onion Thrips although these lesser thrips species have less products with label claims available. It can be difficult to distinguish between thrips species in the field. It is important to use different insecticide modes of action to prevent the development of resistance. MT16009 IPM Project Recommends: The use of predatory thrips, mites & bug releases, control flowering weeds, mulch and use of certified seed.</p>								
Dimethoate	1B	Contact	7	A	ALL	Registered in onions for control of Aphids, Jassids, Mites, Leaf Hoppers, Green Vegetable Bug, Thrips and Wingless Grasshoppers. Apply when pests appear and repeat at 3 weekly intervals as required. Treatments per season not limited.	H Bee H	R1
Fonicamid (Mainman) PER89185	29	Ingestion	7	A	ALL (excl. VIC)	Permitted in onions for suppression of Onion Thrips and Western Flower Thrips . Apply as a foliar spray at first signs of infestation. Do not use more than 3 applications per crop, with a minimum 14 day retreatment interval between applications.	M Bee VL	-
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars, Earwigs, Whitefly, Thrips and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH Bee H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Petroleum Oil PER12221	-	Contact	1	A	ALL (excl. VIC)	Permitted in alliums for control of Aphids, Green Mirid, Green Vegetable Bug, Grey Cluster Bug, Leafhoppers, Mites, Rutherglen Bug and Thrips . Apply as a cover spray when pest numbers are low and repeat as necessary. Treatments per season not limited.	L Bee L	-
Phorate (Thimet)	1B	Contact	70	A	ALL	Registered in onions for control of Onion Maggot and Thrips . Apply granules as a band at sowing or to established plants in 5cm band either side of the growing crop. Incorporate into soil where possible or apply when rain is expected, or overhead irrigation can be made. Avoid contact with seed. Treatments per season not limited.	H Bee H	R3
Potassium Salts of Fatty Acid (Natrasoap)	-	Contact	NR	A	ALL	Soft option registered in vegetables for control of Aphids, Thrips , Mealybug, Spider Mite and Whitefly. Apply as a cover spray.	L Bee L	-
Cyantraniliprole (Benevia) FMC	28	Ingestion	7	P-A	ALL	Registered in onions for suppression of Onion Thrips. Apply to a newly developing infestation. To maximise efficacy apply 3 sequential treatments on a 7 day spray interval. A maximum of 3 applications are to be applied per season.	L-M Bee VH	-
Ethyl Formate	-	Contact	NR	P-A	ALL	Registered in onions for post-harvest fumigation treatment of Onion Thrips. Use only approved fumigation equipment. Treatment chamber must remain completely sealed for 1 hour exposure period.		-
Lambda-Cyhalothrin (Karate Zeon) Syngenta	3A	Contact	14	P-A	ALL	Registered in onions for control of Onion Thrips. Apply when thrips first appear. Do not use more than 4 applications per crop with a minimum retreatment interval of 7 days between consecutive applications.	VH Bee H	-
Malathion	1B	Contact	3	P-A	SA, VIC, WA & NT	Registered in onions for control of Onion Thrips. Apply at first sign of infestation. Repeat every 10 days or as necessary. Treatments per season not limited.	H Bee H	-
Spirotetramat (Movento) Bayer	23	Ingestion	7	P-A	ALL	Registered in bulb onions for control of Onion Thrips. Commence applications when pests appear. Do not use retreatment intervals less than 14 days. Do not apply more than 2 applications per crop.	M Bee L	-
<i>Beauveria bassiana</i> (Velifer) BASF	UN	Biological		P		Registered in protected vegetables and ornamentals for suppression of Onion Thrips. No MRLs required for biological product.		-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
NUL3445 Nufarm	TBC			P		New active in development from Nufarm with activity on Thrips.		-
Spinetoram (Success Neo) Corteva	5	Ingestion		P		Registered in various crops for control of various Thrips species. No AU MRL, Codex MRL *0.01 mg/kg.	M Bee VH	-
Spinosad (Entrust Organic) Corteva	5	Ingestion		P		Registered for control of Thrips in various crops. Suitable for organic growers. No AU MRL, Codex MRL 0.1 mg/kg.	L Bee H	-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, Bugs and Caterpillars.		-
Onion Maggot (<i>Delia platura</i>) Priority: Low								
Onion Maggot is not a significant issue in any growing region except SA, where it is rated as a high priority in some specific regions. The larvae live beneath the soil and burrow into germinating seeds or the stems of young seedlings. Direct feeding damage results in reduced plant vigour and the wounds can become entry points for diseases such as Neck Rot.								
Diazinon	1B	Contact	14	A	ACT, NSW, SA, VIC & WA	Registered in onions for control of Onion Seedling Maggot, Onion Maggot and Wireworm. Spray soil before sowing and harrow to depth of 5-8 cm or irrigate immediately after application.	H Bee H	R3
Phorate (Thimet)	1B	Contact	70	A	ALL	Registered in onions for control of Onion Maggot and Thrips. Apply granules as a band at sowing or to established plants in 5cm band either side of the growing crop. Incorporate into soil where possible or apply when rain is expected, or overhead irrigation can be made. Avoid contact with seed. Treatments per season not limited.	H Bee H	R3
Wireworm (<i>Heteroderes</i> spp.) Priority: Low								
Wireworms are not a widespread pest, although they are rated as high priority in within some regions in SA. The larvae are soil-dwelling and will attack newly germinated seedlings by chewing the leaves and stems. This often leads to destruction of the whole plant.								
Diazinon	1B	Contact	14	A	ACT, NSW, SA, VIC & WA	Registered in onions for control of Onion Seedling Maggot, Onion Maggot and Wireworm . Spray soil before sowing and harrow to depth of 5-8 cm or irrigate immediately after application.	H Bee H	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
NUL3445 Nufarm	TBC			P		New active in development from Nufarm with activity on Lepidoptera and various beetles.		-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, Bugs and Caterpillars.		-
Tetraniliprole (Vayego) Bayer	28	Ingestion		P		Registered for control of various weevils, beetles and Lepidoptera in almonds, macadamias, pome and stone fruit. Hort Innovation has several projects underway towards assisting registration in minor crops.	L-M Bee VH	-
<p>Root-Knot Nematode (<i>Meloidogyne</i> spp.) Stumpy Root Nematode (<i>Pratylenchus</i> spp.) Priority: Low</p> <p>Nematodes are rated as high priority in some regions within SA, moderate priority in NSW and low priority in all other regions. Onions are generally susceptible to nematodes. They cause direct feeding damage to the bulbs affecting marketability and creating entry points for disease. There are no nematicides registered for use in onions.</p>								
Fluazaindolizine (Reklemel, Salibro) Corteva	New	Contact		P		New MOA nematicide under development in AU by Corteva, to be launched globally in 2021.		-
Fluensulfone (Nimitz) Adama	-	Contact		P		Currently registered in several crops for Root-Knot Nematode and Root Lesion Nematode. No MRLs in place for AU or Codex.		-
Fluopyram (Velum Prime) Bayer	7	Contact		P		Registration pending in AU in various crops. No MRL for AU. Codex MRL 0.07 mg/kg.		-
NUL3145 Nufarm	TBC			P		New nematicide under development by Nufarm.		-
SYNSTN1 Syngenta	TBC			P		New nematicide (cyclobutrifluram) under development from Syngenta.		-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
White-Fringed Weevil (<i>Naupactus leucoloma</i>)								
Priority: Low								
Rated as low priority in all regions except Tasmania, where they are rated moderate priority. Larvae are soil-borne, and if in large numbers may cause significant feeding damage to roots and bulbs of onions. Their incidence is usually sporadic within a field, making them difficult to detect and control. Onions grown in rotation with preferred host crops such as Lucerne or potatoes are more at risk. MT16009 IPM Project Recommends: Rotation (avoid planting into ground previously sown to legumes) and Spade check (for larvae) prior to planting								
Fipronil (Regent) BASF	2B	Contact / Ingestion		P		Registered in potatoes and sweet potatoes as a pre-plant, incorporated treatment for White-Fringed Weevil control. No MRLs for AU or Codex.	M Bee VH	-
Tetraniliprole (Vayego) Bayer	28	Ingestion		P		Registered for control of various weevils, beetles and Lepidoptera in almonds, macadamias, pome and stone fruit. Hort Innovation has several projects underway towards assisting registration in minor crops.	L-M Bee VH	-
Common Blossom Thrips (<i>Frankliniella schultzei</i>)								
Priority: Low								
Uncommon pest in onions although rated as high priority in some regions within SA. Damage caused and management required is similar to Onion Thrips although these lesser thrips species have less products with label claims available. It can be difficult to distinguish between thrips species in the field. MT16009 IPM Project Recommends: The use of predatory thrips, mites & bug releases, control flowering weeds, mulch and use of certified seed.								
Dimethoate	1B	Contact	7	A	ALL	Registered in onions for control of Aphids, Jassids, Mites, Leaf Hoppers, Green Vegetable Bug, Thrips and Wingless Grasshoppers. Apply when pests appear and repeat at 3 weekly intervals as required. Treatments per season not limited.	H Bee H	R1
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars, Earwigs, Whitefly, Thrips and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH Bee H	-
Petroleum Oil PER12221		Contact	1	A	ALL (excl. VIC)	Permitted in alliums for control of Aphids, Green Mirid, Green Vegetable Bug, Grey Cluster Bug, Leafhoppers, Mites, Rutherglen Bug and Thrips . Apply as a cover spray when pest numbers are low and repeat as necessary. Treatments per season not limited.	L Bee L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Phorate (Thimet)	1B	Contact	70	A	ALL	Registered in onions for control of Onion Maggot and Thrips . Apply granules as a band at sowing or to established plants in 5cm band either side of the growing crop. Incorporate into soil where possible or apply when rain is expected, or overhead irrigation can be made. Avoid contact with seed. Treatments per season not limited.	H Bee H	R3
Potassium Salts of Fatty Acid (Natrasoap)	-	Contact	NR	A	ALL	Soft option registered in vegetables for control of Aphids, Thrips , Mealybug, Spider Mite and Whitefly. Apply as a cover spray.	L Bee L	-
Cyantraniliprole (Benevia) FMC	28	Ingestion	7	P-A	ALL	Registered in onions for suppression of Onion Thrips. Apply to a newly developing infestation. To maximise efficacy apply 3 sequential treatments on a 7 day spray interval. A maximum of 3 applications are to be applied per season.	L-M Bee VH	-
Ethyl Formate	-	Contact	NR	P-A	ALL	Registered in onions for post-harvest fumigation treatment of Onion Thrips. Use only approved fumigation equipment. Treatment chamber must remain completely sealed for 1 hour exposure period.		-
Lambda-Cyhalothrin (Karate Zeon) Syngenta	3A	Contact	14	P-A	ALL	Registered in onions for control of Onion Thrips. Apply when thrips first appear. Do not use more than 4 applications per crop with a minimum retreatment interval of 7 days between consecutive applications.	VH Bee H	-
Malathion	1B	Contact	3	P-A	SA, VIC, WA & NT	Registered in onions for control of Onion Thrips. Apply at first sign of infestation. Repeat every 10 days or as necessary. Treatments per season not limited.	H Bee H	-
Spirotetramat (Movento) Bayer	23	Ingestion	7	P-A	ALL	Registered in bulb onions for control of Onion Thrips. Commence applications when pests appear. Do not use retreatment intervals less than 14 days. Do not apply more than 2 applications per crop.	M Bee L	-
<i>Beauveria bassiana</i> (Velifer) BASF	UN	Biological		P		Registered in protected vegetables and ornamentals for suppression of Onion Thrips. No MRLs required for biological product.		-
NUL3445 Nufarm	TBC			P		New active in development from Nufarm with activity on Thrips.		-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, Bugs and Caterpillars.		-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Native Budworm (<i>Helicoverpa punctigera</i>) Cotton Bollworm (<i>Helicoverpa armigera</i>) Cluster Caterpillar (<i>Spodoptera</i> spp.) Priority: Low								
Onions are not a preferred host of these caterpillar pests, rated as low priority in all regions. They can occasionally cause minor leaf feeding damage, providing an entry point for diseases such as Botrytis.								
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars , Earwigs, Whitefly, Thrips and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH Bee H	-
NUL3445 Nufarm	TBC			P		New active in development from Nufarm with activity on Lepidoptera and various beetles.		-
Spinetoram (Success Neo) Corteva	5	Ingestion		P		Registered in various crops for control of <i>Helicoverpa</i> spp. No AU MRL, Codex MRL *0.01 mg/kg.	M Bee VH	-
Spinosad (Entrust Organic) Corteva	5	Ingestion		P		Registered for control of Thrips in various crops. Suitable for organic growers. No AU MRL, Codex MRL 0.1 mg/kg.	L Bee H	-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, Bugs and Caterpillars.		-
Tetraniliprole (Vayego) Bayer	28	Ingestion		P		Registered for control of various weevils, beetles and Lepidoptera in almonds, macadamias, pome and stone fruit. Hort Innovation has several projects underway towards assisting registration in minor crops.	L-M Bee VH	-
Earwigs (<i>Dermaptera</i>) Priority: Low								
Low importance in onions as they are not a preferred host for earwigs. The nymphs can bore into the bulb and reduce general plant health, but the occurrence of this is very low.								
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars, Earwigs , Whitefly, Thrips and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH Bee H	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Red Legged Earth Mite (<i>Halotydeus destructor</i>)								
Priority: Low								
A low priority pest in onions, except NSW where it is rated moderate priority. Can cause minor leaf feeding damage to newly emerged crops. MT16009 IPM Project Recommends: Control broadleaf weed hosts (e.g. capeweed) in the season prior to planting								
Dimethoate	1B	Contact	7	A	ALL	Registered in onions for control of Aphids, Jassids, Mites , Leaf Hoppers, Green Vegetable Bug, Thrips and Wingless Grasshoppers. Apply when pests appear and repeat at 3 weekly intervals as required. Treatments per season not limited.	H Bee H	R1
Petroleum Oil PER12221	-	Contact	1	A	ALL (excl. VIC)	Permitted in alliums for control of Aphids, Green Mirid, Green Vegetable Bug, Grey Cluster Bug, Leafhoppers, Mites , Rutherglen Bug and Thrips. Apply as a cover spray when pest numbers are low and repeat as necessary. Treatments per season not limited.	L Bee L	-
Strawberry Beetle (<i>Coleoptera</i>)								
Priority: Low								
Rated as moderate priority in Tas but low in all other regions.								
NUL3445 Nufarm	TBC			P		New active in development from Nufarm with activity on Lepidoptera and various beetles.		-
Tetraniliprole (Vayego) Bayer	28	Ingestion		P		Registered for control of various weevils, beetles and Lepidoptera in almonds, macadamias, pome and stone fruit. Hort Innovation has several projects underway towards assisting registration in minor crops.	L-M Bee VH	-
Onion Aphid (<i>Neotoxoptera formosana</i>)								
Priority: Low								
Rated as moderate priority in some regions within SA but low in all other regions. Although an infrequent pest, aphids will suck sap from leaves leading to general poor health and reduced yields.								
Dimethoate	1B	Contact	7	A	ALL	Registered in onions for control of Aphids , Jassids, Mites, Leaf Hoppers, Green Vegetable Bug, Thrips and Wingless Grasshoppers. Apply when pests appear and repeat at 3 weekly intervals as required. Treatments per season not limited.	H Bee H	R1

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids , Caterpillars, Earwigs, Whitefly, Thrips and Leafhoppers. Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH Bee H	-
Petroleum Oil PER12221	-	Contact	1	A	ALL (excl. VIC)	Permitted in alliums for control of Aphids , Green Mirid, Green Vegetable Bug, Grey Cluster Bug, Leafhoppers, Mites, Rutherglen Bug and Thrips. Apply as a cover spray when pest numbers are low and repeat as necessary. Treatments per season not limited.	L Bee L	-
Potassium Salts of Fatty Acid (Natrasoap)	-	Contact	NR	A	ALL	Soft option registered in vegetables for control of Aphids , Thrips, Mealybug, Spider Mite and Whitefly. Apply as a cover spray.	L Bee L	-
Spirotetramat (Movento) Bayer	23	Ingestion	7	P-A	ALL	Registered in onions for control of Onions Thrips and registered for control of aphids in various crops. Commence applications when pests appear. Do not use retreatment intervals less than 14 days. Do not apply more than 2 applications per crop.	M Bee L	-
Afidopyropen (Versys) BASF	9D			P		Registered for control of aphids in various crops. No MRLs for AU or Codex.	L Bee L	-
<i>Beauveria bassiana</i> (Velifer) BASF	UN	Biological		P		Registered in protected vegetables and ornamentals for suppression of various Aphid Species. No MRLs required for biological product.		-
Sulfoxaflor (Transform) Corteva	4C	Contact & Ingestion		P		Registered for control of aphids in various crops. No MRL for AU. Codex MRL *0.01 mg/kg.	M Bee VH	-
Jassids / Leafhoppers (<i>Cicadellidae</i>)								
Priority: Low								
An infrequent pest that is rated as low priority in all regions.								
Dimethoate	1B	Contact	7	A	ALL	Registered in onions for control of Aphids, Jassids , Mites, Leaf Hoppers, Green Vegetable Bug, Thrips and Wingless Grasshoppers. Apply when pests appear and repeat at 3 weekly intervals as required. Treatments per season not limited.	H Bee H	R1

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Caterpillars, Earwigs, Whitefly, Thrips and Leafhoppers . Suitable for organic growers. Apply as a cover spray and re-apply as necessary every 2-3 weeks.	VH Bee H	-
Petroleum Oil PER12221	-	Contact	1	A	ALL (excl. VIC)	Permitted in alliums for control of Aphids, Green Mirid, Green Vegetable Bug, Grey Cluster Bug, Leafhoppers , Mites, Rutherglen Bug and Thrips. Apply as a cover spray when pest numbers are low and repeat as necessary. Treatments per season not limited.	L Bee L	-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, Bugs and Caterpillars.		-
<p>Rutherglen Bug (<i>Nysius vinitor</i>) Green Vegetable Bug (<i>Nezara viridula</i>) Green Mirid (<i>Creontiades dilutus</i>) Grey Cluster Bug (<i>Nysius clevelandensis</i>) Priority: Low</p> <p>Sporadic pests that are rated a low priority in all regions. Large numbers can cause significant feeding damage to leaves by sucking the sap and depleting the crop of nutrients.</p>								
Dimethoate	1B	Contact	7	A	ALL	Registered in onions for control of Aphids, Jassids, Mites, Leaf Hoppers, Green Vegetable Bug , Thrips and Wingless Grasshoppers. Apply when pests appear and repeat at 3 weekly intervals as required. Treatments per season not limited.	H Bee H	R1
Petroleum Oil PER12221	-	Contact	1	A	ALL (excl. VIC)	Permitted in alliums for control of Aphids, Green Mirid, Green Vegetable Bug, Grey Cluster Bug , Leafhoppers, Mites, Rutherglen Bug and Thrips. Apply as a cover spray when pest numbers are low and repeat as necessary. Treatments per season not limited.	L Bee L	-
Sulfoxaflor (Transform) Corteva	4C	Contact & Ingestion	7	P-A	ALL	Registered in several crops for control of various species of bugs. No MRL for AU. Codex MRL *0.01 mg/kg.	M Bee VH	-
NUL3445 Nufarm	TBC			P		New active in development from Nufarm with activity on Lepidoptera and various bugs.		-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, Bugs and Caterpillars.		-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Field Crickets (<i>Gryllidae</i>) Black Field Cricket (<i>Teleogryllus commodus</i>) Mole Crickets (<i>Gryllotalpidae</i>) Wingless Grasshopper (<i>Phaulacridium vittatum</i>) Priority: Low								
Crickets and grasshoppers are infrequent and low priority pests in all regions. Damage is limited to feeding on newly established plants and reducing plant populations.								
Chlorpyrifos (Lorsban)	1B	Contact	NR	A	NSW, ACT, VIC & TAS	Registered in onions for control of Wingless Grasshopper . Apply immediately infestation is observed. Spray should cover soil out to at least 20cm on both sides of the crop. Treatments per season not limited.	H Bee H	R1
					QLD	Registered in onions for control of Field Crickets and Mole Crickets . Apply immediately infestation is observed. Spray should cover soil out to at least 20cm on both sides of the crop. Treatments per season not limited.		
Dimethoate	1B	Contact	7	A	ALL	Registered in onions for control of Aphids, Jassids, Mites, Leaf Hoppers, Green Vegetable Bug, Thrips and Wingless Grasshoppers . Apply when pests appear and repeat at 3 weekly intervals as required. Treatments per season not limited.	H Bee H	R1
Bulb Mites (<i>Rhizoglyphus callae</i>) Dry Bulb Mite (<i>Aceria tulipae</i>) Two-Spotted Mite (<i>Tetranychus urticae</i>) Priority: Low								
Mites are a low priority pest in all areas. Bulb Mites and Dry Bulb Mites can feed on the bulb's scales with the damage caused providing entry points for soil-borne disease. Two-Spotted Mite causes minor and infrequent damage to the aerial parts of the plant.								
Dimethoate	1B	Contact	7	A	ALL	Registered in onions for control of Aphids, Jassids, Mites , Leaf Hoppers, Green Vegetable Bug, Thrips and Wingless Grasshoppers. Apply when pests appear and repeat at 3 weekly intervals as required. Treatments per season not limited.	H Bee H	R1
Petroleum Oil PER12221	-	Contact	1	A	ALL (excl. VIC)	Permitted in alliums for control of Aphids, Green Mirid, Green Vegetable Bug, Grey Cluster Bug, Leafhoppers, Mites , Rutherglen Bug and Thrips. Apply as a cover spray when pest numbers are low and repeat as necessary. Treatments per season not limited.	L Bee L	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Abamectin PER81876	6	Contact & Ingestion	H:30 NG	P-A	ALL (excl. VIC)	Permitted in bulb onions for suppression of Vegetable Leaf Miner, also has activity on mites. Do not use more than 2 consecutive applications and do not use more than 3.6 L/ha (3 full rate applications) per cropping season per crop.	M Bee H	-
Potassium Salts of Fatty Acid (Natrasoap)		Contact	NR	P-A	ALL	Soft option registered in vegetables for control of Aphids, Thrips, Mealybug, Spider Mite and Whitefly. Apply as a cover spray.	L Bee L	-
Spiromesifen (Oberon) Bayer	23	Ingestion		P		No registration in AU but studies are underway with Bayer and Hort Innovation. US registration for control of various mite species in several crops. No MRLs for AU or Codex.	M Bee VL	-
SYNFOI21 Syngenta	New			P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, Bugs and Caterpillars. Also has activity on mites.		-
Vegetable Leafminer (<i>Liriomyza sativae</i>)								
Priority: Low								
Vegetable Leafminer is not present in onion-growing regions, but it poses a significant threat to production if it appears in onion crops. It will feed on the leaves and the bulbs, causing reduced yield and poor quality produce.								
Abamectin PER81876	6	Contact & Ingestion	H:30 NG	A	ALL (excl. VIC)	Permitted in bulb onions for suppression of Vegetable Leaf Miner . Apply as a cover spray when leaf miners first appear. Minimum retreatment interval of 7-14 days between consecutive applications. Do not use more than 2 consecutive applications and do not use more than 3.6 L/ha (3 full rate applications) per cropping season per crop.	M Bee H	-
Cyantraniliprole (Benevia) FMC	28	Ingestion	7	P-A	ALL	Registered in onions for suppression of Onion Thrips. Also has activity on Vegetable Leafminer.	L-M Bee VH	-
Vegetable Weevil (<i>Listroderes difficilis</i>)								
Priority: Low								
Low priority pest in all growing regions. Can cause damage to onions by tunnelling into leaves and reducing plant vigour. MT16009 IPM Project Recommends: Control broadleaf weed hosts (e.g. marshmallow) in the season prior to planting								
Chlorpyrifos (Lorsban)	1B	Contact	NR	A	NSW, ACT	Registered in onions for control of Vegetable Weevil . Apply immediately infestation is observed. Spray should cover soil out to at least 20cm on both sides of the crop. Treatments per season not limited.	H Bee H	R1

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Indoxacarb (Avatar eVo) FMC	22A	Ingestion		P		Registered in celery for control of Vegetable Weevil. No MRLs for AU or Codex.	M Bee H	R3
NUL3445 Nufarm	TBC			P		New active in development from Nufarm with activity on Lepidoptera and various beetles.		-
Tetraniliprole (Vayego) Bayer	28	Ingestion		P		Registered for control of various weevils, beetles and Lepidoptera in almonds, macadamias, pome and stone fruit. Hort Innovation has several projects underway towards assisting registration in minor crops.	L-M Bee VH	-
Fall Armyworm (<i>Spodoptera frugiperda</i>)								
Priority: Unknown								
Fall Armyworm has recently been detected in Australia for the first time. It has not been seen in onion crops and the potential impact is currently unknown.								
Methomyl (Lannate) (PER89293)	1A	Contact	7	A	ALL	Permitted in onions for control of Fall Armyworm . Apply as a foliar spray. Target sprays against eggs and newly hatched larvae (prior to third instar stage) before they become entrenched. Treatments per season not limited.	H Bee H	R2
Spinetoram (Success Neo) Corteva (PER89331)	5	Ingestion	H:3 NG	A	ALL (excl. VIC)	Permitted in bulb onions for control of Fall Armyworm . Target sprays against mature eggs and newly-hatched larvae. Do not make more than 3 applications per season, with a minimum retreatment interval of 7 days. Do not use more than 2 consecutive applications of Group 5 insecticides.	M Bee VH	-
Spinosad (Entrust Organic) Corteva	5	Ingestion		P		Registered for control of Thrips in various crops. Suitable for organic growers. No AU MRL, Codex MRL 0.1 mg/kg.	L Bee H	-
Tetraniliprole (Vayego) Bayer	28	Ingestion		P		Registered for control of various weevils, beetles and Lepidoptera in almonds, macadamias, pome and stone fruit. Hort Innovation has several projects underway towards assisting registration in minor crops.	L-M Bee VH	-

4.3 Weeds in onions

4.3.1 Weed priorities

Common Name	Scientific Name
High	
Wireweed	<i>Polygonum aviculare</i>
Fumitories	<i>Fumaria</i> spp.
Fat-Hen	<i>Chenopodium album</i>
Wild Radish	<i>Raphanus raphanistrum</i>
Annual Ryegrass	<i>Lolium rigidum</i>
Self-Sown Potato	<i>Solanum tuberosum</i>
Moderate	
Shepherd's Purse	<i>Capsella bursa-pastoris</i>
Blackberry Nightshade	<i>Solanum nigrum</i>
Marshmallow	<i>Malva parviflora</i>
Clover	<i>Trifolium</i> spp.
Flaxleaf Fleabane	<i>Conyza bonariensis</i>
Nutgrass	<i>Cyperus rotundus</i>
Turnip Weed	<i>Rapistrum rugosum</i>
Wild Turnip	<i>Brassica tournefortii</i>
Pigweed	<i>Portulaca</i> spp.

Weed control is a key focus for the onion industry due to a number of inherent challenges with maintaining an effective program. Onions compete poorly with weeds, even at later crop stages. Multiple herbicide applications are necessary throughout the crop to keep it weed-free and to prevent weed competition from impacting on production. The long growing season necessitates use of a wide range of herbicides to keep crops weed free and also means that both summer and winter weeds need to be controlled in-crop.

There are a number of weed species that are high priority in onions. These species are all widespread in their distribution and can compete aggressively with the crop. The weeds rated high priority are Wireweed, Fumitories, Fat-Hen, Wild Radish, Annual Ryegrass and Self-Sown Potato.

An effective weed control program for onions should include:

- starting with a weed-free field at sowing time
- targeting specific problem weeds with the most effective herbicides
- using a combination of pre-emergence and knockdown herbicides
- rotating different herbicide groups to avoid the development of resistance
- using non-herbicide weed control such as cultivation before planting, to reduce the reliance on herbicides
- keeping fallows weed-free to prevent build up of weed seed banks

The onion industry's reliance on herbicides creates a high risk of resistance developing. Resistance to glyphosate in Willow Leaved Lettuce (*Lactuca saligna*) was confirmed in onions in 2017. Specific resistance management strategies for high resistance risk (A and B) and moderate resistance risk (C, D, F, G, I, J, K, L, M, N, Q and Z) herbicide modes of action are available on the CropLife Australia webpage.

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

4.3.2 Available and potential products for weed control

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

Availability			
A	Available via either registration or permit approval		
P	Potential – a possible candidate to pursue for registration or permit		
P-A	Potential, already approved in the crop for another use		
Resistance risk		Regulatory risk (refer to Appendix 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
Wireweed (<i>Polygonum aviculare</i>)							
Priority: High							
A widespread and high priority weed in all regions except Qld and NSW, where it is rated moderate. Grows rapidly in the warmer months and is difficult to control with herbicides. Application timing is critical to ensure small weeds are targeted.							
Bromoxynil (Maya) Nufarm PER87914	C**	Bulb Onions	Permitted in onions for control of various broadleaf weeds, including Wireweed . Apply when weeds are 4-leaf stage or when plants are no more than 35mm in diameter. Do not apply more than 2 applications per season. If 2 applications are used, apply the first post-sowing pre-emergence and the second foliar post-emergence. Do not apply later than the 4 leaf stage in-crop. Nufarm have submitted for registration of this product for use in onions. Registration is expected in October 2020.	NR NG	A	ALL	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Chlorthal Dimethyl (Dacthal) Nufarm	D**	Onions / Pre-Emergence Application	Registered in onions for control of various grass and broadleaf weeds, including Wireweed . Spray at time of seeding or transplanting. Can be sprayed directly over transplants. Lay-by applications can be made up to 14 weeks after planting or transplanting. Should weeds emerge, weed or cultivate prior to spraying.	NR NG	A	ALL	R3
Ethofumesate (Tramat) Bayer	J**	Onions	Registered in onions for control of various broadleaf and grass weeds, including Wireweed . Apply after 2 leaf stage of crop. Follow up program using alternative herbicides.	91	A	TAS	-
Ethofumesate (Tramat) Bayer PER84808	J**	Bulb Onions	Permitted in bulb onions for control of various broadleaf and grass weeds, including Wireweed . Apply 1 application only after 2-leaf growth stage.	70	A	ALL	-
Fluroxypyr (Starane Advanced) Corteva PER87200	I**	Bulb Onions	Permitted in bulb onions for control of various broadleaf weeds, including Wireweed . Apply a maximum of 4 applications per crop between the 1 and 5 true leaf stage. Use a minimum retreatment interval of 7 days. Do not exceed a maximum seasonal dose of 800 mL/ha.	NR	A	TAS	-
Ioxynil (Totril) Barmac	C**	Onions	Registered in onions for control of various broadleaf weeds, including seedlings of Wireweed/Hogweed . Apply between 3 and 8 leaf crop stage and when the weeds are at cotyledon stage. Satisfactory control of Wireweed requires 2 applications using a spray interval of 14-21 days. NOTE: Hort Innovation did not support this permit application due to crop safety concerns.	NR	A	ALL	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Pendimethalin (Stomp) BASF	D**	Onions / Pre-Emergence Application	Registered in onions for control of Hogweed / Wireweed . Apply in conjunction with other herbicides to ensure an adequate level of weed control. Do not use as a pre-emergence application on sandy soils. Apply from immediately after sowing until just prior to emergence. For optimum performance, incorporate with no more than 12mm of spray irrigation within 1 day of application.	NR	A	TAS	-
		Onions / Post-Emergence Application	Apply from first true leaf until the 3 leaf stage. Repeat applications may be made after the 3 leaf stage, providing total usage on crop does not exceed 1 kg ai/ha. Apply in conjunction with other herbicides to ensure an adequate level of weed control. For optimum performance, incorporate with no more than 12mm of spray irrigation within 1 day of application. Do not apply more than 3 times per season.				
		Onions / Light Sandy Soils	Do not apply pre-emergence. Apply post-emergence at the 4-5 leaf stage, with 1-2 further applications as needed throughout the season, approximately 3-4 weeks apart.				
		Onions / Heavy, High Organic Matter Soils	Apply pre-emergence within 2 days of planting. For furrow-irrigated crops, application to a dry seed bed followed by irrigation within 5 days is optimal. A post-emergence application can be at the 2 leaf stage.				
NUL3438 Nufarm	TBC		New active in development, Nufarm claim activity on broadleaf weeds.		P		-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Fumitories (<i>Fumaria</i> spp.)							
Priority: High							
A widespread and high priority weed in all regions except NSW, where it is rated moderate. Strongly competitive weed with highly persistent seeds making it an ongoing problem every year.							
Bromoxynil (Maya) Nufarm PER87914	C**	Bulb Onions	Permitted in onions for control of various broadleaf weeds, including Fumitories . Apply when weeds are 4-leaf stage or when plants are no more than 35mm in diameter. Do not apply more than 2 applications per season. If 2 applications are used, apply the first post-sowing pre-emergence and the second foliar post-emergence. Do not apply later than the 4 leaf stage in-crop. Nufarm plan to register this product for use in onions.	NR NG	A	ALL	-
Ethofumesate (Tramat) Bayer	J**	Onions	Registered in onions for control of various broadleaf and grass weeds, including Fumitory . Apply after 2 leaf stage of crop. Follow up program using alternative herbicides.	91	A	TAS	-
Ethofumesate (Tramat) Bayer PER84808	J**	Bulb Onions	Permitted in bulb onions for control of various broadleaf and grass weeds, including Fumitory . Apply 1 application only after 2-leaf growth stage.	70	A	ALL	-
Ioxynil (Totril) Barmac	C**	Onions	Registered in onions for control of various broadleaf weeds, including Fumitory . Apply between 3 and 8 leaf crop stage and when the weeds are between the cotyledon to 6 leaf stage.	NR	A	ALL	-
Methabenzthiazuron (Tribunil) AgNova	C**	Onions	Registered in onions for control of various broadleaf and grass weeds, including Fumitory . Apply to young weeds when onions have 1 or more true leaves. Repeat spraying may be necessary to maintain weed free crops. Treatments per season not limited.	70	A	QLD, NSW, VIC, TAS & WA	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Oxyfluorfen (Goal) Corteva	G**	Onions / Seeded	Registered in onions for various broadleaf weeds, including Fumitory . Apply at the hook leaf stage, followed by a second application when onions are at the 1.5-2.5 true leaf stage. Multiple treatments may be applied provided the total dose does not exceed 0.48 kg ai/ha per season.	H:NR NG	A	ALL	-
NUL3438 Nufarm	TBC		New active in development, Nufarm claim activity on broadleaf weeds.		P		-
Fat-Hen (<i>Chenopodium album</i>) Priority: High							
Widespread and aggressive weed that is rated high priority in all regions except Qld where it is moderate and NSW where it is low priority. Herbicide control can be difficult and targeting weeds at early growth stages is critical.							
Bentazone (Basagran) BASF PER14773	C**	Onions	Permitted in onions for various broadleaf weeds, including Fat-Hen . Can be used alone or in a tank-mix with ioxynil to improve the spectrum of weeds controlled. Do not apply herbicides other than ioxynil for 10 days before or after applications of bentazone. Apply after onions have 3 leaves, are waxy and healthy, and when weeds are still seedlings. Apply as either a single application or as 2 split applications to control late-germinating weeds. Do not exceed a cumulative total of 1.44 kg ai/ha. For split application, allow a minimum of 7 days between consecutive applications.	56	A	ALL (excl. VIC)	-
Bromoxynil (Maya) Nufarm PER87914	C**	Bulb Onions	Permitted in onions for control of various broadleaf weeds, including Fat-Hen . Apply when weeds are 4-leaf stage or when plants are no more than 35mm in diameter. Do not apply more than 2 applications per season. If 2 applications are used, apply the first post-sowing pre-emergence and the second foliar post-emergence. Do not apply later than the 4 leaf stage in-crop. Nufarm plan to register this product for use in onions.	NR NG	A	ALL	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Chlorthal Dimethyl (Dacthal) Nufarm	D**	Onions / Pre-Emergence Application	Registered in onions for control of various grass and broadleaf weeds, including Fat-Hen . Spray at time of seeding or transplanting. Can be sprayed directly over transplants. Lay-by applications can be made up to 14 weeks after planting or transplanting. Should weeds emerge, weed or cultivate prior to spraying.	NR NG	A	ALL	R3
Ethofumesate (Tramat) Bayer	J**	Onions	Registered in onions for control of various broadleaf and grass weeds, including Fat-Hen . Apply after 2 leaf stage of crop. Follow up program using alternative herbicides.	91	A	TAS	-
Ethofumesate (Tramat) Bayer PER84808	J**	Bulb Onions	Permitted in bulb onions for control of various broadleaf and grass weeds, including Fat-Hen . Apply 1 application only after 2-leaf growth stage.	70	A	ALL	-
Ioxynil (Totril) Barmac	C**	Onions	Registered in onions for control of various broadleaf weeds, including Fat-Hen . Apply between 3 and 8 leaf crop stage and when the weeds are between the cotyledon to 6 leaf stage.	NR	A	ALL	R3
Linuron	C**	Onions	Registered in onions for control of various broadleaf weeds, including Fat-Hen . Apply post-emergence after onions are 15cm high, with at least 3 leaves. Repeat as necessary. Treatments per season not limited.	NR	A	ALL	R3
Methabenzthiazuron (Tribunil) AgNova	C**	Onions	Registered in onions for control of various broadleaf and grass weeds, including Fat-Hen . Apply to young weeds when onions have 1 or more true leaves. Repeat spraying may be necessary to maintain weed free crops. Treatments per season not limited.	70	A	QLD, NSW, VIC, TAS & WA	R3
		Onions / Tank Mix with Oxyfluorfen	Apply to young weeds when onions have 1 or more true leaves. Repeat spraying may be necessary to maintain weed free crops. Treatments per season not limited.			TAS	

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Propachlor (Ramrod) Nufarm	K**	Onions / Direct Seeded	Registered in onions for control of various grass and broadleaf weeds, including Fat-Hen . Apply as a surface spray immediately after seeding. Rainfall or overhead irrigation is required as soon as possible after application. Treatment with other herbicides (post emergence) will be required later in the crop.	NR	A	ALL	R3
Aclonifen (Emerger) Bayer	H**	Pre-Emergence	Minor Used Approval in the UK for control of some annual broadleaf and grass weeds in onions. Fat-Hen is listed as susceptible. Bayer is expected to seek registration in Australia. No MRLs for AU or Codex.		P		-
Ethyl Dipropylthiocarbamate (Eptam) Nufarm	E**		Registered in several crops for control of various grass and broadleaf weeds, including Fat-Hen. Pre-plant residual herbicide that requires mechanical incorporation. No MRLs for AU or Codex.		P		-
NUL3438 Nufarm	TBC		New active in development, Nufarm claim activity on broadleaf weeds.		P		-
Wild Radish (<i>Raphanus raphanistrum</i>) Priority: High Widespread and aggressive weed that is rated high priority in all regions except Qld where it is moderate and NSW where it is low priority. 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.							
Bentazone (Basagran) BASF PER14773	C**	Onions	Permitted in onions for various broadleaf weeds, including Wild Radish . Can be used alone or in a tank-mix with ioxynil to improve the spectrum of weeds controlled. Do not apply herbicides other than ioxynil for 10 days before or after applications of bentazone. Apply after onions have 3 leaves, are waxy and healthy, and when weeds are still seedlings. Apply as either a single application or as 2 split applications to control late-germinating weeds. Do not exceed a cumulative total of 1.44 kg ai/ha. For split application, allow a minimum of 7 days between consecutive applications.	56	A	ALL (excl. VIC)	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Bromoxynil (Maya) Nufarm PER87914	C**	Bulb Onions	Permitted in onions for control of various broadleaf weeds, including Wild Radish . Apply when weeds are 4-leaf stage or when plants are no more than 35mm in diameter. Do not apply more than 2 applications per season. If 2 applications are used, apply the first post-sowing pre-emergence and the second foliar post-emergence. Do not apply later than the 4 leaf stage in-crop. Nufarm plan to register this product for use in onions.	NR NG	A	ALL	-
Ethofumesate (Tramat) Bayer	J**	Onions	Registered in onions for control of various broadleaf and grass weeds, including Cruciferous Weeds . Apply after 2 leaf stage of crop. Follow up program using alternative herbicides.	91	A	TAS	-
Ethofumesate (Tramat) Bayer PER84808	J**	Bulb Onions	Permitted in bulb onions for control of various broadleaf and grass weeds, including Cruciferous Weeds . Apply 1 application only after 2-leaf growth stage.	70	A	ALL	-
Ioxynil (Totril) Barmac	C**	Onions	Registered in onions for control of various broadleaf weeds, including Wild Radish . Apply between 3 and 8 leaf crop stage and when the weeds are between the cotyledon to 6 leaf stage.	NR	A	ALL	R3
Linuron	C**	Onions	Registered in onions for control of various broadleaf weeds, including Wild Radish . Apply post-emergence after onions are 15cm high, with at least 3 leaves. Repeat as necessary. Treatments per season not limited.	NR	A	ALL	R3
Methabenzthiazuron (Tribunil) AgNova	C**	Onions	Registered in onions for control of various broadleaf and grass weeds, including Wild Radish . Apply to young weeds when onions have 1 or more true leaves. Repeat spraying may be necessary to maintain weed free crops. Treatments per season not limited.	70	A	QLD, NSW, VIC, TAS & WA	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Bixlozone (Overwatch) FMC	Q**		Registered in wheat, barley and canola for control of various grass and broadleaf weeds, and suppression of Wild Radish. Crop selectivity to onions unknown. No MRLs for AU or Codex.		P		-
NUL3438 Nufarm	TBC		New active in development, Nufarm claim activity on broadleaf weeds.		P		-
Annual Ryegrass (<i>Lolium rigidum</i>)							
Priority: High							
The most serious grass weed of southern Australia with distribution that is gradually extending north. Rated as high priority in southern states, moderate in NSW and low priority in Qld. 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. In-crop options are limited to Group A's so it is important to use alternate, broad-spectrum products in non-crop periods.							
Clethodim (Select) UPL	A***	Onions	Registered in onions for control of various grass weeds, including Annual Ryegrass . Apply to young, actively growing weeds. Do not apply to weeds after they are fully tillered. Do not use more than 1 application per crop.	14	A	ALL	R3
Fluazifop-P (Fusilade) Syngenta	A***	Onions	Registered in onions for control of various grass weeds, including Annual Ryegrass . Apply to young, actively growing weeds. Do not apply to weeds after they are fully tillered. Treatments per season not limited.	35	A	ALL	-
Propachlor (Ramrod) Nufarm	K**	Onions / Direct Seeded	Registered in onions for control of various grass and broadleaf weeds, including Annual Ryegrass . Apply as a surface spray immediately after seeding. Rainfall or overhead irrigation is required as soon as possible after application. Treatment with other herbicides (post emergence) will be required later in the crop to maintain weed control to harvest.	NR	A	ALL	R3
Quizalofop-P-Ethyl (Targa) Sipcam	A***	Onions	Registered in onions for control of various grass weeds, including Annual Ryegrass . Apply to young, actively growing weeds. Treatments per season not limited.	126	A	ALL	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Sethoxydim (Sertin) Bayer	A***	Onions	Registered in onions for control of various grass weeds, including Annual Ryegrass . Apply when the majority of weeds are in the 2-6 leaf stage and are actively growing. Will control Ryegrass up to the 4 tiller stage. Treatments per season not limited.	28	A	ALL	R3
Bixlozone (Overwatch) FMC	Q**		Registered in wheat, barley and canola for control of various grass and broadleaf weeds, including Annual Ryegrass. Crop selectivity to onions unknown. No MRLs for AU or Codex.		P		-
Ethyl Dipropylthiocarbamate (Eptam) Nufarm	E**		Registered in several crops for control of various grass and broadleaf weeds, including Annual Ryegrass. Pre-plant residual herbicide that requires mechanical incorporation. No MRLs for AU or Codex.		P		-
Prosulfocarb + S-Metolachlor (Boxer Gold) Syngenta	J** + K**		Hort Innovation Project ST18001 (AgVet Grant funded) for residue and efficacy trials to support registration for control of Annual Ryegrass in onions contracted May 2019. Due for completion January 2023. No MRLs for AU or Codex.		P		-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Dimethenamid-P (Outlook Herbicide) BASF (*Frontier-P NZ Label registered in onions)	K**	Onions – post-emergence (2 to 4 leaf onion stage)	<p>A minor use permit application has been submitted to the APVMA by Hort Innovation, seeking Dimethenamid-P (Outlook Herbicide) for suppression of resistant Annual Ryegrass in Onions (All States). The use pattern is as per the NZ registered use pattern in onions. One post-crop emergence application applied between 2 and 4 leaf stage of onions on low annual ryegrass populations only.</p> <p>A number of Group A herbicides are approved for post-emergent treatment. However, due to the levels of resistance these products are of limited value and do not provide residual control. Annual ryegrass is proving particularly problematic in bulb onion production. In particular, managing weed emergence as the season progresses. Currently, chlorthalidimethyl (Group D) and propachlor (Group K) are specifically approved for the control of annual ryegrass control in onions. However, both are as pre-emergent/at planting treatments. Having access to dimethenamid-P as an early post-crop emergence treatment would provide an additional option for annual ryegrass management later in the crop cycle as a typical onion crop reaches the 2-4 leaf stage 6 weeks after planting. As dimethenamid-P would provide some residual control it's use would extend herbicidal activity further into the crops life without having to rely on Group A herbicides, for which resistance is widespread.</p>		P		

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Self-Sown Potato (<i>Solanum tuberosum</i>)							
Priority: High							
Rated as a high priority weed in southern states, but low priority in NSW and Qld. In regions where onions are commonly grown in rotation with potatoes, volunteer potatoes are difficult to remove from the onion phase of the cropping cycle. Attention should be given to reducing the population of potatoes in non-cropping periods if possible. Residual herbicides used in the cropping period should provide some control.							
Oxyfluorfen (Goal) Corteva	G**	Onions / Seeded	Registered in onions for various broadleaf weeds, including Volunteer Potato . Apply at the hook leaf stage, followed by a second application when onions are at the 1.5-2.5 true leaf stage. Multiple treatments may be applied provided the total dose does not exceed 0.48 kg ai/ha per season.	H:NR NG	A	ALL	-
Shepherd's Purse (<i>Capsella bursa-pastoris</i>)							
Priority: Moderate							
Present in all regions, it is rated as high priority in SA, but low in NSW and moderate elsewhere. Seeds prolifically but quick-growing crops can compete and will tend to choke it out as they mature.							
Bentazone (Basagran) BASF PER14773	C**	Onions	Permitted in onions for various broadleaf weeds, including Shepherd's Purse . Can be used alone or in a tank-mix with ioxynil to improve the spectrum of weeds controlled. Do not apply herbicides other than ioxynil for 10 days before or after applications of bentazone. Apply after onions have 3 leaves, are waxy and healthy, and when weeds are still seedlings. Apply as either a single application or as 2 split applications to control late-germinating weeds. Do not exceed a cumulative total of 1.44 kg ai/ha. For split application, allow a minimum of 7 days between consecutive applications.	56	A	ALL (excl. VIC)	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Bromoxynil (Maya) Nufarm PER87914	C**	Bulb Onions	Permitted in onions for control of various broadleaf weeds, including Shepherd's Purse . Apply when weeds are 4-leaf stage or when plants are no more than 35mm in diameter. Do not apply more than 2 applications per season. If 2 applications are used, apply the first post-sowing pre-emergence and the second foliar post-emergence. Do not apply later than the 4 leaf stage in-crop. Nufarm plan to register this product for use in onions.	NR NG	A	ALL	-
Ioxynil (Totril) Barmac	C**	Onions	Registered in onions for control of various broadleaf weeds, including Shepherd's Purse . Apply between 3 and 8 leaf crop stage and when the weeds are between the cotyledon to 6 leaf stage.	NR	A	ALL	R3
Linuron	C**	Onions	Registered in onions for control of various broadleaf weeds, including Shepherd's Purse . Apply post-emergence after onions are 15cm high, with at least 3 leaves. Repeat as necessary. Treatments per season not limited.	NR	A	ALL	R3
Methabenzthiazuron (Tribunil) AgNova	C**	Onions	Registered in onions for control of various broadleaf and grass weeds, including Shepherd's Purse . Apply to young weeds when onions have 1 or more true leaves. Repeat spraying may be necessary to maintain weed free crops. Treatments per season not limited.	70	A	QLD, NSW, VIC, TAS & WA	R3
Propachlor (Ramrod) Nufarm	K**	Onions / Direct Seeded	Registered in onions for control of various grass and broadleaf weeds, including Shepherd's Purse . Apply as a surface spray immediately after seeding. Rainfall or overhead irrigation is required as soon as possible after application. Treatment with other herbicides (post emergence) will be required later in the crop to maintain weed control to harvest.	NR	A	ALL	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Ethyl Dipropylthiocarbamate (Eptam) Nufarm	E**		Registered in several crops for control of various grass and broadleaf weeds, including Shepherd's Purse. Pre-plant residual herbicide that requires mechanical incorporation. No MRLs for AU or Codex.		P		-
NUL3438 Nufarm	TBC		New active in development, Nufarm claim activity on broadleaf weeds.		P		-
Blackberry Nightshade (<i>Solanum nigrum</i>)							
Priority: Moderate							
Present in all regions, it is rated as high priority in SA, but low in NSW and moderate elsewhere. Prolific weed that is widely adapted and difficult to eradicate, mainly due to its long-term seed viability.							
Bentazone (Basagran) BASF PER14773	C**	Onions	Permitted in onions for various broadleaf weeds, including Blackberry Nightshade . Can be used alone or in a tank-mix with ioxynil to improve the spectrum of weeds controlled. Do not apply herbicides other than ioxynil for 10 days before or after applications of bentazone. Apply after onions have 3 leaves, are waxy and healthy, and when weeds are still seedlings. Apply as either a single application or as 2 split applications to control late-germinating weeds. Do not exceed a cumulative total of 1.44 kg ai/ha. For split application, allow a minimum of 7 days between consecutive applications.	56	A	ALL (excl. VIC)	-
Chlorthal Dimethyl (Dacthal) Nufarm	D**	Onions / Pre-Emergence Application	Registered in onions for control of various grass and broadleaf weeds, including Blackberry Nightshade . Spray at time of seeding or transplanting. Can be sprayed directly over transplants. Lay-by applications can be made up to 14 weeks after planting or transplanting. Should weeds emerge, weed or cultivate prior to spraying.	NR NG	A	ALL	R3
Cyanazine (Bladex) AgNova	C**	Onions	Registered in onions for the control of various broadleaf weeds, including Blackberry Nightshade . Apply after the first leaf is fully expanded and the second true leaf has emerged, but not after mid-bulbing. Apply only in the cooler months (late autumn / early spring).	NR	A	TAS	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Linuron	C**	Onions	Registered in onions for control of various broadleaf weeds, including Blackberry Nightshade . Apply post-emergence after onions are 15cm high, with at least 3 leaves. Repeat as necessary. Treatments per season not limited.	NR	A	ALL	R3
Methabenzthiazuron (Tribunil) AgNova	C**	Onions / Tank Mix with Oxyfluorfen	Registered in onions for control of various broadleaf and grass weeds, including Blackberry Nightshade . Apply to young weeds when onions have 1 or more true leaves. Repeat spraying may be necessary to maintain weed free crops. Treatments per season not limited.	70	A	TAS	R3
Oxyfluorfen (Goal) Corteva	G**	Onions / Seeded	Registered in onions for various broadleaf weeds, including Blackberry Nightshade . Apply at the hook leaf stage, followed by a second application when onions are at the 1.5-2.5 true leaf stage. Multiple treatments may be applied provided the total dose does not exceed 0.48 kg ai/ha per season.	H:NR NG	A	ALL	-
Aclonifen (Emerger) Bayer	H**	Pre-Emergence	Minor Used Approval in the UK for control of some annual broadleaf and grass weeds in onions. Blackberry Nightshade is listed as moderately susceptible at a high rate. Bayer is expected to seek registration in Australia. No MRLs for AU or Codex.		P		-
Ethyl Dipropylthiocarbamate (Eptam) Nufarm	E**		Registered in several crops for control of various grass and broadleaf weeds, including Blackberry Nightshade. Pre-plant residual herbicide that requires mechanical incorporation. No MRLs for AU or Codex.		P		-
NUL3438 Nufarm	TBC		New active in development, Nufarm claim activity on broadleaf weeds.		P		-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Marshmallow (<i>Malva parviflora</i>)							
Priority: Moderate							
Widespread in all regions and rated as high priority in SA, low in NSW and TAS, and moderate elsewhere. Adapted to a wide variety of environments and highly competitive weed. Control with knockdown herbicides can be unreliable.							
Fluroxypyr (Starane Advanced) Corteva PER87200	I**	Bulb Onions	Permitted in bulb onions for control of various broadleaf weeds, including Marshmallow . Apply a maximum of 4 applications per crop between the 1 and 5 true leaf stage. Use a minimum retreatment interval of 7 days. Do not exceed a maximum seasonal dose of 800 mL/ha.	NR	A	TAS	-
Ioxynil (Totril) Barmac	C**	Onions	Registered in onions for control of various broadleaf weeds, including seedlings of Small Flower Mallow . Apply between 3 and 8 leaf crop stage and when the weeds are between the cotyledon to 6 leaf stage.	NR	A	ALL	R3
Methabenzthiazuron (Tribunil) AgNova	C**	Onions	Registered in onions for control of various broadleaf and grass weeds, including Small Flowered Mallow . Apply to young weeds when onions have 1 or more true leaves. Repeat spraying may be necessary to maintain weed free crops. Treatments per season not limited.	70	A	QLD, NSW, VIC, TAS & WA	R3
Oxyfluorfen (Goal) Corteva	G**	Onions / Seeded	Registered in onions for various broadleaf weeds, and Small Flowered Mallow is listed on the general weeds-controlled list both before germination and at the seedling stage. Apply at the hook leaf stage, followed by a second application when onions are at the 1.5-2.5 true leaf stage. Multiple treatments may be applied provided the total dose does not exceed 0.48 kg ai/ha per season.	H:NR NG	P-A	ALL	-
NUL3438 Nufarm	TBC		New active in development, Nufarm claim activity on broadleaf weeds.		P		-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Clover (<i>Trifolium</i> spp.) Priority: Moderate							
Winter growing weed that is in all growing regions, rated as low priority in NSW and SA. Aggressive weed that is difficult to control with herbicides in-crop.							
Cyanazine (Bladex) AgNova	C**	Onions	Registered in onions for the control of various broadleaf weeds, including Clovers . Apply after the first leaf is fully expanded and the second true leaf has emerged, but not after mid-bulbing. Apply only in the cooler months (late autumn / early spring).	NR	A	TAS	R3
Ethofumesate (Tramat) Bayer	J**	Onions	Registered in onions for control of various broadleaf and grass weeds, including Fat-Hen . Apply after 2 leaf stage of crop. Follow up program using alternative herbicides.	91	A	TAS	-
Ethofumesate (Tramat) Bayer PER84808	J**	Bulb Onions	Permitted in bulb onions for control of various broadleaf and grass weeds, including Fat-Hen . Apply 1 application only after 2-leaf growth stage.	70	A	ALL	-
NUL3438 Nufarm	TBC		New active in development, Nufarm claim activity on broadleaf weeds.		P		-
Flaxleaf Fleabane (<i>Conyza bonariensis</i>) Priority: Moderate							
Rated as moderate priority weed in all regions except TAS, where it is low priority. A problem weed because it seeds and grows prolifically and is difficult to control, particularly with knockdown herbicides.							
Propachlor (Ramrod) Nufarm	K**	Onions / Direct Seeded	Registered in onions for control of various grass and broadleaf weeds, including Fleabane . Apply as a surface spray immediately after seeding. Rainfall or overhead irrigation is required as soon as possible after application. Treatment with other herbicides (post emergence) will be required later in the crop to maintain weed control to harvest.	NR	A	ALL	R3
NUL3438 Nufarm	TBC		New active in development, Nufarm claim activity on broadleaf weeds.		P		-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Nutgrass (<i>Cyperus rotundus</i>)							
Priority: Moderate							
Rated as high priority in QLD and SA, low in TAS and moderate elsewhere. Prefers damp, water-logged soils but the nuts can survive for years underground during dry times. Herbicide options are limited and unreliable. Improve soil drainage if possible.							
Dimethenamid-P (Frontier-P) BASF PER80060	K**	Bulb Onions	Permitted in bulb onions for suppression of Nutgrass and other <i>Cyperus</i> species. Apply prior to main nutgrass emergence in early spring at the 2-4 leaf stage of crop. Apply maximum of 2 treatments per crop, with a minimum 10 day interval between applications.	NR	A	WA	-
Ethyl Dipropylthiocarbamate (Eptam) Nufarm	E**		Registered in several crops for control of various grass and broadleaf weeds, including Nutgrass. Pre-plant residual herbicide that requires mechanical incorporation. No MRLs for AU or Codex.		P		-
Turnip Weed (<i>Rapistrum rugosum</i>)							
Priority: Moderate							
Rated as high priority in SA, low in TAS and moderate elsewhere. Widespread winter broadleaf weed that competes strongly in-crop.							
Bromoxynil (Maya) Nufarm PER87914	C**	Bulb Onions	Permitted in onions for control of various broadleaf weeds, including Turnip Weed . Apply when weeds are 4-leaf stage or when plants are no more than 35mm in diameter. Do not apply more than 2 applications per season. If 2 applications are used, apply the first post-sowing pre-emergence and the second foliar post-emergence. Do not apply later than the 4 leaf stage in-crop. Nufarm plan to register this product for use in onions.	NR NG	A	ALL	-
Ethofumesate (Tramat) Bayer	J**	Onions	Registered in onions for control of various broadleaf and grass weeds, including Cruciferous Weeds . Apply after 2 leaf stage of crop. Follow up program using alternative herbicides.	91	A	TAS	-
Ethofumesate (Tramat) Bayer PER84808	J**	Bulb Onions	Permitted in bulb onions for control of various broadleaf and grass weeds, including Cruciferous Weeds . Apply 1 application only after 2-leaf growth stage.	70	A	ALL	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Ioxynil (Totril) Barmac	C**	Onions	Registered in onions for control of various broadleaf weeds, including Turnip Weed . Apply between 3 and 8 leaf crop stage and when the weeds are between the cotyledon to 6 leaf stage.	NR	A	ALL	R3
Linuron	C**	Onions	Registered in onions for control of various broadleaf weeds, including Turnip Weed . Apply post-emergence after onions are 15cm high, with at least 3 leaves. Repeat as necessary. Treatments per season not limited.	NR	A	ALL	R3
NUL3438 Nufarm	TBC		New active in development, Nufarm claim activity on broadleaf weeds.		P		-
Wild Turnip (<i>Brassica tournefortii</i>) Priority: Moderate							
Widespread weed that is rated moderate priority in all regions except NSW and SA, where it is rated low. Winter growing that competes aggressively with crops and runs to seed quickly.							
Bentazone (Basagran) BASF PER14773	C**	Onions	Permitted in onions for various broadleaf weeds, including Wild Turnip . Can be used alone or in a tank-mix with ioxynil to improve the spectrum of weeds controlled. Do not apply herbicides other than ioxynil for 10 days before or after applications of bentazone. Apply after onions have 3 leaves, are waxy and healthy, and when weeds are still seedlings. Apply as either a single application or as 2 split applications to control late-germinating weeds. Do not exceed a cumulative total of 1.44 kg ai/ha. For split application, allow a minimum of 7 days between consecutive applications.	56	A	ALL (excl. VIC)	-
Cyanazine (Bladex) AgNova	C**	Onions	Registered in onions for the control of various broadleaf weeds, including Wild Turnip . Apply after the first leaf is fully expanded and the second true leaf has emerged, but not after mid-bulbing. Apply only in the cooler months (late autumn / early spring).	NR	A	TAS	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Ethofumesate (Tramat) Bayer	J**	Onions	Registered in onions for control of various broadleaf and grass weeds, including Cruciferous Weeds . Apply after 2 leaf stage of crop. Follow up program using alternative herbicides.	91	A	TAS	-
Ethofumesate (Tramat) Bayer PER84808	J**	Bulb Onions	Permitted in bulb onions for control of various broadleaf and grass weeds, including Cruciferous Weeds . Apply 1 application only after 2-leaf growth stage.	70	A	ALL	-
Ioxynil (Totril) Barmac	C**	Onions	Registered in onions for control of various broadleaf weeds, including Wild Turnip . Apply between 3 and 8 leaf crop stage and when the weeds are between the cotyledon to 6 leaf stage.	NR	A	ALL	R3
Linuron	C**	Onions	Registered in onions for control of various broadleaf weeds, including Wild Turnip . Apply post-emergence after onions are 15cm high, with at least 3 leaves. Repeat as necessary. Treatments per season not limited.	NR	A	ALL	R3
Methabenzthiazuron (Tribunil) AgNova	C**	Onions	Registered in onions for control of various broadleaf and grass weeds, including Wild Turnip . Apply to young weeds when onions have 1 or more true leaves. Repeat spraying may be necessary to maintain weed free crops. Treatments per season not limited.	70	A	QLD, NSW, VIC, TAS & WA	R3
NUL3438 Nufarm	TBC		New active in development, Nufarm claim activity on broadleaf weeds.		P		-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Pigweed (<i>Portulaca</i> spp.)							
Priority: Moderate							
Rated as high priority in SA, low in TAS and moderate elsewhere. Summer growing weed that competes aggressively in-crop and can be difficult to control with herbicides.							
Chlorthal Dimethyl (Dacthal) Nufarm	D**	Onions / Pre-Emergence Application	Registered in onions for control of various grass and broadleaf weeds, including Pigweed . Spray at time of seeding or transplanting. Can be sprayed directly over transplants. Lay-by applications can be made up to 14 weeks after planting or transplanting. Should weeds emerge, weed or cultivate prior to spraying.	NR NG	A	ALL	R3
Fluroxypyr (Starane Advanced) Corteva PER87200	I**	Bulb Onions	Permitted in bulb onions for control of various broadleaf weeds, including Pigweed . Apply a maximum of 4 applications per crop between the 1 and 5 true leaf stage. Use a minimum retreatment interval of 7 days. Do not exceed a maximum seasonal dose of 800 mL/ha.	NR	A	TAS	-
Linuron	C**	Onions	Registered in onions for control of various broadleaf weeds, including Pigweed . Apply post-emergence after onions are 15cm high, with at least 3 leaves. Repeat as necessary. Treatments per season not limited.	NR	A	ALL	R3
Methabenzthiazuron (Tribunil) AgNova	C**	Onions	Registered in onions for control of various broadleaf and grass weeds, including Pigweed . Apply to young weeds when onions have 1 or more true leaves. Repeat spraying may be necessary to maintain weed free crops. Treatments per season not limited.	70	A	QLD, NSW, VIC, TAS & WA	R3
Ethyl Dipropylthiocarbamate (Eptam) Nufarm	E**		Registered in several crops for control of various grass and broadleaf weeds, including Pigweed. Pre-plant residual herbicide that requires mechanical incorporation. No MRLs for AU or Codex.		P		-
NUL3438 Nufarm	TBC		New active in development, Nufarm claim activity on broadleaf weeds.		P		-

4.4 Plant Growth Regulators in Onions

4.4.1 Plant Growth Regulator Priorities

Priority
Moderate
Inhibit sprouting
Increase crop yield
Increase bulb size
Low
Promote crop evenness
Initiation of bulbing
Promote vegetative growth
Restriction of vegetative growth

Plant Growth Regulators (PGR) do not play a significant role in the management of onions. There were no high priority issues nominated for PGRs. Issues identified as moderate priority are inhibiting sprouting, increasing crop yield and increasing bulb size. There is only one PGR currently available for use in onions, Maleic Hydrazide which is used for the inhibition of sprouting.

4.4.2 Available and Potential Plant Growth Regulators

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

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

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use	WHP (days)	Availability	States	Regulatory risk
Inhibit Sprouting							
Priority: Moderate							
Post-harvest sprouting will reduce shelf-life and marketability of onions.							
Maleic Hydrazide	Plant Growth Regulator	Onion	Registered in onions to inhibit sprouting of bulbs. Spray when onion bulbs are fully mature and have 5-6 green leaves and their necks are soft enough for the lops to fall if they have not already done so. Apply when 50% of the tops have fallen, but while all the tops are still green.	NR	A	TAS, NSW, ACT, VIC, SA & WA	-

5. References

5.1 Information:

AgChem Access Priority Access Forum	https://www.agrifutures.com.au/national-rural-issues/agvet-chemicals/
Australian Pesticide and Veterinary Medicines Authority	www.apvma.gov.au
APVMA MRLs	www.legislation.gov.au/Details/F2020C00050
APVMA Permit search	https://productsearch.apvma.gov.au/permits
APVMA Product search	https://productsearch.apvma.gov.au/products
Codex MRL database	http://www.fao.org/fao-who-codexalimentarius/codex-texts/dbs/pestres/pesticides/en/
Cotton Pest Management Guide 2019-20	https://www.cottoninfo.com.au/publications/cotton-pest-management-guide
CropLife Australia	https://www.croplife.org.au/
Growcom – Infopest Database	www.infopest.com.au
Hort Innovation	www.horticulture.com.au

5.2 Abbreviations and Definitions:

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

5.3 Acknowledgements:

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

6. Appendices

Appendix 1. Products available for disease control in onion

Appendix 2. Products available for control of insects, mites and nematode pests in onion

Appendix 3. Products available for weed control in onion

Appendix 4. Plant Growth Regulators available in onion

Appendix 5. Current permits for use in onion

Appendix 6. Onion Maximum Residue Limits (MRLs)

Appendix 7. Onion regulatory risk assessment

Appendix 1. Products available for disease control in onions

Active Ingredient (Trade Name)	Chemical group	Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Azoxystrobin + Oxathiapiprolin (Orondis Flexi) Syngenta	11+49	Bulb Vegetable	Downy Mildew (<i>Peronospora destructor</i>) Suppression of: White Rot (<i>Sclerotium cepivorum</i>)	ALL	H:3 NG	-
<i>Bacillus amyloliquefaciens</i> Strain QST 713 (Serenade Prime Soil Ameliorant and Biofungicide) Bayer	44	Vegetables	Registered for application to soil to improve bioavailability of soil resources to horticultural crops.	ALL	NR	-
Boscalid (Filan) BASF	7	Onions	Neck Rot (<i>Botrytis allii</i>)	ALL	NR	-
Boscalid (Filan) BASF PER14602	7	Onion Seed	Neck Rot (<i>Botrytis allii</i>)	ALL (excl. VIC)	NR	-
Bromo Chloro Dimethyl Hydatoin (BCDMH)	-	Sanitiser / Post- Harvest Treatment	External Rot Causing Organisms	ALL	NR	-
Chlorine	-	Sanitiser / Post- Harvest Treatment	Bacteria and Fungi	ALL	NR	-
Chlorothalonil (Bravo) Syngenta	M5	Onions	Downy Mildew (<i>Peronospora destructor</i>)	ALL	14	R3
Copper (Cu) present as Cupric Hydroxide	M1	Onions	Downy Mildew (<i>Peronospora destructor</i>)	ALL	1	-
Copper (Cu) present as Tribasic Copper Sulphate	M1	Onions	Downy Mildew (<i>Peronospora destructor</i>)	ALL	1	-
Copper (Cu) present as Copper Ammonium Complex	M1	Onions	Downy Mildew (<i>Peronospora destructor</i>)	ALL	1	-

Active Ingredient (Trade Name)	Chemical group	Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Copper (Cu) present as Copper Oxychloride	M1	Onions	Downy Mildew (<i>Peronospora destructor</i>)	ALL	1	-
Copper (Cu) present as Cuprous Oxide	M1	Onions	Downy Mildew (<i>Peronospora destructor</i>)	ALL	1	-
Dimethomorph (Acrobat) BASF	40	Onions	Downy Mildew (<i>Peronospora destructor</i>) Leaf Blight	ALL	7	-
			Purple Blotch (<i>Alternaria porri</i>)	QLD, NT		
Fludioxonil + Cyprodinil (Switch) Syngenta	12+9	Onions	Neck Rot (<i>Botrytis allii</i>) Suppression of Black Mould (<i>Aspergillus niger</i>)	ALL	7	-
Iprodione (Rovral) + Chlorothalonil (Bravo) PER14602	2+M5	Onions	Neck Rot (<i>Botrytis allii</i>)	ALL (excl. VIC)	NR	R2
Hydrogen Peroxide + Peroxyacetic Acid (Peratec)	M	Allium Vegetables	Neck & Bulb Rot (<i>Botrytis spp.</i>) Downy Mildew (<i>Peronospora destructor</i>)	ALL	1	-
Iodine	M	Onions / Sanitiser / Post-Harvest Dip	Bacteria & Fungi	ALL	NR	-
Mancozeb	M3	Onions	Downy Mildew Purple Blotch	ALL	7	R2
Mancozeb + Benalaxyl	M3+4	Onions	Downy Mildew (<i>Peronospora destructor</i>)	ALL	7	R2
			Purple Blotch (<i>Alternaria porri</i>)	QLD		
Mancozeb + Dimethomorph (Acrobat WDG) BASF	M3+40	Onions	Downy Mildew (<i>Peronospora destructor</i>)	ALL	7	R2
			Purple Blotch (<i>Alternaria porri</i>)	QLD, NT		

Active Ingredient (Trade Name)	Chemical group	Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Mancozeb + Metalaxyl (Ridomil Gold MZ) Syngenta	M3+4	Onions	Downy Mildew (<i>Peronospora destructor</i>)	ALL	7	R2
			Purple Blotch (<i>Alternaria porri</i>)	QLD		
Metiram (Polyram)	M3	Bulb Onions	Downy Mildew Purple Blotch	ALL	7	R2
Oxathiapiprolin (Zorvec Enicade) Corteva	49	Onions	Downy Mildew (<i>Peronospora destructor</i>)	ALL	10	-
Penthiopyrad (Fontelis) Corteva	7	Onions	Botrytis Blight & Neck Rot (<i>Botrytis</i> spp.) Purple Blotch (<i>Alternaria porri</i>)	ALL	3	-
Peroxyacetic Acid	M	Sanitiser / Post-Harvest Treatment	Bacteria	ALL	NR	-
Phosphorous Acid PER13698	33	Bulb Onion	Suppression of Downy Mildew (<i>Peronospora</i> spp.)	ACT, NSW, QLD, SA, TAS, NT & WA	1	-
Procymidone (Sumisclex)	2	Onions / Seed Treatment	White Rot (<i>Sclerotium cepivorum</i>)	VIC, QLD, NSW, SA, TAS & NT	28	-
		Onions / In-Furrow Application		VIC, QLD, NSW, SA & TAS		
		Onions / Soil Spray		VIC, QLD, NSW, SA & NT		
		Onions / Transplant Dip		VIC, QLD, NSW & SA		

Active Ingredient (Trade Name)	Chemical group	Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Propamocarb Hydrochloride + Fluopicolide (Infinito) Bayer	28+43	Bulb Vegetables	Downy Mildew (<i>Peronospora destructor</i>)	ALL	7	-
Propineb (Antracol)	M3	Onions	Downy Mildew	ALL	7	R2
Propineb + Oxadixyl (Rebound) Kiwi Rural Products	M3+4	Onions	Downy Mildew	ALL	14	R2
Tebuconazole	3	Onions	White Root Rot	TAS	NR	R3
Triadimenol (Allitron) FMC	3	Onions	White Rot	ALL	28	R3
Zineb	M3	Onions	Downy Mildew Purple Blotch Blue Mould	NSW, VIC, SA, WA, TAS & QLD	7	R2

Appendix 2. Products available for control of insects, mites and nematode pests in onion

Active Ingredient (Trade Name)	Chemical group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Abamectin PER81876	6	Bulb Onions	Suppression of Vegetable Leaf Miner (<i>Lyriomyza sativae</i>)	ALL (excl. VIC)	H:30 NG	-
Alpha-Cypermethrin PER80282	3A	Onion	Onion Thrips (<i>Thrips tabaci</i>)	ALL (excl. VIC)	14	-
Chlorpyrifos (Lorsban)	1B	Onion	Wingless Grasshopper	NSW, ACT, VIC & TAS	NR	R1
			Cutworm	ALL		
			Field Crickets Mole Crickets	QLD		
			Vegetable Weevil	NSW, ACT		
Cyantraniliprole (Benevia) FMC	28	Onions	Suppression of Onion Thrips (<i>Thrips tabaci</i>)	ALL	7	-
Diazinon	1B	Onions	Onion Seedling Maggot Onion Maggot Wireworm	ACT, NSW, SA, VIC & WA	14	R3
Diazinon PER13119	1B	Onions	Onion Thrips	TAS	14	R3
Dimethoate	1B	Onions	Aphids Jassids Mites Leafhoppers Green Vegetable Bug Thrips Wingless Grasshoppers	ALL	7	R1

Active Ingredient (Trade Name)	Chemical group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Ethyl Formate	-	Onion / Post-Harvest Fumigation	Onion Thrips (<i>Thrips tabaci</i>)	ALL	NR	-
Fonicamid (Mainman) PER89185	29	Bulb Vegetables / Field- Grown	Suppression of: Onion Thrips (<i>Thrips tabaci</i>) Western Flower Thrips (<i>Frankliniella occidentalis</i>)	ALL (excl. VIC)	7	-
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide	3A	Vegetables	Suitable for organic growers. Broad spectrum activity including ants, aphids, caterpillars, earwigs, whitefly, thrips, and leafhopper.	ALL	1	-
Lambda-Cyhalothrin (Karate Zeon) Syngenta	3A	Bulb Onions	Onion Thrips	ALL	14	-
Malathion	1B	Onions	Onion Thrips (<i>Thrips tabaci</i>)	SA, VIC, WA & NT	3	-
Methomyl (Lannate) PER89293	1A	Bulb Onion	Fall Armyworm (<i>Spodoptera frugiperda</i>)	ALL	7	-
Petroleum Oil PER12221	-	Alliums	Aphids Green Mirid Green Vegetable Bug Grey Cluster Bug Leafhoppers Mites Rutherglen Bug Thrips	ALL (excl. VIC)	1	-
Phorate (Thimet)	1B	Onions	Onion Maggot Thrips	ALL	70	R3

Active Ingredient (Trade Name)	Chemical group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Potassium Salts of Fatty Acid (Natrasoap)	-	Vegetables	Aphids Thrips Mealybug Two-Spotted Mite Spider Mite Whitefly	ALL	NR	-
Spinetoram (Success Neo) Corteva PER89331	5	Bulb Onions	Fall Armyworm (<i>Spodoptera frugiperda</i>)	ALL (excl. VIC)	H:3 NG	-
Spinosad (Naturalure) Corteva	5	Tree, Fruit, Nut, Vine & Vegetable Crops / Fruit Fly Bait	Queensland Fruit Fly (<i>Bactrocera tryoni</i>) Mediterranean Fruit Fly (<i>Ceratitis capitata</i>)	ALL	NR	-
Spirotetramat (Movento) Bayer	23	Bulb Onions	Onion Thrips (<i>Thrips tabaci</i>)	ALL	7	-

Appendix 3. Products available for weed control in onions

Active ingredient (Trade Name)	Chemical Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Asulam	R**	Onions	Docks	H:NR G:21	TAS	-
Bentazone (Basagran) BASF PER14773	C**	Onions	Broadleaf weeds as listed on the product label PLUS Wild carrot, White thistle, Erodium, Field madder, Hemlock/carrot fern, Volunteer dill, Burr chervil, Groundsel, Crowsfoot grass	56	ALL (excl. VIC)	-
Bromoxynil (Maya - Unregistered) Nufarm PER87914 *Note Maya is not currently registered in Australia	C**	Bulb Onions	Bellvine, Black Bindweed, Capeweed, Chickweed, Corn Gromwell, Deadnettle, Fat Hen, Fumitories, Green Amaranth, Lesser Swinecress or Bittercress, Saffron Thistle, Scarlet Pimpernel, Shepherd's Purse, Sow or Milk Thistle, Stagger Weed or Mint Weed, Three Cornered Jack or Doublegee, Threeflower Nightshade, Turnip Weed, Wild Radish, Wireweed	NR NG	ALL	-
Chlorthal Dimethyl (Dacthal) Nufarm	D**	Onions	Annual Sedge, Apple-of-Peru, Barnyard Grass, Black Bindweed, Climbing Buckwheat, Blackberry Nightshade, Blue Pimpernel, Caltrop, Canary Grass, Cape Gooseberries, Capeweed, Chickweed, Columbus Grass, Corn Spurry, Crowsfoot Grass, Crabgrass, Crowfoot / Storksbill, Dandelion, Deadnettle, Docks, Dodder, Fat-Hen, Fescues, Giant Pigweed, Green Amaranth, Heliotrope, Innocent Weed, Sand Burr, Johnson Grass, Kidney Weed, Love Grasses, Mexican Clover, Mossman River Grass, Mouse-Ear Chickweed, Petty Spurge, Pheasants Eye, Pigeon Grass, Pigweed, Prickly Paddy Melon, Prince of Wales Feather, Red Natal Grass, Lamb's Tongue, Rolypoly / Buckbush, Ryegrass, Salvation Jane / Paterson's Curse, Scarlet Pimpernel, Sow Thistle / Milk Thistle, Spiny Burr Grass, Spiny Emex / Doublegee / Three Cornered Jack, Stagger Weed, Stinging Nettle, Summer Grass, Toadflax, Urochloa / Liverseed Grass, Ward's Weed, Windmill Grass / Rhodes Grass, Winter Grass, Wireweed	NR NG	ALL	R3

Active ingredient (Trade Name)	Chemical Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Clethodim (Select) UPL	A***	Onions	Barnyard Grass, Blown Grass, Crowsfoot Grass, Feathertop Rhodes Grass, Liverseed Grass, Paradoxa Grass, Red Sprangletop Grass, Seedling Johnson Grass, Summer Grass, Volunteer Sorghum, Annual Ryegrass, Annual Phalaris, Barley Grass, Brome Grass, Wild Oats, Volunteer Wheat, Volunteer Oats, Volunteer Barley, Suppression of Silver Grass (not QLD, WA), Winter Grass	14	ALL	R3
Cyanazine (Bladex) AgNova	C**	Onions	Blackberry Nightshade, Black Bindweed, Chickweed, Clovers, Cotula, Crowfoot / Storksbill, Docks, Mountain Sorrel, Persicaria / Redshank, Plantain, Sorrel, Sowthistle, Spear Thistle, Wild Turnip	NR	TAS	R3
Dimethenamid-P (Outlook) BASF PER88567	K**	Bulb Onions	Amaranthus	NR	TAS	-
Dimethenamid-P (Frontier-P) BASF PER80060	K**	Bulb Onions	Suppression of: Nutgrass / Purple Nutsedge Other Cyperus species, including <i>C. congestus</i> and <i>C. eragrostis</i>	NR	WA	-
Ethofumesate (Tramat) Bayer	J**	Onions	Broadleaf and Grass Weeds, particularly: Barley Grass, Clovers, Cruciferous Weeds, Fat-Hen, Fumitory, Winter Grass, Wireweed	91	TAS	-
Ethofumesate (Tramat) Bayer PER84808	J**	Bulb Onions	Broadleaf and Grass Weeds, particularly: Barley Grass, Clovers, Cruciferous Weeds, Fat-Hen, Fumitory, Winter Grass, Wireweed	70	ALL	-
Fluazifop-P (Fusilade) Syngenta	A***	Onions	Annual Ryegrass, Barley Grass, Barnyard Grass, Brome Grasses, Crowsfoot Grass, Johnson Grass (seedling), Liverseed Grass, Volunteer Cereals, Wild Oats, Innocent Weed, Stinkgrass, Summer Grass Seedlings of: Couch Grass, English Couch, Water Couch, Pigeon Grass and Foxtail seedlings	35	ALL	-

Active ingredient (Trade Name)	Chemical Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Fluroxypyr (Starane Advanced) Corteva PER87200	I**	Bulb Onions	Annual Ground Cherry, Bathurst Burr, Bellvine, Black Bindweed, Bladder Ketmia, Caltrop / Yellow Vine, Cowvine, Marsh / Smallflower Mallow, Noogoora Burr, Perennial Ground Cherry, Polymeria, Red Pigweed, Rhynchosia, Sesbania Pea, Silverleaf Nightshade, Smallflower Mallow, Thornapple, Volunteer Cotton – Roundup Ready, Volunteer Peanut, Volunteer Sunflower, Wild Gooseberry, Yellow Vine / Spineless Caltrop, Bedstraw, Black Bindweed, Cleavers, Marsh / Smallflower Mallow, Prickly Lettuce Sow Thistle / Milk Thistle, Three Cornered Jack / Doublegee, Wireweed, Knotweed / Hogweed	NR	TAS	-
Glyphosate (Roundup)	M**	Onions / Post-Plant, Pre-Emergence Application	Control of Annual Grass and Broadleaf Weeds, and suppression of perennial weeds, including Rope Twitch.	NR	TAS	-
Haloxyfop (Verdict) Corteva PER84734	A***	Bulb Onions	Storksbill, <i>Erodium</i> spp. , Australian Millet, Green Panic, Mossman River Grass, Prairie Grass	NR	ALL	-
Ioxynil (Totril) Barmac	C**	Onions	Bellvine, Black Bindweed, Burr Medic – Seedling, Capeweed – Seedling, Chickweed, Common Heliotrope, Corn Gromwell, Ironweed / Sheepweed, Dandelion, Deadnettle, Fat Hen, Fumitory, Green Amaranth, Keeled Goosefoot, Lesser Swinecress / Bittercress, Ox-Tongue, Paddy Melon, Perennial Pigweed, Potato Weed / Yellow Weed, Saffron Thistle – Seedling, Scarlet Pimpernel / Red Pimpernel, Shepherd’s Purse, Slender Celery – Seedling, Smallflower Mallow – Seedling, Sow Thistle / Milk Thistle, Stagger Weed, Three Cornered Jack / Doublegee, Threeflower Nightshade, Turnip Weed, Ward’s Weed, Wild Radish / Radish Weed, Wild Turnip, Wireweed / Knotweed – Seedling	NR	ALL	-

Active ingredient (Trade Name)	Chemical Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Linuron	C**	Onions	Three-Cornered Jack (Double Gee), Capeweed, Wild Radish, Corn Gromwell, Wild Turnip, Deadnettle, Mustard, Turnip Weed, Rough Poppy, Slender Thistle, Amsinckia, Saffron Thistle, Fat-Hen, Shepherd's Purse, Amaranth, Blackberry Nightshade, Pigweed, Chickweed, Nettles, Wintergrass	NR	ALL	R3
Methabenzthiazuron (Tribunil) AgNova	C**	Onions	Deadnettle, Three-Cornered Jack / Spiny Emex / Double Gee, Mustard / Charlock, Wild Turnip, Dwarf Nettle, Ball Mustard, Amsinckia / Yellow Burr Weed, Capeweed, Chickweed, Long Storksbill / Crowsfoot, Ice plant, Rough Poppy, Corn Gromwell, Spurry, Stagger Weed, Variegated Thistle, Treacle-Mustard / Hares Ear, Common Cotula, Fat-Hen, Fumitory, Mustard, Lesser Swinecress, Ribwort / Common Plantain, Lamb's Tongue, London Rocket, Smaller Flowered Mallow, Mexican Lovegrass, Pimpernel, Pigweed, Potato Weed, Redshank, Shepherd's Purse, Sowthistle, Speedwell, Stinking Goosefoot, Winter Grass, Wild Radish	70	QLD, NSW, VIC, TAS & WA	R3
		Onions / Tank Mix with Oxyfluorfen	Fat-Hen, Blackberry Nightshade, Stinging Nettle, Bindweed		TAS	
Oxyfluorfen (Goal) Corteva	G**	Onions / Seeded	Blackberry Nightshade, Docks, Crowsfoot / Storksbill, Fumitory Hogweed / Wireweed, Plantain, Sorrel, Volunteer Potato, Potato Weed, Milk Thistle, Deadnettle, Common Cotula, Groundsel	H:NR NG	ALL	-
Pendimethalin (Stomp) BASF	D**	Onions	Hogweed / Wireweed	NR	TAS, NSW, ACT, VIC, SA & WA	-
Propachlor (Ramrod) Nufarm	K**	Onions / Direct Seeded	Annual Ryegrass, Barnyard Grass, Blue and Red Pimpernel, Chickweed, Course and Swamp Clubrush, Crowsfoot Grass, Dead Nettle, Fat Hen, Fleabane, Green and Pale Pigeon Grass / Foxtail Grass, Hairy Centrolepis, Liverseed Grass, Milk Thistle, Mouse-Ear Chickweed, Prince of Wales Feather, Cudweeds, Shepherd's Purse, Stinging Nettle, Summer Grass, Toad Rush, Winter Grass, White Clover, Potato Weed / Yellow Weed	NR	ALL	R3

Active ingredient (Trade Name)	Chemical Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Quizalofop-P-Ethyl (Targa) Sipcam	A***	Onions	Annual Ryegrass, Brome Grass, Barley Grass, Volunteer Barley, Volunteer Wheat, Wild Oats	126	ALL	-
Sethoxydim (Sertin) Bayer	A***	Onions	Awnless Barnyard Grass, Barnyard Grass / Water Grass, Bulbous Oatgrass / Onion Twitch, Crowsfoot Grass, Dinebra, English Couch / Rope Twitch, Foxtail, Green Summer Grass, Johnson Grass – Seedling, Lesser Canary Grass, Liverseed Grass – Seed, Paradoxa Grass, Pigeon Grass, Prairie Grass / Annual Prairie Grass, Ryegrass, Stink Grass, Summer Grass / Crab Grass, Velvet Grass, Volunteer Oat, Volunteer Sorghum, Volunteer Wheat, Whorled Pigeon Grass, Wild Oats / Black Oats	28	ALL	R3

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

Appendix 4. Plant Growth Regulators available in onion

Active ingredient (Trade Name)	Chemical Group	Situation	Comment / Use	WHP (days)	States	Regulatory risk
Maleic Hydrazide	Plant Growth Regulator	Onions	Inhibit Sprouting of Bulbs	NR	TAS, NSW, ACT, VIC, SA & WA	-

Appendix 5. Current permits for use in onions

Permit ID	Description	Date Issued	Expiry Date	Permit holder
PER89185	Flonicamid (Mainman) / Bulb Vegetables / Field Grown / Suppression of Onion Thrips & Plague Thrips	06-Aug-20	31-Aug-23	Hort Innovation
PER89331	Spinetoram (Success Neo) / Onion / Fall Armyworm Emergency Use Permit	23-Mar-20	31-Mar-23	Hort Innovation
PER89293	Methomyl (Lannate) / Various Crops as per Label / Fall Armyworm Emergency Use Permit	10-Apr-20	30-Apr-23	Hort Innovation
PER13119 Version 5	Diazinon / Onions / Onion thrips (TAS only)	06-Mar-12	31-May-23	Hort Innovation
PER88567	Dimethenamid-P / Bulb Onions / Amaranthus Emergency Use Permit (TAS only)	18-Nov-19	30-Nov-20	Wynyon Pty Ltd
PER87914	Bromoxynil (Maya) / Onions / Broadleaf Weeds Emergency Use Permit for an unregistered product	22-May-19	31-May-21	Australian Onion Industry Association
PER84734 Version 2	Haloxypop (Verdict) / Onions / Storksbill	19-Dec-17	31-Dec-24	Hort Innovation
PER87200	Fluroxypyr (Starane Advanced) / Bulb Onion / Weeds (TAS only)	26-Aug-19	31-Aug-24	Australian Onion Industry Association
PER81876 Version 3	Abamectin / Brassica Vegetables, Bulb Vegetables, Fruiting Vegetables / Leaf Miner	24-Jun-16	30-Apr-24	Hort Innovation
PER80060 Version 3	Dimethenamid-P / Bulb onions / Nut grass and other Cyperus spp. (WA only)	31-Aug-15	31-Jul-21	WA Vegetable Growers Association
PER86865 Version 3	Ioxynil / Onions / Annual Broadleaf Weeds Emergency Use Permit	10-Aug-18	31-Aug-21	Australian Onion Industry Association C/ Hort Innovation
PER14602 Version 4	Boscalid, Iprodione & Chlorothalonil / Onion (Bulb & Seed) / Botrytis Neck-Rot	24-Jul-14	30-Sep-23	Australian Onion Industry Association C/ Hort Innovation
PER14773 Version 3	Bentazone-Sodium (Basagran) / Onions / Broadleaf Weeds	16-Apr-14	31-Jan-23	Australian Onion Industry Association C/ Hort Innovation
PER12221 Version 4	Petroleum oil / Specified vegetable crops / Specified insect pests	29-Jun-12	30-Nov-22	Hort Innovation
PER84808	Ethofumesate (Tramat) / Onions / Broadleaf and Grass weeds	20-Feb-18	28-Feb-23	Australian Onion Industry Association C/ Hort Innovation
PER80282 Version 2	Alpha-Cypermethrin / Onions / Onion Thrips	16-Dec-14	30-Nov-20	Australian Onion Industry Association
PER13698 Version 3	Phosphorous / Lettuce (Leaf+Hydro), Parsley, Coriander Fennel and Bulb (Allium) Vegetables / Downy Mildew	01-Oct-12	30-Sep-22	Hort Innovation

Appendix 6. Onion Maximum Residue Limits (MRLs)

CODEX commodity groupings of Onions and subgroups:

	Vegetables
VA 0035	Group of Bulb Vegetables
VA 0036	Bulb Vegetables, except fennel, bulb
VA 0385	Onion, bulb
VA 2031	Subgroup of Bulb onions (includes all commodities in this subgroup)

Note: Major export markets for onions include Thailand, Taiwan, Malaysia, France and Belgium. Available information indicates that in the absence of specific limits in legislation, some countries defer to Codex, followed by EU MRL standards, or apply a 0.01 mg/kg default value. Food exported to New Zealand from Australia may be legally sold if it complies with Australian requirements (FSANZ Schedule 20 of the Food Code). MRLs and legislation are subject to change; the values presented should not be relied on.

Chemical	Codex Code	Description	APVMA MRL mg/kg	Codex MRL mg/kg
2,2-DPA		Vegetables	*0.1	-
Abamectin	VA 0035	Bulb vegetables	0.05	-
Abamectin	VA 0385	Onion, bulb	-	0.005
Acetamiprid	VA 0385	Onion, bulb	-	0.02
Acibenzolar-S-methyl	VA 0385	Onion, bulb	-	0.15
Aldicarb	VA 0385	Onion, bulb	-	0.1
Aldrin & Dieldrin	VA 0035	Bulb vegetables	-	E0.05
Ametoctradin	VA 0385	Onion, bulb	1.5	1.5
Azoxystrobin	VA 0035	Bulb vegetables	-	10
Azoxystrobin	VA 0385	Onion, bulb	0.2	-
Benalaxyl	VA 0385	Onion, bulb	0.1	*0.02
Bentazone	VA 0385	Onion, bulb	T0.1	0.04
Boscalid	VA 0035	Bulb vegetables	5	5
Boscalid	VA 0385	Onion, bulb	0.5	-
Bromoxynil	VA 0385	Onion, bulb	T*0.01	-
Chlorfenapyr	VA 0385	Onion, bulb	-	*0.01
Chlorothalonil	VA 0385	Onion, bulb	10	1.5
Chlorpyrifos	VA 0385	Onion, bulb	0.2	0.2
Chlorpyrifos		Vegetables	T*0.01	-
Chlorthal-dimethyl		Vegetables	5	-
Clethodim	VA 0385	Onion, bulb	-	0.5
Cyanazine	VA 0035	Bulb vegetables	*0.02	-
Cyantraniliprole	VA 0385	Onion, bulb	0.05	0.05
Cyazofamid	VA 2031	Bulb onions, subgroup of	-	1.5
Cycloxydim	VA 0385	Onion, bulb	3	3
Cyhalothrin	VA 0035	Bulb vegetables	-	0.2
Cyhalothrin	VA 0385	Onion, bulb	*0.05	-
Cypermethrin	VA 0385	Onion, bulb	*0.01	*0.01
Cyprodinil	VA 0385	Onion, bulb	0.2	0.3
Cyromazine	VA 0385	Onion, bulb	-	0.1
Deltamethrin	VA 0385	Onion, bulb	-	0.05
Diazinon	VA 0385	Onion, bulb	-	0.05
Diazinon		Vegetables	0.7	-
Dichlobinil	VA 0385	Onion, bulb	-	*0.01
Dichloran	VA 0385	Onion, bulb	-	0.2

Chemical	Codex Code	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Dicofol		Vegetables	5	-
Difenoconazole	VA 0385	Onion, bulb	-	0.1
Dimethenamid-P	VA 0385	Onion, bulb	T*0.01	*0.01
Dimethoate	VA 0385	Onion, bulb	0.7	-
Dimethomorph	VA 0385	Onion, bulb	0.6	0.6
Dinotefuran	VA 0385	Onion, bulb	-	0.1
Diquat	VA 0385	Onion, bulb	0.1	
Dithiocarbamates	VA 0385	Onion, bulb	4	0.5
EPTC		Vegetables	*0.04	-
Ethofumesate	VA 0035	Bulb vegetables	*0.1	-
Etridiazole		Vegetables	0.2	-
Fenamidone	VA 0385	Onion, bulb	-	0.15
Fonicamid	VA 0035	Bulb vegetables	T0.2	-
Fluazifop-p-butyl	VA 0385	Onion, bulb	0.05	0.3
Fludioxonil	VA 2031	Bulb onions, subgroup of	-	0.5
Fludioxonil	VA 0385	Onion, bulb	0.2	-
Flumioxazin	VA 0385	Onion, bulb	-	*0.02
Fluopicolide	VA 0385	Onion, bulb	0.1	1
Fluopyram	VA 0385	Onion, bulb	-	0.07
Flupyradifurone	VA 0036	Bulb vegetables, except fennel, bulb	-	*0.01
Fluroxypyr	VA 0385	Onion, bulb	0.2	-
Fluxapyroxad	VA 0035	Bulb vegetables	1.5	-
Fluxapyroxad	VA 0385	Onion, bulb	-	0.6
Folpet	VA 0385	Onion, bulb	-	1
Glufosinate-Ammonium	VA 0385	Onion, bulb	-	0.05
Glyphosate	VA 0035	Bulb vegetables	*0.1	-
Haloxypol	VA 0385	Onion, bulb	T0.2	0.2
Imazalil	VA 0385	Onion, bulb	0.05	-
Imidacloprid	VA 0385	Onion, bulb	-	0.1
Inorganic bromide		Vegetables	20	-
Ioxynil	VA 0385	Onion, bulb	*0.02	-
Iprodione	VA 0385	Onion, bulb	T0.7	0.2
Linuron		Vegetables	*0.05	-
Maldison / Malathion	VA 0385	Onion, bulb	2	1
Maleic hydrazide	VA 0385	Onion, bulb	15	15
Mandipropamid	VA 0385	Onion, bulb	-	0.1
Metalaxyl	VA 0035	Bulb vegetables	0.1	-
Metalaxyl	VA 0385	Onion, bulb	-	2
Metaldehyde		Vegetables	1	-
Methabenzthiazuron	VA 0385	Onion, bulb	*0.05	-
Methidathion	VA 0385	Onion, bulb	*0.01	-
Methiocarb	VA 0385	Onion, bulb	-	0.5
Methiocarb		Vegetables	0.1	-
Methomyl	VA 0385	Onion, bulb	T0.1	0.2
Methyl bromide		Vegetables	T*0.05	-
Myclobutanil	VA 0035	Bulb vegetables	-	0.06
Omethoate		Vegetables	2	-
Oxadixyl	VA 0385	Onion, bulb	0.5	-
Oxathiapiprolin	VA 0385	Onion, bulb	0.02	0.04
Oxyfluorfen	VA 0035	Bulb vegetables	*0.05	-
Paraquat		Vegetables	*0.05	-

Chemical	Codex Code	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Pendimethalin	VA 0035	Bulb vegetables	*0.05	-
Pendimethalin	VA 0385	Onion, bulb	-	*0.05
Penthiopyrad	VA 0385	Onion, bulb	1	0.7
Phorate	VA 0385	Onion, bulb	0.5	-
Phosphorous acid	VA 0035	Bulb vegetables	T10	-
Piperonyl butoxide		Vegetables	8	-
Pirimicarb	VA 0385	Onion, bulb	-	0.1
Pirimicarb		Vegetables	1	-
Procymidone	VA 0385	Onion, bulb	T0.2	-
Prometryn		Vegetables	*0.1	-
Propachlor	VA 0385	Onion, bulb	0.7	-
Propamocarb	VA 0385	Onion, bulb	0.5	2
Propaquizafop	VA 0385	Onion, bulb	*0.05	-
Propargite		Vegetables	3	-
Propazine		Vegetables	*0.1	-
Propineb	VA 0385	Onion, bulb	2	-
Pyraclostrobin	VA 0385	Onion, bulb		1.5
Pyrethrins		Vegetables	1	-
Pyrimethanil	VA 0385	Onion, bulb		0.2
Quizalofop-ethyl	VA 0385	Onion, bulb	*0.02	-
Quizalofop-p-tefuryl	VA 0385	Onion, bulb	*0.02	-
Sethoxydim	VA 0385	Onion, bulb	0.3	-
Spinetoram	VA 0385	Onion, bulb	T*0.01	*0.01
Spinosad	VA 0385	Onion, bulb	-	0.1
Spirotetramat	VA 0035	Bulb vegetables	0.5	-
Spirotetramat	VA 0385	Onion, bulb	-	0.4
Sulfoxaflor	VA 0385	Onion, bulb	-	*0.01
Tebuconazole	VA 0035	Bulb vegetables	*0.01	-
Tebuconazole	VA 0385	Onion, bulb	-	0.15
Triadimenol	VA 0385	Onion, bulb	0.05	-
Trichlorfon		Vegetables	0.1	-
Trifluralin		Vegetables	0.05	-

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

NOTE: For the groups "Bulb Vegetables" and "Vegetables" listed above, (onion) crop group exclusions (if any) have not been specified.

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

T = Temporary MRL

E = The MRL is based on extraneous residues

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

Sources: APVMA MRLs: Agricultural and Veterinary Chemicals Code (MRL Standard) Instrument 2019. Compilation 4. Prepared 15 January 2020. CODEX MRLs: CODEX Alimentarius International Food Standards database (February 2020), <http://www.fao.org/fao-who-codexalimentarius/codex-texts/dbs/pestres/en/>

Appendix 7. Onion regulatory risk assessment

Bulb Onion Agrichemical Regulatory Risk Assessment

March 2020

Regulatory pressures on agrichemicals are increasing globally, with many being either restricted or withdrawn from use. For older agrichemicals these pressures are often the result of reconsiderations involving new or refined risk assessment methodologies that require the generation of new data. A consequence of which can be that many of these chemicals 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 farm chemicals 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 prohibiting the use in the exporting country to ensure compliance, as breaches of MRLs could adversely affect market access.

The effects of the above are greater pressure placed on the availability and use of individual chemicals or chemical groups. As a consequence, it is possible that the number of approved agrichemical options available for use 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 bulb onions as well as current initiatives aimed at addressing identified pest management deficiencies.

Onion regulatory risk assessment

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

Problem	Active Constituents	Chemical Group	Comment	Activities
INSECT AND MITE PESTS				
Seed harvesting ants	Chlorpyrifos	1B	Currently under review by the APVMA & outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure. EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
Aphids				
Aphids	Dimethoate	1B	Codex: MRL deletion recommended. EU proposing to set all MRLs to < 0.01 mg/kg	
	Petroleum oil (PER12221)			
Beetles				
False wireworm	Chlorpyrifos	1B	Currently under review by the APVMA & outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure. EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
Spotted vegetable weevil	Chlorpyrifos	1B		
Vegetable weevil	Chlorpyrifos	1B		
Wireworm	Diazinon	1B	EU – Deregistered Codex - To be reviewed by 2020/21.	
	1,3-dichloropropene +chloropicrin			
Caterpillars/Lepidoptera				
Cutworms	Chlorpyrifos	1B	Currently under review by the APVMA & outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure. EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
Fall armyworm	Spinetoram (PER89327)	5		

Onion regulatory risk assessment

Problem	Active Constituents	Chemical Group	Comment	Activities	
Grasshoppers/Locusts					
Australian plague locust Migratory locust Spur-throated locust	Chlorpyrifos	1B	Currently under review by the APVMA & outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure. EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use		
	Maldison	1B	APVMA – Under review – chemistry		
Black field cricket	Chlorpyrifos	1B	Currently under review by the APVMA & outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure.		
Field crickets	Chlorpyrifos	1B	EU: Proposed cancellation of use Canada – proposed cancellation of most uses.		
Mole crickets	Chlorpyrifos	1B	USA – EPA decision to allow continued use		
Wingless grasshopper	Chlorpyrifos	1B			
	Dimethoate	1B	Codex: MRL deletion recommended. EU proposing to set all MRLs to < 0.01 mg/kg		
Jassids/Plant bugs					
Bugs	Dimethoate	1B	Codex: MRL deletion recommended. EU proposing to set all MRLs to < 0.01 mg/kg		
Brown marmorated stink bug	Pyrethrins (PER82426)	3A			
Green mirids	Petroleum oil (PER12221)				
Green vegetable bug	Dimethoate	1B	Codex: MRL deletion recommended. EU proposing to set all MRLs to < 0.01 mg/kg		
Grey cluster bug	Petroleum oil (PER12221)				
Jassids	Dimethoate	1B	Codex: MRL deletion recommended.		
Leafhoppers	Dimethoate	1B	EU proposing to set all MRLs to < 0.01 mg/kg		
	Petroleum oil (PER12221)				
Rutherglen bug	Petroleum oil (PER12221)				

Onion regulatory risk assessment

Problem	Active Constituents	Chemical Group	Comment	Activities	
Mites					
Mites	Dimethoate	1B	Codex: MRL deletion recommended. EU proposing to set all MRLs to < 0.01 mg/kg	ST17000 Data generated for a minor use permit for MainMan (Fonicamid) for various thrips in Bulb vegetables. PER89185 issued 6-Aug-20	
	Petroleum oil (PER12221)				
Redlegged earth mite	Dimethoate	1B	Codex: MRL deletion recommended. EU proposing to set all MRLs to < 0.01 mg/kg		
Thrips					
Onion thrips	Alpha-cypermethrin (PER80282)	3A			
	Cyantraniliprole	28			
	Diazinon (PER13119)	1B	EU – Deregistered Codex - To be reviewed by 2020/21.		
	Ethyl formate	8A			
	Fonicamid (PER89185)	29			
	Lambda-cyhalothrin	3A			
	Maldison	1B	APVMA – Under review – chemistry		
	Spirotetramat	23			
Plague thrips	Spirotetramat	23			
Thrips	Dimethoate	1B	Codex: MRL deletion recommended. EU proposing to set all MRLs to < 0.01 mg/kg		
	Petroleum oil (PER12221)				
	Phorate	1B	APVMA – Nominated for review EU: No authorisation in place		
Tomato thrips	Spirotetramat	23			
Western flower thrips	Spirotetramat	23			
	Fonicamid (PER89185)				

Onion regulatory risk assessment

Problem	Active Constituents	Chemical Group	Comment	Activities
Other				
Earwig	Chlorpyrifos	1B	Currently under review by the APVMA & outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure. EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
Leafminer flies	Dimethoate	1B	Codex: MRL deletion recommended. EU proposing to set all MRLs to < 0.01 mg/kg	
Onion seedling maggot	Diazinon	1B	EU – Deregistered Codex - To be reviewed by 2020/21.	
	Phorate	1B	APVMA – Nominated for review EU: No authorisation in place	
Symphylids	1,3-dichloropropene +chloropicrin	8B		
Vegetable leafminer	Abamectin (PER81876)	6		
Nematodes				
Cyst forming nematodes	1,3-dichloropropene +chloropicrin	1B		
Non cyst forming	Dazomet			

Onion regulatory risk assessment

Problem	Active Constituents	Chemical Group	Comment	Activities
DISEASES				
Bactericide	Iodine			
Black mould	Cyprodinil +fludioxonil	9 + 12		
Blue mould	Zineb	M3	APVMA - Nominated for review Codex - To be reviewed 2022/23 EU: No authorisation in place	
Botrytis blight	Penthiopyrad	7		
Botrytis rot (various)	Dimethomorph +mancozeb	40 + M3		
Club root	Dazomet			
Downy mildew	Azoxystrobin +oxathiapiprolin	11		Hort Innovation project ST16006, supported by an AgVet grant, is generating residue and efficacy trials to support a label registration for Ametoctradin + Dimethomorph (Zampro) to control Downy Mildew in onions.
	Benalaxyl	4		
	Chlorothalonil	M5	APVMA - Nominated for review Canada – Review recently completed; continued use considered acceptable Europe - Deregistration proposed.	
	Copper	M1		
	Dimethomorph	40		
	Fluopicolide +propamocarb HCl	28 + 43		
	Hydrogen peroxide +peroxyacetic acid	M		
	Mancozeb	M3	APVMA - Nominated for review	
	Metiram	M3	Canada – Under review Codex - To be reviewed 2020/21	
	Metalaxyl/metalaxyl-M	4		
	Oxadixyl	4	EU: No authorisation in place	
	Oxathiapiprolin	49		
	Phosphorous acid (PER13698)	33		
	Propineb	M3	APVMA - Nominated for review	
Zineb	M3	EU: No authorisation in place Codex - To be reviewed 2020/21		
Fungi (Post-harvest)	Iodine			

Onion regulatory risk assessment

Problem	Active Constituents	Chemical Group	Comment	Activities
Grey mould	Cyprodinil + fludioxonil	9 + 12	Fludioxonil: - EU – Under review Cyprodinil: - Canada – Under review	
Neck and bulb rot	Boscalid	7		
	Chlorothalonil	M5	APVMA - Nominated for review Canada – Review recently completed; continued use considered acceptable Europe - Deregistration proposed.	
	Cyprodinil + fludioxonil	9 + 12	Fludioxonil: - EU – Under review Cyprodinil: - Canada – Under review	
	Hydrogen peroxide + peroxyacetic acid	M		
	Iprodione	2	Europe – Deregistered Canada – Majority of food crop uses deleted Codex – Review scheduled for 2022	
Purple blotch	Benalaxyl	4	EU: Proposed non-renewal of authorisation	
	Copper	M1		
	Dimethomorph	40		
	Mancozeb	M3	APVMA - Nominated for review Canada – Under review	
	Metiram	M3	Codex - To be reviewed 2020/21	
	Metalaxyl / Metalaxyl-M	4		
	Penthiopyrad	7		
	Zineb	M3	APVMA - Nominated for review Codex - To be reviewed 2022/23 EU: No authorisation in place	
Rhizoctonia	1,3-dichloropropene +chloropicrin			
	Dazomet			
White rot	Azoxystrobin	11		
	Oxathiapiprolin	49		
	Procymidone	2		
	Tebuconazole	3	APVMA - Nominated for review	
	Triadimenol	3	APVMA - Nominated for review	

Onion regulatory risk assessment

Problem	Active Constituents	Chemical Group	Comment	Activities
WEEDS				
Broadleaf weeds and grasses	Asulam	R		Hort Innovation project ST18001, supported by an AgVet grant, is generating residue and efficacy trials to support a label registration for Prosulfocarb + S-Metolachlor to control Annual Ryegrass in onions.
	Bentazone (PER14773)	C		
	Bromoxynil (PER87914)	C		
	Chlorthal-dimethyl	D	EU: No authorisation in place	
	Clethodim	A	Codex: MRLs proposed for deletion	
	Cyanazine	C	APVMA – Nominated for review EU: No authorisation in place	
	Dimethenamid-P (PER80060 & PER88567)	K		
	Diquat	L	APVMA - Currently under review EU: No authorisation in place	
	Ethofumesate (PER84808)	J		
	Fluazifop-P	A		
	Fluroxypyr (PER87200)	I		
	Glyphosate	M	Ongoing issues internationally	
	Haloxypop-P (PER84734)	A		
	Ioxynil (PER86865)	C	EU: No authorisation	
	Linuron	C	EU: No authorisation in place	
	Methabenzthiazuron	C	EU: No authorisation in place	
	Oxyfluorfen	G		
	Pendimethalin	D		
Propachlor	K	EU: No authorisation in place		
Quizalofop-P	A	Canada – Under re-evaluation EU – Candidate for substitution		
Sethoxydim	A	EU: No authorisation in place		
Plant growth regulators				
	Maleic hydrazine	-		

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