


Spring Onion and Shallots

Strategic Agrichemical Review Process
2011-2014

HAL Projects - MT10029 & VG12081

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Horticulture Australia project no:
MT10029 – Managing pesticide access in horticulture.
VG12081 - Review of vegetable SARP reports.

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Purpose of the report:
This report was funded by Horticulture Australia and the Australian vegetable industry to investigate the pest problem, agrichemical usage and pest management alternatives for the spring onion and shallots industries across Australia. The information in this report will assist the industry with its agrichemical selection and usage into the future.

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Horticulture Australia

Contents

1. Media Summary

A Strategic Agrichemical Review Process (SARP) through the process of a desktop audit and industry liaison assesses the importance of the diseases, insects and weeds (plant pests) that can affect a horticultural industry; evaluates the availability and effectiveness of fungicides, insecticides and herbicides (pesticides) to control the plant pests; determines any 'gaps' in the pest control strategy and 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.

SARP workshops for spring onions and shallots were conducted in Queensland, South Australia and Victoria as part of combined vegetable meetings in 2008, 2010 and 2011. The results of the process provide the spring onion and shallots industries with pesticide options for the future that the industry can pursue for registration with the manufacturer, or minor-use permits with the Australian Pesticides and Veterinary Medicines Association (APVMA).

DISEASE

Diseases identified as high priorities:

Disease (common name)	**Disease (scientific name)**
Grey mould	*Botrytis* spp.
Downy mildew	*Peronospora destructor*
White rot	*Sclerotium cepivorum*

Very few fungicides are registered for control of disease in spring onions and shallots. Extension of registrations for onions and other alliums would be helpful. There is also some new chemistry, particularly for downy mildew, that should be considered.

INSECTS

Insects identified as high priorities:

Insect (common name)	**Insect (scientific name)**
Onion thrips	*Thrips tabaci*
Western flower thrips	*Frankliniella occidentalis*

There are few insecticides registered or permitted for use in spring onion and shallots.

The impact of financial return, as a driver of research and development choices for product registrants, is evident in these minor crops – the cost of the efficacy and residue data packages required relative to the value of the potential chemical sales are usually too high to justify the work.

The most straight forward means of increasing options for growers would be to extend registrations in other alliums to spring onion and shallots.

WEEDS

No weeds were reported as a high priority for new registrations or permits. Most weeds can be controlled with currently available herbicides but growers would welcome inclusion of spring onions and shallots in new chemical registrations.

Growers reported that a pre-plant herbicide, generally a knock-down, was used to prepare the paddock. Growers then usually only spot spray grass weeds with a grass selective herbicide.

2. The Australian spring onion and shallot industries

The Australian spring onion and shallot industry is a small horticultural industries. Consumption of spring onion and shallots has risen in recent years with the growth in healthier lifestyles and moves to fresh food.

Accurate statistics on spring onion and shallot production is not available, but it is known to be grown in reasonable quantities at:

- Melbourne Metro area (Vic)
- Lockyer Valley (QLD)
- Perth Metro outer areas (WA)
- North Adelaide Plains (SA)
- Sydney Basin (NSW)

The spring onion species referred to in this report is *Allium fistuolosum*, and are also known as Welsh bunching onion or Japanese bunching onion. The shallot species referred to in this report is *Allium cepa var. aggregatum* , or *A. ascalonicum*, and are also known as multiplier onion.

The common names, spring onion and shallots, are often interchangeable depending on which state you are from, eg. in Victoria, spring onion (*A. fistuolosum*) is called shallots in Queensland and vice versa.

Due to Australia's varying weather conditions and the introduction of different varieties of spring onion and shallots, the Australian industries is now able to supply domestic markets with fresh spring onion and shallots throughout the year.

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 is not of sufficient size for agchem manufacturers 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 agchem companies unwilling to bear the initial high cost of registering suitable pesticides. As an added complication some horticultural crops may be grown in protected cropping or hydroponic situations. These can have a significant impact on pesticide performance and residue outcomes, further increasing product development requirements and registration costs.

Growers may at times be in a situation where they face severe losses from diseases, pests and weeds if they do nothing to protect their crops, or face penalties if they use a product that is not registered or available via a permit. The spring onions and shallots industry is very aware of the possible consequences of the use of unregistered or non-permitted pesticides. These can include: produce with unauthorised pesticide residues; rejection at both local and export market levels; placing Australian export trading arrangements in jeopardy, and; fines and penalties.

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.

Pesticides have always been an important tool in the production of spring onion and shallots. 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 utilized in seedling production, pre-plant, during plant establishment, through crop development and into crop maturity to maximise crop yield, quality and customer appeal.

From a pesticide access perspective, the APVMA classifies spring onions and shallots as minor crops. They fit within the APVMA crop group 009 Bulb vegetable. Onion, Leeks, Spring onions.

As a consequence of the issues facing the spring onion and shallot industries regarding pesticide access, Horticulture Australia Ltd and the vegetable industry undertook a review of the pesticide requirements in spring onions and shallots via a Strategic Agrichemical Review Process (SARP). See Appendix 1 – the Strategic Agrichemical Review Process. The aim was to determine solutions (primarily pesticide) to current and future pest threats.

This SARP process identified diseases, insect pests and weeds of major concern to the industry. Against these threats available registered or permitted pesticides, along with non-pesticide solutions, were evaluated for overall suitability in terms of IPM, resistance, residues, withholding period, efficacy, trade, human safety and environmental issues. Where tools were unavailable or unsuitable the process aimed to identify potential future solutions.

This report is not a comprehensive assessment of all pests and control methods impacting on spring onion and shallot production in Australia but attempts to prioritise the major problems.

3.2 Minor-use permits and registration

The APVMA classifies spring onion and shallots, as minor crops. Therefore access to minor-use permits can be relatively straight forward so long as a reasonable justification is provided. Possible justification for future permit applications could be based on:

- New disease, insect or weed identified as a cropping issue
- No pesticide available
- Current pesticides no longer work – resistance
- Current pesticides limiting trade
- IPM, environmental or operator issues
- Loss of pesticides due to removal from market
- New, effective pesticide registered in another crop
- Alternate pesticide has overseas registration or minor use permit

With each of these options, sound, scientific argument is required to justify any new registrations or permit applications.

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

3.3 Methods

The SARP was conducted in Queensland, South Australia and Victoria as part of combined vegetable meetings in 2008, 2010 and 2011. The meeting included leading growers, consultants, government agencies, agchem companies and agricultural reseller staff.

- Participants were given a comprehensive list of most major pests of spring onions and shallots and asked to prioritise them into high, moderate and low categories.
- Participants were then asked to list the main pesticides and or other control agents used for each pest.
- Mostly pesticide trade names were used and the list provided was certainly not comprehensive but a starting point for further assessment.
- Pesticides that are under review by the Australian Pesticides and Veterinary Medicines Authority (AVPMA) were listed.
- Information was collated onto Excel spreadsheets for diseases, insects and weeds.
- The information was circulated to participants for any further comments to ensure the accuracy of the information.
- Each alternative pesticide was assessed for:
    - IPM compatibility
    - Improved scope for resistance management
    - Sound biological profile
    - Residue and trade acceptance domestically and for export

Final selections of proposed new pesticides for the industry to pursue were listed.

3.4 Results

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

4. Pests and diseases of spring onion and shallots

4.1 Diseases of spring onion and shallots

Common name	Scientific name
HIGH PRIORITY	
Grey mould	*Botrytis* spp.
Downy mildew	*Peronospora destructor*
White rot	*Sclerotium cepivorum*
MODERATE PRIORITY	
Bacterial rot	*Erwinia* spp. *& Pseudomonas* spp.
Garlic rust	*Puccini allii*
Leaf blight	*Stemphylium* spp.
Purple blotch	*Alternaria porri*
LOW PRIORITY	
Blue mould	*Penicillium* spp.

Opinion various as to the priority of diseases. As an example, Victorian growers have observed that **Garlic rust** (Puccini allii) has increased in significance. They would like propineb + oxadixyl (REBOUND^) to be considered for a permit or for extension of registration from onions.

4.1.1 High priority diseases

Grey mould (*Botrytis* spp.)

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. Lesions begin as small, brown or grey, sunken lesions on the side or near the base of the bulb. At times, grey mycelia can be seen growing in the lesions.

As lesions expand, they become surrounded by large, brown discolored areas on the outer 2-3 scales. Hard, dry reproductive structures called sclerotia often form on the scales. Sclerotia may be white at first, but turn black with age. *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.

Grey mould is considered a major-moderate problem in SA and Qld and a low priority in Victoria.

- Growers alternate the use of different fungicides to reduce the resistance risk.
- Growers would like other protective/curative fungicides for alternation.
- Botrytis can be a significant problem in humid warm conditions. It can lead to significant crop losses.

Fungicides **registered** for the control of grey mould in spring onion and shallots:

- Hydrogen peroxide + peroxyacetic acid (PERATEC PLUS^) - Group M fungicide
  - Maximum 5 sprays per crop
  - 1 day withholding period is advantageous.

- Penthiopyrad (FONTELIS^) Group 7 fungicide
  - New entrant to the market.
  - Registered for spring onion and shallot

Fungicides listed for control of Grey mould control in spring onion and shallots via **permit**:

- Chlorothalonil (various) – Group M5 protectant fungicide
    - PER11950 has expired but data has been generated for renewal shortly.
    - For use in spring onion only.
    - Listed for the control of Downy mildew and Botrytis.
    - Commonly used.
    - Good efficacy.
    - Moderately harmful to some beneficial insects.

- Dimethomorph + mancozeb (ACROBAT^ MZ/WDG) (PER14473, expires Jun 2018) Group 40 + M3 protectant and systemic fungicide
    - For use in spring onion and shallots.
    - Listed for the control of Downy mildew, Purple blotch and Botrytis rots.
    - Commonly used as a protectant.
    - Reported as very effective.
    - Moderately harmful to some beneficial insects.

When the SARP meetings were conducted the only options were the two permits. Growers now also have two registered chemicals for Botrytis management so there is no longer a high priority for action on obtaining permits.

Downy mildew (*Peronospora destructor*)

The first evidence of Downy mildew is a fine, furry, greyish white to purple growth on the surface of older leaves. Leaf tissue under the growth becomes pale green, then yellow, and finally collapses. Large, yellowish, circular clumps of infected plants, may be the first symptom noticed in the crop. The yellowing patterns often enlarge in the direction of prevailing winds. Downy mildew can develop from an initial infection by airborne spores into an epidemic very quickly if humidity and temperature conditions are favourable.

Spores can travel long distances in moist air, but are quickly killed by dry conditions. Initial sources of disease can be infected bulbs, sets, seeds, and plant debris.

Downy mildew is considered a major problem in all states and is the main disease problem in spring onion and shallot production.

- In some seasons, when conditions favour the disease, it is impossible to control.
- Growers alternate the use of different fungicides to reduce the resistance risk.
- Growers would like other protective/curative fungicides for alternation.

Fungicides **registered** for the control of downy mildew in spring onion and shallots:

- Copper + Metalaxyl-M (RIDOMIL^ GOLD PLUS) – Group 4 + M3 systemic, protective and curative fungicide
    - Commonly used.
    - There is a restricted number of applications.
    - Considered very expensive.
    - Moderately harmful to some beneficial insects.

- Hydrogen peroxide + peroxyacetic acid (PERATEC PLUS^) - Group M fungicide
    - Maximum 5 sprays per crop
    - 1 day withholding period is advantageous.
    - Penthiopyrad (FONTELIS^) Group 7 fungicide.
    - New entrant to the market.
    - Registered for spring onion and shallot.

- Sulphur (various) – insecticide
    - High selectivity.
    - Only short term impact on beneficials.

Fungicides listed for control of downy mildew control in spring onion and shallots via **permit** are:

- Chlorothalonil (various) – Group M5 protectant fungicide
    - PER11950 has expired but data has been generated for renewal shortly.
    - For use in spring onion only.
    - Listed for the control of Downy mildew and Botrytis.
    - Commonly used.
    - Moderately harmful to some beneficial insects.

- Copper (various) (PER10824, expires Sep 2014) Group M1 protectant fungicide
    - For use in spring onion and shallots.
    - Commonly used.
    - It is very effective.
    - Minimal impact on most beneficial insects

- Dimethomorph + mancozeb (ACROBAT^ MZ/WDG) (PER14473, expires Jun 2018) Group 40 + M3 protectant and systemic fungicide
    - For use in spring onion and shallots.
    - Listed for the control of Downy mildew, Purple blotch and Botrytis rots.
    - Commonly used as a protectant.
    - Reported as very effective.
    - Growers expressed concern that with a heavy reliance and limited options that resistance may develop.
    - Moderately disruptive to some beneficial insects.
    - Considered very expensive.

- Phosphorous acid (various) (PER13698, expires Sep 2017) Group 33 protective and systemic fungicide - enhances plants natural defence mechanisms
    - For use in spring onion and shallots.
    - Enhances plants natural defence mechanisms.
    - Listed for the suppression of Downy mildew.
    - Commonly used as a protectant.
    - It is effective when it is used in rotation with other fungicides.
    - Considered very cheap.
    - Minimal impact on all beneficial insects.
    - Permit expires 30-Sep-17. No manufacturers interested in registering use.

Not all growers use every product. They generally alternate between the different fungicides.

White rot (*Sclerotium cepivorum*)

Leaves of plants infected with the white rot show yellowing, leaf dieback, and wilting. Leaf decay begins at the base, with older leaves being the first to collapse. A semi-watery decay of the bulb scales results. Roots also rot, and the plant can be easily pulled from the ground.

Associated with the rot is a fluffy white mycelium growth, which develops around the base of the bulb. As the disease progresses, the mycelium becomes more compacted, less conspicuous, with numerous small spherical black bodies, sclerotia. The sclerotia are the resting bodies of the disease.

Sclerotia 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.

White rot is considered a major problem in Vic, Qld (Lockyer Valley) and parts of SA. It is not a problem in NSW and WA. There is a need for more management options.

Soil fumigants **registered** for the control of diseases, nematodes, insects and weeds in vegetables:

- Chloropicrin (various) – Group 8A insecticide/biocide soil fumigant
- Dazomet (various) – insecticide/ biocide soil fumigant
- Metham sodium (METHAM^) - Group 1A broad spectrum insecticide/biocide fumigant

No fungicides are registered for the control of White rot in spring onion and shallots.

Fungicides listed for White rot control in spring onion and shallot via **permit**:

- Azoxystrobin (various) (PER12999, expires Mar 2014) Group 11 protectant and curative fungicide
    - For use in spring onion and shallots.
    - Commonly used as a protectant.
    - Reported as very effective.
    - Growers expressed concern that with a heavy reliance that resistance may develop.
    - Syngenta is reported to be interested in registering the use but it doesn't seem that this will occur before the permit expires.

Alternate options for management of white rot:

- Soil treatments to eradicate S. cepivorum and other pathogens of vegetables
- Use of Trichoderma as a biological treatment
- Integrated approaches to sustainable disease control

(Villalta et al., 2005)

4.1.2 Summary

High Priority Diseases and control options
Very few fungicides are registered for control of disease in spring onions and shallots. Extension of registrations for onions and other alliums would be helpful. There is also some new chemistry, particularly for downy mildew, that should be considered.

Disease	Control option
Grey mould *(Botrytis* spp.)	**Currently registered fungicides** - Hydrogen peroxide + peroxyacetic acid (PERATEC PLUS^) - Group M fungicide - Penthiopyrad (FONTELIS^) Group 7 fungicide **Currently permitted fungicides** - Dimethomorph + mancozeb (ACROBAT^ MZ/WDG) (PER14473, expires Jun 2018) Group 40 + M3 protectant and systemic fungicide **Fungicide Gaps:** New chemistry with IPM fit. **Potential fungicide solutions** Chlorothalonil (various) – Group M5 protectant fungicide PER11950 has expired but data has been generated for renewal shortly. **Non-chemical options** Farm hygiene, Planting of non-diseased bulbs
Downy mildew *(Peronospora destructor)*	**Currently registered fungicides** - Copper + Metalaxyl-M (RIDOMIL^ GOLD PLUS) – Group 4 + M3 systemic, protective and curative fungicide - Hydrogen peroxide + peroxyacetic acid (PERATEC PLUS^) - Group M fungicide - Sulphur (various) – insecticide **Currently permitted fungicides** - Chlorothalonil (various) – Group M5 protectant fungicide - Copper (various) (PER10824, expires Sep 2014) Group M1 protectant fungicide - Dimethomorph + mancozeb (ACROBAT^ MZ/WDG) (PER14473, expires Jun 2018) Group 40 + M3 protectant and systemic fungicide - Phosphorous acid (various) (PER13698, expires Sep 2017) Group 33 protective and systemic fungicide - enhances plants natural defence mechanisms **Fungicide Gaps** New chemistry with IPM fit, although it is recognised that there are more options now than when the SARP process began. **Potential fungicide solutions** – requested by growers - Cyazofamid (new ISK Fungicide) – first registration under assessment at APVMA. - Metiram (POLYRAM^) - Azoxystrobin - Dimethomorph **Non-chemical options** Not discussed in meetings. Should be explored in next SARP.
White rot (*Sclerotium cepivorum*)	**Currently registered fungicides** Soil fumigants for the control of diseases, nematodes insects and weeds. There are no specific fungicides for control of white rot in shallots and spring onions. **Currently permitted fungicides** Azoxystrobin (various, PER12999, expires Mar 2014) – efficacious, minimal impact on beneficials, uncertainty on registration or renewal of permit **Fungicide Gaps** New chemistry with IPM fit. **Potential fungicide solutions** Soil treatments to eradicate S. cepivorum and other pathogens of vegetables **Non-chemical options** Use of Trichoderma as a biological treatment Integrated approaches to sustainable disease control

Currently available fungicides

Disease	Active		Crop Comment	WHP, days	Chemical group
Bean rust	Sulphur		Vegetables	NR	M2
Botrytis – blight, neck and bulb rot	Dimethomorph + mancozeb (ACROBAT^ MZ/WDG)	(PER14473, expires Jun 2018)	Spring Onion, Shallot	7(H), *(G)	40+M3
	Hydrogen peroxide+ peroxyacetic acid (PERATEC^ PLUS)		Spring Onion, Shallot	1	M
	Penthiopyrad (FONTELIS^)		Spring Onion, Shallot		
	Chlorothalonil	Await permit renewal	Spring onion	1	M5
Downy mildew	Chlorothalonil	Await permit renewal	Spring onions	14	M5
	Copper	(PER10824, expires Sep 2014)	Spring Onion, Shallot	1	1
	Copper + metalaxyl-M (RIDOMIL GOLD PLUS)			7	M1+4
	Dimethomorph + mancozeb (ACROBAT^ MZ/WDG)	(PER14473, expires Jun 2018)	Spring Onion, Shallot	7(H), *(G)	40+M3
	Hydrogen peroxide+ peroxyacetic acid (PERATEC^ PLUS)		Spring Onion, Shallot	1	M
	Phosphorous acid	(PER13698, expires Sep 2017)	Shallot, Spring Onion	1	_
	Sulphur		Vegetables	NR	M2
Purple blotch (*Alternaria porri*)	Dimethomorph + mancozeb (ACROBAT^ MZ/WDG)	(PER14473, expires Jun 2018)	Spring Onion, Shallot	7(H), *(G)	40+M3
	Penthiopyrad (FONTELIS^)		Spring Onion, Shallot		
Sclerotinia	Boscalid	(PER12050, expires Jun 2015)	Bulb Vegetables	14	7
Soil borne diseases incl Fusarium, Verticillium wilts, Rhizoctonia, Pythium	1,3-dichloropropene + chloropicrin		Vegetables	NR	8B
White rot	Azoxystrobin	(PER12999, expires Mar 2014)	Alliums (Except Onions)	1	21

*Do not graze or cut for stockfood
NR= Not required
H=Harvest
G=Grazing

4.2 Insects of spring onion and shallots

Common name	Scientific name
HIGH PRIORITY	
Onion thrips	*Thrips tabaci*
Western flower thrips	*Frankliniella occidentalis*
MODERATE PRIORITY	
Aphids	*Aphidae*
Cutworms	*Agrotis* spp.
Onion maggot	*Delia antiqua*
Snails	*Gastropoda*
LOW PRIORITY	
Black field cricket	*Teleogryllus commodus*
Earwigs	*Dermaptera*
Field crickets	*Gryllidae*
Jassids	*Cicadellidae*
Mites	*Acarina*
Mole crickets	*Gryllotalpidae*
Redlegged earth mite	*Halotydeus destructor*
Seed harvesting ants	*Pheidole spp.*
Spotted vegetable weevil	*Desiantha diversipes*
Thrips	*Thysanoptera*
Vegetable weevil	*Listroderes difficilis*
Wingless grasshopper	*Phaulacridium vittatum*
Wireworm	*Heteroderes* sp.

4.2.1 High priority insects

Onion thrips (*Thrips tabaci*)

Onion thrips are very small and slender. Mature thrips are 1.3 mm long. Adults are pale yellow to light brown in colour. The immature stages have the same body shape as adults but are lighter in colour and are wingless. A hot, dry spring that follows a mild, dry winter favours this pest. Onion thrips have a very extensive range of hosts, including cereals and broadleaved crops. Symptoms are 'white flecking' on the leaves of plants.

High populations of thrips can reduce both yield and keeping quality of Alliums. Onions thrips can affect onions throughout the growing phase in all regions. Marking of spring onion stems makes them unmarketable.

Onion thrips are considered a major problem in all states.

- There is reported resistance to commonly used insecticides. These insecticides are hard on beneficial insects.
- Onion thrips are easier to control than Western Flower Thrips, in that they do not develop resistance to insecticides as quickly.

Insecticides **registered** for the control of **thrips** in vegetables:

- Potassium salts of fatty acids (various) – contact biological insecticide.
    - No reports of use from growers
    - Pyrethrins+piperonyl butoxide (various) – Group 3A contact insecticide
    - Good knockdown
    - Harmful to beneficials

Insecticides listed for Onion thrips control in spring onion and shallots via **permit**:

- Alpha-cypermethrin (various, PER12397, expires Nov 2014, application made for renewal) - Group 3A contact and systemic insecticide.
    - For use in all leeks, spring onions and shallots.
    - Occasionally used.
    - Controls Onion thrips only (not WFT).
    - Growers expressed concern that heavy reliance could lead to resistance.
    - Moderately harmful to harmful to many beneficial insects.

- Diazinon (various) (PER14073, expires Jun 2018) Group 1B contact and systemic insecticide
    - For use in spring onion and shallots
    - Commonly used.
    - Controls thrips (not WFT) and onion maggot.
    - Works well.
    - Moderately disruptive to disruptive to many beneficial insects.

- Petroleum oil (various, PER12221, Expires Nov 2017) – contact insecticide
    - Permit for alliums / thrips
    - Occasionally used.
    - Reported as not very effective, but offers short term suppression.
    - Also controls other pests.
    - Moderately harmful to some beneficial insects.
    -
- Maldison (PER13653, expires Oct 2018)– Group 1B contact and systemic insecticide
    - For use in all leeks, spring onions and shallots.
    - Commonly used.
    - Controls Onion thrips only (not WFT).
    - Works well.
    - Growers expressed concern that heavy reliance could lead to resistance.
    - Moderately harmful to harmful to many beneficial insects.

- Phorate (various) (PER8930, expires Jul 2017) Group 1B contact and systemic insecticide
    - For use in spring onion and shallots
    - Occasionally used. Permit for all states except Victoria.
    - Controls aphids, jassids, mites, thrips and onion maggot.
    - Works well.
    - Disruptive to many beneficial insects.

Potential insecticides listed for control of thrips.

- Chlorantraniliprole + thiamethoxam + (DURIVO^) Group 4A + 28 contact and systemic insecticide
- Sulfoxaflor (TRANSFORM^) Group 4C insecticide

- Spirotetramat (MOVENTO^) Group 23 contact and systemic insecticide

Western flower thrips (Frankliniella occidentalis)

The adults are tiny insects, generally measuring only 1 to 2 mm in length. They have thin bodies and vary in colour from near black to straw coloured.
While thrips can cause direct damage to foliage and fruit, their role as vectors viruses.
They are weak fliers but are capable of infesting large areas of crop as they are easily blown by wind.

Western flower thrips cause most damage by discolouring, scaring and deforming leaves as they feed.

They are fast breeders when the weather is warm but not too hot and are capable of producing 12-15 generations per year with optimal conditions. Females live for up to 90 days and are capable of reproducing after approximately 15-20 days.

Western flower thrips are considered a major-moderate problem Vic, SA, NSW and WA and a moderate problem in Queensland.

- All insecticides used in alternation due to rapid resistance development to many commonly used insecticides.
- Growers find it difficult to distinguish difference between thrips species with the naked eye due to their very small size.
- WFT develop resistance more easily than other thrips species.
- Growers need multiple options.

No insecticides are **registered** specifically for the control of Western flower thrips in spring onion and shallot. Refer to the onion thrip section for information on general thrips registrations and permits and potential insecticides for thrips.

Insecticides listed specifically for control of Western flower thrips in spring onion and shallot via **permit**:

- Chlorfenapyr (various) (PER13205, expires Jun 2017) Group 13 contact and systemic insecticide
    - For use in spring onion and shallots.
    - Very effective.
    - Commonly used.
    - Moderately disruptiveto disruptive to many beneficial insects.

- Methomyl (various) (PER14080, expires Sep 2014) Group 1A contact and systemic insecticide
    - For use in spring onion and shallots.
    - Very effective.
    - Commonly used.
    - Moderately disruptive to disruptive to many beneficial insects.
    - Growers expressed concern that a heavy reliance and limited options that resistance may develop.

- Spinetoram (SUCCESS^ NEO) (PER13088, expires Mar 2017) Group 5A contact and systemic insecticide
    - For use in spring onion and shallots.
    - Commonly used in some regions.
    - Very effective. Also controls a range of other pests.
    - Moderately harmful to some beneficial insects.
    - Growers expressed concern that a heavy reliance and limited options that resistance may develop.

4.2.2 Summary

High priority insects and control options

There are few insecticides registered or permitted for use in spring onion and shallots.

The impact of financial return, as a driver of research and development choices for product registrants, is evident in these minor crops – the cost of the efficacy and residue data packages required relative to the value of the potential chemical sales are usually too high to justify the work.

The most straight forward means of increasing options for growers would be to extend registrations in other alliums to spring onion and shallots.

Insect	Control option
Onion thrips (*Thrips tabaci*) Western flower thrips (*Frankliniella occidentalis*)	**Currently registered and permitted insecticides** **General thrips control** - Diazinon (various) (PER14073, expires Jun 2018) Group 1B contact and systemic insecticide - Thrips (not WFT) - Petroleum oil (various, PER12221, Expires Nov 2017) – contact insecticide - Phorate (various) (PER8930, expires Jul 2017) Group 1B contact and systemic insecticide - Potassium salts of fatty acids (various) – contact biological insecticide. - Pyrethrins+piperonyl butoxide (various) – Group 3A contact insecticide **Onion thrips** - Alpha-cypermethrin (various, PER12397, expires Nov 2014, application made for renewal) Group 3A contact and systemic insecticide. - Maldison (PER13653, expires Oct 2018)– Group 1B contact and systemic insecticide. **Western flower thrips** - Chlorfenapyr (various) (PER13205, expires Jun 2017) Group 13 contact and systemic insecticide - Methomyl (various) (PER14080, expires Sep 2014) Group 1A contact and systemic insecticide - Spinetoram (SUCCESS^ NEO) (PER13088, expires Mar 2017) Group 5A contact and systemic insecticide **Insecticide Gaps** Soft alternatives, more alternatives **Potential insecticide solutions** - Sulfoxaflor (TRANSFORM^) – Group 4C – thrips registrations in many crops - Thiamethoxam + chlorantraniliprole (DURIVO, Group 4A+28, efficacious but moderately harmful to some beneficial insects **Non-chemical options** IPM strategies

Currently available insecticides

Insect	Active	Crop Comment	WHP, days	Chemical group
Ants - Seed harvesting	Chlorpyrifos		NR	1B
Ants	pyrethrins+piperonyl butoxide	Vegetables	1	3A
Aphids	Botanical oil	Vegetables	NR	-
	Petroleum (PER12221, expires Nov 2017)	Alliums	1	_
	Phorate (PER8930, expires Jul 2017)	Shallot, Spring Onion	70	1B
	Pirimicarb (PER13900, expires Mar 2014)	Spring Onions	2	1A
	Potassium salts of fatty acids	Vegetables	1	3A
	pyrethrins+piperonyl butoxide	Vegetables	1	3A

Insect	Active	Crop Comment	WHP, days	Chemical group
Armyworm	*Bacillus thuringiensis* subsp. *kurstaki*	Vegetables	NR	11C
Cabbage moth	*Bacillus thuringiensis* subsp. *Kurstaki*	Vegetables	NR	11C
	Trichlorfon	Vegetables	2	1B
Cabbage white butterfly	*Bacillus thuringiensis* subsp. *Kurstaki*	Vegetables	NR	11C
	Trichlorfon	Vegetables	2	1B
Caterpillars	pyrethrins+piperonyl butoxide	Vegetables	1	3A
Cricket - Black field	Chlorpyrifos		NR	1B
Crickets - mole	Chlorpyrifos		NR	1B
Cutworms	Chlorpyrifos		NR	1B
Earwigs	Chlorpyrifos		NR	1B
Grasshopper -wingless	Chlorpyrifos		NR	1B
Green mired	Petroleum (PER12221, expires Nov 2017)	Alliums	1	_
Green vegetable bug	Petroleum (PER12221, expires Nov 2017)	Alliums	1	_
	Trichlorfon	Vegetables	2	1B
Grey cluster bug	Petroleum (PER12221, expires Nov 2017)	Alliums	1	_
Helicoverpa	*Bacillus thuringiensis* subsp. *Kurstaki*	Vegetables	NR	11C
Jassids	Phorate (PER8930, expires Jul 2017)	Shallot, Spring Onion	70	1B
Leafhoppers	Petroleum (PER12221, expires Nov 2017)	Alliums	1	_
	pyrethrins+piperonyl butoxide	Vegetables	1	3A
Lightbrown apple moth	*Bacillus thuringiensis* subsp. *Kurstaki*	Vegetables	NR	11C
Locust - Australian plague	Carbaryl			
	Chlorpyrifos			
	Diazinon			
	Maldison			
Loopers	*Bacillus thuringiensis* subsp. *Kurstaki*	Vegetables	NR	11C
Mealybug	Potassium salts of fatty acids	Vegetables	1	3A
Mites	Petroleum (PER12221, expires Novr 2017)	Alliums	1	_
	Phorate (PER8930, expires Jul 2017)	Shallot, Spring Onion	70	1B
Mite - Two spotted (red spider)	Sulphur	Vegetables	NR	-
	Propargite (21 day re-entry)	Vegetables	7	12C
Onion seedling maggot	Diazinon (PER14073, expires Jun 2018)	Spring Onion, Shallot	14	1B
	Phorate (PER8930, expires Jul 2017)	Shallot, Spring Onion	70	1B
Plant parasitic nematodes	1,3-dichloropropene + chloropicrin	Vegetables	NR	8B
Rutherglen bug	Petroleum (PER12221, expires Novr 2017)	Alliums	1	_
	Trichlorfon	Vegetables	2	1B
Symphylans (garden centipedes)	1,3-dichloropropene + chloropicrin	Vegetables	NR	8B
Thrips	Petroleum (PER12221, expires Novr 2017)	Alliums	1	_
	Phorate (PER8930, expires Jul 2017)	Shallot, Spring Onion	70	1B
	Potassium salts of fatty acids	Vegetables	1	3A
	pyrethrins+piperonyl butoxide	Vegetables	1	3A
Thrips - onion	Alpha cypermethrin (PER12397, expires Nov 2014)	Spring Onion, Shallots	14	3A
	Maldison (PER13653, expires Oct 2018)	Spring Onion, Shallots	3	1B
Thrips (not WFT)	Diazinon (PER14073, expires Jun 2018)	Spring Onion, Shallot	14	1B
Thrip-western flower	Chlorfenapyr (PER13205, expires Jun 2017)	Spring Onion, Shallot	7	13
	Methomyl (PER14080, expires Sep 2014)	Shallot, Spring Onions	5(H), 1(G)	1A
	Spinetoram (PER13088, expires Mar 2017)	Spring Onion, Shallots	3(H), *(G)	5

Insect	Active	Crop Comment	WHP, days	Chemical group
Vine moth	*Bacillus thuringiensis* subsp. *Kurstaki*	Vegetables	NR	11C
Weevil - vegetable	Chlorpyrifos		NR	1B
Whiteflies	pyrethrins+piperonyl butoxide	Vegetables	1	3A
Wireworms	1,3-dichloropropene + chloropicrin	Vegetables	NR	8B
Wireworms - false	Chlorpyrifos		NR	1B

*Do not graze or cut for stockfood
NR= Not required
H=Harvest
G=Grazing

4.3 Weeds of spring onion and shallots

Registered herbicides that are used in spring onion and shallots are:

- Chlorthal-dimethyl (various) – Group D general knockdown and residual herbicide
    - For use in spring onion and shallots.
    - Occasionally used at planting to control annual broadleaf weeds.
    - Considered very effective.
    - Controls many weeds.
- Glyphosate (various) – Group M pre-plant general knockdown herbicide
    - Commonly used.
    - Works well as a pre-crop spray.

- Paraquat + diquat (various) - Group L pre-plant general knockdown herbicide.
    - Occasionally used.
    - Works well as a pre-crop spray

Herbicides listed for control of weeds in spring onion and shallot via **permit**:

- Clethodim (various) (PER13257, expires Jun 2017) Group A grass selective post-emergent herbicide
    - Commonly used.
    - Considered very effective on most annual grass weeds.
    - Also used to spot spray couch grass post-emergent.
    - Does not control Winter grass (Poa annum).

- Fluazifop-P as butyl (various) (PER13394, expires Sep 2015) Group A grass selective post-emergent herbicide
    - Commonly used.
    - Considered very effective on most annual grass weds.
    - Also used to spot spray couch grass post-emergent.
    - Does not control Winter grass (Poa annum).

- Ioxynil (TORTRIL^) (PER14142, expires Mar 2016) Group C post-emergent herbicide
    - Commonly used for broadleaf weeds control post- emergent.
    - Considered very effective.
    - Controls many weeds.

- Methabenzthiazuron (various) (PER13584, expires Jun 2014) Group C post-emergent herbicide
    - Commonly used for grass and broadleaf weeds control early post- emergent.
    - Considered very effective.
    - Controls many weeds.
    - Can cause crop damage in hot weather.

- S- Metolachlor (various) (PER13626, expires Jun 2017 Group K pre-plant residual herbicide
    - Occasionally used for grass and broadleaf weeds control pre-plant, pre- emergent.
    - Considered very effective, but does not control all weeds.
    - Controls many weeds.

- Pendimethalin (various) (PER14048, expires Mar 2023) Group D residual herbicide
    - Occasionally used for effective control of annual broadleaf and grass weeds pre-emergent.
    - Considered very effective.
    - Controls many weeds.

- Propachlor (RAMROD^) (PER12008, expires Sep 2015) Group H selective post-emergent herbicide
    - It is commonly used as an effective post plant - pre-emergent herbicide for the control of annual broadleaf and grass weeds.
    - Considered very effective.
    - Controls many weeds.

Growers generally use a pre-plant weed control (general knockdown herbicides) to prepare the paddock. Growers then either alternate the herbicides used or use them in combination for effective weed control. All the herbicides registered/permitted are either pre-emergent herbicides or early post-emergent herbicides.

Most weeds can be controlled with currently available herbicides.

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Images:

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Acronyms

APVMA	Australian Pesticides and Veterinary Medicines Authority
DPI	Department of Primary Industries
HAL	Horticulture Australia Ltd
IPM	Integrated pest management
IR-4	Interregional Research Program 4 (USA)
MRL	Maximum residue limit (mg/kg or ppm)
Plant pests	Diseases, insects, nematodes, viruses, weeds, etc
Pesticides	Plant protection products (fungicide, insecticide, herbicide, nematicides, etc).
SARP	Strategic Agrichemical Review Process
WHP	Withholding period

Australian states and territories: NSW (New South Wales), NT (Northern Territory), Qld (Queensland), SA (South Australia), Tas (Tasmania), Vic (Victoria), WA (Western Australia)

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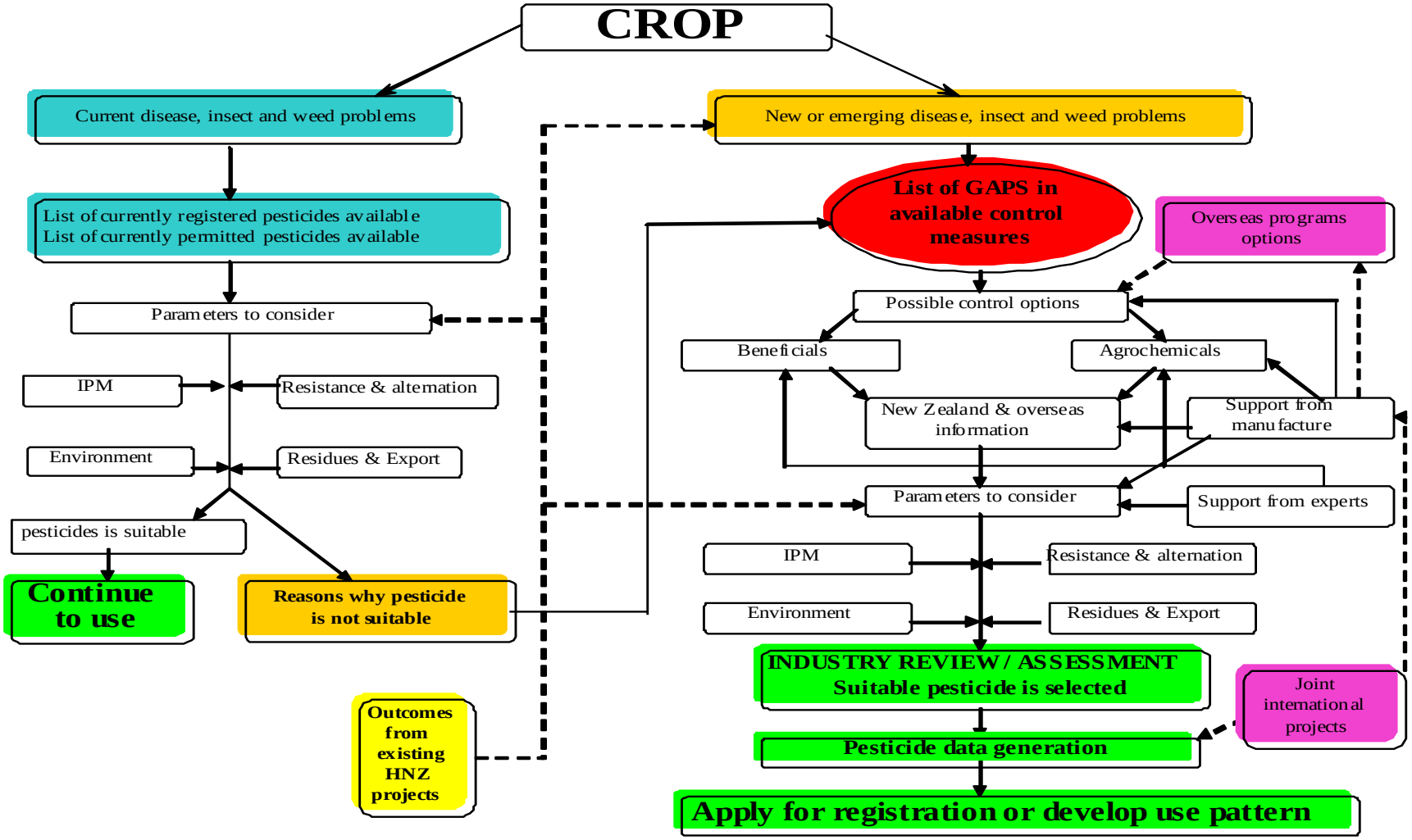
^Trademark

6. Appendices

DIAGRAM 1: The Strategic Agrichemical Review Process



Appendix 2 – currently available fungicides in spring onion and shallot.

Active		Crop Comment	Disease	WHP, days	Chemical group
1,3-dichloropropene + chloropicrin		Vegetables	Soil borne diseases incl Fusarium, Verticillium wilts, Rhizoctonia, Pythium	NR	8B
Azoxystrobin	(PER12999, expires Mar 2014)	Alliums (Except Onions)	White rot	1	21
Boscalid	(PER12050, expires Jun 2015)	Bulb Vegetables	Sclerotinia	14	7
Chlorothalonil			Downy mildew	14	M5
Chlorothalonil			Grey mould	14	M5
Chlorothalonil			Purple blotch	1	M5
Copper	(PER10824, expires Sep 2014)	Spring Onion, Shallot	Downy mildew	1	1
Copper + metalaxyl-M (RIDOMIL GOLD PLUS)			Downy mildew	7	4/M1
Dimethomorph + mancozeb (ACROBAT^ MZ/WDG)	(PER14473, expires Jun 2018)	Spring Onion, Shallot	Botrytis	7(H), *(G)	40+M3
Dimethomorph + mancozeb (ACROBAT^ MZ/WDG)	(PER14473, expires Jun 2018)	Spring Onion, Shallot	Downy mildew	7(H), *(G)	40+M3
Dimethomorph + mancozeb (ACROBAT^ MZ/WDG)	(PER14473, expires Jun 2018)	Spring Onion, Shallot	Purple blotch	7(H), *(G)	40+M3
Hydrogen peroxide+ peroxyacetic acid (PERATEC^ PLUS)		Spring Onion, Shallot	Downy mildew	1	M
Hydrogen peroxide+ peroxyacetic acid (PERATEC^ PLUS)		Spring Onion, Shallot	Neck and bulb rot (Botrytis spp)	1	M
Penthiopyrad (FONTELIS^)		Spring Onion, Shallot	Botrytis – blight and neck rot		
Penthiopyrad (FONTELIS^)		Spring Onion, Shallot	Purple blotch (*Alternaria porri*)		
Phosphorous acid	(PER13698, expires Sep 2017)	Shallot, Spring Onion	Downy mildew	1	_
Sulphur		Vegetables	Bean rust	NR	M2
Sulphur		Vegetables	Powdery mildew	NR	M2

*Do not graze or cut for stockfood
NR= Not required
H=Harvest
G=Grazing

Appendix 3 – currently available insecticides in spring onion and shallot.

Active		Crop Comment	Insect	WHP, days	Chemical group
1,3-dichloropropene + chloropicrin		Vegetables	Plant parasitic nematodes	NR	8B
1,3-dichloropropene + chloropicrin		Vegetables	Symphylans (garden centipedes)	NR	8B
1,3-dichloropropene + chloropicrin		Vegetables	Wireworms	NR	8B
Alpha cypermethrin	(PER12397, expires Nov 2014)	Spring Onion, Shallots	Onion thrips	14	3A
Bacillus thuringiensis subsp*. kurstaki*		Vegetables	Armyworm	NR	11C
Bacillus thuringiensis subsp*. Kurstaki*		Vegetables	Cabbage moth	NR	11C
Bacillus thuringiensis subsp*. Kurstaki*		Vegetables	Cabbage white butterfly	NR	11C
Bacillus thuringiensis subsp*. Kurstaki*		Vegetables	Helicoverpa (Corn bollworm)	NR	11C
Bacillus thuringiensis subsp*. Kurstaki*		Vegetables	Helicoverpa punctigera (Native budworm)	NR	11C
Bacillus thuringiensis subsp*. Kurstaki*		Vegetables	Lightbrown apple moth	NR	11C
Bacillus thuringiensis subsp*. Kurstaki*		Vegetables	Loopers	NR	11C
Bacillus thuringiensis subsp*. Kurstaki*		Vegetables	Vine moth	NR	11C
Botanical oil		Vegetables	Aphids	NR	-
Carbaryl			Locust - Australian plague		
Chlorfenapyr	(PER13205, expires Jun 2017)	Spring Onion, Shallot	Thrip-western flower	7	13
Chlorpyrifos			Cricket - Black field	NR	1B
Chlorpyrifos			Crickets - mole	NR	1B
Chlorpyrifos			Cutworms	NR	1B
Chlorpyrifos			Earwigs	NR	1B
Chlorpyrifos			Grasshopper - wingless	NR	1B
Chlorpyrifos			Locust - Australian plague		
Chlorpyrifos			Seed harvesting ants	NR	1B
Chlorpyrifos			Weevil - vegetable	NR	1B
Chlorpyrifos			Wireworms - false	NR	1B
Diazinon			Locust - Australian plague		
Diazinon	(PER14073, expires Jun 2018)	Spring Onion, Shallot	Onion seedling maggot	14	1B
Diazinon	(PER14073, expires Jun 2018)	Spring Onion, Shallot	Thrips (not wft)	14	1B
Maldison			Locust - Australian plague		
Maldison	(PER13653, expires Oct 2018)	Spring Onion, Shallots	Thrips - onion	3	1B
Methomyl	(PER14080, expires Sep 2014)	Shallot,S Spring Onions	Thrip-western flower	5(H), 1(G)	1A
Petroleum	(PER12221, expires Novr 2017)	Alliums	Aphids	1	_
Petroleum	(PER12221, expires Novr 2017)	Alliums	Green mired	1	_
Petroleum	(PER12221, expires Novr 2017)	Alliums	Green vegetable bug	1	_

Active		Crop Comment	Insect	WHP, days	Chemical group
Petroleum	(PER12221, expires Novr 2017)	Alliums	Grey cluster bug	1	_
Petroleum	(PER12221, expires Novr 2017)	Alliums	Leafhoppers	1	_
Petroleum	(PER12221, expires Novr 2017)	Alliums	Mites	1	_
Petroleum	(PER12221, expires Novr 2017)	Alliums	Rutherglen bug	1	_
Petroleum	(PER12221, expires Novr 2017)	Alliums	Thrips	1	_
Phorate	(PER8930, expires Jul 2017)	Shallot, Spring Onion	Aphids	70	1B
Phorate	(PER8930, expires Jul 2017)	Shallot, Spring Onion	Jassids	70	1B
Phorate	(PER8930, expires Jul 2017)	Shallot, Spring Onion	Mites	70	1B
Phorate	(PER8930, expires Jul 2017)	Shallot, Spring Onion	Onion maggot	70	1B
Phorate	(PER8930, expires Jul 2017)	Shallot, Spring Onion	Thrips	70	1B
Pirimicarb	(PER13900, expires Mar 2014)	Spring Onions	Aphids	2	1A
Potassium salts of fatty acids		Vegetables	Aphids	1	3A
Potassium salts of fatty acids		Vegetables	Mealybug	1	3A
Potassium salts of fatty acids		Vegetables	Thrips	1	3A
Propargite (21 day re-entry)		Vegetables	Mite - Two spotted (red spider)	7	12C
pyrethrins+piperonyl butoxide		Vegetables	Ants	1	3A
pyrethrins+piperonyl butoxide		Vegetables	Aphids	1	3A
pyrethrins+piperonyl butoxide		Vegetables	Caterpillars	1	3A
pyrethrins+piperonyl butoxide		Vegetables	Leafhoppers	1	3A
pyrethrins+piperonyl butoxide		Vegetables	Thrips	1	3A
pyrethrins+piperonyl butoxide		Vegetables	Whiteflies	1	3A
Spinetoram	(PER13088, expires Mar 2017)	Spring Onion, Shallots	Thrip-western flower	3(H), *(G)	5
Sulphur		Vegetables	Mite - Two spotted (red spider)	NR	-
Trichlorfon		Vegetables	Cabbage moth	2	1B
Trichlorfon		Vegetables	Cabbage white butterfly	2	1B
Trichlorfon		Vegetables	Green vegetable bug	2	1B
Trichlorfon		Vegetables	Rutherglen bug	2	1B

*Do not graze or cut for stockfood
NR= Not required
H=Harvest
G=Grazing

Appendix 4 – currently available herbicides in spring onion and shallot.

Active		Crop Comment	Weed	WHP, days	Chemical group
Chlorthal-dimethyl			Grass and broadleaf		D
Clethodim	(PER13257, expires Jun 2017)	Spring Onion, Shallots	Grass weeds	14	A
Fluazifop-P	(PER13394, expires Sep 2015)	Shallots, Spring Onions	Grass weeds-various	35	A
Glyphosate		General pre-plant	Grass and broadleaf	-	M
Ioxynil	(PER14142, expires Mar 2016)	Spring Onion, Shallot	Broadleaf	21	C
Methabenzthiazuron	(PER13584, expires Jun 2014)	Spring Onion, Shallot	Grass and broadleaf-various	7	C
Paraquat + diquat		General pre-plant	Grass and broadleaf	-	L
Pendimethalin	(PER14048, expires Mar 2023)	Spring Onion, Shallot	Grass and broadleaf	NR	D
Propachlor	(PER12008, expires Sep 2015)	Spring Onion, Shallots	Grass and broadleaf-label	NR	K
S-metolachlor	(PER13626, expires Jun 2017	Spring Onions	Grass and broadleaf	NR	K

(H)=Harvest
(G)= Grazing
NR= not required
*= do not graze or cut for stockfood
**Note that for some broad registrations the pests may not occur in leek