



Snow Peas and Sugar Snap Peas

Strategic Agrichemical Review Process

2011-2014

HAL Projects - MT10029 & VG12081

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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 snow pea and sugar snap pea industry 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	2
2. The Australian snow and sugar snap pea industries.....	3
3. Introduction	3
3.1. Background	3
3.2. Minor use permits and registration.....	4
3.3. Methods.....	4
3.4. Results and discussions	5
4. Pests and diseases of snow and sugar snap peas	5
4.1 Diseases of snow and sugar snap peas	5
4.1.1 High priority diseases.....	6
4.1.2 Summary	10
4.2 Insects of snow and sugar snap peas	13
4.2.1 High priority insects	13
4.2.2 Summary	17
4.3 Herbicide use in snow and sugar snap peas	21
5. References	22
Information:.....	22
Acronyms	22
Acknowledgement.....	22
6. Appendices	23

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 snow peas and sugar snap peas were conducted in New South Wales and Queensland as part of combined vegetable meetings in 2008, 2010 and 2011. The results of the process provide the industry 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)
Ascochyta blight	<i>Ascochyta</i> spp.
Chocolate spot / Botrytis rot	<i>Botrytis</i> spp.
Downy mildew	<i>Peronospora viciae</i>
Fusarium wilt	<i>Fusarium oxysporum</i>
Powdery mildew	<i>Erysiphe pisi</i>

Growers struggle with the limited number of options available to them for alternation, increasing the risk of resistance. The industry would like new, soft options with short withholding periods.

INSECTS

Insects identified as high priorities:

Insect (common name)	Insect (scientific name)
Green peach aphid	<i>Myzus persicae</i>
Cluster caterpillar	<i>Spodoptera litura</i>
Helioverpa	<i>Helicoverpa</i> spp.
Two-spotted mite	<i>Tetranychus urticae</i>

Very few insecticides are registered for control of insects in snow and sugar snap peas. Extension of registrations for beans and peas would be helpful. There is also some new chemistry that could be considered.

At the same time growers minimise the use of chemicals by adopting IPM practices - selecting resistant varieties and healthy seeds, using techniques of crop rotation, crop monitoring and early detection and identification of the pest or disease. Growers also find that by practicing IPM the market acceptance of their products increases.

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 are either pre-emergent herbicides or early post-emergent herbicides.

No weeds were identified as a high priority for control and most weeds can be controlled with currently available herbicides. Some growers also use extended fallow ploughing to combat the weeds. At times they may scarify between the rows of young peas but as peas have numerous surface roots that are sensitive to disturbance this may be more harmful than beneficial. Overall peas can compete well with weeds so are not usually sensitive to weed pressure.

2. The Australian snow and sugar snap pea industries

The Australian snow and sugar snap pea industries are both small horticultural industries. Consumption of snow and sugar snap peas has risen in recent years with the growth in healthier lifestyles and moves to fresh food, especially salads and stir-fried.

Ausveg manages the interests of the snow and sugar snap pea industries nationally.

Accurate statistics on snow and sugar snap pea production is not available, but it is known to be grown in reasonable quantities at:

- Bundaberg & Lockyer Valley (Qld)
- Murray & Goulburn Valley (Vic)
- Perth Metro outer areas (WA)
- North Adelaide Plains (SA)
- Sydney Basin (NSW)

The snow pea species referred to in this report is *Pisum sativum var. macrocarpon* and the sugar snap pea species referred to in this report is *Pisum sativum var. scharatum*.

In 2008/09, there were 185 growers growing 1,440 ha of snow and sugar snap peas, producing 3,137 tonnes worth \$23 million (farm gate) (Ausveg 2012). There are also some crops grown in protected structures.

Due to Australia's varying weather conditions and the introduction of different varieties of snow and sugar snap peas, the Australian industry is now able to supply domestic markets with fresh snow and sugar snap peas 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 snow pea and sugar snap pea 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 snow peas and sugar snap peas. 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 snow peas and sugar snap peas as minor crops. The crop fits within the APVMA crop group 014 Legume vegetables (succulent seeds and immature pods).

As a consequence of the issues facing the snow pea and sugar snap pea industry regarding pesticide access, Horticulture Australia Ltd and the vegetable industry undertook a review of the pesticide requirements in snow pea and sugar snap pea 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 snow pea and sugar snap pea 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 snow pea and sugar snap pea production in Australia but attempts to prioritise the major problems.

3.2. Minor use permits and registration

Snow peas and sugar snap peas are classified as minor by the APVMA. Therefore access to minor use permits can be relatively straight forward as 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 snow pea and sugar snap pea industry is for manufacturers to register new pesticides uses in the crop.

3.3. Methods

The SARP was conducted in New South Wales and Queensland 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 snow pea and sugar snap pea 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 snow pea and sugar snap pea industries to pursue were listed.

3.4. Results and discussions

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

4. Pests and diseases of snow and sugar snap peas

4.1 Diseases of snow and sugar snap peas

Common name	Scientific name
HIGH PRIORITY	
Ascochyta blight	<i>Ascochyta</i> spp.
Chocolate spot / Botrytis rot	<i>Botrytis</i> spp.
Downy mildew	<i>Peronospora viciae</i>
Fusarium wilt	<i>Fusarium oxysporum</i>
Powdery mildew	<i>Erysiphe pisi</i>
MODERATE PRIORITY	
Bacterial blight*	<i>Pseudomonas syringae</i>
Black root rot	<i>Aphanomyces euteiches</i>
Rust	<i>Uromyces viciae-fabae</i>
Sclerotinia rot	<i>Sclerotinia</i> spp.
LOW PRIORITY	
Angular leaf spot	<i>Pseudomonas syringae</i>
Anthracnose	<i>Colletotrichum</i> spp.
Damping off	<i>Pythium</i> spp., <i>Phytophthora</i> spp., <i>Fusarium</i> spp., <i>Rhizoctonia</i> spp.
Biosecurity risk	
None listed	

Bacterial blight can be a serious disease, especially in wet conditions.

4.1.1 High priority diseases

Ascochyta blight (*Ascochyta* spp.)



Ascochyta causes spots on leaves, stems and pods. Spots are typically light brown with darker margins.

The size of the lesions is determined by the weather and range from 0.5-20 mm. The fungus is carried on seed and survives on plant residues. Spores are also carried by the wind. The disease is favoured by high humidity.

- Ascochyta blight is considered a major-moderate problem in all states.
 - Growers alternate the use of different fungicides to reduce the resistance risk.
 - Growers would like other protective/curative fungicides for alternation.
 - Ascochyta can be a significant problem in humid warm conditions. It can lead to significant crop losses, especially if crop is dense.
- Fungicides **registered** for the control of Ascochyta blight in snow and sugar snap peas are:
 - Copper (various products) - Group M1 protectant fungicide
 - Commonly used.
 - Used as a protectant fungicide.
 - Some formulations also registered for Bacterial blight, Downy mildew, Leaf & pod spots.
 - Growers have concerns that copper is not effective in pressure conditions.
 - Minimal impact on most beneficial insects.
 - Mancozeb (various) - Group M3 protectant fungicide
 - Commonly used.
 - Used as a protectant fungicide.
 - Some formulations also registered for Chocolate spot, Downy mildew, Rust.
 - Growers have concerns that mancozeb is not effective in pressure conditions.
 - Moderately disruptive to some beneficial insects.

Growers generally alternate between the different fungicides. Growers require new fungicide options for their crops when disease pressure is at a peak.

- No fungicides are listed for control of Ascochyta blight control in snow and sugar snap peas via **permit**.
- Potential fungicides are listed for control of Ascochyta blight control in snow and sugar snap peas:

There is an IR4 project for fluazinam, pea / Ascochyta blight, Anthracnose, white mould, Mycosphaerella blight. Residue studies have been completed. A 30 day WHP has been proposed. This active could be considered for Australia

Chocolate spot / Botrytis rot (*Botrytis* spp.)



Botrytis starts as pale, water-soaked spots on leaves stems and pods that then develop into grey-brown lesions. Disease on the stem can cause it to wilt and die.

Infection occurs after wet, mild-warm weather and starts on flowers.

Dense crops and intensive production can cause the disease to be prominent in some locations.

- Botrytis rot is considered a major-moderate problem in Qld and a minor problem in other states.
 - 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 and rejection of produce.

- Fungicides **registered** for the control of Botrytis in snow and sugar snap peas are:
 - Mancozeb (various) - Group M3 protectant fungicide
 - Commonly used.
 - Used as a protectant fungicide.
 - Some formulations also registered for Ascochyta blight, Downy mildew, Rust.
 - Growers have concerns that mancozeb is not effective in pressure conditions.
 - Moderately disruptive to some beneficial insects.
- Fungicides listed for control of Botrytis control in snow and sugar snap peas via **permit**:
 - Chlorothalonil (various) (PER11964, expires Mar 2018) – Group M5 protectant fungicide
 - Commonly used.
 - Permitted for Downy mildew and Chocolate spot.
 - Moderately disruptive to some beneficial insects.
 - Fenhexamid (TELDOR[®]) (PER14211, expires Sep 2016) - Group 17 protectant fungicide
 - Good efficacy on botrytis
 - Not disruptive to most beneficials
 - Pyrimethanil (various) (PER13633, expires Jun 2014 (renewal requested)) - Group 9 fungicide
 - Not disruptive to most beneficials
 - Protectant and curative role

Downy mildew (*Peronospora viciae*)



Seedlings can be infected soon after emergence. This can lead to stunting and death. Infection can occur on leaves and pods.

The lesions are pale yellow on the top of the leaf and grey-brown on the underside. Severe outbreaks can occur with cool-mild, showery weather.

- Downy mildew is considered a major-moderate problem in Qld and a minor problem in other states.
 - Growers alternate the use of different fungicides to reduce the resistance risk.
 - Growers would like other protective/curative fungicides for alternation.
 - Downy mildew can be a significant problem in cool-mild conditions. It can lead to significant crop losses.
- Fungicides **registered** for the control of Downy mildew in snow and sugar snap peas are:
 - Mancozeb (various) - Group M3 protectant fungicide
 - Occasionally used.
 - Moderately disruptive to some beneficial insects.
 - Zineb (ZINEB) - Group M3 protectant fungicide
 - Occasionally used.
 - It is not effective in high pressure situations.
 - Moderately disruptive to some beneficial insects.
- Fungicides listed for control of Downy mildew control in snow and sugar snap peas via **permit** are:
 - Chlorothalonil (various, PER 11964) – Group M5 protectant fungicide
 - Commonly used.
 - Used as a protectant fungicide.
 - Permitted for Downy mildew and Chocolate spot.
 - Moderately disruptive to some beneficial insects.
 - Expires 31-Mar-18.
 - Copper (various, PER 14038) - Group M1 protectant fungicide
 - Commonly used.
 - Used as a protectant fungicide.
 - Permitted for Bacterial blight, Downy mildew and Black spot.
 - Growers have concerns that copper is not effective in pressure conditions.
 - Minimal impact on most beneficial insects.
 - Expires 30-Sep-23.

- Dimethomorph + Mancozeb (ACROBAT[^] MZ/WDG) (PER13497, expires Apr 2014 (renewal requested) - Group 40+M3 - systemic, protective and curative fungicide
 - Listed for use in snow peas only.
 - Occasionally used.
 - Used as a protectant / curative fungicide.
 - It is very effective, especially in Queensland, however there is a restricted number of applications - maximum of 2 per crop.
 - Minimal impact on most beneficial insects.
- Metalaxyl-M + Mancozeb (RIDOMIL GOLD MZ[^]) (PER12399, expires Sep 2016) – Group 4+M3
 - Protective fungicide

Not all growers use every product. They generally alternate between the different fungicides. Growers believe there are some resistance issues in Qld. Growers require new fungicide options for their crops when disease pressure is at a peak.

Potential fungicides for control of downy mildew in snow and sugar snap peas.

- Cyazofamid (likely to be called RANMAN[^]?, new ISK/FMC Fungicide) – FRAC code 21 – contact and residual fungicide
 - Application for registration with the APVMA, for potatoes, brassicas and possibly brassica leafy
 - Inhibits oomycetes fungal development
 - Resistance management tool
 - The registrant should be approached for interest in developing the product on minor crops
- Ametoctradin + dimethomorph (ZAMPRO[^]) – FRAC code 21+ Group 40 – contact and residual fungicide
 - Controls late blight and downy mildew on potatoes and other crops, including vines. Overseas work on bulb vegetables, brassica vegetables, fruiting vegetables, leafy vegetables, celery and hops has been reported.
 - BASF could be approached for interest in developing the product on minor crops
- Fluopicolide is a new Bayer active in the FRAC group 43. This would be a novel group in Australia. It is a systemic fungicide affecting oomycetes. Bayer CropScience has applied for approval of the active in Australia but registration of a registered product will take some time. There is overseas registration on leafy vegetables / *Peronospora farinose*. It would be sensible to approach Bayer to discuss development opportunities.

Fusarium wilt (*Fusarium oxysporum*)



Fusarium wilt is caused by a soil fungus, *Fusarium oxysporum*. Infected plants are usually stunted; their leaves turn pale green to golden yellow and later wilt, wither, die, and drop off progressively upward from the stem base. Symptoms are yellow/green lower leaves, wilting of lower branches and red stem.

The disease spreads rapidly at temperature >20°C and can remain in the soil for >10 years.

Infected plants must be destroyed immediately to prevent the spread and crop rotation is a must.

No resistant varieties are available.

- Fusarium wilt is considered a major-moderate problem all areas, especially when crops are grown on light soils during warm weather.

It should also be noted that as a number of pathogens can be associated with wilt, management can be improved by correct diagnosis.

- No fungicides are registered for the control of *Fusarium* wilt in snow and sugar snap peas, other than the soil fumigants, eg. 1,3-dichloropropene (various registered products).

- No fungicides are listed for *Fusarium* wilt control in snow and sugar snap peas via **permit**.
- Growers need options for treatment of *Fusarium* wilt
- Growers are **managing** the disease by crop management techniques, including:
 - Varietal choice
 - Grafting onto resistant rootstocks
 - Crop rotations. Mustard has been found to be a good fumigant crop
 - Good farm and crop hygiene
 - Optimal irrigation scheduling
 - Disinfection and testing of the water supply
 - Control of fungus gnats which spread the fungus.

Powdery mildew (*Erysiphe pisi*)



This disease is found primarily on older leaves of plants and forms small, round, whitish spots on the older leaves. On closer examination, a cottony fungal growth can be seen associated with the white spots. Eventually the entire leaf will be covered with this powdery substance.

In severe cases, the leaves will turn yellow or purple and become distorted and may die prematurely resulting in extensive defoliation. Stems and pods may become infected with seeds discoloured.

- Powdery mildew is considered a major to moderate problem in Vic, NSW and SA.
 - Growers believe that the fungus is introduced into an area in diseased seed and can be spread throughout a crop by wind.
 - Growers consider crop rotation is important.
- Fungicides **registered** for the control of Powdery mildew in peas (and therefore also in snow and sugar snap peas).
 - Sulphur (various) – Group M2 fungicide
 - Disruptive of beneficials
 - Tebuconazole (various) – Group 3 fungicide.
 - Protective and curative fungicide.
 - Reports of poor efficacy
 - Triadimefon (various) - Group 3 - systemic, protective and curative fungicide
 - Growers expressed concern that with a heavy reliance resistance may develop.
 - May not have good efficacy
 - Minimal impact on all beneficial insects.
- Fungicides available in snow and sugar snap peas for the control of Powdery mildew via **permit**.
 - Potassium bicarbonate (various) – Group M2 fungicide (PER13695 / snow and sugar snap peas, exp 09/17)
 - Growers didn't comment on use of this fungicide
- **Potential** fungicides for the control of Powdery mildew.
 - There are a number of chemicals, including new entrants to the market that could be considered for development. The registrants should be consulted on suitability. Some examples of new products are:
 - Cyflufenamid (FLUTE[^]) – Group U6 fungicide.
 - Hydrogen peroxide + peroxyacetic acid (PERATEC PLUS[^]) - Group M fungicide
 - Metrafenoe (VIVANDO[^]) – Group U6 protectant fungicide
 - Proquinazid (TALENDO[^]) - Group 13 - protective fungicide

4.1.2 Summary

High Priority Diseases and control options

Growers struggle with the limited number of options available to them for alternation, increasing the risk of resistance. The industry would like new, soft options with short withholding periods.

Disease	Control option
Ascochyta blight (<i>Ascochyta</i> spp.)	<p>Currently registered fungicides Copper (various products) - Group M1 protectant fungicide Mancozeb (various) - Group M3 protectant fungicide</p> <p>Currently permitted fungicides: None</p> <p>Fungicide gaps Additional protective and curative fungicides for alternation.</p> <p>Potential fungicide solutions None nominated by growers. Fluazinam is the subject of an IR4 project on peas</p> <p>Non-chemical options Cultivation techniques, for example to allow good airflow</p>
Chocolate spot / Botrytis rot (<i>Botrytis</i> spp.)	<p>Currently registered fungicides Mancozeb (various) - Group M3 protectant fungicide</p> <p>Currently permitted fungicides Chlorothalonil (various) (PER11964, expires Mar 2018) – Group M5 protectant Fenhexamid (TELDOR[^]) (PER14211, expires Sep 2016) - Group 17 protectant Pyrimethanil (various) (PER13633, expires Jun 2014 (renewal requested)) - Group 9</p> <p>Fungicide gaps Additional protective and curative fungicides for alternation.</p> <p>Potential fungicide solutions None nominated by growers.</p> <p>Non-chemical options Cultivation techniques, for example to allow good airflow.</p>
Downy mildew (<i>Peronospora farinosa</i>)	<p>Currently registered fungicides Mancozeb (various) - Group M3 protectant fungicide Zineb (ZINEB) - Group M3 protectant fungicide</p> <p>Currently permitted fungicides Chlorothalonil (various, PER 11964) – Group M5 protectant fungicide. Copper (various, PER 14038) - Group M1 protectant fungicide. Dimethomorph + Mancozeb (ACROBAT[^] MZ/WDG) (PER13497, expires Apr 2014 (renewal requested) - Group 40+M3 - systemic, protective and curative fungicide. Metalaxyl-M + Mancozeb (RIDOMIL GOLD MZ[^]) (PER12399, expires Sep 2016) – Group 4+M3.</p> <p>Fungicide Gaps Although there are a number of registered or permitted chemicals growers believe there is some resistance. They would like further options for alternation.</p> <p>Potential fungicide solutions Ametoctradin + dimethomorph (ZAMPRO[^]) – new BASF chemistry registered for downy mildew in other crops. Cyazofamid (likely to be called RANMAN[^]?, new ISK/FMC Fungicide) – first new product registration under assessment at the APVMA. Fluopicolide, a new Bayer fungicide being assessed for first registration by the APVMA.</p> <p>Non-chemical options Crop rotation Plant spacing to improve air flow and spray penetration Resistant varieties</p>
<i>Fusarium</i> wilt (<i>Fusarium</i>)	<p>Currently registered fungicides Only soil fumigants such as 1,3-dichloropropene + chloropicrin are registered for</p>

Disease	Control option
<i>oxysporum</i>)	<p><i>Fusarium.</i></p> <p>Currently permitted fungicides None</p> <p>Fungicide gaps New, "safe" chemistry</p> <p>Potential fungicide solutions None nominated by growers</p> <p>Non-chemical options As a number of pathogens can be associated with wilt, management can be improved by correct diagnosis. Crop management techniques, including:</p> <ul style="list-style-type: none"> - Varietal choice - Grafting onto resistant rootstocks - Crop rotations - Good farm and crop hygiene - Optimal irrigation scheduling, - Disinfection and testing of the water supply - Control of fungus gnats which spread the fungus
Powdery mildew (<i>Erysiphe pisi</i>)	<p>Registered fungicides Potassium bicarbonate ((PER13695 / snow and sugar snap peas, exp 09/17)) – Group M2 fungicide Sulphur (various) – Group M2 fungicide. Tebuconazole (various) – Group 3 fungicide. Triadimefon (various) - Group 3 - systemic, protective and curative fungicide.</p> <p>Permitted fungicides None</p> <p>Fungicide Gaps No</p> <p>Potential fungicide solutions There are a number of chemicals, including new entrants to the market that could be considered for development. The registrants should be consulted on suitability. Efficacy and residue data required. Some examples of new products are: Cyflufenamid (FLUTE^) – Group U6 fungicide. Hydrogen peroxide + peroxyacetic acid (PERATEC PLUS^) - Group M fungicide Metrafenoe (VIVANDO^) – Group U6 protectant fungicide Proquinazid (TALENDO^) - Group 13 - protective fungicide</p> <p>Non-chemical options Various crop cultivation and management techniques.</p>

Fungicides currently available

Disease	Active		WHP, days	Chemical group
Bacterial Spot	Copper	(PER14038, expires Sep 2023)	1	1
Bean rust	Sulphur		NR	M2
Black Spot / Leaf Spot / Pod Spot / Ascochyta blight (<i>Ascochyta Pisi</i> and <i>Mycosphaerella Pinodes</i>)	Copper	(PER14038, expires Sep 2023)	1	1
	Mancozeb		7	M3
Chocolate Spot (<i>Botrytis Fabae</i>)	Chlorothalonil	(PER11964, expires Mar 2018)	7(H), *(G)	M5
	Mancozeb		7	M3
	Fenhexamid (TELDOR [^])	(PER14211, expires Sep 2016)	3(H), 1(G)	17
Downy Mildew	Chlorothalonil	(PER11964, expires Mar 2018)	7(H), *(G)	M5
	Copper	(PER14038, expires Sep 2023)	1	1
	Dimethomorph + Mancozeb (ACROBAT [^] MZ/WDG)	(PER13497, expires Apr 2014 (renewal requested))	7(H), *(G)	40+M3
	Mancozeb		7	M3
	Metalaxyl-M + Mancozeb (RIDOMIL GOLD MZ [^])	(PER12399, expires Sep 2016)	14	4+M3
	Zineb		3	M3
Grey Mould (<i>Botrytis Cinerea</i>)	Fenhexamid	(PER14211, expires Sep 2016)	3(H), 1(G)	17
	Mancozeb		7	M3
	Pyrimethanil	(PER13633, expires Jun 2014 (renewal requested))	3(H), *(G)	9
Powdery Mildew	Potassium Bicarbonate	(PER13695 / snow and sugar snap peas, exp 09/17)	0	M2
	Sulphur		NR	M2
	Tebuconazole		3	C
	Triadimefon		14	C
Rust	Mancozeb		7	M3
Soil borne diseases incl Fusarium, Verticillium wilts, Rhizoctonia, Pythium	1,3-dichloropropene + chloropicrin		NR	

(H)=Harvest

(G)= Grazing

NR= not required

*= do not graze or cut for stockfood

4.2 Insects of snow and sugar snap peas

Common name	Scientific name
HIGH PRIORITY	
Green peach aphid	<i>Myzus persicae</i>
Cluster caterpillar	<i>Spodoptera litura</i>
Helioverpa	<i>Helicoverpa</i> spp.
Two-spotted mite	<i>Tetranychus urticae</i>
MODERATE PRIORITY	
African Black Beetle	<i>Heteronychus arator</i>
Cutworm	<i>Agrotis</i> spp.
Green Vegetable bug	<i>Nezara viridula</i>
Looper caterpillars	<i>Chrysodeixis</i> spp.
Rutherglen bug	<i>Nysius vinitor</i>
Thrips	<i>Thrips</i> spp.
Webworm	<i>Hednota</i> spp.
Wireworm and False wireworms	<i>Elateridae, Gonocephalum</i> spp.
LOW PRIORITY	
Silverleaf whitefly	<i>Bemisia tabaci</i> Biotype B & Q
Western flower thrips	<i>Frankliniella occidentalis</i>
Biosecurity risk	
None listed	

4.2 1 High priority insects

Green peach aphid (*Myzus persicae*)



Aphids are sap-sucking insects that deposit a sugary waste that encourages the growth of a sooty mould.

Aphids can develop large colonies. They stunt young plants by sucking the sap and nutrients from leaves.

However the largest problem is contamination of produce, making it unsaleable. They also cause problems when they act as vectors for viruses.

Best management practice includes: the use of IPM compatible insecticides in combination with reliance on parasitic wasps. Beneficial species for controlling aphids - Brown lacewings, Hoverflies, Parasitic wasps and Ladybird beetles.

- Aphids are considered a major-moderate problem in all areas.
 - Aphid numbers can vary, but can be heavy.
 - Growers want IPM compatible alternatives.
- Insecticides **registered** for the control of aphids in snow and sugar snap peas are:
 - Potassium salts of fatty acids (various) – contact biological insecticide
 - Not used.
 - Minimal impact on all beneficial insects.

- Pirimicarb (various) - Group 1A contact and systemic insecticide
 - Occasionally used - only when needed.
 - Can be very effective but widespread resistance across Australia.
 - Minimal impact on most beneficial insects but harmful to Cucumeris which is used for thrips control
- Pyrethrins+piperonyl butoxide (various) – Group 3A contact insecticide
 - Good knockdown
 - Harmful to beneficials
- Sulphur (various) –insecticide
 - Useful in spray program
 - Harmful to beneficials
- Spirotetramat (MOVENTO[^]) – Group 23 contact and systemic insecticide
 - For use in snow and sugar snap peas.
 - Occasionally used - only when needed.
 - Very effective.
 - Also controls thrips and whiteflies.
 - Moderately disruptive to some beneficial insects.
- Insecticides listed for control of aphids in snow and sugar snap peas via **permit** are:
 - Petroleum oil (various) (PER12221, expires Nov 2017) – contact insecticide
 - For use in cucurbits against all aphids.
 - Occasionally used - only when needed.
 - Effective.
 - Also controls thrips and whiteflies.
 - Moderately harmful to some beneficial insects.
 - Pymetrozine (various, PER12822) – Group 9B contact and systemic insecticide
 - For use in snow and sugar snap peas.
 - Occasionally used - only when needed.
 - Very effective.
 - Also controls whiteflies.
 - Moderately disruptive to some beneficial insects.
 - Expires 30-Jun-13. Use to be registered.

Cluster caterpillar (*Spodoptera litura*)



Young larvae are smooth and grey/brown while larger larvae are patterned with red, yellow, and greenish-yellow lines. A row of black dots run along each side, and a conspicuous row of dark triangles decorate each side of the back. The adult moth is brown with a complex pattern of cream streaks criss-crossing the fore wings.

Early instars of this pest feed together in a cluster, hence the common name 'Cluster caterpillar'. Young larvae skeletonise leaves at night, while large larvae can consume whole leaves causing partial defoliation.

- Cluster caterpillar are considered a major -moderate problem in all areas.
 - Growers require a variety of IPM compatible insecticides to manage the potential for resistance.
- Insecticides **registered** for Cluster caterpillar control in snow and sugar snap peas are:
 - Bacillus Thuringiensis var Kurstaki (Btk) (various) - Group 11C contact insecticide
 - Bt is commonly used.
 - Very effective on small grubs, but needs regular reapplication.
 - Minimal impact on all beneficial insects.
 - Pyrethrins+piperonyl butoxide (various) – Group 3A contact insecticide
 - Registered with a general caterpillar claim
 - Good knockdown
 - Harmful to beneficials

- No insecticides are available for the control of Cluster caterpillar in snow and sugar snap peas via **permit**.
- Potential insecticides for the control of Cluster caterpillar in snow and sugar snap peas via **permit**:
 - Spinetoram (SUCCESS NEO[^]) - Group 5A contact and systemic insecticide
 - Commonly used in some regions - registered for loopers, WFT and Helicoverpa in now and sugar snap peas.
 - Registered for cluster caterpillar in other crops.
 - Moderately disruptive to some beneficial insects.
 - Growers expressed concern that with a heavy reliance that resistance may develop.

Heliothis (*Helicoverpa armigera* and *Helicoverpa punctigera*)



This caterpillar varies in colour from green through yellow and brown to nearly black, with pale stripe down each side. They can grow to 40-50 mm and have hairs protruding from dark spots along the body.

The most obvious damage is caused by larvae that burrow directly into developing fruit causing holes and making them unsaleable. Smaller larvae may cause pinprick holes which can act as entry points

for disease. First stage larvae can damage flowers which decreases potential yield.

Helicoverpa species feed prolifically on pods and are capable of causing large amounts of damage.

- Helicoverpa are considered a major problem in all areas.
 - Growers require a variety of IPM compatible insecticides to manage resistance.
 - In Qld and NSW, Helicoverpa numbers peak in peas after crops and pastures hay-off.
 - Growers would like insecticides registered on Helicoverpa registered for all Lepidoptera
 - Insecticide resistance has made Helicoverpa difficult to control.
- Insecticides **registered** for Helicoverpa control in snow and sugar snap peas are:
 - Bacillus Thuringiensis var Kurstaki (Btk) (various) - Group 11C contact insecticide
 - Bt is commonly used.
 - Very effective on small grubs, but needs regular reapplication.
 - Minimal impact on all beneficial insects.
 - Chlorantraniliprole (various, including CORAGEN[^]) - Group 28 contact and systemic insecticide
 - Commonly used in some regions up to twice per crop.
 - Controls all lepidoptera.
 - Very effective.
 - IPM compatible - low impact on beneficial insects and mites.
 - Diazinon (various) – Group 1B insecticide
 - Growers didn't comment on use of this chemical.
 - Helicoverpa NPV (various) – biological insecticide
 - Commonly used.
 - Very effective on small grubs, poor on larger grubs.
 - Works well in a strategy with other insecticides.
 - Minimal impact on all beneficial insects.
 - Spinetoram (SUCCESS NEO) - Group 5A contact and systemic insecticide
 - Commonly used in some regions.
 - Very effective on Helicoverpa and other pests - looper, WFT, Lightbrown apple moth, Cluster caterpillar.
 - Moderately disruptive to some beneficial insects.
 - Growers expressed concern that a heavy reliance and limited options that resistance may develop.
- No insecticides are available for the control of Helicoverpa in snow and sugar snap peas via **permit**.

Two-spotted mite (*Tetranychus urticae*)



Mites generally favour hot, dry conditions, and as the weather becomes warmer, they increase in numbers and move through the plant until the entire plant is infested. Their feeding stimulates the production of the distorted growth where they shelter and feed.

Mites are frequent pest of foliage, flowers and fruit. The mites attack new leaves causing a felt-like growth to be produced on the under-surface. This forms as small blisters but may eventually cover the entire leaf, causing it to curl.

In severe cases, whole shoots may be deformed.

The mites attack new leaves causing a felt-like growth to be produced on the under-surface. This forms as small blisters but may eventually cover the entire leaf, causing it to curl. In severe cases, whole shoots may be deformed. There can also be a problem if the mite moves from leaves onto the developing flowers and fruit. Heavily affected leaves yellow and wither from the edges, eventually turning brown.

- Two-spotted mites are considered a major pest of Vic and NSW, minor and infrequent pest of Qld, minor pest in other states.
 - Infestations are often patchy, but can quickly spread throughout the crop.
- Insecticides **registered** for the control of Two-spotted mite in snow and sugar snap peas are:
 - Potassium salts of fatty acids (various) – contact biological insecticide
 - Not used.
 - Minimal impact on all beneficial insects.
 - Propargite (various) – Group 12 C
 - No comment from growers.
 - 21 day re-entry period is restrictive.
 - Sulphur (various) –insecticide
 - Useful in spray program
 - Short term impact on beneficials
- Insecticides available for the control of Two-spotted mite in snow and sugar snap peas via **permit** are:
 - Abamectin (various, (PER12846, expires Sep 2017)) - Group 6 insecticide
 - low toxicity to non-target beneficial arthropods.
 - Good selectivity.
 - Etoxazole (various, PER13899) - Group 10B contact and systemic insecticide
 - Permit for use in snow and sugar snap peas.
 - Commonly used. Permit allows for 1 application only.
 - Very effective.
 - Moderately harmful to some beneficial insects.
 - Expires 31-Mar-15.
 - Petroleum oil (various) (PER12221, expires Nov 2017) – contact insecticide
 - For use in cucurbits against all aphids.
 - Occasionally used - only when needed.
 - Effective.
 - Also controls thrips and whiteflies.
 - Moderately harmful to some beneficial insects.

4.2.2 Summary

High Priority Insects and control options

Very few insecticides are registered for control of insects in snow and sugar snap peas. Extension of registrations for beans and peas would be helpful. There is also some new chemistry that could be considered.

At the same time growers minimise the use of chemicals by adopting IPM practices - selecting resistant varieties and healthy seeds, using techniques of crop rotation, crop monitoring and early detection and identification of the pest or disease. Growers also find that by practicing IPM the market acceptance of their products increases.

Insect	Control option
<p>Green peach aphid (<i>Myzus persicae</i>,)</p>	<p>Currently registered insecticides Potassium salts of fatty acids (various) – contact biological insecticide. Pirimicarb (various) - Group 1A contact and systemic insecticide. Pyrethrins+piperonyl butoxide (various) – Group 3A contact insecticide. Sulphur (various) – insecticide. Spirotetramat (MOVENTO[^]) – Group 23 contact and systemic insecticide .</p> <p>Currently permitted insecticides Petroleum oil (various) (PER12221, expires Nov 2017) – contact insecticide Pymetrozine (various, PER12822) – Group 9B contact and systemic insecticide</p> <p>Insecticide Gaps Alternates with good IPM fit.</p> <p>Potential insecticide solutions Flonicamid (new ISK/FMC product)– Group 9C – efficacy and residue data required. Pymetrozine (various) – IPM compatible, registered in other crops for aphids.</p> <p>Non-chemical options Best management practice includes the use of IPM compatible insecticides in combination with reliance on parasitic wasps.</p>
<p>Cluster caterpillar (<i>Spodoptera litura</i>)</p>	<p>Currently registered insecticides Bacillus Thuringiensis var Kurstaki (Btk) (various) - Group 11C contact insecticide Pyrethrins+piperonyl butoxide (various) – Group 3A contact insecticide</p> <p>Currently permitted insecticides None</p> <p>Insecticide Gaps Alternates with good IPM fit.</p> <p>Potential insecticide solutions Permits in other minor crops - Emamectin, Methomyl, Methoxyfenozide, Chlorantraniliprole (CORAGEN), Amorphous silica, indoxacarb. Insecticides registered for cluster caterpillars can be expected to be efficacious on cluster caterpillars</p> <p>Non-chemical options IPM practices</p>

Insect	Control option
<p>Helicoverpa <i>Helicoverpa</i> spp.</p>	<p>Currently registered insecticides Bacillus Thuringiensis (Bt) (various) - effective, IPM compatible. Chlorantraniliprole (various, including CORAGEN[^]) - effective, IPM compatible. Diazinon (various) – Group 1B insecticide Helicoverpa NPV (various) - effective on small grubs, IPM compatible. Spinetoram (SUCCESS NEO[^]) - effective, common use, resistance issues.</p> <p>Currently permitted insecticides None</p> <p>Insecticide Gaps Helicoverpa are resistance to many chemicals.</p> <p>Potential insecticide solutions Flubendiamide (BELT[^]) – Group 28 contact and systemic insecticide Indoxacarb (various) - Group 22A contact and systemic insecticide Metaflumizone (New BASF active). Methomyl (PER13395, expires Sep 2017) – Group 1B Methoxyfenozide (PRODIGY[^]) - Group 18 insect growth regulator Novaluron - Group 15. Farnoz and United Phosphorous have approvals of this active</p> <p>Non-chemical options IPM strategies to manage resistance. Parasites including Trichogramma wasps.</p>
<p>Two-spotted mite (<i>Tetranychus</i> <i>urticae</i>)</p>	<p>Currently registered insecticides Potassium salts of fatty acids (various) – efficacious, minimal impact on all beneficials. Propargite (various) – Group 12 C - no comment from growers, 21 day re-entry. Sulphur (various) – selective, no information on use</p> <p>Currently permitted insecticides Abamectin (various, (PER12846, expires Sep 2017)) - Group 6 insecticide Etoxazole (various, PER13899) - Group 10B contact and systemic insecticide Petroleum oil (various) (PER12221, expires Nov 2017) – contact insecticide</p> <p>Insecticide Gaps Good alternation needed as mites quickly develop resistance to chemicals</p> <p>Potential insecticide solutions Good alternation needed as mites quickly develop resistance to chemicals</p> <p>Non-chemical options IPM strategies – required to manage resistance.</p>

Insecticides currently available

Insect	Active	WHP, days	Chemical group
African Black Beetle	Chlorpyrifos (PER14074, expires Mar 2014)	NR	1B
Aphid – Green Peach	Pirimicarb	2	1A
	Spirotetramat (MOVENTO^)	3	23
Aphids	Methidathion	7	1B
	Petroleum (PER12221, expires Nov 2017)	1	–
	Pirimicarb	2	1A
	Potassium Salts Of Fatty Acids	NR	–
	Pymetrozine (PER14185, expires Jun 2015)	14(H),*(G)	9B
	Pyrethrins+Piperonyl Butoxide	1	3A
	Spirotetramat (MOVENTO^)	3	23
Armyworm	Bacillus thuringiensis kurstaki	NR	11
Cabbage Moth	Bacillus thuringiensis kurstaki	NR	11
	Trichlorfon Qld, NT only	2	1B
Cabbage White Butterfly	Bacillus thuringiensis kurstaki	NR	11
	Trichlorfon Qld, NT only	2	1B
Caterpillars	Pyrethrins+Piperonyl Butoxide	1	3A
Cutworm	Lambda Cyhalothrin (PER14033, expires May 2018)	2(H), 7(G)	3A
	Chlorpyrifos	5	1B
	Diazinon	14	1B
	Trichlorfon Qld, NT only	2	1B
False Wireworms	Chlorpyrifos (PER14074, expires Mar 2014)	NR	1B
Fruit Fly	Methyl Bromide (PER10145, PER11092, expires Oct 2014)	3	8A
Green Mired	Petroleum (PER12221, expires Nov 2017)	1	–
Green Vegetable Bug	Petroleum (PER12221, expires Nov 2017)	1	–
	Trichlorfon Qld, NT only	2	1B
Grey Cluster Bug	Petroleum (PER12221, expires Nov 2017)	1	–
Helicoverpa Armigera (Corn Earworm / Cotton Bollworm)	Bacillus thuringiensis kurstaki	NR	11
	Chlorantraniliprole (CORAGEN^)	3	28
	Spinetoram (SUCCESS NEO^)	3	5
	Diazinon	14	1B
	Helicoverpa NPV	NA	–
Helicoverpa Punctigera (Native Budworm)	Bacillus thuringiensis kurstaki	NR	11
	Chlorantraniliprole (CORAGEN^)	3	28
	Diazinon	14	1B
	Helicoverpa NPV	NA	–
	Spinetoram (SUCCESS NEO^)	3	5
Leafhoppers	Petroleum (PER12221, expires Nov 2017)	1	–
	Pyrethrins+Piperonyl Butoxide	1	3A
Lightbrown Apple Moth	Bacillus thuringiensis kurstaki	NR	11
Loopers	Bacillus thuringiensis kurstaki	NR	11
	Diazinon	14	1B
	Methidathion	7	1B
	Spinetoram (SUCCESS NEO^)	3	5
Mealybug	Potassium Salts Of Fatty Acids	NR	–
Mites	Petroleum (PER12221, expires Nov 2017)	1	–
Mite – Bean Spider	Sulphur	NR	–
Mite – Two Spotted / Red Spider	Abamectin (PER12846, expires Sep 2017)	1(H), *(G)	6
	Etoazole (PER13899, expires Mar 2015)	14(H),14(G)	10B
	Sulphur	NR	–
	Propargite (21 Day Re-Entry)	7	12C
	Potassium Salts Of Fatty Acids	NR	–
Pasture Webworm	Lambda Cyhalothrin (PER14033, expires May 2018)	2(H), 7(G)	3A

Insect	Active	WHP, days	Chemical group
	Diazinon	14	
Rutherglen Bug	Lambda Cyhalothrin (PER14033, expires May 2018)	2(H), 7(G)	3A
	Petroleum (PER12221, expires Novr 2017)	1	–
	Trichlorfon Qld, NT only	2	1B
Thrips	Lambda Cyhalothrin (PER14033, expires May 2018)	2(H), 7(G)	3A
	Methyl Bromide (PER10145, PER11092, expires Oct 2014)	3	8A
	Petroleum (PER12221, expires Novr 2017)	1	–
	Potassium Salts Of Fatty Acids	NR	–
	Pyrethrins+Piperonyl Butoxide	1	3A
Vegetable Weevil	Chlorpyrifos (PER14074, expires Mar 2014)	NR	1B
Vine Moth	Bacillus thuringiensis kurstaki	NR	11
Western Flower Thrips	Spinetoram (SUCCESS NEO^)	3	5
Whitefly	Pyrethrins+Piperonyl Butoxide	1	3A
	Potassium Salts Of Fatty Acids	NR	–
Whitefly – Greenhouse	Botanical Oil	NR	–
Whitefly - Silverleaf	Spirotetramat (MOVENTO^)	3	23
Wireworms	Chlorpyrifos (PER14074, expires Mar 2014)	NR	1B

(H)=Harvest

(G)= Grazing

NR= not required

*= do not graze or cut for stockfood

4.3 Herbicide use in snow and sugar snap peas

Herbicides **registered** for use in snow and sugar snap peas are:

- 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 registered for use in peas are:

- Chlorthal-dimethyl (various) - Group D herbicide
 - Used at time of seeding or transplanting.
 - Grass and broadleaf weeds
- Pendimethalin (various) - Group D residual herbicide
 - Occasionally used as a pre-plant for broadleaf and grass control.
 - Growers comment that does not control all weeds that occur.
- trifluralin (various) - Group D residual pre-emergent herbicide
 - Occasionally used as a pre-plant for broadleaf and grass control.
 - Growers comment that does not control all weeds that occur.

The herbicides listed for control of weeds in snow and sugar snap peas via **permit** are:

- Bentazone (various, PER10976) – Group C broadleaf selective post-emergent herbicide
 - Permit for use in snow and sugar snap peas.
 - Commonly used. Split applications allowed.
 - Considered very effective.
 - Can cause crop damage when applied in hot weather.
 - Permit expires 31-Mar-15. No manufacturer interested in registering use.
- Cyanazine (various, PER10988) – Group C broadleaf selective pre or post-emergent herbicide
 - Permit for use in snow and sugar snap peas.
 - Commonly used.
 - Considered very effective.
 - Can cause crop damage when applied to sandy soils.
 - Permit expires 31-Mar-15.
- Glyphosate (various, PER9632) – Group M pre-plant general knockdown herbicide
 - Permit for use in snow and sugar snap peas.
 - Commonly used. With a shielded sprayer between rows.
 - Considered very effective.
 - It is used to spot spray grass weeds such as couch grass post-emergent.
 - Permit expired 31-Dec-12. Applied for renewal.

Potential herbicides for control of weeds in snow and sugar snap peas:

Post emergent grass control herbicides are needed, likely from Group A. A permit for use of Stomp, which is registered for field peas, would be useful.

Summary

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 are either pre-emergent herbicides or early post-emergent herbicides.

No weeds were identified as a high priority for control and most weeds can be controlled with currently available herbicides. Some growers also use extended fallow ploughing to combat the weeds. At times they may scarify between the rows of young peas but as peas have numerous surface roots that are sensitive to disturbance this may be more harmful than beneficial. Overall peas can compete well with weeds so are not usually sensitive to weed pressure.

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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)

Acknowledgement

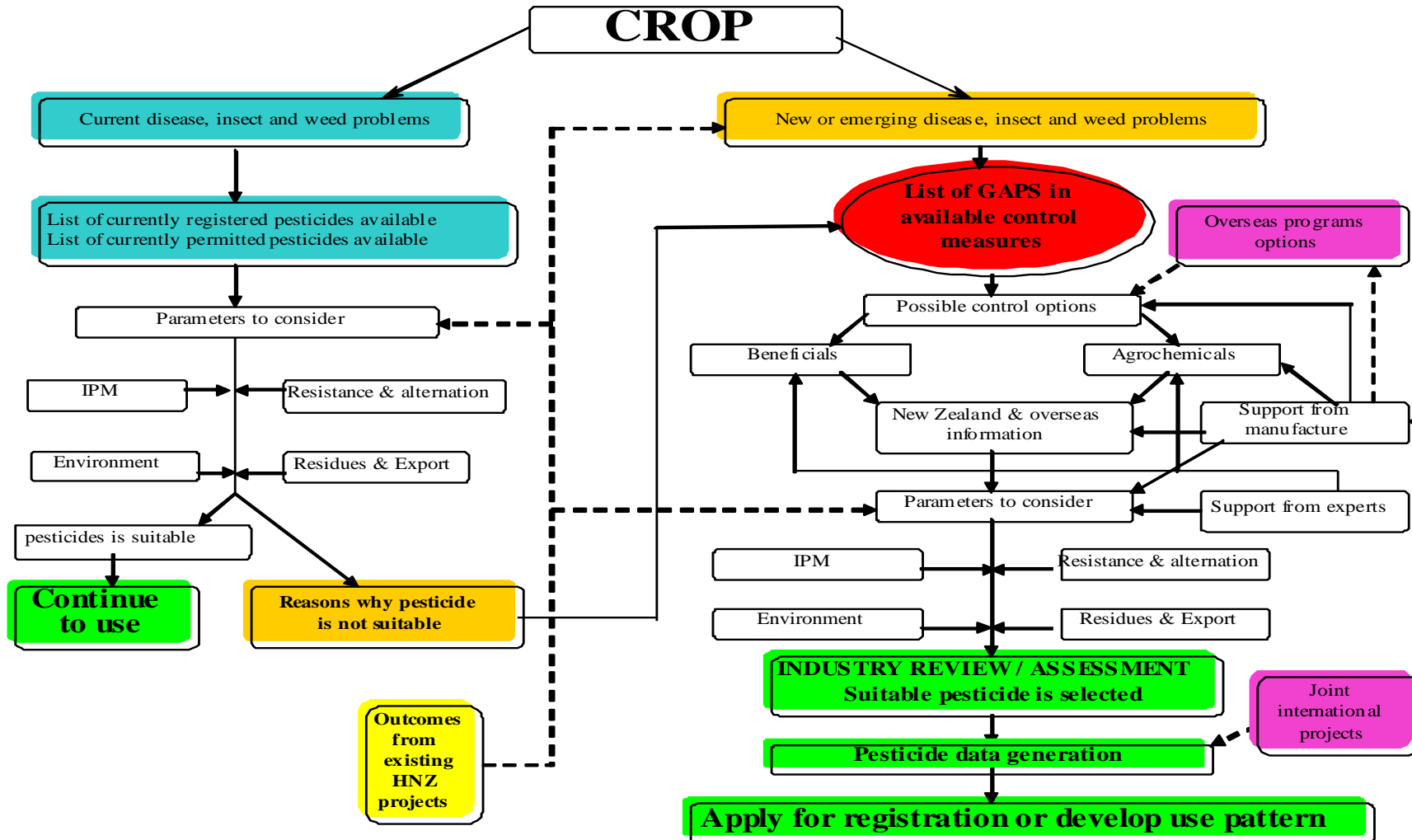
APVMA: All staff especially Alan Norden
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Industry development officers and associates

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

^Trademark

6. Appendices

DIAGRAM 1: The Strategic Agrichemical Review Process



Appendix 2 – currently available fungicides in snow and sugar snap peas.

Active		Disease	WHP, days	Chemical group
1,3-dichloropropene + chloropicrin		Soil borne diseases incl Fusarium, Verticillium wilts, Rhizoctonia, Pythium	NR	–
Chlorothalonil	(PER11964, expires Mar 2018)	Chocolate Spot Downy Mildew	7(H), *(G)	M5
Copper	(PER14038, expires Sep 2023)	Bacterial Spot Black Spot / Leaf Spot / Pod Spot (<i>Ascochyta Pisi</i> and <i>Mycosphaerella Pinodes</i>)	1	1
	(PER14038, expires Sep 2023)	Downy Mildew	1	1
Dimethomorph + Mancozeb (Acrobat^ Mz/Wdg)	(PER13497, expires Apr 2014 (renewal requested))	Downy Mildew	7(H), *(G)	40+M3
Fenhexamid	(PER14211, expires Sep 2016)	Chocolate Spot (<i>Botrytis Fabae</i>)	3(H), 1(G)	17
		Grey Mould (<i>Botrytis Cinerea</i>)		
Mancozeb		Ascochyta Blight	7	M3
		Chocolate Spot		
		Downy Mildew		
		Grey Mould (<i>Botrytis Cinerea</i>)		
		Rust		
Metalaxyl-M + Mancozeb (Ridomil Gold Mz^)	(PER12399, expires Sep 2016)	Downy Mildew	14	4+M3
Potassium Bicarbonate		Powdery Mildew	0	M2
Pyrimethanil	(PER13633, expires Jun 2014 (renewal requested))	Grey Mould (<i>Botrytis Cinerea</i>)	3(H), *(G)	9
Sulphur		Bean rust	NR	M2
		Powdery mildew		
Tebuconazole		Powdery Mildew	3	C
Triadimefon		Powdery Mildew	14	C
Zineb		Downy Mildew	3	M3

(H)=Harvest
(G)= Grazing
NR= not required
*= do not graze or cut for stockfood

Appendix 3 – currently available insecticides in snow and sugar snap peas.

Active		Insect	WHP, days	Chemical group
Abamectin	(PER12846, expires Sep 2017)	Mite-Two Spotted / Red Spider	1(H), *(G)	6
Bacillus thuringiensis kurstaki		Armyworm	NR	11
		Cabbage Moth		
		Cabbage White Butterfly		
		<i>Helicoverpa armigera</i> (Corn Earworm / Cotton Bollworm)		
		<i>Helicoverpa punctigera</i> (Native Budworm)		
		Lightbrown Apple Moth		
		Loopers		
		Vine Moth		
Botanical Oil		Whitefly – Greenhouse	NR	–
Chlorantraniliprole (CORAGEN [^])		<i>Helicoverpa Armigera</i> (Corn Earworm / Cotton Bollworm)	3	28
		<i>Helicoverpa Punctigera</i> (Native Budworm)		
Chlorpyrifos	(PER14074, expires Mar 2014)	Cutworms	5	1B
		African Black Beetle		
		False Wireworms		
		Vegetable Weevil		
		Wireworms		
Diazinon		Cutworms	14	1B
		<i>Helicoverpa Armigera</i> (Corn Earworm)		
		<i>Helicoverpa Punctigera</i> (Native Budworm)		
		Loopers		
		Pasture Webworms		
Etoxazole	(PER13899, expires Mar 2015)	Mite-Two Spotted	14(H), 14(G)	10B
Helicoverpa NPV		Helicoverpa Armigera (Corn Earworm)	NA	–
		Helicoverpa Punctigera (Native Budworm)	NA	–
Lambda Cyhalothrin	(PER14033, expires May 2018)	Cutworm	2(H), 7(G)	3A
		Pasture Webworm		
		Rutherglen Bug		
		Thrips		
Methyl Bromide	(PER10145, PER11092 expires Oct 2014)	Fruit Fly	3	8A
Petroleum	(PER12221, expires Nov 2017)	Aphids	1	–
		Green Mired		
		Green Vegetable Bug		
		Grey Cluster Bug		
		Leafhoppers		
		Mites		

Active		Insect	WHP, days	Chemical group
		Rutherglen Bug		
		Thrips		
Pirimicarb		Aphid – Green Peach	2	1A
		Aphids		
Potassium Salts Of Fatty Acids		Aphids	NR	–
		Mealybug		
		Thrips		
		Two Spotted Mite / Spider Mite		
		Whitefly		
Propargite (21 Day Re-Entry)		Two Spotted Mite / Spider Mites	7	12C
Pymetrozine	(PER14185, expires Jun 2015)	Aphids	14(H),*(G)	9B
Pyrethrins+Piperonyl Butoxide		Ants	1	3A
		Aphids		
		Caterpillars		
		Leafhoppers		
		Thrips		
		Whiteflies		
Spinetoram (SUCCESS NEO^)		Helicoverpa Armigera (Corn Earworm / Cotton Bollworm)	3	5
		Helicoverpa Punctigera (Native Budworm)		
		Loopers		
		Western Flower Thrips		
Spirotetramat (MOVENTO^)		Aphid – Green Peach	3	23
		Aphids		
		Silverleaf (Poinsettia)		
		Whitefly		
Sulphur		Mite – Bean Spider	NR	–
		Mite – Two Spotted / Red Spider		
Trichlorfon		Cabbage Moth	2	1B
		Cabbage White Butterfly		
		Cutworms, Qld, NT only		
		Green Vegetable Bug		
		Rutherglen Bug		

(H)=Harvest

(G)= Grazing

NR= not required

*= do not graze or cut for stockfood

Appendix 4 – currently available herbicides in snow and sugar snap peas.

Weed	Active	WHP, days	Chemical group
Broadleaf-Label	Bentazone (PER10976, expires Mar 2015)	28(H), *(G)	C
Broadleaf-Label	Cyanazine (Registered, Tas only; PER10988, expires Mar 2015)	28(H), *(G)	C
Grass And Broadleaf	Glyphosate (PER13901, expires Jun 2019)	NR	M
Grass And Broadleaf	Chlorthal-dimethyl	NR	D