



Spring Onion and Shallot

Strategic Agrichemical Review Process
(SARP)

October 2020

Hort Innovation
Project – VG18004

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SARP Service Provider:

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Purpose of the report:

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

Date of report:

October 2020

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**Hort
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Strategic levy investment

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FUND**

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1. Summary

The strategic levy investment project Strategic Agrichemical Review Process (SARP) - Updates (MT19008) is part of the Hort Innovation Vegetable 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) Assesses the importance of the diseases, insects and weeds (plant pests) that can affect a horticultural industry;
- (iii) Evaluates the availability and effectiveness of fungicides, insecticides and herbicides (pesticides) to control the plant pests;
- (iv) Determines any gaps in the pest control strategy and
- (v) 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 spring onion and shallot 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>
White rot	<i>Sclerotium cepivorum</i>

1.2 Insects and mites

The high priority insect and mite pests are:

Common Name	Scientific name
Onion thrips	<i>Thrips tabaci</i>
Western flower thrips	<i>Frankliniella occidentalis</i>

1.3 Weeds

The moderate priority weeds are:

Common Name	Scientific name
Amaranthus	<i>Amaranthus</i> spp.
Blackberry nightshade	<i>Solanum nigrum</i>
Fat hen	<i>Chenopodium album</i>
Nutgrass	<i>Cyperus rotundus</i>
Pig weed	<i>Portulaca oleracea</i>
Wild turnips	<i>Raphanus raphanistrum</i> L.

2. The Australian Spring onion and Shallot Industry

The Australian Spring onion and shallot industries are both minor horticultural industries. The varieties referred to in this SARP are:

Crop Subgroup	Common Name	Scientific Name
Subgroup 009A, Bulb Onions	Shallot	<i>Allium cepa var. aggregatum.</i>
Subgroup 009B, Green Onions	Spring onion	<i>Allium fistulosum</i>

Spring onion and Shallot are grouped with brown, red, and white onions for production and trade data purposes. Therefore, it is difficult to determine accurate supply chain data due to the high volume of onions which are sent for processing and export.

¹However, a total of 1,158 tonnes of Spring onion and Shallot were produced in Australia for the year ending in June 2019. This is <1% of the total fresh production of all onions.

Onions are grown in most states of Australia, with the majority of production occurring in South Australia and Tasmania. The major production areas include the Lockyer Valley in Queensland; Upper South Australia and the Adelaide Plains in South Australia; and in the North-West region of Tasmania.

The major growing period of Spring onion and Shallot is from February to April. However, Spring onion and Shallot are available throughout the year due to a wide number of varieties and Australia's varying weather conditions.

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 Spring onion and Shallot 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 Spring onion and Shallot industries 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 Spring onion and Shallot industries. 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 Spring onion and Shallot industries 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 Spring onion and Shallot 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 Vegetable Industry in consultation with industry, government and scientists. The Biosecurity Plan for the Vegetable Industry which covers Spring onion and Shallot 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. <https://ausveg.com.au/app/uploads/2018/06/Industry-Biosecurity-Plan-for-the-Vegetable-Industry.pdf>

3.2 Minor use permits and registration

From a pesticide access perspective, the APVMA classifies spring onion and shallot as minor crops. These crops fit within the APVMA crop group (Crop group 009: Bulb Vegetables). Therefore, access to minor use permits can be relatively straight forward as long as a reasonable justification is provided in accordance to the APVMA's minor use guidance (<https://apvma.gov.au/node/10931>).

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 Spring onion and Shallot industry is for manufacturers to register new pesticides uses in the crop.

3.3 Methods

The current update of the Spring onion and Shallot Strategic Agrichemical Review Process (SARP), which was last updated in 2014, was conducted by desktop audit using industry information gathered during 2011-2014 under MT10029 – Managing pesticide access in horticulture and finalised under VG12081 - Review of vegetable SARP reports. The process included gathering, collating and confirming information:

Hort Innovation Project Reference	Process of Review - Activity
VG16060 - Vegetable Agrichemical Pest Management Needs and Priorities (AUSVEG) - Commenced: 2 May 2017	<p>Engagement and consultation with growers and other relevant stakeholders. Including; Online crop specific surveys, workshops and one on one consultation Nationally.</p> <p>Collation of information collected by commodity on applicable pests, diseases and weeds in order of priority.</p>
MT17019 – Regulatory Support & Co-ordination (AKC)	<p>Spring onion and Shallot Agrichemical Regulatory Risk Assessment Document</p> <p>To assist strategic planning, with respect to future pest management options, this document was developed as part of the Hort Innovation funded project MT17019 to highlight the regulatory threats to agrichemicals currently approved for the management of the pests and diseases in Spring onion and Shallot as well as current initiatives aimed at addressing identified pest management deficiencies.</p>
VG18004 – Vegetable Strategic Agrichemical Review Process (SARP) Report Updates	<p>SARP updated via a desktop audit:</p> <p>Review list of priorities ranked as high, moderate and low for each plant pest groups (disease, insects and weeds) – provided by VG16060</p> <p>Identify industries pest priority gaps in order of importance</p> <p>Update current pesticides available via label registrations or minor use permits</p> <p>Update available pesticide use patterns, IPM ranking/compatibility, mode of action and chemical group.</p> <p>Identify pesticides at risk (under review and/or limited uses) via MT17019 Regulatory Support & Co-ordination – AKC consulting.</p> <p>Identify any appropriate solutions through the outcomes of the AgChem Forum’s or similar market intelligence and their overall suitability (IPM compatibility, Chemical group to manage resistance, risk profile, existing domestic MRL’s or global MRL’s including any potential trade barriers, efficacy, OH&S, environmental safety and sustainability).</p> <p>Include known pesticide solutions that are currently under development with registrants for new uses in the nominated crops or in current Hort Innovation projects.</p> <p>Update MRL tables to include Australian MRL’s, Codex and any applicable export market MRL’s</p>

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 spring onion and shallot

Appendix 2. Products available for control of insects and mites in spring onion and shallot

Appendix 3. Products available for weed control in spring onion and shallot

Appendix 4. Current permits for use in spring onion and shallot

Appendix 5. Spring onion and Shallot Maximum Residue Limits (MRLs)

Appendix 6. Spring onion and Shallot Agrichemical Regulatory Risk Assessment

4. Diseases, Pests and Weeds of Spring onion and Shallot

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 (In Chapter 4) - Regulatory support and coordination (Appendix 6) has been incorporated.

Some of the suggested options have no overseas MRLs (see Appendix 5). If treated produce is to be exported, nil residues at harvest would be needed for these options.

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

4.1 Diseases of spring onion and shallot

4.1.1 Disease priorities

Common name	Scientific name
High	
Downy Mildew	<i>Peronospora destructor</i>
White rot	<i>Sclerotium cepivorum</i>
Moderate	
Grey mould	<i>Botrytis</i> spp.
Pink root	<i>Phoma terrestris</i>
Leaf blight	<i>Stemphylium</i> spp.
Bacterial rot	<i>Erwinia</i> spp. & <i>Pseudomonas</i> spp.
Onion rust / Garlic rust	<i>Puccinia allii</i>
Purple blotch	<i>Alternaria porri</i>
Low	
Blue mould	<i>Penicillium</i> spp.
Fusarium	<i>Fusarium</i> spp.

The most important disease issues based on the feedback received were Downy mildew and White rot. These two diseases received the highest ranking in 2014 along with Grey mould which has come down to a moderate priority in 2019. Available and potential products for these diseases are in Section 4.1.2.

Bacterial soft rots are caused by several bacteria, most commonly *Pectobacterium* spp. *Erwinia* spp. and certain species of *Pseudomonas*, *Bacillus* and *Clostridium*. These bacteria can enter plants through wounds caused by tools, insects, severe weather such as hail, or through natural openings. The bacteria can be spread from plant to plant by insects, on contaminated tools, or by movement of infested plant debris, soil, or contaminated water. Bacterial soft rots tend to be more of a problem during wet weather and has shown to be more severe when plants lack sufficient calcium.

Once soft rot bacteria have infected plant tissue, there are no treatments. Immediately remove and discard infected plants or plant parts. Use soft rot-resistant vegetables in rotation with susceptible vegetables. Corn, snap beans and beets are vegetables that are not considered susceptible to soft rot.

Some organisms such as *Fusarium* sp., *Rhizoctonia*, *Sclerotinia* may be carried on cutting knives or on residue in produce bins. Therefore, good farm hygiene is also important in preventing such occurrences.

Some of the fungal and bacterial diseases that have received moderate to low priority have few options to suppress or control but should be supplemented by management practices that would increase airflow and minimise moisture in the plant canopy.

Management methods that promote clean seeds and transplant material, early detection and disposal of infected seedlings would keep most of these diseases in check whilst eliminating alternative hosts, crop rotation, cover crops and farm hygiene are also important to prevent spread of these between sites. Taking precautions to prevent spread of disease from nursery to field would also help in this effort.

Resistance Management

Downy mildew is considered to have a high risk of resistance development.

There are several disease strategies that apply to vegetable crops on the CropLife website², including Downy mildew.

² www.croplife.org.au/resources/programs/resistance-management/

4.1.2 Available and potential products for priority diseases

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

Availability		Regulatory risk (refer to Appendix 6)	
A	Available via either registration or permit approval	R1	Short-term: Critical concern over retaining access
P	Potential - a possible candidate to pursue for registration or permit	R2	Medium-term: Maintaining access of significant concern
P-A	Potential, already approved in the crop for another use	R3	Long-term: Potential issues associated with use - Monitoring required
Withholding Period (WHP) – Number of days from last treatment to harvest (H) or Grazing (G)			
Harvest	H	Not Required when used as directed	NR
Grazing	G	No Grazing Permitted	NG

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Downy Mildew (<i>Peronospora destructor</i>)							
Priority: High							
Downy mildew was ranked as the highest disease priority in all States surveyed. (VIC, QLD, SA & TAS). Downy mildew is an issue every season, particularly during wet cool weather and foggy and dewy nights. Large, yellowish, circular clumps of infected plants may be the first symptom noticed in the crop. General farm hygiene, crop rotation, planting space (to allow air movement) and the use of protectant and curative fungicide spray applications when conditions favour disease outbreaks are required.							
Chlorothalonil (Apparent)	M5	Protective	7	A	ALL	Registered in spring onion for Botrytis grey mould & Downy mildew . [Max. 2 applications per crop; re-treatment interval: 14 d].	R3
Copper oxychloride, cuprous oxide & cupric hydroxide PER14842	M1	Contact	1	A	ALL (excl. VIC)	Permitted for use in spring onion and shallot for control of Downy mildew . [Max. 6 applications per crop; re-treatment interval not specified]	-
Copper Hydroxide + Metalaxyl-M (Ridomil Gold Plus)	DY	Contact	7	A	ALL	Registered in Spring onion and Shallot for control of Downy mildew . [Max. 2 applications per crop; re-treatment interval: 7 - 10 d]	-
Dimethomorph plus Mancozeb (tank mix) PER14473	40+M3	Protective & systemic	7 NG	A	ALL (excl. VIC)	Permitted for use in spring onion, shallot & leeks for control of Downy mildew & Purple blotch. [Max. 4 applications per crop; 2 consecutive; re-treatment interval: 7 - 14 d]	R2

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Mancozeb (alone) PER14473	M3	Protective	7 NG	A	ALL (excl. VIC)	Permitted for use in spring onion, shallot & leeks for control of Downy mildew , Purple blotch & Botrytis rots. [Max. 4 applications per crop; 2 consecutive; re-treatment interval: 7 - 14 d]	R2
Fluopicolide + propamocarb (Infinito)	28+43	Protective & systemic	7	A	ALL	Registered for Downy mildew control in bulb vegetables	
Hydrogen peroxide + peroxy acetic acid (Peratec)	M	Contact	1	A	ALL	Registered in spring onion and shallot for control of Downy mildew and Botrytis rot. Use subject to CropLife disease management strategies. [Max. 4 applications per crop; re-treatment interval: 5-7 d].	-
Oxathiapiprolin (Zorvec Enicade) Corteva	49	Protective & systemic	10 NG	A	ALL	Registered in Spring onion and Shallot for control of Downy mildew . Apply at first sign of disease. [Max. 3 applications per crop; 2 consecutive; re-treatment interval 10 d]	-
Phosphorous acid (Agri-Fos) PER13698	-	Protective & systemic	1	A	ALL (excl. VIC)	Permitted for use in spring onion and shallot for suppression only of Downy mildew . [Max. no. of applications and re-treatment interval not specified]	-
Azoxystrobin + Oxathiapiprolin (Orondis Flexi) Syngenta	11+49	Protectant & Curative		P		Registered in bulb vegetables for control of Downy Mildew and suppression of White Rot. Applied at the first sign of disease or preferably preventatively when a disease predictive assessment shows conditions favourable to disease development.	
Acibenzolar-S-methyl (Actigard Plant Activator) Syngenta	P01	Protective		P		Registered in the USA for the control of Downy mildew in Brassica vegetables Registered in Australia for use in tomatoes for the suppression of Powdery mildew.	
Dimethomorph + Amitoctradin (Zampro) AgNova/BASF	45+40	Protective		P		Registered in Australia for control of Downy mildew in grape vines. Hort Innovation project ST16006, generated residue and efficacy trials to support a label registration for control of Downy Mildew in onions. Label registration extension anticipated in 2021.	

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Cyazofamid (Ranman) ISK	21	Protectant		P		Registered for control of Late blight and White blister in potatoes and broccoli. Overseas registration on Brassica leafy for White rust (<i>Albugo occidentalis</i>), Downy mildew , Pythium damping-off, Club root (<i>Plasmodiophora brassicae</i>).	
Mandipropamid (Revus) Syngenta	40	Protectant		P		Registered in Aust for Downy mildew control in grapes and Brassica leafy crops. Possible option as a different chemical group.	
White rot (<i>Sclerotium cepivorum</i>)							
Priority: High							
White rot was ranked as a high priority in QLD & TAS and a moderate priority in VIC & SA. Growers in some regions commented that White rot is the number one priority pest issue they face and that there are limited curative options available. 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. The sclerotia are the resting bodies of the disease which can survive for over 20 years, even in the absence of a host plant. Disease severity depends on sclerotia levels in the soil at planting. Plants can become infected at any stage of growth. It is difficult to control with fungicides and the use of soil fumigation, crop rotation and farm hygiene are critical aspects of controlling the disease.							
1,3-dichloropropene (Tri-Form)	-	Soil fumigant	NR	A	ALL	Registered in field crops as a fumigant for control of soil borne diseases, plant parasitic Nematodes.	-
Azoxystrobin (Amistar)	11	Protective & curative	7	A	ALL	Registered in spring onion and shallot for suppression only of White rot (<i>Sclerotium cepivorum</i>) . [Max. 3 applications per crop; re-treatment interval 7-14 d]	-
Dazomet (Cerlong)	8F	Soil fumigant	NR	A	ALL	Registered in various situations for control of soil fungi , Nematodes, soil insects and weeds. Soil moisture is essential for release of gas and plastic cover brings optimum results. See label for details.	-
Triadimenol (Allitron) PER14906	3	Systemic, protective & curative	28	A	ALL (excl. VIC)	Permitted for use in spring onion and shallot for control of White rot (<i>Sclerotium cepivorum</i>) . [Max. 3 applications per season; re-treatment interval 21-28 d]	R3

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Azoxystrobin + Oxathiapiprolin (Orondis Flexi) Syngenta	11+49	Protectant & Curative	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.	-
Ethanedinitrile (EDN Fumigas) Draslovka Services	-	Soil fumigant		P		Registered in cucurbits for control of soil borne pathogens (including Sclerotium spp. and <i>Fusarium</i> spp.), Nematodes (including <i>Meloidogyne</i> spp.) and weeds (including <i>Amaranthus retroflexus</i> , <i>Cyperus rotundus</i> and <i>Solanum nigrum</i>). [Use by licensed fumigators or approved persons only]	-
Fluopyram (Luna Privilege) Bayer	7	SDH inhibitor		P		Registered for bananas only but Hort Innovation is undertaking studies with Bayer to achieve a label registration for the Bulb Vegetable crop group, including leek.	
Pydiflumetofen + Fludioxonil (Miravis prime) Syngenta	7+12	SDH inhibitor		P		Registered overseas for multiple crops including bulb vegetables for foliar diseases, Cladosporium leaf blotch (<i>Cladosporium allii</i>), Purple blotch (<i>Alternaria porri</i>), White rot (<i>Sclerotium cepivorum</i>) & Botrytis leaf blight (<i>Botrytis aclada</i>). Pending registration in Australia by Syngenta in grapes, berries, leafy vegetables & potatoes.	
Grey mould (<i>Botrytis</i> spp.)							
Priority: Moderate							
Grey mould was ranked as a moderate priority in VIC, QLD, SA & TAS. Botrytis infections occur most frequently during years with cool, moist spring conditions. Bulb rot symptoms begin in the field and can become severe post-harvest. Botrytis can also be a significant problem in humid warm conditions. It can lead to significant crop losses. Botrytis is a soil-borne fungus transmitted by infected bulbs or seed, or through wind-dispersed spores. The fungus overwinters on onion debris as spores or sclerotia.							
Chloropicrin + 1,3-dichloropropene (Tri-Form)	8B	Soil fumigant	NR	A	ALL (Restricted use TAS, VIC & SA)	Registered in various crops including vegetables for control of plant parasitic Nematodes, Symphylans, Wireworms, soil borne diseases and suppression of weeds. Restricted chemical. [Users may require fumigator license]	-
Chlorothalonil (Apparent)	M5	Protective	7	A	ALL	Registered in spring onion for Botrytis grey mould and Downy mildew. [Max. 2 applications per crop; re-treatment interval: 14 d].	R3

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Chlorothalonil (Apparent) PER82895	M5	Protective	7	A	ALL	Permitted for use in spring onion for control of Downy mildew & Botrytis grey mould . [Max. 2 applications per crop; re-treatment interval: 14 d]	R3
Cyprodinil + fludioxonil (Switch) PER80501	9+12	Protective & systemic	7	A	ALL	Permitted for use in alliums for suppression of Black mould and Botrytis grey mould . [Max. 2 applications per crop; re-treatment interval: 7-14 d]	R3
Dimethomorph and/or Mancozeb (tank mix or alone) PER14473	40+M3	Protective & systemic	7 NG	A	ALL (excl. VIC)	Permitted for use in spring onion, shallot & leeks for control of Downy mildew, Purple blotch & Botrytis rots (mancozeb only). [Max. 4 applications per crop; 2 consecutive; re-treatment interval: 7 - 14 d]	R2
Hydrogen peroxide + peroxy acetic acid (Peratec)	M	Contact	1	A	ALL	Registered in spring onion and shallot for control of Downy mildew and Botrytis rot . Use subject to CropLife disease resistance management strategy. [Max. 4 applications per crop; re-treatment interval: 5-7 d].	-
Penthiopyrad (Fontelis)	7	Protective	7	A	ALL	Registered in spring onion and shallot for control of Botrytis rot and Purple blotch. Use subject to CropLife disease resistance management strategy. [Max. 2 sequential applications per crop; retreatment interval 7-14 d]	-
<i>Aureobasidium pullulans</i> (Botector) Nufarm	-	Protective Biofungicide		P		Registered in grapes and berries for control of Botrytis and suppression of several other fungal pathogens (Anthracnose, Phomopsis and Rhizopus) in berries.	
<i>Bacillus amyloliquefaciens</i> (Serenade Opti) Bayer	44	Protective Biofungicide		P		Registered for control of Botrytis in tomato, capsicum, chilli & several fruits. Registered in US for control of various fungal diseases in a range of fruits and vegetables.	
<i>Bacillus amyloliquefaciens</i> (Serifel) strain MBI 600 BASF	44	Protective Biofungicide		P		Registered for control of Botrytis in grapes and strawberries in Australia. Registered in the USA in peppers for the management of <i>Pythium</i> spp., <i>Phytophthora</i> spp., <i>Fusarium</i> spp., <i>Rhizoctonia</i> spp.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
BLAD (Banda de <i>Lupinus albus</i> doce) polypeptide CEV S.A.	BM 01	Contact & translaminar		P		Registered in stone fruit for control of Brown rot and Blossom blight in stone fruit. Pending final registered in USA in several crops for control of a variety of fungal diseases including Botrytis and Powdery mildew.	
Fluopyram + Tebuconazole (Luna Experience) Bayer	3+7	Protective		P		Registered in Australia for control of Yellow sigatoka, Leaf speckle and Cordana leaf spot in bananas. The US label is for use in various crops for control of a variety of diseases including Powdery mildew, Alternaria leaf spot, gummy stem blight, Septoria, Cladosporium, Cercospora, Sclerotinia, Botrytis leaf blight, neck rot (<i>Botrytis allii</i> & <i>B. porri</i>), Purple blotch (<i>Alternaria porri</i>), Rusts (<i>Puccinia alli</i> and <i>P. porri</i>) Anthracnose and suppression of Rhizoctonia.	R3
Pydiflumetofen + Fludioxonil (Miravis prime) Syngenta	7+12	SDH inhibitor		P		Registered overseas for multiple crops including bulb vegetables for foliar diseases, Cladosporium leaf blotch (<i>Cladosporium allii</i>), Purple blotch (<i>Alternaria porri</i>), White rot (<i>Sclerotium cepivorum</i>) & Botrytis leaf blight (Botrytis aclada). Pending registration in Australia by Syngenta in grapes, berries, leafy vegetables & potatoes.	
Pink root (<i>Phoma terrestris</i>)							
Priority: Moderate							
Pink root was ranked as a moderate priority in VIC, and as a low priority in QLD & SA. 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 delays in maturity. The fungus can survive in the soil for many years. There are no chemical control options.							
Chloropicrin + 1,3-dichloropropene (Tri-Form)	8B	Soil fumigant	NR	A	ALL (Restricted use TAS, VIC & SA)	Registered in vegetable crops for control of plant parasitic Nematodes, Symphylans, Wireworms, soil borne diseases (including <i>Fusarium</i> and <i>Verticillium</i> wilts, <i>Rhizoctonia</i> , <i>Pythium</i>) and suppression of weeds. Restricted chemical. [Users may require fumigator license]	-
Dazomet (Cerlong)	8F	Soil fumigant	NR	A	ALL	Registered in broadacre seed beds for control of soil fungi (including <i>Fusarium</i> spp.), Nematodes (cyst and non-cyst forming), soil insects and germinating seeds of weeds.	-

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
<i>Bacillus amyloliquefaciens</i> Strain QST 713 (Serenade Prime Soil Ameliorant and Biofungicide) Bayer	44	Biological	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.	-
Fludioxynil + sedaxane (Vibrance) Syngenta	7+12	Systemic & protective		P		Registered in potatoes as a seed treatment for control of Phoma sp. infections.	R3
Mancozeb + Sulphur (Yates) Duluxgroup	M3+UN	Systemic & protective		P		Registered in tomatoes to control Anthracnose, Bean spider mite, early blight, grey leaf spot, Late blight, leaf mould, Phoma rot and bean rust. [Max. no. of applications not specified; re-treatment interval 7-10 d]	R2
Thiabendazole (Sharda) Sharda Cropchem	1	Systemic, curative & protective		P		Registered in potatoes for control of Phoma sp. infections.	
Tebuconazole + Trifloxystrobin (Zombie) Farmalinx	3+11	Protective		P		Registered in turf for control of several fungal infections including <i>Anthracnose</i> , <i>Fusarium</i> and <i>Helminthosporium</i> . US label (Absolute Max-Bayer) allows use in peanuts for control of Phoma infections.	R3
Leaf blight (<i>Stemphylium</i> spp.)							
Priority: Moderate							
Leaf blight was ranked as a moderate priority in VIC, QLD & SA and as a low priority in TAS. 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.							
Chlorothalonil (Sabakem) Sabakem	M5	Protective		P		Registered in tomato for control of Stemphylium . [Max no. of applications not specified; re-treatment interval 7-10 d]	R3
Propineb (Antracol) Bayer	M3	Contact & protective		P		Registered in tomato for control of Grey leaf spot (Stemphylium spp.). [Max no. of applications not specified; re-treatment interval 7-10 d]	R2

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Bacterial rot (<i>Erwinia</i> spp. & <i>Pseudomonas</i> spp.) Priority: Moderate							
Bacterial rot was ranked as a moderate priority in VIC QLD, SA & TAS. Leads to stunting of plants and reduction of bulb size. The use of overhead irrigation should be avoided. Once soft rot bacteria have infected plant tissue, there are no treatments. Good farm hygiene helps control bacterial infections.							
Copper-Oxychloride + hydroxide (Relyon Airone) Isagro	M1	Protectant		P		Registered in Celery for control of Bacterial soft rot (<i>Erwinia carotovora</i>) [Max. no. of applications not specified; re-treatment interval 7-14 d]	-
<i>Bacillus amyloliquefaciens</i> (Serenade Opti) Bayer	44	Protective Biofungicide		P		Registered for control Botrytis in strawberries and grapes, suppression of bacterial spot in tomato, chili and capsicum and control of Anthracnose and suppression of stem end rot in tropical fruits. Registered in US for control of Botrytis, Sclerotinia, Xanthomonas and Erwinia in grapes, strawberries, pome fruits, tree nuts and leafy vegetables. In root and leafy vegetables, it is registered for the suppression of <i>Erwinia carotovora</i> .	
Onion rust / Garlic rust (<i>Puccinia allii</i>) Priority: Moderate							
Onion / Garlic rust was ranked as a moderate priority in VIC & SA, and as a low priority in QLD & TAS. Note: Present in all states except Western Australia. Rust on leaves appear as bright-orange or brownish, circular to long bumps along the veins, followed by the formation of blackish spores. It is spread by wind, infected plant material such as seed and mother bulbs, and garlic imported for human consumption but planted in backyard gardens. This is a relatively recent problem in Australia and can pose a biosecurity threat. Growers need to inform ³ Plant health Australia if Rust symptoms impact their crop.							
Sulphur (Solo)	UN	Contact	NR	A	ALL	Registered in vegetables for control of Powdery mildew and Rust . Do not apply during the heat of the day. [Max. no. of applications not specified; re-treatment interval 14-21 d]	-

³ <https://www.planthealthaustralia.com.au/pests/onion-rust/>

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Fluopyram + Tebuconazole (Luna Experience) Bayer	3+7	Protective		P		Registered in Australia for control of Yellow sigatoka, Leaf speckle and Cordana leaf spot in bananas. Registered overseas as Luna Experience. The US label is for use in almond, Brassica leafy vegetables, legume vegetables, melons and various fruit crops for control of a variety of diseases including Powdery mildew, Alternaria leaf spot, gummy stem blight, Septoria, Cladosporium, Cercospora, Sclerotinia, Botrytis leaf blight, neck rot (<i>Botrytis allii</i> & <i>B. porri</i>), Purple blotch (<i>Alternaria porri</i>), Rusts (<i>Puccinia alli</i> and <i>P. porri</i>) Anthracnose and suppression of Rhizoctonia.	R3
Oxycarboxin (Plantvax) Arysta LifeScience	G	Systemic		P		Registered in green beans for control of Rust [Max. 2 applications per crop; re-treatment interval 14 d]	-
Tebuconazole (AgProtect) Agprotect Aust.	3	Systemic, protective & curative		P		Registered in green beans for control of Rust . [Max. 3 applications per crop; re-treatment interval 10-14 d]	R3
Purple blotch (<i>Alternaria porri</i>)							
Priority: Moderate							
Purple blotch was ranked as a moderate priority in QLD and as a low priority in VIC, SA & TAS. 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.							
Chlorothalonil (AC Clatter)	M5	Protective	1	A	ALL	Registered in shallot for control of Purple blotch. Apply at first sign of disease. [Max. no. of applications not specified; re-treatment interval 7-10 d]	R3
Dimethomorph + or Mancozeb PER14473	40+M3	Protective & systemic	7 NG	A	ALL (excl. VIC)	Permitted for use spring onion, shallot & leeks for control of Downy mildew, Purple blotch (either mancozeb alone or as a tank mix of mancozeb + dimethomorph) & Botrytis rots (mancozeb only). [Max. 4 applications per crop; 2 consecutive; re-treatment interval: 7 - 14 d]	R2

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Penthiopyrad (Fontelis)	7	Protective	7	A	ALL	Registered in spring onion and shallot for control of Botrytis rot and Purple blotch . Use subject to CropLife disease resistance management strategy. [Max. 2 sequential applications per crop; retreatment interval 7-14 d]	-
Florylpicoxamid (Adavelt) Corteva	21	Protectant & Curative		P		New active in development from Corteva with activity on Alternaria 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.	-
Mancozeb + Metalaxyl (Ridomil Gold MZ) Syngenta	M3+4	Protectant & Curative		P		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
Mefentrifluconazole (Belanty) BASF	3	Protective & Curative		P		Registered in apples for control of Black Spot and grapes for control of Powdery Mildew. BASF claims activity on Alternaria spp. No MRL's for AU or Codex.	-
NUL3446 Nufarm	NEW	TBC		P		New active in development from Nufarm with activity on Alternaria spp.	-
Pydiflumetofen + Fludioxonil (Miravis prime) Syngenta	7+12	SDH inhibitor		P		Registered overseas for multiple crops including bulb vegetables for foliar diseases, Cladosporium leaf blotch (<i>Cladosporium allii</i>), Purple blotch (<i>Alternaria porri</i>), White rot (<i>Sclerotium cepivorum</i>) & Botrytis leaf blight (<i>Botrytis aclada</i>). Pending registration in Australia by Syngenta in grapes, berries, leafy vegetables & potatoes.	R3

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Tebuconazole + Fluopyram (Luna Experience) Bayer	3+7	Protective		P		Registered in Australia for control of Yellow sigatoka, Leaf speckle and Cordana leaf spot in bananas. The US label is for use in almond, Brassica leafy vegetables, legume vegetables, melons and various fruit crops for control of a variety of diseases including Powdery mildew, Alternaria leaf spot, gummy stem blight, Septoria, Cladosporium, Cercospora, Sclerotinia, Botrytis leaf blight, neck rot (<i>Botrytis allii</i> & <i>B. porri</i>), Purple blotch (<i>Alternaria porri</i>) , Rusts (<i>Puccinia alli</i> and <i>P. porri</i>) Anthracnose and suppression of Rhizoctonia.	R3
Zineb (Barmac) Amgrow	M3	Protectant		P		Registered in onions for control of Downy Mildew, Purple Blotch & Blue Mould. Apply when disease threatens and repeat at 7-10 day intervals or as required. Treatments per season not limited.	R2
Blue mould (<i>Penicillium</i> spp.) Priority: Low Blue mould was ranked as a low priority in VIC, QLD, SA & TAS. Usually this organism is associated with post-harvest infections in crops. Infection typically enters the bulbs through plant wounds. Symptoms usually appear during harvest and storage. Farm hygiene is considered important in containing this disease including the use of post-harvest sanitisers.							
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		P		Registered in vegetables as a post-harvest treatment for bacteria and fungi. Post-harvest spray. Must make contact with the produce for at least 30 seconds. Can also be used as a general disinfectant for equipment.	-
Fludioxonil (Campbell) Colin Campbell Chemicals	12	Systemic		P		Registered as a post-harvest dip for control of Blue mould , Green mould, Grey mould and Bacterial rots in various fruits including citrus, kiwi fruit, pomegranate, pome and stone fruits.	R3

Disease / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Regulatory risk
Peroxyacetic Acid	M	Sanitiser / Post-Harvest Treatment		P		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.	-
Thiabendazole (Sharda) Sharda Cropchem	I	Protective		P		Registered in bulbs and corms for post-harvest control of Fusarium basal rot and Blue mould . Dip for 15-30 minutes within 24 h of digging.	-
Zineb (Barmac) Amgrow	M3	Protective		P		Registered in onions for control of Downy Mildew, Purple Blotch & Blue Mould . Apply when disease threatens and repeat at 7-10 day intervals or as required. Treatments per season not limited.	R2
<p>Fusarium (<i>Fusarium</i> spp.) Damping-Off (<i>Fusarium</i> spp., <i>Pythium</i> spp., <i>Rhizoctonia</i> spp.) Priority: Low</p> <p>Fusarium was ranked as a low priority in VIC & QLD. A soil-borne disease that is widespread in most regions but rated as low priority. 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. Damping off - disease attacks seedlings at the 1-2 leaf stage, causing water-soaked lesions on the stem and roots. Good on-farm sanitation is recommended.</p>							
Dazomet (Cerlong)	8F	Soil fumigant	NR	A	ALL	Registered in broadacre seed beds for control of soil fungi (including Fusarium spp.), Nematodes (cyst and non-cyst forming), soil insects and germinating seeds of weeds.	-
Mancozeb + Sulphur (Amgrow)	M3+UN	Protective	7	A	ALL	Registered in vegetable seedlings for control of Damping off . [Max. no. of applications not specified; re-treatment interval 10 d]	R2
Metham sodium (Imtrade)	-	Soil fumigant	NR	A	ALL	Registered for control of Nematodes, various weeds & fungus diseases in field crops.	-
Bacillus amyloliquefaciens Strain QST 713 (Serenade Prime Soil Ameliorant and Biofungicide) Bayer	44	Biological	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
Fludioxonil + Sedaxane (Vibrance Premium) Syngenta	7+12	Systemic & protective		P		Registered in potatoes for control of Black scurf, Silver surf, Black rot, Gangrene and Fusarium and suppression of Scab. Hort innovation is pursuing studies on control of Rhizoctonia in beetroot.	R3
NUL3163 Nufarm	NEW	TBC		P		New active in development from Nufarm with activity on Fusarium, Pythium & Rhizoctonia.	-

4.2 Insect and mite pests of spring onion and shallot

4.2.1 Insect and mite pest priorities

Common name	Scientific name
High	
Onion thrips	<i>Thrips tabaci</i>
Western flower thrips	<i>Frankliniella occidentalis</i>
Moderate	
Plague thrips	<i>Thrips imagines</i>
Bean Blossom Thrips	<i>Megalurothrips usitatis</i>
Melon thrips	<i>Thrips palmi</i>
Onion maggot	<i>Delia antiqua</i>
Aphids	Aphididae
Cutworms	<i>Agrotis</i> spp.
Low	
Earwigs	<i>Forficula</i> spp.
Jassids	<i>Cicadellidae</i>
Mites	<i>Acarina</i>
Redlegged earth mite	<i>Halotydeus destructor</i>
Snails	<i>Gastropoda</i>
Spotted vegetable weevil	<i>Desiantha diversipes</i>
Vegetable weevil	<i>Listroderes difficilis</i>
Wireworm	<i>Heteroderes</i> spp.
Crickets & Grasshoppers Wingless grasshopper Black field cricket Field crickets Mole crickets	<i>Phaulacridium vittatum</i> <i>Teleogryllus commodus</i> Gryllidae <i>Gryllotalpidae</i>

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

Common Name	Scientific name
Fall Armyworm	<i>Spodoptera frugiperda</i>

Onion thrips and Thrips including Western flower thrips are high priority pests in spring onion and shallot. These insect pest priorities have not changed since the last SARP report in 2014. Available and potential products for all these insects and mites are in Section 4.2.2.

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. 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 allium crops for the control of thrips. Croplife Australia⁴ has a resistance management strategy for Western Flower Thrips and a detailed strategy is also available from NSW Department of Primary Industries⁵. 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*⁶

⁴ www.croplife.org.au/resources/programs/resistance-management/various-western-flower-thrips/

⁵ <http://archive.dpi.nsw.gov.au/content/agriculture/horticulture/pests,-diseases-and-disorders-in-horticultural-crops/wft-resistance>

⁶ <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 and mites

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

Availability		Regulatory risk (refer to Appendix 6)	
A	Available via either registration or permit approval	R1	Short-term: Critical concern over retaining access
P	Potential - a possible candidate to pursue for registration or permit	R2	Medium-term: Maintaining access of significant concern
P-A	Potential, already approved in the crop for another use	R3	Long-term: Potential issues associated with use - Monitoring required
Withholding Period (WHP) – Number of days from last treatment to harvest (H) or Grazing (G)			
Harvest	H	Not Required when used as directed	NR
Grazing	G	No Grazing Permitted	NG
IPM – indicative overall impact on beneficials (based on the Cotton Pest Management Guide 2018-19 and cotton use patterns)			
VL – Very low; L – Low; M – Moderate; H – High; VH – Very High; - not specified			

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Onion thrips (<i>Thrips tabaci</i>)								
Priority: High								
Onion thrips were ranked as the highest priority in VIC, QLD, SA & TAS. Onion Thrips cause direct feeding damage to foliage by piercing and rasping leaves. This damage can lead to yield loss. They are also a vector for plant viruses. 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. There is reported resistance to commonly used insecticides.								
Alpha-cypermethrin (Dominex Duo) PER14457	3A	Contact & systemic	7	A	ALL (excl. VIC)	Permitted for use in spring onion and shallot for control of Onion thrips . [Max. 3 applications per crop; re-treatment interval 7 d]	VH H-Bees	-
<i>Beauveria bassiana</i> (Broadband OD / Velifer)	UNF	Protective biopesticide	NR	A	ALL	Registered in protected vegetables and ornamentals for suppression of various pests including: Western Flower Thrips, Onion thrips , Greenhouse Whitefly, Silverleaf Whitefly, Sweet Potato Whitefly, Green Peach Aphid & Two-spotted Spider Mites. [Max. 3 application per crop; re-treatment interval 3-14 d]	L L-Bees	-
Cyantraniliprole (Benevia)	28	Systemic & stomach	7	A	ALL	Registered in spring onion and shallot for suppression of Onion thrips .	L-M VH-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	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 H-Bees	-
Lambda-cyhalothrin (Karate Zeon) PER14471	3A	Contact & systemic	14 NG	A	ALL (excl. VIC)	Permitted for use in spring onion and shallot for control of Red-legged earth mite, Loopers, Rutherglen bug, Onion maggot, Onion thrips , and Plague thrips. (some restrictions on Thrip control. Refer to permit). [Max. 2 applications per crop; re-treatment interval 7-10 d]	VH H-Bees	-
Maldison (Fyfanon) PER13653	1B	Contact & systemic	3	A	ALL (excl. VIC)	Permitted for use in spring onion and shallot for control of Onion thrips . [Max. 3 applications per crop; re-treatment interval 7 d]	H H-Bees	-
Petroleum oil (Biocover) PER12221	UN	Contact	1	A	ALL (excl. VIC)	Permitted for use in spring onion and shallot for control of Aphids, Green mirid, Green vegetable bug, Grey cluster bug, Leafhoppers, Mites, Rutherglen bugs and Thrips . [Max. no. of applications and re-treatment interval not specified].	VL L-Bees	-
Phorate (Thimet) PER8930	1B	Contact & systemic	56	A	ALL	Permitted for use in spring onion and shallot for control of Aphids, Mites, Jassids, Thrips & Onion maggots. [Max. 1 applications per year]	H H-Bees	R3
Potassium salts of fatty acids (Natrasoap)	-	Contact	Nil	A	ALL	Registered in vegetables for control of Aphids, Thrips , Mealybug, Two spotted mites, Spider mite, and White fly. Apply when temperatures are cooler. [Max no. of applications not specified; re-treatment interval 5-7 d]	L L-Bees	-
Pyrethrins + piperonyl butoxide (Kendon)	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Thrips , Caterpillars, Leaf hoppers, and Whitefly. [Max no. of applications not specified; re-treatment interval: 7 d]	VH H-Bees	-
Rotenone (Amgrow Derris Dust)	21B	Contact	1	A	ALL	Registered in vegetables for control of Thrips and Aphids. [Max no. of applications not specified; Re-treatment interval: 10-14 d]	-	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Spirotetramat (Movento 240 SC)	23	Contact & systemic	7	A	ALL	Registered in bulb vegetables for Onion thrips , Western flower thrips, Tomato thrips and Plague thrips. Uses subject to CropLife resistance management strategies. [Max. 2 applications per crop; re-treatment interval 7 d].	M VL-Bees	-
<i>Beauveria bassiana</i> (Broadband OD / Velifer)	UNF	Protective biopesticide		P-A		Registered in protected vegetables and ornamentals for suppression of various pests including: Western Flower Thrips, Onion thrips , Greenhouse Whitefly, Silverleaf Whitefly, Sweet Potato Whitefly, Green Peach Aphid & Two-spotted Spider Mites. [Max. 3 application per crop; re-treatment interval 3-14 d]	L L-Bees	-
Spinetoram (Success Neo) PER13088	5	Contact & ingestion		P-A		Permitted for use in spring onion & shallot for control of Western flower thrips (PER13088). [Max. 3 applications per crop; re-treatment interval not specified].	M H-Bees	-
Chlorantraniliprole + thiamethoxam (Durivo) Syngenta	4A+28	Contact & systemic		P		Registered in other vegetables as a seedling drench or soil drench for Aphids, Lepidoptera, Whitefly and Thrips .	L-H H-Bees	R2
Flonicamid (Mainman) ISK	9C	Systemic		P		Permitted in onions for suppression only of Onion Thrips and Western Flower Thrips as a foliar spray.	M L-Bees	-
NUL3445 Nufarm	TBC			P		New active in development. Nufarm claims activity on Lepidoptera .		
SYNFOI21 Syngenta	NEW	TBC		P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips , Bugs and Caterpillars.	-	-
Spinosad (Entrust Organic) Corteva	5	Contact & ingestion		P		Registered in Brassica vegetables for control of Diamondback moth, Cabbage white butterfly, Cabbage cluster caterpillar, Cabbage centre grub, Loopers , Helicoverpa & Western flower thrips . [Max. 4 applications per season; re-treatment interval 7-14 d]	L L-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Western flower thrips (<i>Frankliniella occidentalis</i>)								
Priority: High								
Western flower thrips (WFT) were ranked as a high priority in VIC, QLD & SA and as a moderate priority in TAS. Identification of the correct species is important prior to treatment. Resistance is an ongoing issue and virus transmission with thrip infestations are a concern for industry. IPM Recommendations include: The use of predatory thrips, mites & bug releases, control flowering weeds, mulch and use of certified seed.								
<i>Beauveria bassiana</i> (Broadband OD / Velifer)	UNF	Protective biopesticide	NR	A	ALL	Registered in protected vegetables and ornamentals for suppression of various pests including: Western Flower Thrips , Onion thrips, Greenhouse Whitefly, Silverleaf Whitefly, Sweet Potato Whitefly, Green Peach Aphid & Two-spotted Spider Mites. [Max. 3 application per crop; re-treatment interval 3-14 d]	L L-Bees	-
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	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 H-Bees	-
Methomyl (Lannate) PER14890	1A	Contact & systemic	3	A	ALL (excl. VIC)	Permitted for use in spring onion and shallot for control of Western flower thrips . [Max. no. of applications and re-treatment interval not specified]	H H-Bees	R2
Petroleum oil (Biocover) PER12221	UN	Contact	1	A	ALL (excl. VIC)	Permitted for use in spring onion and shallot for control of Aphids, Green mirid, Green vegetable bug, Grey cluster bug, Leafhoppers, Mites, Rutherglen bugs and Thrips . [Max. no. of applications and re-treatment interval not specified].	VL L-Bees	-
Phorate (Thimet) PER8930	1B	Contact & systemic	56	A	ALL	Permitted for use in spring onion and shallot for control of Aphids, Mites, Jassids, Thrips and Onion maggots. [Max. 1 applications per year]	H H-Bees	R3
Pyrethrins+ piperonyl butoxide (Kendon)	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Thrips , Caterpillars, Leaf hoppers, and Whitefly. [Max no. of applications not specified; re-treatment interval: 7 d]	VH H-Bees	-
Rotenone (Amgrow Derris Dust)	21B	Contact	1	A	ALL	Registered in vegetables for control of Thrips and Aphids. [Max no. of applications not specified; Re-treatment interval: 10-14 d]	-	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Spinetoram (Success Neo) PER13088	5	Contact & ingestion	3 NG	A	ALL (excl. VIC)	Permitted for use in spring onion and shallot for control of Western flower thrips in Spring onion and Shallot. [Max. 3 applications per crop; re-treatment interval not specified]	M H-Bees	-
Spirotetramat (Movento 240 SC)	23	Contact & systemic	7	A	ALL	Registered in bulb vegetables for Onion thrips, Western flower thrips , Tomato thrips and Plague thrips. Uses subject to CropLife resistance management strategies. [Max. 2 applications per crop; re-treatment interval 7 d]	M VL-Bees	-
Cyantraniliprole (Benevia) FMC	28	Systemic & stomach		P-A		Registered in spring onion and shallot for suppression of Onion thrips .	L-M VH-Bees	-
Maldison (Fyfanon) FMC	1B	Contact & systemic		P-A		Permitted for use in spring onion and shallot for control of Onion thrips (PER13653). [Max. 3 applications per crop; re-treatment interval 7 d]	H H-Bees	-
Fonicamid (Mainman) ISK	9C	Systemic		P		Hort Innovation data generation project ST17000 completed and data submitted to the APVMA in January 2020. Pending permit application with APVMA for control of Onion thrips & Western Flower thrips in bulb vegetables.	M L-Bees	-
Flupyradifurone (Sivanto) Bayer	4D	Systemic, ingestion & contact		P		Registered in macadamia for control of Macadamia lace bug, Banana spotting bug, Fruit spotting bug and suppression of Scirtothrips. US label (Sivanto) approves use on Brassica vegetables for control of Leafhoppers, Aphids and Whiteflies and for control of Blueberry thrips in Bushberries.	L VL-Bees	-
SYNFOI21 Syngenta	NEW	TBC		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
Thiamethoxam + Chlorantraniliprole (Durivo) Syngenta	4A+28	Contact & systemic		P		Registered in brassica vegetables for control of Diamondback moth, Cabbage white butterfly, Helicoverpa, Cabbage centre grub, Cabbage cluster caterpillar, Cluster caterpillar, Soya bean looper, Cabbage aphid, Green peach aphid, Silverleaf white fly, Greenhouse whitefly, Green vegetable bug, Western flower thrips and Onion thrips. [max 1 application per crop; seedlings should be transplanted within 48 h of application]	L-H H-Bees	R2
<p>Thrips (Thysanoptera) Includes: Plague thrips (<i>Thrips imagines</i>), Bean Blossom Thrips (<i>Megalurothrips usitatis</i>) & Melon thrips (<i>Thrips palmi</i>) Priority: Moderate</p> <p>Thrips were ranked as a high priority in QLD and as a moderate priority in VIC, SA & TAS. Identification of the correct species is important prior to treatment. Resistance is an ongoing issue and virus transmission with thrip infestations are a concern for industry. IPM Recommendations include: The use of predatory thrips, mites & bug releases, control flowering weeds, mulch and use of certified seed.</p>								
Diazinon (Barmac) PER82551	1B	Contact & systemic	14	A	ALL (excl. VIC)	Permitted for use in spring onion and shallot for control of Onion maggots and Thrips . [Max. 4 applications per crop; re-treatment interval 10-14 d]	H VH-Bees	R3
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	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 H-Bees	-
Petroleum oil (Biocover) PER12221	UN	Contact	1	A	ALL (excl. VIC)	Permitted for use in spring onion and shallot for control of Aphids, Green mirid, Green vegetable bug, Grey cluster bug, Leafhoppers, Mites, Rutherglen bugs and Thrips . [Max. no. of applications and re-treatment interval not specified]	VL L-Bees	-
Phorate (Thimet) PER8930	1B	Contact & systemic	56	A	ALL	Permitted for use in spring onion and shallot for control of Aphids, Mites, Jassids, Thrips & Onion maggots. [Max. 1 applications per year]	H H-Bees	R3
Pyrethrins+piperonyl butoxide (Kendon)	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids, Thrips , Caterpillars, Leaf hoppers, and Whitefly. [Max no. of applications not specified; re-treatment interval: 7 d]	VH H-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Rotenone (Amgrow Derris Dust)	21B	Contact	1	A	ALL	Registered in vegetables for control of Thrips and Aphids. [Max no. of applications not specified; Re-treatment interval: 10-14 d]	-	-
Spirotetramat (Movento 240 SC)	23	Contact & systemic	7	A	ALL	Registered in bulb vegetables for Onion thrips, Western flower thrips, Tomato thrips and Plague thrips . Uses subject to CropLife resistance management strategies. [Max. 2 applications per crop; re-treatment interval 7 d]	M VL-Bees	-
Alpha-cypermethrin (Dominex Duo) FMC	3A	Contact & systemic	7	P-A	ALL (excl. VIC)	Permitted for use in spring onion and shallot for control of Onion thrips (PER14457). [Max. 3 applications per crop; re-treatment interval 7 d]	VH H-Bees	-
<i>Beauveria bassiana</i> (Broadband OD / Velifer)	UNF	Protective biopesticide		P-A		Registered in protected vegetables and ornamentals for suppression of various pests including: Western Flower Thrips, Onion thrips , Greenhouse Whitefly, Silverleaf Whitefly, Sweet Potato Whitefly, Green Peach Aphid & Two-spotted Spider Mites. [Max. 3 application per crop; re-treatment interval 3-14 d]	L L-Bees	-
Cyantraniliprole (Benevia) FMC	28	Systemic & stomach	7	P-A	ALL	Registered in spring onion and shallot for suppression of Onion thrips .	L-M VH-Bees	-
Maldison (Fyfanon) FMC	1B	Contact & systemic		P-A		Permitted for use in spring onion and shallot for control of Onion thrips (PER13653). [Max. 3 applications per crop; re-treatment interval 7 d]	H H-Bees	-
Spinetoram (Success Neo) Corteva	5	Contact & ingestion		P-A		Permitted for use in spring onion and shallot for control of Western flower thrips (PER13088). [Max. 3 applications per crop; re-treatment interval not specified].	M H-Bees	-
Chlorantraniliprole + thiamethoxam (Durivo) Syngenta	4A+28			P		Registered in other vegetables as a seedling drench or soil drench for Aphids, Lepidoptera, Whitefly and Thrips .	L-H H-Bees	R2

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Flonicamid (Mainman) ISK	9C	Systemic		P		Hort Innovation data generation project ST17000 completed and data submitted to the APVMA in January 2020. Pending permit application with APVMA for control of Onion thrips & Western Flower thrips in bulb vegetables.	M L-Bees	-
Flupyradifurone (Sivanto) Bayer	4D	Systemic, ingestion & contact		P		Registered in macadamia for control of Macadamia lace bug, Banana spotting bug, Fruit spotting bug and suppression of Scirtothrips. US label (Sivanto) approves use on Brassica vegetables for control of Leafhoppers, Aphids and Whiteflies and for control of Blueberry thrips in Bushberries.	L VL-Bees	-
SYNFOI21 Syngenta	NEW	TBC		P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips , Bugs and Caterpillars.		
<p>Onion maggot (<i>Delia platura</i>) Priority: Moderate</p> <p>Onion maggot was ranked as a moderate priority in VIC & SA and as a low priority in QLD & TAS. Onion Maggot is not a significant issue in any growing region except SA & VIC, where it is rated as a moderate 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.</p>								
Diazinon (Barmac) PER82551	1B	Contact & systemic	14	A	ALL (excl. VIC)	Permitted for use in spring onion and shallot for control of Onion maggots & Thrips. [Max. 4 applications per crop; re-treatment interval 10-14 d]	H VH-Bees	R3
Lambda-cyhalothrin (Karate Zeon) PER14471	3A	Contact & systemic	14 NG	A	ALL (excl. VIC)	Permitted for use in spring onion and shallot for control of red-legged earth mite, Loopers, Rutherglen bug, Onion maggot , Onion thrips & Plague thrips. (some restrictions on thrip control. Refer to permit). [Max. 2 applications per crop; re-treatment interval 10-14 d]	VH H-Bees	-
Phorate (Thimet) PER8930	1B	Contact & systemic	56	A	ALL	Permitted for use in spring onion and shallot for control of Aphids, Mites, Jassids, Thrips and Onion maggots . [Max. 1 applications per year]	H H-Bees	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Onion Aphid (<i>Neotoxoptera formosana</i>)								
Priority: Moderate								
Aphids were ranked as a moderate priority in VIC, QLD & SA, and as a low priority in TAS. Although an infrequent pest, damage can occur in two ways: directly as the aphids suck the sap of plants causing them to collapse, and indirectly through the spread of viruses. The extent of either kind of damage is not well documented.								
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	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 H-Bees	-
Petroleum oil (Biocover) PER12221	UN	Contact	1	A	ALL (excl. VIC)	Permitted for use in spring onion and shallot for control of Aphids , Green mirid, Green vegetable bug, Grey cluster bug, Leafhoppers, Mites, Rutherglen bugs & Thrips. [Max. no. of applications and re-treatment interval not specified].	VL L-Bees	-
Phorate (Thimet) PER8930	1B	Contact & systemic	56	A	ALL	Permitted for use in in spring onion and shallot for control of Aphids , Mites, Jassids, Thrips & Onion maggots. [Max. 1 applications per year]	H H-Bees	R3
Pirimicarb (Primor)	1A	Systemic, contact & stomach	2	A	ALL	Registered in shallot for control of Aphids . [Max. no. of applications & re-treatment interval not specified]	VL VL-Bees	R3
Potassium salts of fatty acids (Natrasoap)	-	Contact	Nil	A	ALL	Registered in vegetables for control of Aphids , Thrips, Mealybug, Two spotted mites, Spider mite, and White fly. Apply when temperatures are cooler. [Max no. of applications not specified; re-treatment interval 5-7 d]	L L-Bees	-
Pyrethrins+ piperonyl butoxide (Kendon)	3A	Contact	1	A	ALL	Registered in vegetables for control of Ants, Aphids , Thrips, Caterpillars, Leaf hoppers, and Whitefly. [Max no. of applications not specified; re-treatment interval: 7 d]	VH H-Bees	-
Rotenone (Amgrow Derris Dust)	21B	Contact	1	A	ALL	Registered in vegetables for control of Thrips and Aphids . [Max no. of applications not specified; Re-treatment interval: 10-14 d]	-	-
Afidopyropen (Versys) BASF	9D	Behaviour disruption		P		Registered for control of Aphids in various crops including, potato, sweet potato & ginger.	L L-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
<i>Beauveria bassiana</i> (Broadband OD / Velifer) BASF	UNF	Protective biopesticide		P		Registered in protected vegetables and ornamentals for suppression of various pests including: Western Flower Thrips, Onion thrips, Greenhouse Whitefly, Silverleaf Whitefly, Sweet Potato Whitefly, Green Peach Aphid & Two-spotted Spider Mites. [Max. 3 application per crop; re-treatment interval 3-14 d]	L L-Bees	-
Spirotetramat (Movento 240 SC) Bayer	23	Contact & systemic		P		Registered in cucurbits for the control of Silverleaf whitefly, and Aphids (Green peach & Cotton). Uses subject to CropLife resistance management strategies. [Max 3 applications per crop; re-treatment interval 7 d]	M VL-Bees	-
Sulfoxaflor (Transform) Corteva	4C	Systemic		P		Registered in cucurbits (field grown only) for control of Green peach aphid , Melon (Cotton) aphid , and Greenhouse whitefly. Do not use if honeybees are foraging. [Max. no. of applications not specified; re-treatment interval 7-10 d]	M VH-Bees	-

Cutworms (*Agrotis* spp.)

Priority: Moderate

Cutworms were ranked as a moderate priority in VIC & QLD and as a low priority in SA & TAS. 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.

<i>Bacillus thuringiensis</i> subsp. kurstaki (Dipel)	11A	Protective biopesticide	NR	A	ALL	Registered in vegetables for control of a range of Lepidopteran pests. Most effective on larvae < 8 mm. [Apply a minimum of 2 sprays; re-treatment interval 3-5 d]	VL L-Bees	-
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	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 H-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Bifenthrin (various)	3A	Contact & systemic		P		Registered in ornamentals for soil application for control of Cutworms . Spray evenly over the soil. After application apply approximately 5 mm of sprinkler irrigation.	VH H-Bees	R3
Carbaryl (David Grays) David Gray & Co	1A	Contact & ingestion		P		Registered in cucurbits (prior to flowering) for the control of Helicoverpa, Pumpkin beetle, 28 spotted lady bird, Wingless grasshopper, Green vegetable bug, Leaf eating ladybird, Cutworms , Earwig, potato moth, Rutherglen bug and Army worm. [Max. no. of applications and re-treatment interval not specified]	H H-Bees	R3
Clothianidin + Imidacloprid (Poncho Plus) BASF	4A	Protective		P		Registered in sweet corn, sunflower, canola & forage brassica for control of Wireworms, Cutworms and Aphids. Will provide early protection for 3-4 weeks after sowing	M VH-Bees	R2
Cyantraniliprole + Thiamethoxam (Spinner) Syngenta	4A+28	Systemic, contact & stomach		P		Registered in Turf for control of Caterpillars including Cutworms and Army worms, African black beetle larvae, Argentinian scarab larvae and stem weevil larvae. US label (Minecto Duo) approves use on Brassica, cucurbits, fruiting vegetables, leafy vegetables & tuberous and corm vegetables on a range of insect pests including Army worm, Leaf hoppers, Leaf miners, diamond back moth and potato beetle.	L-H VH-Bees	R2
Tetraniliprole (Vayego) Bayer	28	Disrupts feeding		P		Registered in Australia in multiple crops for various insect pests such as Beetles, Weevils & Lepidoptera . Hort Innovation has several projects underway towards assisting registration in minor crops.	M VH-Bees	-
NUL3445 Nufarm	NEW	TBC		P		New active in development. Nufarm claims activity on Lepidoptera .		
SYNFOI21 Syngenta	NEW	TBC		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
Earwigs (<i>Forficula</i> spp.)								
Priority: Low								
Earwigs were ranked as a low priority in VIC, QLD, SA & TAS. Low importance in alliums 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 (Richgro)	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 H-Bees	-
Pyrethrins (Yates)	3A	Contact	1	A	ALL	Registered in vegetables for control of Earwigs . Apply when pests first appear. [Max no. of applications not specified; re-treatment interval 7 d]	VH H-Bees	-
Pyrethrins + Piperonyl butoxide (Crop Culture)	3A	Contact	1	A	ALL	Registered in vegetables for control of Aphids, Thrips, Caterpillars, Ants, Flies, Earwigs , Whitefly and Leafhoppers. [Max no. of applications not specified; Re-treatment interval: 7 d]	VH H-Bees	-
Jassids / Leafhoppers (<i>Cicadellidae</i>)								
Priority: Low								
Jassids were ranked as a low priority in VIC, QLD, SA & TAS. An infrequent pest that is rated as low priority in all regions.								
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	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 H-Bees	-
Petroleum Oil PER12221	UN	Contact & protective	1	A	ALL (excl. VIC)	Permitted in alliums for control of Aphids, Green Mirid, Green Vegetable Bug, Grey Cluster Bug, Leafhoppers , Mites, Rutherglen Bug & Thrips. Apply as a cover spray when pest numbers are low and repeat as necessary. Treatments per season not limited.	VL L-Bees	-
Phorate (various) PER8930	1B	Contact & systemic	56	A	ALL	Permitted for use in spring onion and shallot for control of Aphids, Mites, Jassids , Thrips & Onion maggots. [Max. 1 applications per year]	H H-Bees	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
SYNFOI21 Syngenta	NEW	TBC		P		SYNFOI21 is not registered but the first global application is proposed for 2020/21 for Thrips, Bugs and Caterpillars.		
Bulb Mites (<i>Rhizoglyphus callae</i>), Dry Bulb Mite (<i>Aceria tulipae</i>) & Two-Spotted Mite (<i>Tetranychus urticae</i>)								
Priority: Low								
Mites were ranked as a low priority in VIC, QLD, SA & TAS. 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.								
Abamectin (Vantal) PER14536	6	Contact	3	A	ALL (excl. VIC)	Permitted for use in spring onion and shallot for control of Two-spotted mite . [Max. 2f applications per crop; re-treatment interval 28 d]	M H-Bees	-
<i>Beauveria bassiana</i> (Broadband OD / Velifer)	UNF	Protective biopesticide	NR	A	ALL	Registered in protected vegetables and ornamentals for suppression of various pests including: Western Flower Thrips, Onion thrips, Greenhouse Whitefly, Silverleaf Whitefly, Sweet Potato Whitefly, Green Peach Aphid & Two-spotted Spider Mites . [Max. 3 application per crop; re-treatment interval 3-14 d]	L L-Bees	-
Petroleum oil (Biocover) PER12221	UN	Contact	1	A	ALL (excl. VIC)	Permitted for use in spring onion and shallot for control of Aphids, Green mirid, Green vegetable bug, Grey cluster bug, Leafhoppers, Mites , Rutherglen bugs & Thrips. [Max. no. of applications and re-treatment interval not specified].	VL L-Bees	-
Phorate (various) PER8930	1B	Contact & systemic	56	A	ALL	Permitted for use in spring onion and shallot for control of Aphids, Mites , Jassids, Thrips & Onion maggots. [Max. 1 applications per year]	H H-Bees	R3
Potassium salts of fatty acids (Natrasoap)	3A	Contact	Nil	A	ALL	Registered in vegetables for control of Aphids, Thrips, Mealybug, Two spotted Mites , Spider Mites , and White fly. Apply when temperatures are cooler. [Max no. of applications not specified; re-treatment interval 5-7 d]	L L-Bees	-
Sulphur (Novaguard)	UN	Contact	NR	A	ALL	Registered in vegetables for control of Mites . Repeat as needed. [Max no. of applications not specified; re-treatment interval 14 d]	L L-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Redlegged earth mites (<i>Halotydeus destructor</i>)								
Priority: Low								
Redlegged earth mite was ranked as a low priority in VIC, QLD, SA & TAS. 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.								
Lambda-cyhalothrin (Karate Zeon) PER14471	3A	Contact & systemic	14 NG	A	ALL (excl. VIC)	Permitted for use in spring onion and shallot for control of Red-legged earth mite , Loopers, Rutherglen bug, Onion maggot, Onion thrips & Plague thrips. (some restrictions on thrip control. Refer to permit). [Max. 2 applications per crop; re-treatment interval 10-14 d]	VH H-Bees	-
Snails (<i>Gastropoda</i>)								
Priority: Low								
Snails were ranked as a low priority in VIC, QLD, SA & TAS. They are active after dusk when chemical treatments can be most effective.								
Iron EDTA Complex (Eradicate Snail)	-	Contact & ingestion	NR	A	ALL	Registered in all plants for the control of Snails and Slugs. Spread pellets evenly on ground. [Max no. of applications and re-treatment not specified]	-	-
Metaldehyde (Sabakem)	-	Contact & ingestion	7	A	ALL	Registered in vegetables for the control of Snails and Slugs. Spread pellets evenly on ground. [Max no. of applications and re-treatment not specified]	-	-
Spotted vegetable weevil (<i>Desiantha diversipes</i>)								
Priority: Low								
Spotted vegetable weevil was ranked as a low priority in VIC, QLD, SA & TAS. Can cause damage 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.								
Pyrethrins (Yates)	3A	Contact	1	A	ALL	Registered in vegetables for control of various insect pests. Apply when pests first appear. [Max no. of applications not specified; re-treatment interval 7 d]	VH H-Bees	-
Indoxacarb (Avatar eVo) FMC	22A	Contact		P		Registered in celery for control of Beet web worm, Helicoverpa, Lightbrown Apple moth & Vegetable weevils . [Max. 3 applications per crop; re-treatment interval 7 d]	L H-Bees	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Tetraniliprole (Vayego) Bayer	28	Disrupts feeding		P		Registered in Australia in multiple crops for various insect pests such as Beetles, Weevils & Lepidoptera. Hort Innovation has several projects underway towards assisting registration in minor crops.	M VH-Bees	
Vegetable weevil (<i>Listroderes difficilis</i>)								
Priority: Low								
Vegetable weevil was ranked as a low priority in VIC, QLD, SA & TAS. Can cause damage 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								
Pyrethrins (Yates)	3A	Contact	1	A	ALL	Registered in vegetables for control of various insect pests. Apply when pests first appear. [Max no. of applications not specified; re-treatment interval 7 d]	VH H-Bees	-
Indoxacarb (Avatar eVo) FMC	22A	Contact		P		Registered in celery for control of Beet web worm, Helicoverpa, Lightbrown Apple moth & Vegetable weevils . [Max. 3 applications per crop; re-treatment interval 7 d]	L H-Bees	R3
Tetraniliprole (Vayego) Bayer	28	Disrupts feeding		P		Registered in Australia in multiple crops for various insect pests such as Beetles, Weevils & Lepidoptera. Hort Innovation has several projects underway towards assisting registration in minor crops.	M VH-Bees	
Wireworms (<i>Heteroderes sp.</i>)								
Priority: Low								
Wireworms were ranked as a low priority in VIC, QLD, SA & TAS. Wireworms are not a widespread pest. The larvae are soil-dwelling and will attack newly germinated seedlings by chewing the leaves and stems. This can lead to destruction of the whole plant.								
1,3-dichloropropene + Chloropicrin (Tri-Form)	8B	Soil fumigant	NR	A	ALL	Registered in vegetables for control of Wireworms . Leave soil undisturbed at least 7 d after treatment. Aeration before planting should be for a minimum of 21 days.	-	-
Bifenthrin (various)	3A	Contact & ingestion		P		Registered in cotton and sugar cane for control of Wireworm .	VH H-Bees	R3
Broflanilide (BASF)	30	Contact & ingestion		P		Being developed in Australia. Registered in the USA for soil insect control	H VH-Bees	-

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Clothianidin + Imidacloprid (Poncho Plus) BASF	4A	Protective		P		Registered in sweet corn, sunflower, canola & forage brassica for control of Wireworms , Cutworms and Aphids. Will provide early protection for 3-4 weeks after sowing.	M VH-Bees	R2
Diazinon (Barmac) Amgrow	1B	Contact		P		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 H-Bees	R3
Fipronil (Regent) BASF	2B	Contact & systemic		P		Registered in potatoes for control of mole cricket, Whitefringed weevil and Wireworms . Apply as a broadcast spray to surface of soil and incorporate to a depth of 15 cm prior to planting.	M VH-Bees	R3
Phorate (Zeemet) United Phosphorous	1B	Contact & systemic		P		Registered in potatoes for control of Wireworms .	H H-Bees	R3
Crickets & Grasshoppers - Wingless grasshopper (<i>Phaulacridium vittatum</i>), Black field cricket (<i>Teleogryllus commodus</i>), Field crickets (<i>Gryllidae</i>) & Mole crickets (<i>Gryllotalpidae</i>). Priority: Low Crickets & Grasshoppers were ranked as a low priority in VIC, QLD, SA & TAS. They have a voracious appetite and can cause severe damage to foliage if the numbers get high. Damage is limited to feeding on newly established plants and reducing plant populations.								
1,3-dichloropropene (Tri-Form)	-	Soil fumigant	NR	A	ALL	Registered in vegetables for control of soil borne pests. Leave soil undisturbed for 14 d after treatment.	-	-
Chlorpyrifos (Sinon)	1B	Contact & systemic	5	A	QLD & WA	Registered in young vegetable plants for the control of Field and Mole crickets . Apply as a soil drench or boom spray. [Max no. of applications and re-treatment interval not specified]	H H-Bees	R1
Carbaryl (David Grays) David Gray & Co	1A	Contact & ingestion	3	P	ALL	Registered in cucurbits (prior to flowering) for the control of Helicoverpa, pumpkin beetle, 28 spotted lady bird, Wingless grasshopper , Green vegetable bug, Leaf eating ladybird, Cutworms, Earwig, potato moth, Rutherglen bug and Army worm. [Max. no. of applications and re-treatment interval not specified]	H H-Bees	R3

Pest / Active Ingredient (Trade Name)	Chemical group	Activity	WHP, days	Availability	States	Comments	Impact on beneficials	Regulatory risk
Fall Armyworm (<i>Spodoptera frugiperda</i>)								
New Pest to Australia (unknown priority)								
Fall Armyworm has recently been detected in Australia for the first time. It has not been seen in spring onion and shallot crops and the potential impact is currently unknown.								
Methomyl (Lannate) PER89293	1A	Contact & systemic	7	A	ALL (excl. VIC)	Permitted for use in shallot & spring onion for control of Fall Armyworm [Max. 3 applications per crop; re-treatment interval not specified]	H H-Bees	R2
Spinetoram (Success Neo) PER89284	5	Contact & ingestion	3 NG	A	ALL (excl. VIC)	Permitted for use in Leek, Spring onion, Shallot & Galangal for control of Fall Armyworm . [Max. 3 applications per crop; re-treatment interval not specified]	M H-Bees	-
Tetraniliprole (Vayego) Bayer	28	Disrupts feeding		P		Registered in Australia in multiple crops for various insect pests such as Beetles, Weevils & Lepidoptera . Hort Innovation has several projects underway towards assisting registration in minor crops.	M VH-Bees	-
Indoxacarb (Avatar eVo) FMC	22A	Contact		P		Registered in several vegetable groups for control of various Lepidoptera pests. [Max 4 applications per crop: re-treatment interval 7 d]	L H-Bees	R3
Spinosad (Entrust Organic) Corteva	5	Contact & ingestion		P		Permitted for use in Brassica vegetables, Brassica leafy vegetables, Stalk and stem vegetables, Leafy vegetables, Fruiting vegetables, Legume vegetables (succulent seeds & immature pods only), Stalk and stem vegetables, Culinary herbs, Root and tuber vegetables and several fruits (PER89870). (Protected cropping) for control of Fall Armyworm . [Max. 4 applications per season; re-treatment interval 7-14 d]	L L-Bees	-

4.3 Weeds in spring onion and shallot

4.3.1 Weed priorities

The moderate priority weeds are:

Common Name	Scientific name
Amaranthus	<i>Amaranthus</i> spp.
Blackberry nightshade	<i>Solanum nigrum</i>
Fat hen	<i>Chenopodium album</i>
Nutgrass	<i>Cyperus rotundus</i>
Pig weed	<i>Portulaca oleracea</i>
Wild turnips	<i>Raphanus raphanistrum</i> L.

Weeds ranked by individual regions and grass weeds that were not ranked are:

Common Name	Scientific name
African Spider Flower (QLD)	<i>Cleome gynandra</i>
Fumitory (QLD)	<i>Fumaria</i> spp.
Slender celery (QLD)	<i>Ciclospermum leptophyllum</i>
Grass weeds including Annual Ryegrass	<i>Lolium rigidum</i>

There were no weeds identified as high priority in the recent survey, but the growers are concerned about the lack of post-emergent options for broadleaf weeds in general. As Spring onion and Shallot are considered extremely sensitive to herbicides, some growers prefer to manage the weeds manually.

Several species were identified as moderate priority and these weeds can be controlled with currently available herbicides as identified in section 4.3.2. Managing these weeds would be possible using herbicides mentioned in Appendix 3 or by various management practices such as soil fumigation, pre-crop spraying, spot spraying, using mechanical devices and other cultural practises including crop rotation.

An effective weed control program 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

Resistance management

Specific resistance management strategies for high resistance risk (A and B) and moderate resistance risk (C, D, F, G, I, J, K, L, M, N, Q and Z) herbicide modes of action are available on the CropLife Australia webpage.

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

4.3.2 Available and potential products for weed control

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

Availability			
A	Available via either registration or permit approval		
P	Potential – a possible candidate to pursue for registration or permit		
P-A	Potential, already approved in the crop for another use		
Resistance risk		Regulatory risk (refer to Appendix 6)	
		R1	Short-term: Critical concern over retaining access
**	Moderate resistance risk	R2	Medium-term: Maintaining access of significant concern
***	High resistance risk	R3	Long-term: Potential issues associated with use - Monitoring required
Withholding Period (WHP) – Number of days from last treatment to harvest (H) or Grazing (G)			
Harvest	H	Not Required when used as directed	NR
Grazing	G	No Grazing Permitted	NG

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Amaranthus (<i>Amaranthus</i> spp.)							
Priority: Moderate							
Amaranthus was ranked as a moderate priority in VIC, QLD, SA & TAS. It is a short-lived annual weed that can pose a problem every year as they are prolific seeders.							
2,4-D Acid (Farmalinx)	I**	Post emergent spot spray / Selective	Registered for spot spraying on all situations for control of a range of weeds. Thorough wetting of weed essential. Do not spray if rain is likely within 6 h. [Max no of applications not specified].	NR	A	ALL	-
Chlorthal-Dimethyl (AgProject)	D**	Spring onion & Shallot / Pre-emergent	Registered in Spring onion and Shallot control of various grass and broadleaf weeds including Amaranthus , Blackberry nightshade, Fat hen and Pigweed. Spray at transplanting. [Max. 1 application per crop].	NR	A	ALL	-
Glyphosate (various)	M**	General knockdown. Pre-crop spray	Registered for control of general weeds as a pre-crop spray.	NR	A	ALL	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Ioxynil (Totril) PER14142	C**	Spring onion, shallot & welsh onion / Post emergent	Permitted for use in spring onion & shallot for control of label registered weeds including Fat hen, Fumitory, Green Amaranth , Pigweed and Wild radish in Spring onion and Shallot. Apply between 3 to 8 leaf stage of crop and between the cotyledon and 6-leaf stage of the weeds. [Max. 2 applications per year; re-treatment interval 14-21 d]	21	A	ALL (excl. VIC)	-
Linuron (Aflon) PER89645	C**	Spring onion & shallot / Post-emergent	Permitted for use in spring onion & shallot for control of label registered broadleaf weeds including Blackberry nightshade, Fat hen, Pigweed, Wild radish, Shepherd's purse, Slender thistle & Amaranth . [Max. 2 applications per crop; re-treatment interval 14-21 d].	NR NG	A	ALL	R3
S-Metolachlor (Dual Gold) PER13626	K**	Spring onion & shallot / Pre-emergent	Permitted for use in spring onion & shallot for control of label registered broadleaf and grass weeds including Blackberry nightshade, Fat hen, Pigweed (suppression) and Amaranth (suppression). Apply before, at or immediately after planting and before crops and weeds have germinated. [Max. 1 application per crop]	NR	A	ALL (excl. VIC)	-
Paraquat + diquat (Agro-Essence)	L***	Vegetables / General seed bed preparation / Post-emergence inter-row weed control	General weeds as a pre-crop spray. Only used in field grown crops. Post-emergence inter-row weed control (shielded spray – do not touch the crop). Add diquat where broadleaf weeds dominate. [Max no of applications not specified]	1 G:1	A	ALL	R3
Pendimethalin (Stomp) PER14048	D**	Spring onion & shallot (pre-planting application) / Residual	Permitted for use in spring onion & shallot for control of label registered weeds including Amaranth , Fat hen and Pigweed and suppression of Blackberry nightshade in Spring onion and Shallot. Apply as a single pre-planting application only.	NR	A	ALL (excl. VIC)	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Bromoxynil (Maya) Unregistered Nufarm	C**	Bulb Onions / Pre- & post-emergent	Nufarm advised in 2018 that they are undertaking the required label registration for the EU formulation of Bromoxynil (Group C) in onions. The Australian formulation is not compatible with onions as it causes crop damage. This will be an alternative to Ioxynil (Group C) herbicide. Nufarm planned to undertake Australian trials in 2019. Registration submission is expected October 2020.		P		-
Oxyfluorfen (Kelpie Oxy-F 240) Sinochem International	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. Multiple treatments may be applied provided the total dose does not exceed 0.48 kg ai/ha per season.		P		-
Phenmedipham (Betanal) Bayer	C**	Silverbeet, beetroot / Post-emergent /	Registered in silverbeet and beetroot for control of a range of weeds, including, Blackberry nightshade, Cape weed, Chickweed, Fat hen, Pigweed and Amaranthus . Apply when weeds are at 2-leaf stage. [Max no of applications and re-treatment interval not specified]		P		R3
NUL3438 Nufarm	NEW	TBC	New active in development, Nufarm claims activity on broadleaf weeds.		P		-
Blackberry nightshade (<i>Solanum nigrum</i>)							
Priority: Moderate							
Blackberry nightshade was ranked as a moderate priority in VIC, QLD, SA & TAS. It is a prolific weed that is widely adapted and difficult to eradicate, mainly due to its long-term seed viability.							
Chlorthal-Dimethyl (AgProject)	D**	Spring onion & Shallot / Pre-emergent	Registered in Spring onion and Shallot control of various grass and broadleaf weeds including Amaranthus , Blackberry nightshade , Fat hen and Pigweed. Spray at transplanting. [Max. 1 application per crop].	NR	A	ALL	-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Glyphosate (various)	M**	General knockdown. Pre-crop spray	Registered for control of general weeds as a pre-crop spray.	NR	A	ALL	R3
Linuron (Afolon) PER89645	C**	Spring onion & shallot / Post-emergent	Permitted for use in spring onion & shallot for control of label registered broadleaf weeds including Blackberry nightshade , Fat hen, Pigweed, Wild radish, Shepherd's purse, Slender thistle & Amaranth. [Max. 2 applications per crop; re-treatment interval 14-21 d].	NR NG	A	ALL	R3
S-Metolachlor (Dual Gold) PER13626	K**	Spring onion & shallot / Pre-emergent	Permitted for use in spring onion & shallot for control of label registered broadleaf and grass weeds including Blackberry nightshade , Fat hen, Pigweed (suppression) and Amaranth (suppression). Apply before, at or immediately after planting and before crops and weeds have germinated. [Max. 1 application per crop]	NR	A	ALL (excl. VIC)	-
Paraquat + diquat (Agro-Essence)	L***	Vegetables / General seed bed preparation / Post-emergence inter-row weed control	General weeds as a pre-crop spray. Only used in field grown crops. Post-emergence inter-row weed control (shielded spray – do not touch the crop). Add diquat where broadleaf weeds dominate. [Max no of applications not specified]	1 G:1	A	ALL	R3
Pendimethalin (Stomp) PER14048	D**	Spring onion & shallot (pre-planting application) / Residual	Permitted for use in spring onion & shallot for control of label registered weeds including Amaranth, Fat hen and Pigweed and suppression of Blackberry nightshade in Spring onion and Shallot. Apply as a single pre-planting application only.	NR	A	ALL (excl. VIC)	-
Bromoxynil (Maya) Unregistered Nufarm	C**	Bulb Onions / Pre- & post-emergent	Nufarm advised in 2018 that they are undertaking the required label registration for the EU formulation of Bromoxynil (Group C) in onions. The Australian formulation is not compatible with onions as it causes crop damage. This will be an alternative to Ioxynil (Group C) herbicide. Nufarm planned to undertake Australian trials in 2019. Registration submission is expected October 2020.		P		-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
NUL3438 Nufarm	NEW	TBC	New active in development, Nufarm claims activity on broadleaf weeds.		P		-
Oxyfluorfen (Kelpie Oxy-F 240) Sinochem International	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. Multiple treatments may be applied provided the total dose does not exceed 0.48 kg ai/ha per season.		P		-
Bentazone (Basagran) BASF	C**	Onions / Post-emergent	Permitted in onions for various broadleaf weeds, including Blackberry Nightshade , Wild turnip & Fat hen. Can be used alone or in a tank-mix with ioxynil to improve the spectrum of weeds controlled.		P		
Cyanazine (Bladex) AgNova	C**	Onions / Post-emergent	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).		P		
Aclonifen (Emerger) Bayer	H**	Pre-Emergent	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**	Beans & Sweet corn / Pre-emergent / Pre-plant	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	NEW	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
Fat hen (<i>Chenopodium album</i>)							
Priority: Moderate							
Fat hen was ranked as a moderate priority in VIC, QLD, SA & TAS. Widespread and aggressive weed. Herbicide control can be difficult and targeting weeds at early growth stages is critical.							
2,4-D Acid (Farmalinx)	I**	Post emergent spot spray / Selective	Registered for spot spraying on all situations for control of a range of weeds. Thorough wetting of weed essential. Do not spray if rain is likely within 6 h. [Max no of applications not specified]	NR	A	ALL	-
Chlorthal-Dimethyl (AgProject)	D**	Spring onion & Shallot / Pre- emergent	Registered in Spring onion and Shallot control of various grass and broadleaf weeds including Amaranthus, Blackberry nightshade, Fat hen and Pigweed. Spray at transplanting. [Max. 1 application per crop]	NR	A	ALL	-
Glyphosate (various)	M**	General knockdown. Pre-crop spray	Registered for control of general weeds as a pre-crop spray.	NR	A	ALL	R3
Ioxynil (Totril) PER14142	C**	Spring onion, shallot & welsh onion / Post emergent	Permitted for use in spring onion & shallot for control of label registered weeds including Fat hen , Fumitory, Green Amaranth, Pigweed and Wild radish in Spring onion and Shallot. Apply between 3 to 8 leaf stage of crop and between the cotyledon and 6-leaf stage of the weeds. [Max. 2 applications per year; re-treatment interval 14-21 d]	21	A	ALL (excl. VIC)	-
Linuron (Afalon) PER89645	C**	Spring onion & shallot / Post-emergent	Permitted for use in spring onion & shallot for control of label registered broadleaf weeds including Blackberry nightshade, Fat hen , Pigweed, Wild radish, Shepherd's purse, Slender thistle & Amaranth. [Max. 2 applications per crop; re-treatment interval 14-21 d]	NR NG	A	ALL	R3
Methabenzthiazuro n (Tribunil) PER14742	C**	Spring onion & shallot / Post-emergent	Permitted for use in spring onion & shallot for control of label registered weeds including Fat hen , Fumitory, Pigweed and Wild radish in Spring onion and Shallot. [Max. 1 application per crop]	49	A	ALL (excl. VIC)	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
S-Metolachlor (Dual Gold) PER13626	K**	Spring onion & shallot / Pre-emergent	Permitted for use in spring onion & shallot for control of label registered broadleaf and grass weeds including Blackberry nightshade, Fat hen , Pigweed (suppression) and Amaranth (suppression). Apply before, at or immediately after planting and before crops and weeds have germinated. [Max. 1 application per crop]	NR	A	ALL (excl. VIC)	-
Paraquat + diquat (Agro-Essence)	L***	Vegetables / General seed bed preparation / Post-emergence inter-row weed control	General weeds as a pre-crop spray. Only used in field grown crops. Post-emergence inter-row weed control (shielded spray – do not touch the crop). Add diquat where broadleaf weeds dominate. [Max no of applications not specified]	1 G:1	A	ALL	R3
Pendimethalin (Stomp) PER14048	D**	Spring onion & shallot (pre-planting application) / Residual	Permitted for use in spring onion & shallot for control of label registered weeds including Amaranth, Fat hen and Pigweed and suppression of Blackberry nightshade in Spring onion and Shallot. Apply as a single pre-planting application only.	NR	A	ALL (excl. VIC)	-
Propachlor (Ramrod) PER12008	H**	Spring onion & shallot / Post-emergent	Permitted for use in spring onion & shallot for control of label registered grass and broad leaf weeds including Fat hen & Pigweed. Apply as a surface spray immediately after planting or transplanting.	NR	A	ALL (excl. VIC)	R3
Bentazone (Basagran) BASF	C**	Onions / Post- emergent	Permitted in onions for various broadleaf weeds, including Blackberry Nightshade, Wild turnip & Fat hen . Can be used alone or in a tank-mix with ioxynil to improve the spectrum of weeds controlled.		P		
Bromoxynil (Maya) Unregistered Nufarm	C**	Bulb Onions / Pre- & post-emergent	Nufarm advised in 2018 that they are undertaking the required label registration for the EU formulation of Bromoxynil (Group C) in onions. The Australian formulation is not compatible with onions as it causes crop damage. This will be an alternative to Ioxynil (Group C) herbicide. Nufarm planned to undertake Australian trials in 2019. Registration submission is expected October 2020.		P		-

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 Fat-Hen , Cruciferous weeds, Fat hen, Fumitory, Winter grass & Wireweed. Apply after 2 leaf stage of crop. Follow up program using alternative herbicides.		P		-
NUL3438 Nufarm	NEW	TBC	New active in development, Nufarm claims activity on broadleaf weeds.		P		-
Oxyfluorfen (Kelpie Oxy-F 240) Sinochem International	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. Multiple treatments may be applied provided the total dose does not exceed 0.48 kg ai/ha per season.		P		-
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		-
Nutgrass (<i>Cyperus rotundus</i>)							
Priority: Moderate							
Nutgrass was ranked as a moderate priority in VIC, QLD, SA & TAS. Prefers damp, water-logged soils but can survive for years underground during dry times. Herbicide options are limited and unreliable. Improve soil drainage if possible.							
2,4-D Acid (Farmalinx)	I**	Post emergent spot spray / Selective	Registered for spot spraying on all situations for control of a range of weeds including nutgrass . Thorough wetting of weed essential. [Spray within 4 weeks of foliage emergence; repeat if necessary]	NR	A	ALL	-
Glyphosate (various)	M**	General knockdown. Pre-crop spray	Registered for control of general weeds as a pre-crop spray.	NR	A	ALL	R3
Paraquat + diquat (Agro-Essence)	L***	Vegetables/General seed bed preparation / Post-emergence inter-row weed control	General weeds as a pre-crop spray. Only used in field grown crops. Post-emergence inter-row weed control (shielded spray – do not touch the crop). Add diquat where broadleaf weeds dominate. [Max no of applications not specified]	1 G:1	A	ALL	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Norflurazon (Zoliar) Agnova	F**	Asparagus, citrus, grapes, nuts, stone & pome fruits / Pre-emergent	Registered in asparagus, citrus, grapes, nuts, stone & pome fruits for control of grass and broadleaf weeds including Nutgrass . [Max. 2 applications per year; re-treatment interval not specified]		P		
Dimethenamid-P (Frontier-P) BASF	K**	Bulb onions / Pre-emergent	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.		P		-
Ethyl Dipropylthiocarbamate (Eptam) Nufarm	E**	Beans & Sweet corn / Pre-emergent / Pre-plant	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		-
Pig weed (<i>Portulaca oleracea</i>) Priority: Moderate							
Pig weed was ranked as a moderate priority in VIC, QLD, SA & TAS. Summer growing weed that competes aggressively in-crop and can be difficult to control with herbicides.							
Chlorthal-Dimethyl (AgProject)	D**	Spring onion & Shallot / Pre-emergent /	Registered in Spring onion and Shallot control of various grass and broadleaf weeds including Amaranthus, Blackberry nightshade, Fat hen and Pigweed . Spray at transplanting. [Max. 1 application per crop]	NR	A	ALL	-
Glyphosate (various)	M**	General knockdown. Pre-crop spray	Registered for control of general weeds as a pre-crop spray.	NR	A	ALL	R3
Ioxynil (Totril) PER14142	C**	Spring onion, shallot & welsh onion / Post emergent	Permitted for use in spring onion & shallot for control of label registered weeds including Fat hen, Fumitory, Green Amaranth, Pigweed & Wild radish. Apply between 3 to 8 leaf stage of crop and between the cotyledon and 6-leaf stage of the weeds. [Max. 2 applications per year; re-treatment interval 14-21 d]	21	A	ALL (excl. VIC)	-
Methabenzthiazuron (Tribunil) PER14742	C**	Spring onion and shallot / Post-emergent	Permitted for use in spring onion & shallot for control of label registered weeds including Fat hen, Fumitory, Pigweed & Wild radish. [Max. 1 application per crop]	49	A	ALL (excl. VIC)	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
S-Metolachlor (Dual Gold) PER13626	K**	Spring onion & shallot / Pre-emergent	Permitted for use in spring onion & shallot for control of label registered broadleaf and grass weeds including Blackberry nightshade, Fat hen, Pigweed (suppression) and Amaranth (suppression). Apply before, at or immediately after planting and before crops and weeds have germinated. [Max. 1 application per crop]	NR	A	ALL (excl. VIC)	-
Paraquat + diquat (Agro-Essence)	L***	Vegetables/General seed bed preparation / Post-emergence inter-row weed control	General weeds as a pre-crop spray. Only used in field grown crops. Post-emergence inter-row weed control (shielded spray – do not touch the crop). Add diquat where broadleaf weeds dominate. [Max no of applications not specified]	1 G:1	A	ALL	R3
Pendimethalin (Stomp) PER14048	D**	Spring onion & shallot (pre-planting application) / Residual	Permitted for use in spring onion & shallot for control of label registered weeds including Amaranth, Fat hen and Pigweed and suppression of Blackberry nightshade. Apply as a single pre-planting application only	NR	A	ALL (excl. VIC)	-
Propachlor (Ramrod) PER12008	H**	Spring onion & shallot / Post-emergent	Permitted for use in spring onion & shallot for control of label registered grass and broad leaf weeds including Fat hen and Pigweed . Apply as a surface spray immediately after planting or transplanting.	NR	A	ALL (excl. VIC)	R3
Bromoxynil (Maya) Unregistered Nufarm	C**	Bulb Onions / Pre- & post-emergent	Nufarm advised in 2018 that they are undertaking the required label registration for the EU formulation of Bromoxynil (Group C) in onions. The Australian formulation is not compatible with onions as it causes crop damage. This will be an alternative to Ioxynil (Group C) herbicide. Nufarm planned to undertake Australian trials in 2019. Registration submission is expected October 2020.		P		-
NUL3438 Nufarm	NEW	TBC	New active in development, Nufarm claims activity on broadleaf weeds.		P		-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Oxyfluorfen (Kelpie Oxy-F 240) Sinochem International	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. Multiple treatments may be applied provided the total dose does not exceed 0.48 kg ai/ha per season.		P		-
Wild turnips & Wild radish (<i>Raphanus raphanistrum</i> L.)							
Priority: Moderate							
Wild turnip was ranked as a moderate priority in VIC, QLD, SA & TAS. It is a Winter growing weed that competes aggressively with crops and runs to seed quickly. Wild radish can be confused with wild turnip (<i>Brassica tournefortii</i>), charlock (<i>Sinapis arvensis</i>), turnip weed (<i>Rapistrum rugosum</i>) or garden radish (<i>Raphanus sativus</i>). Confirmed Wild radish herbicide resistance in Australia*** Populations (mostly in WA) have developed resistance to herbicides in the mode-of-action (MOA) Groups B, C, F and I. Group B resistance is the most common, followed by Group F.							
Glyphosate (various)	M**	General knockdown	Registered for control of general weeds as a pre-crop spray.	NR	A	ALL	R3
Ioxynil (Totril) PER14142	C**	Spring onion, shallot & welsh onion / Post emergent	Permitted for use in spring onion & shallot for control of label registered weeds including Fat hen, Fumitory, Green Amaranth, Pigweed and Wild radish in Spring onion and Shallot. Apply between 3 to 8 leaf stage of crop and between the cotyledon and 6-leaf stage of the weeds. [Max. 2 applications per year; re-treatment interval 14-21 d]	21	A	ALL (excl. VIC)	-
Linuron (Afalon) PER89645	C**	Spring onion & shallot / Post-emergent	Permitted for use in spring onion & shallot for control of label registered broadleaf weeds including Blackberry nightshade, Fat hen, Pigweed, Wild radish , Shepherd's purse, Slender thistle & Amaranth. [Max. 2 applications per crop; re-treatment interval 14-21 d]	NR NG	A	ALL	R3
Methabenzthiazuron (Tribunil) PER14742	C**	Spring onion & shallot / Post-emergent	Permitted for use in spring onion & shallot for control of label registered weeds including Fat hen, Fumitory, Pigweed and Wild radish in Spring onion and Shallot. [Max. 1 application per crop]	49	A	ALL (excl. VIC)	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Pyraflufen-ethyl (Sledge)	G**	General pre-plant fallowing agent / Post-emergent	Registered for control of number of broadleaf and grass weeds, including Wild radish . Apply prior to sowing winter crops or starting a winter fallow. Apply to growing weeds at 2-6 leaf stage. Do not sow crops for a minimum of 1 hour after application.	NR	A	ALL	-
Bentazone (Basagran) BASF	C**	Onions / Post- emergent	Permitted in onions for various broadleaf weeds, including Blackberry Nightshade, Wild turnip & Fat hen. Can be used alone or in a tank-mix with ioxynil to improve the spectrum of weeds controlled		P		
Bromoxynil (Maya) Unregistered Nufarm	C**	Bulb Onions / Pre- & post-emergent	Nufarm advised in 2018 that they are undertaking the required label registration for the EU formulation of Bromoxynil (Group C) in onions. The Australian formulation is not compatible with onions as it causes crop damage. This will be an alternative to Ioxynil (Group C) herbicide. Nufarm planned to undertake Australian trials in 2019. Registration submission is expected October 2020.		P		-
Ethofumesate (Tramat) Bayer	J**	Onions / Post- emergent	Registered in onions for control of various broadleaf and grass weeds, including Fat-Hen, Cruciferous weeds , Fat hen, Fumitory, Winter grass & Wireweed. Apply after 2 leaf stage of crop. Follow up program using alternative herbicides.		P		-
Norflurazon (Zoliar) Agnova	F**	Asparagus, citrus, grapes, nuts, stone & pome fruits / Pre- emergent	Registered in asparagus, citrus, grapes, nuts, stone & pome fruits for control of grass and broadleaf weeds including nut grass. [Max. 2 applications per year; re-treatment interval not specified]		P		
NUL3438 Nufarm	NEW	TBC	New active in development, Nufarm claims activity on broadleaf weeds.		P		-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Oxyfluorfen (Kelpie Oxy-F 240) Sinochem International	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. Multiple treatments may be applied provided the total dose does not exceed 0.48 kg ai/ha per season.		P		-
Pendimethalin + Dimethenamid (Podium) BASF	D+K**	Ornamental plants & recreational turf / Pre-emergent	Registered in ornamentals & recreational turf for control of grass and broadleaf weeds [Max. no. of applications not specified; re-treatment interval 60 – 90 d]		P		
African Spider Flower (<i>Cleome gynandra</i>)							
Priority: Moderate (QLD only)							
African spider flower was ranked as a moderate priority in QLD. Managing these would be possible using herbicides mentioned in Appendix 3 or by various management practices such as soil fumigation, pre-crop spraying, spot spraying, or using mechanical devices.							
Glyphosate (various)	M**	General knockdown. Pre-crop spray	Registered for control of general weeds as a pre-crop spray	NR	A	ALL	R3
Glyphosate (Various) PER86434	M**	Spring onion & Shallot / Shielded spray	Permitted for use in spring onion & shallot for control of various grass and broad leaf weeds. Only apply with shielded sprayer between the crop rows or near other emerged crops.	NR	A	ALL (excl. VIC)	R3
Paraquat + diquat (Agro-Essence)	L***	Field crops / Fallow / Direct drilling / General knockdown	General weeds as a pre-crop spray. Refer to label for application details.	NR	A	Variable- Refer to label	R3
Chlorthal-Dimethyl (AgProject)	D**	Spring onion & Shallot / Pre- emergent	Registered in Spring onion and Shallot control of various grass and broadleaf weeds including Amaranthus, Blackberry nightshade, Fat hen and Pigweed. Spray at transplanting. [Max. 1 application per crop]		P-A		-
Pendimethalin (Stomp) PER14048	D**	Spring onion & shallot (pre-planting application) / Residual	Permitted for use in spring onion & shallot for control of label registered weeds including Amaranth, Fat hen & Pigweed and suppression of Blackberry nightshade. Apply as a single pre-planting application only.		P-A		-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Propachlor (Ramrod) PER12008	H**	Spring onion and shallot / Post-emergent	Permitted for use in spring onion & shallot for control of label registered grass and broad leaf weeds including Fat hen & Pigweed. Apply as a surface spray immediately after planting or transplanting		P-A		R3
S-Metolachlor (Dual Gold) PER13626	K**	Spring onion & shallot / Pre-emergent	Permitted for use in spring onion & shallot for control of label registered broadleaf and grass weeds including Blackberry nightshade, Fat hen, Pigweed (suppression) & Amaranth (suppression). Apply before, at or immediately after planting and before crops and weeds have germinated. [Max. 1 application per crop]		P-A		-
Bromoxynil (Maya) Unregistered Nufarm	C**	Bulb Onions / Pre- & post-emergent	Nufarm advised in 2018 that they are undertaking the required label registration for the EU formulation of Bromoxynil (Group C) in onions. The Australian formulation is not compatible with onions as it causes crop damage. This will be an alternative to Ioxynil (Group C) herbicide. Nufarm planned to undertake Australian trials in 2019. Registration submission is expected October 2020.		P		-
Norflurazon (Zoliar) Agnova Technologies	F**	Asparagus, citrus, grapes, nuts, stone & pome fruits / Pre-emergent	Registered in asparagus, citrus, grapes, nuts, stone & pome fruits for control of grass and broadleaf weeds including Nutgrass. [Max. 2 applications per year; re-treatment interval not specified]		P		
NUL3438 Nufarm	NEW	TBC	New active in development, Nufarm claims activity on broadleaf weeds.		P		-
Oxyfluorfen (Kelpie Oxy-F 240) Sinochem International	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. Multiple treatments may be applied provided the total dose does not exceed 0.48 kg ai/ha per season.		P		-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Fumitory (<i>Fumaria</i> spp.)							
Priority: Moderate (QLD only)							
Fumitory was ranked as a moderate priority in QLD. Managing these would be possible using herbicides mentioned in Appendix 3 or by various management practices such as soil fumigation, pre-crop spraying, spot spraying, or using mechanical devices. It is a strongly competitive weed with highly persistent seeds making it an ongoing problem every year.							
Glyphosate (various)	M**	General knockdown. Pre-crop spray	Registered for control of general weeds as a pre-crop spray	NR	A	ALL	R3
Glyphosate (Various) PER86434	M**	Spring onion & Shallot / Shielded spray	Permitted for use in spring onion & shallot for control of various grass and broad leaf weeds. Only apply with shielded sprayer between the crop rows or near other emerged crops.	NR	A	ALL (excl. VIC)	R3
Ioxynil (Totril) PER14142	C**	Spring onion, shallot & welsh onion / Post- emergent	Permitted for use in spring onion & shallot for control of label registered weeds including Fat hen, Fumitory , Green Amaranth, Pigweed & Wild radish. Apply between 3 to 8 leaf stage of crop and between the cotyledon and 6-leaf stage of the weeds. [Max. 2 applications per year; re-treatment interval 14-21 d].	21	A	ALL (excl. VIC)	-
Methabenzthiazuron (Tribunil) PER14742	C**	Spring onion & shallot / Post-emergent	Permitted for use in spring onion & shallot for control of label registered weeds including Fat hen, Fumitory , Pigweed & Wild radish. [Max. 1 application per crop]	49	A	ALL (excl. VIC)	R3
Paraquat + diquat (Agro-Essence)	L***	Field crops / Fallow / Direct drilling / General knockdown	General weeds as a pre-crop spray. Refer to label for application details.	NR	A	Variable- Refer to label	R3
Pendimethalin (Stomp) PER14048	D**	Spring onion & shallot (pre-planting application) / Residual	Permitted for use in spring onion & shallot for control of label registered weeds including Amaranth, Fat hen & Pigweed and suppression of Blackberry nightshade. Apply as a single pre-planting application only.		P-A		-
Propachlor (Ramrod) PER12008	H**	Spring onion and shallot / Post- emergent	Permitted for use in spring onion & shallot for control of label registered grass and broad leaf weeds including Fat hen & Pigweed. Apply as a surface spray immediately after planting or transplanting.		P-A		R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
S-Metolachlor (Dual Gold) PER13626	K**	Spring onion & shallot / Pre-emergent	Permitted for use in spring onion & shallot for control of label registered broadleaf and grass weeds including Blackberry nightshade, Fat hen, Pigweed (suppression) & Amaranth (suppression). Apply before, at or immediately after planting and before crops and weeds have germinated. [Max. 1 application per crop]		P-A		-
Bromoxynil (Maya) Unregistered Nufarm	C**	Bulb Onions / Pre- & post-emergent	Nufarm advised in 2018 that they are undertaking the required label registration for the EU formulation of Bromoxynil (Group C) in onions. The Australian formulation is not compatible with onions as it causes crop damage. This will be an alternative to Ioxynil (Group C) herbicide. Nufarm planned to undertake Australian trials in 2019. Registration submission is expected October 2020.		P		-
Ethofumesate (Tramat) Bayer	J**	Onions / Post- emergent	Registered in onions for control of various broadleaf and grass weeds, including Fat-Hen, Cruciferous weeds, Fat hen, Fumitory , Winter grass & Wireweed. Apply after 2 leaf stage of crop. Follow up program using alternative herbicides.		P		-
NUL3438 Nufarm	NEW	TBC	New active in development, Nufarm claims activity on broadleaf weeds.		P		-
Slender celery (<i>Ciclospermum leptophyllum</i>)							
Priority: Moderate (QLD only)							
Slender celery was ranked as a moderate priority in QLD. Managing these would be possible using herbicides mentioned in Appendix 3 or by various management practices such as soil fumigation, pre-crop spraying, spot spraying, or using mechanical devices.							
Chloropicrin + 1,3- dichloropropene (Tri-Form)	8B	Vegetables / Soil fumigant	Registered in various crops including vegetables for control of plant parasitic Nematodes, Symphylans, Wireworms, soil borne diseases and suppression of weeds. Do not plant for 7 d after soil treatment.	NR	A	ALL (Restricted use TAS, VIC & SA)	-
Glyphosate (various)	M**	Field crops / General seed bed preparation	Various weeds as specified, a pre-crop spray. Only used in field grown crops.	NR	A	ALL	R3

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Paraquat + diquat (Agro-Essence)	L***	Field crops / Fallow / Direct drilling / General knockdown	General weeds as a pre-crop spray. Refer to label for application details.	NR	A	Variable- Refer to label	R3
Ioxynil (Genfarm) Nutrien Ag Solutions	C**	Onions / Pre- & post- emergent	Registered in onions for control of various broadleaf weeds including Slender celery . [Max. 2 applications per crop; re-treatment interval 14-21 d]		P		-
NUL3438 Nufarm	NEW	TBC	New active in development, Nufarm claims activity on broadleaf weeds.		P		-
Grass weeds including Annual Ryegrass (<i>Lolium rigidum</i>) Priority: Unknown							
Grass weeds were not ranked in the recent survey. However, permits are in place for control of grass weeds in spring onion & shallot. Populations of Annual ryegrass 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 (Apparent) PER82459	A***	Spring onion & shallot / Grass selective post-emergent	Permitted for use in spring onion & shallot for control of grass weeds. [Max. 1 application per crop].	14	A	ALL	R3
Fluazifop-P (Surefire) PER82556	A***	Spring onion & shallot / Post-emergent	Permitted for use in spring onion & shallot for control of various grass weeds in Spring onion and Shallot.	35	A	ALL (excl. VIC)	-
Bixlozone (Overwatch) FMC	Q**		Registered in wheat, barley & canola for control of various grass and broadleaf weeds, including Annual Ryegrass . Crop selectivity to onions unknown. No MRLs for AU or Codex.		P		-
Ethofumesate (Tramat) Bayer	J**	Onions	Registered in onions for control of various broadleaf and grass weeds, including Fat-Hen, Cruciferous weeds, Fat hen, Fumitory, Winter grass & Wireweed. Apply after 2 leaf stage of crop. Follow up program using alternative herbicides.		P		-

Active ingredient (Trade Name)	Chemical Group	Crop/ Situation	Comment / Use / Weed	WHP (days)	Availability	States	Regulatory risk
Ethyl Dipropylthiocarbamate (Eptam) Nufarm	E**	Beans & Sweet corn / Pre-emergent / Pre-plant	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		-
Norflurazon (Zoliar) Agnova Technologies	F**	Asparagus, citrus, grapes, nuts, stone & pome fruits / Pre-emergent	Registered in asparagus, citrus, grapes, nuts, stone & pome fruits for control of grass and broadleaf weeds including Blackberry nightshade, Chickweed, Fat hen, Milk thistle, Pigweed, Shepherds purse, Wild radish & Winter grass. [Max. 2 applications per year; re-treatment interval not specified]		P		
Prosulfocarb + S-Metolachlor (Boxer Gold) Syngenta	J**+K**	Faba beans, field peas & potatoes / Pre-emergent	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		-

5. References

5.1 Information:

AgChem Access Priority Access Forum	https://www.agrifutures.com.au/national-rural-issues/agvet-chemicals/
Australian Pesticide and Veterinary Medicines Authority	www.apvma.gov.au
APVMA Chemical review	https://apvma.gov.au/chemicals-and-products/chemical-review/listing
APVMA MRLs	www.legislation.gov.au/Details/F2020C00713
APVMA Permit search	https://productsearch.apvma.gov.au/permits
APVMA Product search	https://productsearch.apvma.gov.au/products
AUSVEG	https://ausveg.com.au
Codex MRL database	http://www.fao.org/fao-who-codexalimentarius/codex-texts/dbs/pestres/en/
Cotton Pest Management Guide 2018-19	https://www.cottoninfo.com.au/publications/cotton-pest-management-guide
CropLife Australia (resistance management)	https://www.croplife.org.au/resources/programs/resistance-management/
Growcom – Infopest Database	www.infopest.com.au
Hort Innovation	www.horticulture.com.au

5.2 Abbreviations and Definitions:

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

5.3 Acknowledgements:

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

6. Appendices:

Appendix 1. Products available for disease control in spring onion and shallot

Appendix 2. Products available for control of insects and mites in spring onion and shallot

Appendix 3. Products available for weed control in spring onion and shallot

Appendix 4. Current permits for use in spring onion and shallot

Appendix 5. Spring onion and Shallot Maximum Residue Limits (MRLs)

Appendix 6. Spring onion and Shallot Agrichemical Regulatory Risk Assessment

Appendix 1. Products available for disease control in spring onion and shallot

Active Ingredient (Trade Name)	Chem. group	Situation	Diseases / Comments	States	WHP Days	Regulatory risk
1,3-dichloropropene (Tri-Form)	-	Field crops	Soil borne diseases, plant parasitic Nematodes. Restricted chemical.	ALL (Restricted use TAS, VIC & SA)	NR	-
Azoxystrobin (Amistar)	11	Spring onion & shallot	Suppression only of White rot (<i>Sclerotinium cepivorum</i>)	ALL	7	
Chloropicrin + 1,3-dichloropropene (Tri-Form)	8B	Vegetables	plant parasitic Nematodes, Symphylans, Wireworms, soil borne diseases and suppression of weeds.	ALL (Restricted use TAS, VIC & SA)	NR	-
Chlorothalonil (various)	M5	Shallot	Purple blotch	ALL	1	R3
Chlorothalonil (Apparent)	M5	Spring onion only	Downy mildew and Botrytis grey mould	ALL	7	R3
Chlorothalonil (Apparent) PER82895	M5	Spring onion only	Downy mildew and Botrytis grey mould	ALL	7	R3
Copper oxychloride, cuprous oxide & cupric hydroxide (various) PER14842	M1	Spring onion and shallot	Downy mildew	ALL (excl. VIC)	1	-
Copper + Metalaxyl (Ridomil Gold Plus)	M1+4	Spring onion & shallot	Downy mildew	ALL	1	-
Cyprodinil + fludioxonil (Switch) PER80501	9+12	Alliums	Suppression of black mould and Botrytis grey mould	ALL	7	R3
Dazomet (Cerlong)	8F	Vegetables	Soil fungi, Nematodes, soil insects and weeds	ALL	NR	

Active Ingredient (Trade Name)	Chem. group	Situation	Diseases / Comments	States	WHP Days	Regulatory risk
Dimethomorph and/or Mancozeb (tank mix or alone) (various) PER14473	40+M3	Spring onion & shallot	Downy mildew, Purple blotch & Botrytis rots (Mancozeb only)	ALL (excl. VIC)	7 NG	R2
Fluopicolide + propamocarb (Infinito)	28+43	Bulb vegetables	Downy mildew	ALL	7	-
Hydrogen peroxide + peroxyacetic acid (Peratec plus)	M	Allium vegetables	Neck & bulb rot (<i>Botrytis</i> spp.) and downy mildew	ALL	1	-
Metham sodium (Imtrade)	-	General pre-plant soil fumigation	Nematodes, fungi, and weed seeds.	ALL	NR	-
Oxathiapiprolin (Zorvec)	U15	Spring onion & shallot	Downy mildew	ALL	10	-
Penthiopyrad (Fontelis)	7	Spring onion & shallot	Botrytis blight, Botrytis neck rot, and purple blotch	ALL	3	-
Phosphorous acid (various) PER13698	33	Spring onion & shallot	Downy mildew (suppression only)	ALL (excl. VIC)	1	-
Sulphur + Mancozeb (Amgrow)	UN+M3	Seedlings (general)	Damping off	ALL	7	R2
Sulphur (Solo)	UN	Vegetables	Powdery mildew, rust, tomato russet mite, Bean spider mite, and Two-spotted mite	Variable refer to label	NR	
Triadimenol (Allitron) PER14906	3	Spring onion & shallot	White rot (<i>Sclerotinia cepivorum</i>)	ALL (excl. VIC)	28	R3

Appendix 2. Products available for control of insects and mites in spring onion and shallot

Active Ingredient (Trade Name)	Chem. group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
1,3-dichloropropene (Tri-Form)	-	Field crops	Plant parasitic Nematodes in field crops	ALL	NR	-
1,3-dichloropropene + Chloropicrin (Tri-Form)	8B	Vegetables	Wireworms	ALL	NR	-
Abamectin (Vantal) PER14536	6	Spring onion & shallot (field only)	Two-spotted mite	ALL (excl. VIC)	3	-
Alpha-cypermethrin (Dominex Duo) PER14457	3A	Spring onion & shallot	Onion thrips	ALL (excl. VIC)	7 NG	-
<i>Bacillus thuringiensis</i> subsp. kurstaki (Dipel)	11A	Vegetables	Armyworm, cotton bollworm, native budworm, Cabbage moth, Cabbage white butterfly, Green looper, lightbrown apple moth, pear looper, soybean looper, vine moth, and tobacco looper. Very effective on small grubs, but needs regular application based on pest pressure	ALL	NR	-
<i>Beauveria bassiana</i> (Broadband OD / Velifer)	UNF	Protected vegetables & ornamentals	Suppression of various pests including: Western Flower Thrips, Onion thrips, Greenhouse Whitefly, Silverleaf Whitefly, Sweet Potato Whitefly, Green Peach Aphid & Two-spotted Spider Mites.	ALL	NR	-
Chlorpyrifos (various)	1B	Shallot	Cutworm, field crickets, mole crickets, and vegetable weevil	Variable refer to label	14	R1
Cyantraniliprole (Benevia)	28	Spring onion & shallot	Rasping pests (suppression only) and onion thrips	ALL	7	-
Dazomet (Cerlong)	8F	Vegetables	Soil fungi, Nematodes, soil insects and weeds	ALL	NR	-

Active Ingredient (Trade Name)	Chem. group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Diazinon (Barmac) PER82551	1B	Spring onion & shallot	Onion maggot and Thrips (excluding Western flower thrips)	ALL (excl. VIC)	14	R3
Garlic + Chilli + Pyrethrins + Piperonyl Butoxide (Richgro)	3A	Vegetables	Ants, Aphids, Caterpillars, Earwigs, Whitefly, Thrips and Leafhoppers. Suitable for organic growers	ALL	1	-
Iron EDTA Complex (Eradicate Slug and Snail Bait)	-	Plants generally	Slugs and snails	ALL	NR	-
Lambda-cyhalothrin (Karate Zeon) PER14471	3A	Spring onion & shallot	Red-legged earth mite, Loopers, Rutherglen bug, onion maggot, onion thrips, and Plague thrips (some restrictions on thrip control. Refer to permit)	ALL (excl. VIC)	14 NG	-
Maldison (Fyfanon) PER13653	1B	Spring onion & shallot	Onion thrips	ALL (excl. VIC)	3	-
Metaldehyde (various)	-	Plants generally	Slugs and snails	ALL	7	-
Methomyl (Lannate) PER14890	1A	Spring onion & shallot	Western flower thrips	ALL (excl. VIC)	3	R2
Methomyl (Marlin) PER82428	1A	Shallot	<i>Helicoverpa</i> spp., cucumber moth, Cluster caterpillar, Loopers, webworm, Rutherglen bug, Thrips including Western flower thrips	ALL	7	R2
Methomyl (Lannate) PER89293	1A	Spring onion & shallot	Fall armyworm (<i>Spodoptera frugiperda</i>)	ALL (excl. VIC)	7	R2
Petroleum oil PER12221	UN	Alliums	Aphids, Green mirid, Green vegetable bug, grey cluster bug, Leafhoppers, Mites, Rutherglen bug and Thrips	ALL (excl. VIC)	1	-

Active Ingredient (Trade Name)	Chem. group	Situation	Pests / Comments	States	WHP Days	Regulatory risk
Phorate (various) PER8930	1B	Spring onion & shallot	Aphids, Jassids, Mites, Thrips & onion maggot	ALL	70	R3
Pirimicarb (Primor)	1A	Shallot	Aphids	ALL	2	R3
Potassium salts of fatty acids (Natrasoap)	3A	Vegetables	Aphids, Thrips, Mealybug, Two spotted mites, Spider mite, and White fly	ALL	Nil	-
Propargite (Betamite)	12C	Vegetables	Spider mite (QLD and WA only) and Two spotted mite	Variable refer to label	7	R3
Pyrethrins (Yates)	3A	Vegetables	Earwigs	ALL	1	-
Pyrethrins+piperonyl butoxide (various)	3A	Vegetables	Ants, Aphids, Thrips, Caterpillars, leaf hoppers, and Whitefly	ALL	1	-
Rotenone (Derris Dust)	21B	Vegetables	Aphids, Cabbage white butterfly, Cabbage moth, Cabbage-centre grub, Caterpillars, potato moth (leafminer), Thrips	ALL	1	-
Spinetoram (Success NEO) PER13088	5	Spring onion & shallot	Western flower thrips (specified resistance management strategy on label)	ALL (excl. VIC)	3 NG	-
Spinetoram (Success Neo) PER89284	5	Spring onion & Shallot	Fall armyworm (<i>Spodoptera frugiperda</i>)	ALL (excl. VIC)	3 NG	-
Spirotetramat (Movento)	23	Bulb vegetables	Onion thrips, Western flower thrips, tomato thrips, and Plague thrips	ALL	7	-
Sulphur (NovaGuard)	M2	Vegetables	Powdery mildew, bean rust, tomato russet mite, and Two spotted mites	Variable. Refer to label.	NR	-

Appendix 3. Products available for weed control in spring onion and shallot

Active ingredient (Trade Name)	Chemical Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
2,4-D Acid (Farmalinx)	I**	Post emergent spot spray/selective	Post emergent spot spray spraying on all situations for control of a range of weeds including nutgrass.	NR	ALL	-
Chlorthal-dimethyl (Pterodactyl)	D**	Spring onion & shallot / General knockdown and residual herbicide	Various annual broadleaf weeds	NR NG	ALL	-
Clethodim (Apparent) PER82459	A***	Spring onion & shallot / Post-emergent	Various grass as per the product label	14	ALL	R3
Fluazifop-P (Surefire) PER82556	A***	Spring onion & shallot / Post-emergent	Various grass weeds	35	ALL (excl. VIC)	-
Glyphosate (various)	M**	General seed bed preparation	General weeds as a pre-crop spray	NR	ALL	R3
Glyphosate (Round-Up) PER86434	M**	Shallot (Hanh huong [Vietnamese]) / Shielded spray between crop rows	Grass and broadleaf weeds	NR	ALL	R3
Ioxynil (Totril) PER14142	C**	Spring onion, shallot & welsh onion / Post- emergent	Broadleaf weeds as per the product label	21	ALL (excl. VIC)	-
Linuron (Afolon) PER89645	C**	Spring onion & shallot / Post-emergent	Broadleaf weeds as per the product label	NR NG	A	R3
Methabenzthiazuron (Tribunil) PER14742	C**	Spring onion & shallot /Post-emergent	Broadleaf and grass weeds as listed on the product label	49	ALL (excl. VIC)	R3
Paraquat + diquat (various)	L***	General seed bed preparation	General weeds as a pre-crop spray	NR	ALL	R3

Active ingredient (Trade Name)	Chemical Group	Situation	Comment / Use / Weed	WHP (days)	States	Regulatory risk
Pendimethalin (Stomp) PER14048	D**	Spring onion & shallot (pre-planting application)	Various broadleaf and grass weeds as contained on the product label	NR	ALL (excl. VIC)	-
Propachlor (Ramrod) PER12008	H**	Spring onion & shallot / Post-emergent	Annual grasses and broadleaf weeds as per the product label	NR	ALL (excl. VIC)	R3
Pyraflufen-ethyl (Sledge)	G**	General pre-plant fallowing agent / Post- emergent	broadleaf and grass weeds, including Wild radish.	NR	ALL	-
S-Metolachlor (Dual Gold) PER13626	K**	Spring onion & shallot / Pre-emergent	Various broadleaf and grassweeds as per the product label	NR	ALL (excl. VIC)	-

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

Appendix 4. Current permits for use in spring onion and shallot

Permit No.	Description	Issued Date	Expiry Date	Permit Holder
PER14536 Version 3	Abamectin / Spring onion and shallot (field only) / Two-spotted mite	30-May-14	31-Dec-23	Hort Innovation
PER14457 Version 3	Alpha-cypermethrin / Spring onion and shallot / Onion thrips	19-Mar-14	30-Jun-24	Hort Innovation
PER82895 Version 2	Chlorothalonil (Apparent) / Spring onion only / Downy mildew, and Botrytis grey mould	04-Aug-17	31-Aug-25	Hort Innovation
PER82459	Clethodim / Spring onion and shallot / Various grass as per the product label	19-Apr-17	30-Sep-21	Hort Innovation
PER14842 Version 3	Copper oxychloride, cuprous oxide and cupric hydroxide (various) / Spring onion and shallot / Downy mildew	01-Oct-14	30-Sep-24	Hort Innovation
PER80501 Version 3	Cyprodinil + fludioxonil (Switch) / Alliums / Suppression of black mould and Botrytis grey mould	20-Jul-15	31-July-24	Hort Innovation
PER82551 Version 2	Diazinon (Barmac) / Spring onion and shallot / Onion maggot and Thrips (excluding Western flower thrips)	20-May-16	31-Mar-21	Hort Innovation
PER82556	Fluazifop-P (Surefire) / Spring onion and shallot / Various grass weeds	16-Apr-14	31-Jan-23	Hort Innovation
PER86434	Glyphosate (various) / Shallot (Hanh huong [Vietnamese]) / Grass and broadleaf weeds	30-Apr-09	31-July-23	Hort Innovation
PER14142 Version 5	Ioxynil (Totril) / Spring onion, shallot & welsh onion / Broadleaf weeds as per the product label	17-Oct-13	30-Sep-25	Hort Innovation
PER14471 Version 3	Lambda-cyhalothrin (Karate Zeon) / Spring onion and shallot / Red-legged earth mite, Loopers, Rutherglen bug, onion maggot, onion thrips, and Plague thrips (some restrictions on thrip control. Refer to permit)	30-May-14	31-Mar-24	Hort Innovation
PER89645	Linuron / Afalon / Shallot and Spring onion / Annual Weeds as per Afalon Label	11-Jun-20	30-Jun-22	Hort Innovation
PER13653 Version 3	Maldison (Fyfanon) / Spring onion and shallot / Onion thrips	01-Oct-12	28-Feb-23	Hort Innovation
PER14473 Version 2	Mancozeb (Imtrade) & Dimethomorph (Acrobat) (tank mix or alone) / Spring onion and shallot / Downy mildew, purple blotch & Botrytis rots	18-Dec-13	30-Jun-23	Hort Innovation
PER14742 Version 3	Methabenzthiazuron (Tribunil) / Spring onion and shallot / Broadleaf and grass weeds as listed on the product label	01-Jul-14	30-Jun-21	Hort Innovation
PER14890 Version 3	Methomyl / Spring onion and shallot / Western flower thrips	25-Nov-14	31-Oct-24	Hort Innovation
PER89293	Methomyl / Various Crops as per Label / Fall Armyworm	10-APR-20	30-Apr-23	Hort Innovation
PER82428 Version 4	Methomyl / Shallot / <i>Helicoverpa</i> spp., cucumber moth, Cluster caterpillar, Loopers, webworm, Rutherglen bug & thrips	22-Apr-16	31-Mar-24	Hort Innovation
PER14048 Version 2	Pendimethalin (Stomp) / Spring onion and shallot (pre-planting application) / Various broadleaf and grass weeds as contained on the product label	01-May-13	31-Mar-23	Hort Innovation

Permit No.	Description	Issued Date	Expiry Date	Permit Holder
PER12221 Version 4	Petroleum oil / Alliums / Aphids, Green mirid, Green vegetable bug, grey cluster bug, Leafhoppers, mites, Rutherglen bug and Thrips	29-Jun-12	30-Nov-22	Hort Innovation
PER8930 Version 5	Phorate (Thimet) / Spring onion and shallot/ Aphids, Jassids, Mites, Thrips & onion maggot	14-Aug-11	31-Jan-21	Hort Innovation
PER13698 Version 3	Phosphorous acid (Agri-fos) / Spring onion and shallot / Downy mildew (suppression only)	01-Oct-12	30-Sep-22	Hort Innovation
PER12008 Version 6	Propachlor (Ramrod) / Spring onion and shallot / Annual grasses and broadleaf weeds as per the product label	18-Jun-12	30-Nov-25	Hort Innovation
PER13626 Version 2	S-Metolachlor (Dual Gold) / Spring onion and shallot / Various broadleaf and grassweeds as per the product label	23-Jul-12	30-Jun-22	Hort Innovation
PER13088 Version 2	Spinetoram (Success Neo) / Spring onion and shallot / Western flower thrips (specified resistance management strategy on label)	29-Mar-12	31-Mar-22	Hort Innovation
PER14906 Version 3	Triadimenol (Allitron) / Spring onion and shallot / White rot	22-Oct-14	31-Oct-24	Hort Innovation
PER89284	Spinetoram (Success Neo) / Various Tubers and Bulbs / Fall Armyworm	16-Mar-20	31-Mar-23	Hort Innovation

Appendix 5. Spring Onion and Shallot Maximum Residue Limits (MRLs)

CODEX commodity groupings of bulb vegetables and subgroups:

-	Vegetables
VA 0035	Group of Bulb Vegetables
VA 0389	Spring onion
VA 0388	Shallot
VA 0387	Onion, Welsh

Note: Currently production of all Spring onion and Shallot is for the Australian market and no exports are recorded. Available information indicates that in the absence specific limits in legislation the most countries defers to Codex, followed by EU MRL standards or applies a 0.01ppm default value. Food exported to New Zealand from Australia may be legally sold if it complies with Australian requirements. MRLs and legislation are subject to change; the values presented should not be relied on.

Chemical	Codex Code	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Abamectin	VA0388	Shallot	-	0.005
	VA0035	Bulb vegetables	T0.05	-
Acetamiprid	VA0389	Spring onion	-	5
Aldrin and Dieldrin	VA0035	Bulb vegetables	-	E0.05
Ametoctradin	VA0388	Shallot	-	1.5
	VA0389	Spring onion	-	20
Azoxystrobin	VA0035	Bulb vegetables	5	10
Benalaxyl	VA0389	Spring onion	T0.1	-
	VA0388	Shallot	T0.5	-
Bentazone	VA0389	Spring onion	-	0.08
Boscalid	VA0035	Bulb vegetables	T5	5
Chlorfenapyr	VA0389	Spring onion	T1	-
	VA0387	Onion, Welsh	T1	-
	VA0388	Shallot	T1	-
Chlorthal-dimethyl		Vegetables	5	-
Chlorothalonil	VA0388	Shallot	T10	1.5
	VA0387	Onion, Welsh	T10	10
	VA0389	Spring onion	T10	10
Cyhalothrin (includes lambda-cyhalothrin)	VA 0035	Bulb vegetables	-	0.2
	VA0387	Onion, Welsh	T0.05	-
	VA0388	Shallot	T0.05	-
	VA0389	Spring onion	T0.05	-
Cyanazine	VA0035	Bulb vegetables [alliums]	*0.02	-
Cyantraniliprole	VA0388	Shallot	-	0.05
	VA0035	Bulb vegetables	7	-
	VA0387	Onion, Welsh	-	8
	VA0389	Spring onion	-	8
Cypermethrin	VA0389	Spring onion	T0.5	-
	VA0387	Onion, Welsh	T0.5	-
	VA0388	Shallot	T0.5	-
Cyprodinil	VA0035	Bulb vegetables	T3	-
Cyromazine	VA0389	Spring onion	-	3
Diafenthiuron	VA0388	Shallot	T0.5	

Chemical	Codex Code	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Diazinon	VA0389	Spring onion	T0.5	1
	VA0388	Shallot	T0.5	-
		Vegetables	0.7	-
Dicofol		Vegetables	5	-
Difenoconazole	VA0389	Spring onion	-	9
Dimethenamid-P	VA0388	Shallot	-	*0.01
Dimethomorph	VA0388	Shallot	0.5	0.6
	VA0387	Onion, Welsh	2	9
	VA0389	Spring onion	2	9
Dinotefuran	VA0389	Spring onion	-	4
Dithiocarbamates	VA0389	Spring onion	-	10
	VA0035	Bulb vegetables	T10	-
Ethofumesate	VA0035	Bulb vegetables	*0.1	-
EPTC		Vegetables	*0.04	-
Etridiazole		Vegetables	0.2	-
Fenamidone	VA0388	Shallot	-	0.15
	VA0387	Onion, Welsh	-	3
	VA0389	Spring onion	-	3
Fluazifop-p-butyl	VA0387	Onion, Welsh	0.05	-
	VA0389	Spring onion	0.05	-
	VA0388	Shallot	0.05	-
Fludioxonil	VA0035	Bulb vegetables	T3	-
Fluopicolide	VA0387	Onion, Welsh	-	10
	VA0035	Bulb vegetables	3	-
Fluxapyroxad	VA0388	Shallot	-	0.6
Glyphosate	VA0035	Bulb vegetables	*0.1	-
Inorganic bromide		Vegetables	20	-
Ioxynil	VA0389	Spring onion	T10	-
	VA0387	Onion, Welsh	T10	-
	VA0388	Shallot	T10	-
Linuron		Vegetables	*0.05	-
Maleic Hydrazide	VA0388	Shallot	-	15
Malathion	VA0389	Spring onion	-	5
Maldison	VA0389	Spring onion	T0.1	-
	VA0387	Onion, Welsh	T0.1	-
	VA0388	Shallot	T0.1	-
Mandipropamid	VA0389	Spring onion	-	7
Methabenzthiazuron	VA0389	Spring onion	T0.5	-
	VA0387	Onion, Welsh	T0.5	-
	VA0388	Shallot	T0.5	-
Metaldehyde		Vegetables	1	-
Metalaxyl	VA0035	Bulb vegetables [alliums]	0.1	-
Methiocarb		Vegetables	0.1	-
Methomyl	VA0389	Spring onion	T2	-
	VA0387	Onion, Welsh	T2	-
	VA0388	Shallot	T2	-
Methyl bromide		Vegetables	T*0.05	-

Chemical	Codex Code	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Metolachlor	VA0389	Spring onion	*0.01	-
	VA0387	Onion, Welsh	*0.01	-
	VA0388	Shallot	*0.01	-
Myclobutanil	VA0035	Bulb vegetables	-	0.06
Omethoate		Vegetables	2	-
Oxamyl	VA0389	Spring onion	T0.5	-
	VA0387	Onion, Welsh	T0.5	-
	VA0388	Shallot	T0.5	-
Oxathiapiprolin	VA0035	Bulb vegetables	1	-
Oxyfluorfen	VA0035	Bulb vegetables	*0.05	-
Paraquat		Vegetables	*0.05	-
Pendimethalin	VA0035	Bulb vegetables [alliums]	*0.05	-
Penthiopyrad	VA0389	Spring onion	5	4
	VA0388	Shallot	5	-
	VA0387	Onion, Welsh	5	4
Permethrin	VA0389	Spring onion	-	0.5
Phorate	VA0389	Spring onion	0.5	-
	VA0387	Onion, Welsh	0.5	-
	VA0388	Shallot	0.5	-
Phosphorous acid	VA0035	Bulb vegetables	T10	-
Piperonyl butoxide		Vegetables	8	-
Pirimicarb	VA0389	Spring onion	T7	-
	VA0387	Onion, Welsh	T7	-
	VA0388	Shallot	T7	-
		Vegetables	1	-
Prometryn		Vegetables	*0.1	-
Propachlor	VA0389	Spring onion	T1	-
	VA0387	Onion, Welsh	T1	-
	VA0388	Shallot	T1	-
Propamocarb	VA0035	Bulb vegetables	30	-
Propargite		Vegetables	3	-
Propazine		Vegetables	*0.1	-
Pyraclostrobin	VA0389	Spring onion	-	1.5
Pyrethrins		Vegetables	1	-
Pyrimethanil	VA0389	Spring onion	-	3
Sethoxydim	VA0389	Spring onion	0.7	-
	VA0387	Onion, Welsh	0.7	-
	VA0388	Shallot	0.7	-
Spinetoram	VA0389	Spring onion	T0.3	0.8
	VA0388	Shallot	T0.3	-
	VA0387	Onion, Welsh	T0.3	0.8
Spinosad	VA0389	Spring onion	0.3	4
	VA0387	Onion, Welsh	0.3	-
	VA 0388	Shallot	0.3	-
Spirotetramat	VA0035	Bulb vegetables	0.5	-
Sulfoxaflor	VA0389	Spring onion	-	0.7
Tebuconazole	VA0388	Shallot	-	0.15
	VA0389	Spring onion	-	2
	VA0035	Bulb vegetables	*0.01	-

Chemical	Codex Code	Description	APVMA MRL mg/kg	Codex MRL mg/kg
Triadimenol	VA0389	Spring onion	T3	-
	VA0387	Onion, Welsh	T3	-
	VA0388	Shallot	T3	-
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.

* Indicates that an MRL is at the Limit of Quantitation (LOQ)
 NR - Uses of substances where MRLs are not necessary / required.
 T =Temporary MRL
 E = The MRL is based on extraneous residues

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 6. Spring onion & Shallot Agrichemical Regulatory Risk Assessment

Spring Onion & Shallot Agrichemical Regulatory Risk Assessment

August 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 would 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 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 spring onions and shallots as well as current initiatives aimed at addressing identified pest management deficiencies.

Spring Onion & Shallot 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	Actions
INSECT AND MITE PESTS				
Aphids				
Aphids	Paraffinic oil/ petroleum oil	-		
	Pirimicarb	1A	Codex - JMPR Periodic re-evaluation 2022/23	
	Phorate	1B	APVMA – Nominated for review EU: No authorisation in place	
Green peach aphid	Pirimicarb	1A	Codex - JMPR Periodic re-evaluation 2022/23	
Onion aphid	Pirimicarb	1A	Codex - JMPR Periodic re-evaluation 2022/23	
Beetles				
Spotted vegetable weevil	Chlorpyrifos	1B	APVMA: Currently under review, outcome uncertain. Potential issues w.r.t. environmental loading and worker exposure.	
Vegetable weevil	Chlorpyrifos	1B	EU: Proposed cancellation of use Canada – proposed cancellation of most uses. USA – EPA decision to allow continued use	
Caterpillars				
Cutworms	Chlorpyrifos	1B	APVMA: Currently under review, 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	Methomyl (PER89293)	1A	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed EU: No authorisations	
	Spinetoram (PER89284)	5		
Looper caterpillars	Lambda-cyhalothrin (PER14471)	3A		

Spring Onion & Shallot Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Actions
Mites				
Mites	Petroleum oil	-		
	Phorate	1B	APVMA – Nominated for review EU: No authorisation in place	
Red-legged earth mite	Lambda-cyhalothrin (PER14471)	3A		
Two-spotted mite	Abamectin	6		
Plant bugs and leaf hoppers				
Green mirid	Petroleum oil	-		
Green vegetable bug	Petroleum oil	-		
Grey cluster bug	Petroleum oil	-		
Jassids	Phorate	1B	APVMA – Nominated for review EU: No authorisation in place	
Leafhoppers	Petroleum oil	-		
Rutherglen bugs	Lambda-cyhalothrin (PER14471)	3A		
	Petroleum oil	-		
Grasshoppers and crickets				
Black field crickets	Chlorpyrifos	1B	APVMA: Currently under review, 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	
Field crickets	Chlorpyrifos	1B		
Mole crickets	Chlorpyrifos	1B		
Wingless grasshopper	Chlorpyrifos	1B		

Spring Onion & Shallot Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Activities
Thrips				
Onion thrips	Alpha-cypermethrin (PER14457)	3A	EU: Proposed restricted authorisation & Candidate for substitution	
	Cyantraniliprole	28		
	Lambda-cyhalothrin (PER14471)	3A		
	Malathion/Maldison (PER13653)	1B	APVMA – Under review – chemistry Codex: Re-evaluation scheduled for 2022/23	
	Spirotetramat	23		
Plague thrips	Lambda-cyhalothrin (PER14471)	3A		
	Spirotetramat	23		
Thrips	Diazinon (PER82551)	1B	EU – Deregistered Codex - To be reviewed by 2020/21.	
	Petroleum oil	-		
	Phorate	1B	APVMA – Nominated for review EU: No authorisation in place	
Tomato thrips	Spirotetramat	23		
Western flower thrips	Methomyl (PER14890)	1A	APVMA – nominated for review Canada – Re-evaluation completed (2018). Majority of uses removed EU: No authorisations	
	Spinetoram (PER13088)	5		
	Spirotetramat	23		
Other insect pests				
Onion seedling maggot	Diazinon	1B	EU – Deregistered Codex - To be reviewed by 2020/21.	
	Lambda-cyhalothrin (PER14471)	3A		
	Phorate	1B	APVMA – Nominated for review EU: No authorisation in place	
Vegetable leafminer	Abamectin (PER81876)	6		

Spring Onion & Shallot Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Activities
DISEASES				
Black mould	Cyprodinil + fludioxonil	9 + 12	Cyprodinil: Canada – Currently under review EU: Candidate for substitution Fludioxonil: EU – Currently under review Candidate for substitution	
Botrytis blight	Penthiopyrad	7		
Botrytis rot	Dimethomorph (PER14473)	40		
	Mancozeb (PER14473)	M3	APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2022/23 EU: Proposed non-renewal of authorisation	
Botrytis grey mould	Chlorothalonil	M5	APVMA – Previously nominated for review Canada – Review recently completed; continued use considered acceptable Europe - Deregistered ⁱ	
	Cyprodinil + fludioxonil	9 + 12	Cyprodinil: Canada – Currently under review EU: Candidate for substitution Fludioxonil: EU – Currently under review Candidate for substitution	

Spring Onion & Shallot Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Activities
Downy mildew	Chlorothalonil	M5	APVMA - Nominated for review Canada – Review recently completed, use acceptable Europe - Deregistered	
	Copper (PER14842)	M1	EU: Candidate for substitution	
	Dimethomorph (PER14473)	40		
	Mancozeb (PER14473)	M3	APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2022/23 EU: Proposed non-renewal of authorisation	
	Metalaxyl / Metalaxyl-M	4	Metalaxyl EU: Candidate for substitution Metalaxyl-M EU: Restricted use approval	
	Fluopicolide	43		
	Oxathiapiprolin	49		
	Peroxyacetic acid	M		
	Phosphorous acid (PER13698)	33		
	Propamocarb-HCl	28		
Neck and bulb rot	Peroxyacetic acid	M		
Purple blotch	Chlorothalonil	M5	APVMA - Nominated for review Canada – Review recently completed, use acceptable Europe - Deregistered	
	Dimethomorph (PER14473)	40		
	Mancozeb	M3	APVMA - Nominated for review Canada – Under review Codex - To be reviewed 2022/23 EU: Proposed non-renewal of authorisation	
	Penthiopyrad	7		
White rot	Azoxystrobin	11		
	Triadimenol (PER14906)	3	APVMA - Nominated for review	

Spring Onion & Shallot Regulatory Risk Assessment

Problem	Active Constituents	Chemical Group	Comment	Activities
WEEDS				
Broadleaf weeds and grasses	Clethodim (PER82459)	A	Codex: MRLs proposed for deletion	
	Chlorthal-dimethyl	D	EU: No authorisation in place	
	Fluazifop-P (PER82556)	A		
	Glyphosate	M	Ongoing issues internationally	
	loxynil (PER14142)	C	EU: No authorisation in place	
	Linuron (PER89645)	C	EU: No authorisation in place	
	Methabenzthiazuron (PER14742)	C	EU: No authorisation in place	
	Metolachlor/ S-metolachlor (PER13626)	K		
	Pendimethalin (PER14048)	C		
	Propachlor (PER12008)	K	EU: No authorisation in place	

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ⁱ Chlorothalonil - Withdrawal authorisations by 20 November 2019. Max period of grace: 20 May 2020. Commission Implementing Regulation (EU) 2019/677 <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32019R0677&from=EN>