Beans and Peas

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 beans and peas 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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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 beans and peas were conducted in Queensland, New South Wales and Tasmania as part of combined vegetable meetings in 2008, 2010 and 2011. The results of the process provide the beans and peas 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)
Damping off	*Pythium* spp*., Phytophthora* spp*., Fusarium* spp., *Rhizoctonia* spp.
Sclerotinia mould	*Sclerotinia sclerotiorum*

There are few control options for the major diseases of beans and peas. This is a problem as growers prefer to alternate the use of fungicides within a crop and through crop rotations.

Beans and peas are crops where growers turn to non-chemical solutions, partly due to lack of approved pesticides, but partly also by choice. Integrated crop and disease management strategies are considered best practice in many cases. Nevertheless there remain considerable gaps and growers would like the newer fungicide entrants to the market to be considered for beans and peas.

INSECTS

Insects identified as high priorities:

Insect (common name)	Insect (scientific name)
Helioverpa	*Helicoverpa* spp*.*
Bean podborer	*Maruca vitrata*
Thrips, including Bean Blossom Thrips, Western flower thrips	*Megalurothrips usitatis, Frankliniella occidentalis*

There are a considerable number of insecticides registered for use in beans and peas. However it would be helpful if a registrations in specific pea and bean crops could be extended to beans and peas more broadly. It would also be helpful if registrations for Helicoverpa covered Lepidoptera more extensively.

Some soft chemistry is available but growers would welcome registration of others to use in alternation, particularly as the use of the older, broader spectrum chemistry is disruptive to beneficials that are important for control of Helicoverpa and as resistance is a risk.

IPM is practiced widely and includes strategies of pest monitoring, spray timing, protection of beneficials and control of weed hosts.

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. Most weeds can be controlled with currently available herbicides.

2. The Australian bean and pea industry

The Australian bean and pea industries are well established, resourceful horticultural industries, which are always looking for systems to improve production efficiencies. Consumption of beans and peas has remained relatively stable over the past few years. Beans were Australia's 10th largest vegetable crop in 2008/09, accounting for 2.4% of total vegetable production (Ausveg 2011).

Beans are grown across Australia with the main growing regions being:

- Qld - Burdekin, Bowen, Bundaberg, Stanthorpe, Lockyer Valley, Gympie
- Tas - north west
- NSW - mid north coast
- Vic - Gippsland, Murray Valley
- WA - Carnarvon, Perth metro
- SA - Adelaide plains

In 2010, Queensland accounted for 54% of bean production, Tas 25% and NSW 12%.

In 2008/09, the area planted to beans (butter, French and runner) was 4,507 ha by 317 growers, production was 12,259 tonnes with a gross value of $70.7 mill. Production has fluctuated between butter, French and runner beans varieties. (Ausveg 2011).

Peas are grown across Australia with the main growing regions being:

- Tas - north west
- Vic - Gippsland, Murray Valley
- NSW - Griffith, Sydney basin
- Qld – Stanthorpe, Brisbane metro area
- WA - Perth metro
- SA - Adelaide plains

In 2010, Queensland accounted for 54% of bean production, Tas 25% and NSW 12%.
In 2010/ 11 a total area of 6 054 ha of French and Runner beans was planted yielding 37 818 tonnes of product, with a total value of $129.6 Mill.

In 2010/11, the area planted to peas (fresh & processing) was 3,333 ha by 306 growers, production was 14,205 tonnes with a gross value of $8.3 mill. (Ausveg 2011). Processing peas accounts for 3,006 ha and 13,392 tonnes of the total pea production.

Due to Australia's varying weather conditions, various production locations and the introduction of different varieties of beans and peas, the Australian industry is now able to supply the domestic markets with fresh beans and peas throughout the year.

3. Introduction

3.1 Introduction

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 beans and peas 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 beans and 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 beans and peas as a major crop. The crop fits within the APVMA crop group 014 Legume vegetables (succulent seeds and immature pods).

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

3.2 Minor-use permits and registration

APVMA classify beans and peas and the crop group, legume vegetables as major crops. Therefore access to minor use permits can be difficult, and will only be granted for limited uses within the crop. 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 lettuce industry is for manufacturers to register new pesticides uses in the crop.

3.3 Methods

The SARP was conducted in Queensland, New South Wales and Tasmania 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 lettuces 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 lettuce industry 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 beans and peas

4.1 Diseases of beans and peas

Common name	Scientific name
HIGH PRIORITY	
Damping off (beans & peas)	*Pythium* spp., *Phytophthora* spp. *Fusarium* spp., *Rhizoctonia* spp.
Sclerotinia mould (beans & peas)	*Sclerotinia sclerotiorum*
MODERATE PRIORITY	
Ascochyta blight	*Ascochyta* spp.
Anthracnose	*Colletotrichum lindemuthianum*
Bacterial brown spot	*Pseudomonas syringae pv. Syringae*
Blight	*Mycosphaerella pinodes*
Botrytis	*Botrytis* spp.
Common bacterial blight	*Xanthomonas campestris pv. Phaseoli*
Downy mildew	*Peronospora viciae*
Fusarium wilt	*Fusarium* spp.
Halo blight	*Pseudomonas syringae pv. Phaseolicola*
Leaf blight	*Ascochyta fabae*
Leaf & pod spot	*Ascochyta pisi*
Powdery mildew	*Erysiphe pisi*
Rust	*Uromyces* spp.
Stem blight	*Macrophomina* spp.
LOW PRIORITY	
Angular leaf spot	*Phaeoisariopsis griseola*
Black spot	*Phoma medicaginis var. pinodella*
Root rot	*Rhizoctonia solani*
Biosecurity risk	
None listed	

4.1.1 High priority diseases

Damping off (*Pythium* spp., *Phytophthora* spp., *Fusarium* spp., *Rhizoctonia* spp.)

Pythium, Phytophthora and Fusarium can cause pre-emergent rots and in some cases damping-off of young plants. Symptoms include water-soaked lesions with eventual collapse of the hypocotyl at or below ground. Plants become yellow and stunted if they survive. Occasionally, older plants are infected and develop water-soaked lesions that extend some distance up the stem, causing a linear band of dead cortical tissue. Common when temperatures vary dramatically with high soil moisture.

Rhizoctonia causes post-emergence damping-off of the seedling. Heavy infection will girdle the stem and the seedlings may die. Stems and roots can exhibit red lesions. Often the lesions heal over as the plant ages. Rhizoctonia root canker also occasionally occurs on the upper tap roots of older plants as discrete, reddish brown lesions and is common in lighter soils.

- Damping-off is considered a major-moderate problem in all states.
    - This is a plant establishment problem only.
    - Management strategies used by growers for this disease include crop rotation and alternation of chemicals from different fungicide groups.

- Fungicides registered for the control of Damping-off in beans and peas are:
    - 1,3-dichloropropene + chloropicrin (various products) fumigant
        - Restricted chemical
        - Broad vegetable claim for control of soil borne diseases as pre-plant treatment
        - Schedule 7 dangerous poison

    - Metalaxyl / Metalaxyl-M (various) - Group 4 – systemic seed treatment fungicide:
        - Registered in peas.
        - Occasionally used up by some growers.
        - Only used in known problem areas.
        - Does not provide control for long enough in adverse situations.
        - Works well when conditions are favourable.
        - Minimal impact on all beneficial insects.

    - Thiram (various) - Group M3 protectant fungicide
        - Registered in peas and beans as a seed treatment.
        - Registered as a drench for beans (Qld only)
        - There have been reports of lack of efficacy.
        - Minimal impact on all beneficial insects.

    - Thiram+Thiabendazole (various) - Group M3+1 protectant fungicide
        - Registered as a seed dressing in peas.
        - Registered to control seedling root rots (*Fusarium* spp, *Pythium* spp., *Macrophomina Phaseolina*).

- No fungicides are listed for the control of Damping-off in beans and peas via permits.

- Potential fungicide solutions

    - 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. Efficacy on *Pythium* spp.

- Non-chemical options
    - Crop rotation with gramineous or biofumigant crops
    - Disease-resistant varieties
    - Alternation of sowing dates to favour cooler, drier months
    - Avoidance of throwing soil up over the plants during inter-row cultivation
    - Consider disease species in the site when making planting decisions

Sclerotinia mould (*Sclerotinia sclerotiorum*)

Sclerotinia produce prominent white, cottony mycelium covering affected plant parts. Initial lesions are small, circular, water-soaked and light green but rapidly increase in size. Affected tissues dry, turn brown, and may be covered with a white, cottony mycelium. Sclerotia form in infected tissue and entire branches or plants may be killed. Survival structures, known as sclerotia, which are about 1 mm in diameter and black in colour, develop on diseased tissue and within killed stems.

- Sclerotinia mould is considered a major-moderate problem in all states.

- Crop rotation critical to minimise disease. But as many alternate crops are also affected due to the wide host range, crop rotation alone is not in itself a solution.
- The industry desperately needs alternatives.

- Fungicides registered for the control of Sclerotinia mould in beans and peas.
  - Cyprodinil+fludioxonil (SWITCH^) Beans, Green Peas / Sclerotinia minor and Sclerotinia sclerotiorium

- Fungicides listed for Sclerotinia mould control in beans and peas via permits are:
  - Azoxystrobin (various) (PER13123, expires Mar 2014) – Group 11 protectant and curative fungicide
    - Protective and systemic fungicide.
    - Allowed in beans only.
    - Occasionally used in high pressure areas.
    - It is very effective but considered very expensive.
    - Minimal impact on all beneficial insects.
    - The expectation of the industry is that Syngenta will register the use.

  - Boscalid (FILAN^) – Group 7 protectant and curative fungicide
    - legume vegetables, field grown only.
    - Commonly used in high pressure areas.
    - It is very effective but considered very expensive.
    - Efficacy has been reported as better in some states than others. Poor in Qld. Reported as better than procymidone in Vic.
    - Minimal impact on all beneficial insects.

- Potential fungicides for the control of Sclerotinia in beans and peas:

Growers alternate between the different fungicides. Sclerotinia rot can be a significant problem in cool wet conditions which can lead to significant crop losses. Growers feel they need more systemic/curative options. The control of this disease needs a management strategy put in place to reduce the risk of resistance to the currently available products.

There is a new fungicide Penthiopyrad (FONTELLIS^, protective & systemic) with registration in brassica vegetables, brassica leafy vegetables and leafy vegetables for Sclerotinia mould control. It is not currently registered or on permit for use in beans and peas but is very effective in controlling the disease. Fontelis is a group 7 fungicide in the same group as Filan. The permit for Filan use on beans expires on 30-Jun-14 so if the permit is not renewed for Filan, Fontelis may be a possible alternative

4.1.2 Disease control options

Disease	Active	Crop	WHP, days	Chemical group
Angular Leaf Spot	Mancozeb	Beans, peas	7(H), 14(G)	M3
Anthracnose	Mancozeb	Beans, Peas	7(H), 14(G)	M3
	Metiram	Beans	7	M3
	Zineb	Beans	7	Y
Ascochyta Blight / Late Blight	Copper Oxide, Copper ammonium complex, Copper oxychloride, Copper Sulphate	Peas	1	M1
	Mancozeb	Beans, Peas		M3
Black Spot (Ascochyta Pisi, Mycosphaerella Pinodes, Phoma Medicaginis Var. Pinodella)	Chlorothalonil (PER11451, expires Jun 2018)	Garden Peas	7(H), *(G)	M5
Black Spot (Leaf And Pod Spot And Collar Rot)	Thiram+ Thiabendazole	Peas, seed dressing	NR	M3+1
Bacterial Brown Spot	Copper Ammonium	Beans	1	M1

Disease	Active	Crop	WHP, days	Chemical group
	Complex, Copper Oxide, Copper Sulphate			
Bacterial Spot / Bacterial Blight	Copper Oxychloride, Copper Ammonium Complex, Copper Oxide, Copper Sulphate	Peas	1	M1
Blight - Common	Copper Oxychloride, Copper Ammonium Complex, Copper Oxide, Copper Sulphate	Beans	1	M1
Blight - Halo	Copper Oxychloride, Copper Ammonium Complex Copper Ammonium Complex, Copper Oxide, Copper Sulphate	Beans	1	M1
Botrytis - Chocolate Spot	Copper Oxychloride, Copper Ammonium Complex, Copper Oxide	Beans	1	M1
	Mancozeb	Beans, Peas		M3
Botrytis - Grey Mould (*Botrytis Cinerea)*	Cyprodinil+fludioxonil (SWITCH^)	Green peas	14	9+
Downy Mildew	Chlorothalonil	Pea		M1
	Metalaxyl / Metalaxyl-M	Peas (NSW, Tas, SA, WA)		
	Phosphorous Acid (PER11951, expires Mar 2015)	Processing Peas	NR	_
	Zineb	Peas	7	Y
Powdery Mildew	Sulphur	Vegetables	NR	M2
	Tebuconazole	Peas	3(H, G)	3
	Triadimefon	Peas	14	C
Rust	Bitertanol (BAYCOR)	Beans	3	C
	Copper Oxide, Copper Sulphate	Beans	1	M1
	Mancozeb	Beans, Peas	7(H), 14(G)	M3
	Metiram (POLYRAM)	Beans	7	M3
	Oxycarboxin (PLANTVAX^)	Bean	7	G
	Tebuconazole	Bean	3(H, G)	3
	Zineb	Beans	7	Y
Rust - Bean	Sulphur	Vegetables	NR	M2
Sclerotinia	Azoxystrobin (PER13123, expires Mar 2014)	Beans	1	21
	Boscalid	Legume vegetables	7	7
	Cyprodinil+fludioxonil (SWITCH^)	Beans, Green Peas	14	9+12
Seed Decay, Seedling Rot	Thiram	Peas, Beans, seed treatment (Qld, Vic, Tas, SA only)		
Seedling Root Rots (*Fusarium* spp, *Pythium* spp., *Macrophomina Phaseolina*)	Thiram+ Thiabendazole	Peas, seed dressing	NR	M3+1
Soil Borne Disease - Damping Off	Thiram	Beans, drench (Qld only); Peas, Beans, seed treatment (Qld, Vic, Tas, SA only)	7	
Soil Borne Disease - Damping-Off	Metalaxyl / Metalaxyl-M	Peas		

Disease	Active	Crop	WHP, days	Chemical group
Soil Borne Diseases Incl Fusarium, Verticillium Wilts, Rhizoctonia, Pythium	1,3-Dichloropropene + Chloropicrin	Vegetables	NR	_

4.2 Insects of beans and peas

Common name	Scientific name
HIGH PRIORITY	
Helioverpa	*Helicoverpa* spp.
Bean podborer	*Maruca vitrata*
Thrips, including Bean Blossom Thrips, Western flower thrips	*Megalurothrips usitatis, Frankliniella occidentalis*
MODERATE PRIORITY	
Bean fly	*Ophiomyia phaseoli*
Bean spider mite	*Tetranychus ludeni*
Green peach aphid	*Myzus persicae*
Green vegetable bug	*Nezara viridula*
Thrips	*Thrips imaginis, T tabaci*
Rutherglen bug	*Nysius vinitor*
Silverleaf whitefly	*Bemisia tabaci Biotype B*
Two-spotted mite	*Tetranychus urticae*
LOW PRIORITY	
Looper caterpillars	*Chrysodeixis* spp.
Biosecurity risk	
None listed	

4.2.1 High priority insects

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

This caterpillar varies greatly in appearance. They can reach lengths of 50 mm. It is generally initially pale green, sometimes with black dots, and a pattern of thin dark lines running along the body, the lines being darker around the second and third segments. Later the dark lines become less conspicuous, and the black spots develop red areas around them. There is a lot of variation in colour in this species. Some have white spots instead of black.

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

Newly hatched larvae are 1.5 mm long creamy in colour, hairy and have a dark brown head capsule. Older larvae vary greatly in colour and can be green, pink, buff,or brown. The larvae have distinct lateral (side) stripes and visible hairs. Helicoverpa species feed prolifically on leaves and pods and are capable of causing large amounts of damage.

- Helicoverpa are considered a:
    - Moderate-major problem in all areas.

- Heliothis is of major concern as pods are developing.
- *Helicoverpa armigera*, are known to develop insecticide resistance quickly. Effective rotation of soft option products and knowledge of IPM (Integrated Pest Managment) practices will maximise control of this pest.

- Insecticides registered for Helicoverpa control in beans and peas are:
  - *Bacillus thuringiensis subsp. kurstaki* (various) - Group 11C contact insecticide
    - Registered in legume vegetables.
    - Btk is commonly used in bean and pea crops.
    - Very effective on small grubs, but needs regular application based on pest pressure.
    - 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.
  - Esfenvalerate (various) – Group 3A contact and ingestion insecticide
    - Registered in legume vegetables.
    - Occasionally used in some regions .
    - Considered effective.
    - Only used to get 'back in control' of grubs.
    - Moderately harmful to harmful to many beneficial insects.
  - Helicoverpa NPV (various) – biological insecticide
    - Registered in legume vegetables.
    - Commonly used.
    - Very effective .
    - Minimal impact on all beneficial insects.
  - Methomyl (various) - Group 1A contact and ingestion insecticide
    - Registered in beans only.
    - Occasionally used in some regions .
    - Very effective on a range of pests, including thrips.
    - Moderately disruptive to beneficial insects.
  - Permethrin (various) - Group 3A contact and ingestion insecticide
    - Registered in legume vegetables.
    - Occasionally used in some regions .
    - Considered effective.
    - Only used to get 'back in control' of grubs.
    - Moderately disruptive to beneficial insects.
  - Spinetoram (SUCCESS NEO^) - Group 5A contact and ingestion insecticide
    - Registered in legume vegetables.
    - Commonly used.
    - Very effective on a range of pests, including thrips.
    - Minimal impact on beneficial insects.

- No additional insecticides are available for the control of Helicoverpa in beans and peas via permit.

Growers are reporting that some insecticides are less effective and tolerance is suspected. Growers are trying to manage this issue with the selective use of insecticides and increasing reliance on beneficial insects. Growers would like insecticides that are currently registered for use on Helicoverpa registered for all lepidoptera species.

Bean Pod Borer (*Maruca vitrata*)

Daff Qld website, accessed 14 March 2014

Bean podborer shelters within the plant canopy during the day then feeds at night on buds and flowers, boring into the developing pod to eat the seeds. Sesbania is a favoured weed host.

Bean pod borer is considered by some growers as a major pest of beans as it is difficult to distinguish the damage it causes from heliothis when they are both present.

- Insecticides registered for the control of been pod borer:
  - Methomyl (various) - Group 1A contact and ingestion insecticide
    - Registered in beans only.
    - Occasionally used in some regions .
    - Very effective on a range of pests, including thrips.
    - Moderately disruptive to beneficial insects.

- Potential insecticides for the control of been pod borer:
  - Pesticides effective against *Helicoverpa* (except *Helicoverpa virus*) will most likely control been pod borer

- IPM strategies:
  - IPM strategies need to be employed. The use of broad spectrum insecticides before flowering will reduce the populations of natural predators so should be avoided. However, if the bean pod borer numbers are above about 10 per square metre beneficials are unlikely to control the population.
  - Targeting insecticide use to the time after egg hatch and before larvae enter pods can minimise the amount of insecticide needed
  - Rotation with other crops
  - Control of weed hosts

Thrips

including Bean Blossom Thrips, Western Flower Thrips (*Megalurothrips usitatis, Frankliniella occidentalis*)

Thrips species found in Green Bean crops
(Source J. Duff DAFF(Qld))

While thrips can cause direct damage to foliage and fruit, their role as vectors disease is also of concern. They are weak fliers but are capable of infesting large areas of crop as they are easily blown by wind.

A number of thrips species impact beans and peas. Recent research identifies bean blossom thrips causing much more damage than WFT. In peas, onion thrips are the most likely to cause damage. Thrips cause 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 approx 15-20 days.
WFT do not cause as much damage to bean pods as Bean Blossom Thrips *Megalurothrips usitatus*. It only takes 1 Megalurothrips to cause up to 50% pod damage while up to 5 WFT may only cause less than 20% pod damage. (HAL, 2012)

- Thrips are considered a major / moderate problem in most states except Tasmania where they have not been reported.
    - All insecticides are 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. 13 species of thrips have been identified from bean flowers alone (Project final report VG07017)
    - WFT develop resistance more easily than other thrips species.
    - Growers need multiple options and a better understanding of the damage the various species cause if any.

- Insecticides registered for the control of Western flower thrips in beans and peas are:
    - Dimethoate (various) – Group 1B contact and systemic insecticide.
        - Occasionally used for the control of a range of pests.
        - It is reported to still be effective.
        - This treatment is disruptive to beneficial insects in an IPM situation.
    - Esfenvalerate (various) – Group 3A
        - For the control of Plague thrips
        - Not IPM compatible
    - Methomyl (various) - Group 1A contact and ingestion insecticide
        - Registered in French beans and in peas for control of pea thrips.
        - Effective on a range of pests, including thrips.
        - Moderately disruptive to beneficial insects.
    - Paraffinic oil / petroleum oil (various) – contact insecticide
        - General thrips claim.
        - Moderately harmful to some beneficial insects.
    - Potassium salts (various) – contact biological insecticide
        - Also controls some other pests.
        - Minimal impact on all beneficial insects.
    - Pyrethrins+piperonyl butoxide (various) – Group 3A contact insecticide
        - Knockdown.
        - General thrips claim
        - Harmful to beneficials.
    - Spinetoram (SUCCESS NEO^) - Group 5A contact and ingestion insecticide
        - Registered in legume vegetables for WFT.
        - Commonly used in some regions.
        - Very effective on a range of pests, including helicoverpa.
        - Moderately disruptive to beneficial insects.
        - Growers want rotation products to minimise chance of creating resistance.
    - Spirotetramat (MOVENTO^) – Group 23 contact and systemic
        - Registered for beans / tomato thrips, WFT
        - Very effective.
        - Reported as expensive.
        - Also controls other pests.
        - Moderately harmful to some beneficial insects.

- No insecticides are listed for control of Western flower thrips in beans and peas via permits.

- Potential insecticides for control of thrips.
    - chlorantraniliprole + thiamethoxam + (DURIVO^) - Group 4A + 28 contact and systemic insecticide
        - Registered in other vegetables as a seedling drench or soil drench for aphids, lepidoptera, whitefly and thrips.
        - Effective but moderately harmful to some beneficial insects.

    - Sulfoxaflor (TRANSFORM^) – Group 4C insecticide
        - Thrips registrations in a range of vegetables
        - May have adverse effects on parasitic wasps in IPM situations.

- IPM strategies

    - It is important to try and control thrips before flowering as once the flowers open and thrips and inside the flowers then chemical control is very difficult and bean and pea flowers are not as open as other crop flowers.
    - Thrip populations fluctuate throughout the growing season with numbers highest during the spring/summer dropping off during autumn, so the knowledge of population dynamics is important
    - It would be important to look at the range of thrips species and the damage that they cause to the plant and pods in particular as not all those found in flowers would be causing damage or significant damage.

4.2.2 Summary

There are a considerable number of insecticides registered for use in beans and peas. However it would be helpful if a number of registrations in specific pea and bean crops could be extended to beans and peas more broadly. It would also be helpful if registrations for Helicoverpa covered Lepidoptera more extensively.

Some soft chemistry is available but growers would welcome registration of others to use in alternation, particularly as the use of the older, broader spectrum chemistry is disruptive to beneficials that are important for control of Helicoverpa and as resistance is a risk.

IPM is practiced widely and includes strategies of pest monitoring, spray timing, protection of beneficials and control of weed hosts.

Currently available insecticides

Insects	Active	Crop	WHP, days	Chemical group
African Black Beetle	Chlorpyrifos (PER14074, expires Mar 2014)	Beans, Snow Peas, Sugar Snap Peas	NR	1B
Ants	Pyrethrins+Piperonyl Butoxide	Vegetables	1	3A
Aphids	Dimethoate	Beans, peas	7	1B
	Methidathion	Beans, peas (Qld, Vic, Tas, SA, WA)	7	1B
	Paraffinic oil, petroleum oil	Beans	1	
	Potassium Salts Of Fatty Acids	Vegetables	NR	-
	Pyrethrins+Piperonyl Butoxide	Vegetables	1	3A

Insects	Active	Crop	WHP, days	Chemical group
Aphid – Green Peach	Spirotetramat (MOVENTO^)	Beans, peas	7(H), 7(G)	23
Aphid - Cow pea aphid (NSW, WA)	Dimethoate	Beans, peas	7	1B
Armyworm	*Bacillus thuringiensis subsp. kurstaki*	Vegetables	NR	11
Bean fly	Dimethoate	Beans, peas	7	1B
	Methomyl	French beans	1	1A
Bean pod borer	Methomyl	French beans	1	1A
Cabbage Moth	*Bacillus thuringiensis subsp. kurstaki*	Vegetables	NR	11
	Trichlorfon	Vegetables	2	1B
Cabbage White Butterfly	*Bacillus thuringiensis subsp. kurstaki*	Vegetables	NR	11
	Trichlorfon	Vegetables	2	1B
Caterpillars	Pyrethrins+Piperonyl Butoxide	Vegetables	1	3A
Caterpillar - Cluster	Methomyl (PER13395, expires Sep 2014)	Flower Bean, Snake Bean, Faba Bean, Winged Bean	3	1A
Cucumber fly	Dimethoate	Beans, peas	7	1B
Cucumber Moth	Spinetoram (SUCCESS NEO^)	Beans, peas	3(H), 14(G)	5
Cutworms	Trichlorfon	Beans, Peas (Qld, NT only)	2	1B
Fruit fly	Dimethoate	Beans, peas	7	1B
Green Vegetable Bug	Dimethoate	Beans, peas	7	1B
	Methomyl	French beans	1	1A
	Trichlorfon	Vegetables	2	1B
Helicoverpa	*Bacillus thuringiensis subsp. kurstaki*	Vegetables	NR	11
	Chlorantraniliprole (CORAGEN^)	Legume vegetables	1	28
	Esfenvalerate	Beans (*H. punctigera* only, peas (*H. armigera* and *H. punctigera*)		3A
	Methomyl	French Beans, Peas	3	1A
	Nuclear Polyhedrosis Virus (*H. armigera* and *H. punctigera*)	Beans, Peas	-	-
	Permethrin 40:60	Beans, Peas		3A
	Spinetoram (SUCCESS NEO^)	Beans, peas	3(H)14(G)	5
Jassids	Dimethoate	Beans, peas	7	1B
Leaf hoppers	Dimethoate	Beans, peas	7	1B
	Paraffinic oil, petroleum oil	Beans	1	
	Pyrethrins+Piperonyl Butoxide	Vegetables	1	3A
Leafmining fly	Dimethoate	Beans, peas	7	1B
Lightbrown Apple Moth	*Bacillus thuringiensis subsp. kurstaki*	Vegetables	NR	11
Loopers	*Bacillus thuringiensis subsp. kurstaki*	Vegetables	NR	11
	Methidathion	Peas (Qld, Vic, Tas, SA, WA)	7	1B

Insects	Active	Crop	WHP, days	Chemical group
	Methomyl	French Beans, Peas	1	1A
Mealybug	Potassium Salts Of Fatty Acids	Vegetables	NR	-
Mites	Dimethoate	Beans, peas	7	1B
	Paraffinic oil, petroleum oil	Beans	1	
Mite – Two Spotted (Red Spider)	Bifenazate (PER12906, expires Mar 2018)	Snake Beans	1(H), *(G)	UN
	Potassium Salts Of Fatty Acids	Vegetables	NR	-
	Propargite	Beans, vegetables	7	12C
	Sulphur	Vegetables	NR	
Mite - Red legged earth	Dimethoate	Beans, peas	7	1B
Plant parasitic nematodes	1,3-Dichloropropene + Chloropicrin	Vegetables	NR	8B
Rutherglen Bug	Trichlorfon	Vegetables	2	1B
Symphylans (garden centipedes)	1,3-Dichloropropene + Chloropicrin	Vegetables	NR	8B
Thrips	Dimethoate	Beans, peas	7	1B
	Methyl bromide (PER10145 (Tas) expires Oct 2019), 11092 (Qld), expires Oct 2020)	Food Producing Plants (Not Persons Generally)	3	8A
	Paraffinic oil, petroleum oil	Beans	1	
	Potassium Salts Of Fatty Acids	Vegetables	NR	-
	Pyrethrins+Piperonyl Butoxide	Vegetables	1	3A
Thrips - Pea	Methomyl	French Beans, Peas	1	1A
Thrips - Plague	Esfenvalerate	Beans, peas		3A
Thrips - Tomato	Spirotetramat (MOVENTO^)	Beans	7(H), 7(G)	23
Thrips – Western flower	Spirotetramat (MOVENTO^)	Beans	7(H), 7(G)	23
	Spinetoram (SUCCESS NEO^)	Beans, peas	3(H), 14(G)	5
Vegetable Weevil	Chlorpyrifos (PER14074, expires Mar 2014)	Beans, Snow Peas, Sugar Snap Peas	NR	1B
Vine Moth	*Bacillus thuringiensis subsp. kurstaki*	Vegetables	NR	11
Whiteflies	Pyrethrins+Piperonyl Butoxide	Vegetables	1	3A
	Potassium Salts Of Fatty Acids	Vegetables	NR	-
Whitefly - Greenhouse	Botanical oil	Vegetables	NR	
Whitefly-Silverleaf	Spirotetramat (MOVENTO^)	Beans, peas	7(H), 7(G)	23
	Bifenthrin (PER12947, exp Apr 2015)	Beans	2(H), *(G)	3A
Wingless grasshoppers	Dimethoate	Beans, peas	7	1B
Wireworms	1,3-Dichloropropene + Chloropicrin	Vegetables	NR	8B
	Chlorpyrifos (PER14074, expires Mar 2014)	Beans, Snow Peas, Sugar Snap Peas	NR	1B
Wireworms - False	Chlorpyrifos (PER14074, expires Mar 2014)	Beans, Snow Peas, Sugar Snap Peas	NR	1B

4.3 Weeds of beans and peas

- Registered herbicides that are used in beans and peas:
    - Acifluorfen (BLAZER^) – Group G in-crop herbicide.
        - For beans only to control Amaranthus.
        - Occasionally used.
        - Considered very effective.
    - Bentazone (various) – Group C broadleaf selective post-emergent herbicide.
        - For beans only.
        - Occasionally used.
        - Considered very effective.
        - Controls many weeds.
    - Clomazone (various) – Group F pre-emergent residual herbicide.
        - For beans only.
        - Occasionally used.
        - Considered very effective.
        - Controls many broadleaf weeds.
    - Cyanazine (various) – Group C broadleaf selective pre or post-emergent herbicide
        - For peas only.
        - Occasionally used.
        - Considered very effective.
        - Controls most weeds.
    - Chlorthal-dimethyl (various) – Group D pre or post-emergent herbicide
        - Occasionally used.
        - Considered very effective.
        - Controls most weeds.
    - Dimethenamid-P (various) – Group K at sowing residual herbicide.
        - For beans and peas.
        - Occasionally used.
        - Considered very effective.
        - Controls most weeds.
    - Fluazifop-P as butyl (various) – Group A grass selective post-emergent herbicide
        - Peas, beans
        - Commonly used.
        - Considered very effective.
        - Controls most grass weeds. Does not control Winter grass (Poa annum).
    - Glyphosate (various) – Group M pre-plant general knockdown herbicide
        - Commonly used.
        - Works well in non-resistant populations.
    - Metolachlor/ S-Metolachlor (various) - Group K pre-plant residual herbicide
        - For beans only.
        - Commonly used.
        - Considered effective.
        - Controls many broadleaf and some grass weeds.
    - Metribuzin (various) – Group C in-crop residual herbicide
        - For peas only.
        - Commonly used.
        - Some crop phyto issues in some situations.
        - Considered effective.
        - Controls many broadleaf weeds.

- Pendimethalin (various) - Group D residual herbicide
  - For beans and peas.
  - Occasionally used.
  - Growers comment that does not control all weeds that occur.

- Quizalofop-P-ethyl (various) - Group A grass selective post-emergent herbicide
  - For beans and peas.
  - Commonly used.
  - Considered very effective.
  - Controls most grass weeds. Does not control Winter grass (Poa annum).

- Sethoxydim (various) - Group A grass selective post-emergent herbicide
  - For beans and peas.
  - Occasionally used.
  - Used to spot spray grass weeds post-emergent.

- Terbutryn (various) – Group C in-crop residual herbicide
  - For peas only.
  - Rarely used.
  - Some crop phyto issues in some situations.
  - Controls many broadleaf weeds.

- Trifluralin (various) – Group D pre-emergence pre-sowing herbicide
  - For beans and peas.
  - 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.

- The herbicides listed for control of weeds in beans and peas via permits:
  - Bentazone (various) (PER12392, expires Sep 2014) – Group C broadleaf selective post-emergent herbicide
    - For peas only.
    - Occasionally used. Commonly used in Tas in processing peas.
    - Considered very effective.
    - Controls most weeds.

  - Diflufenican (various, includes PER14035, expires Mar 2023) – Group F early post-emergence.
    - For peas only.
    - Occasionally used.
    - Considered very effective.
    - Controls most 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.

Most weeds can be controlled with currently available herbicides.

No weeds were identified as a high priority for control.

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Images:
Google images

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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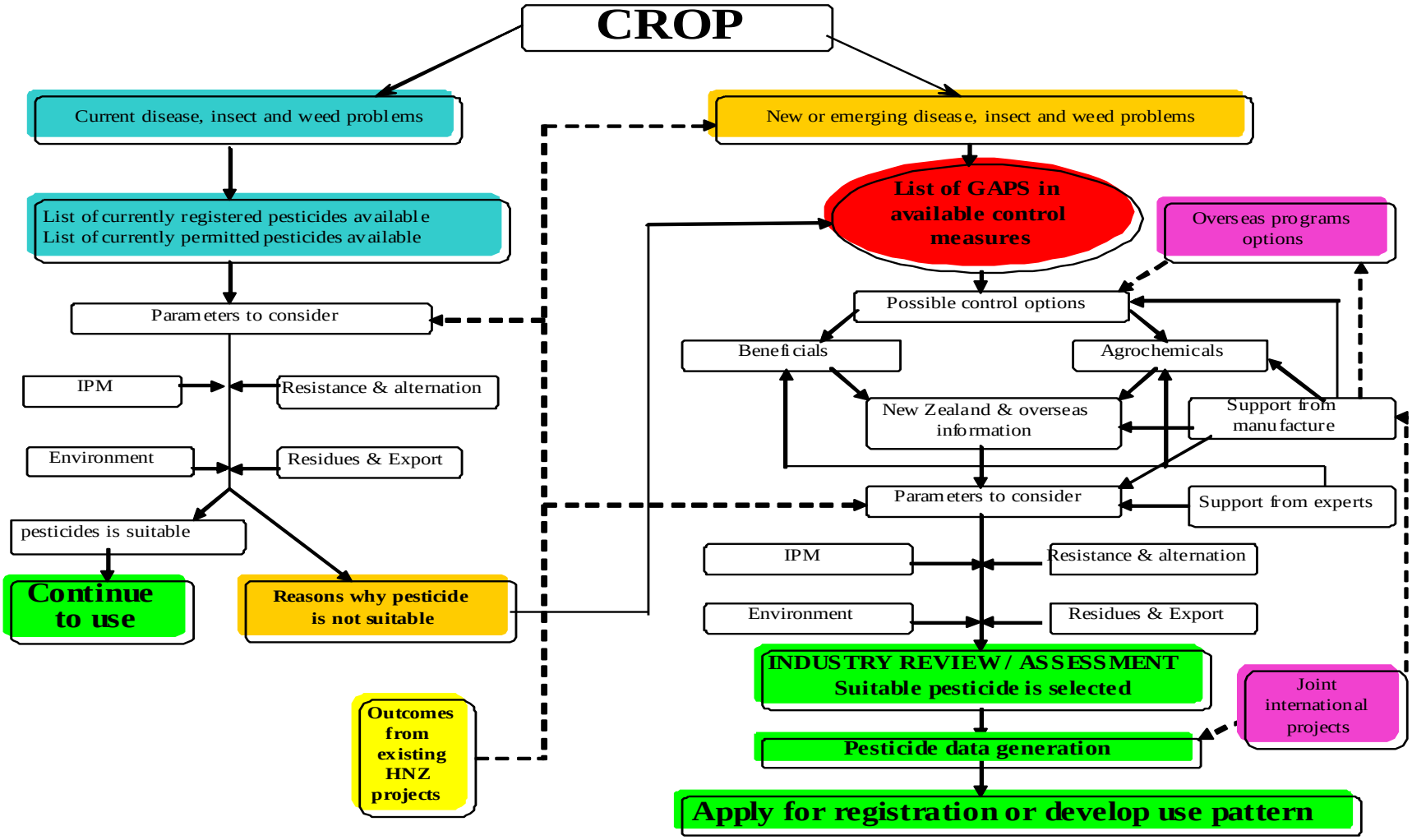
^Trademark

6. Appendices

APPENDIX 1: The Strategic Agrichemical Review Process



Appendix 2 – currently available fungicides in beans and peas.

Active		Crop		WHP, days	Chemical group
1,3-Dichloropropene + Chloropicrin		Vegetables	Soil borne diseases incl Fusarium, Verticillium wilts, Rhizoctonia, Pythium	NR	_
Azoxystrobin	(PER13123, expires Mar 2014)	Beans	Sclerotinia	1	21
Bitertanol (BAYCOR)		Beans	rust	3	C
Boscalid	~~(PER13897, expires Jun 2014)~~	Beans - Green Pods And Immature Seeds	Sclerotinia	7	7
Chlorothalonil		Pea	Downy mildew		M1
Chlorothalonil	(PER11451, expires Jun 2018)	Garden Peas	Black Spot (Ascochyta Pisi, Mycosphaerella Pinodes, Phoma Medicaginis Var. Pinodella)	7(H), *(G)	M5
Copper Ammonium Complex, Copper Oxide, Copper Sulphate		Beans	Bacterial brown spot	1	M1
Copper Oxychloride, Copper Ammonium Complex Copper Ammonium Complex, Copper Oxide, Copper Sulphate		Beans	Blight - Halo	1	M1
Copper Oxychloride, Copper Ammonium Complex, Copper Oxide, Copper Sulphate		Beans	Blight - common	1	M1
Copper Oxychloride, Copper Ammonium Complex, Copper Oxide		Beans	Chocolate spot - Botrytis	1	M1
Copper Oxychloride, Copper Ammonium Complex, Copper Oxide, Copper Sulphate		Peas	Bacterial spot / bacterial blight	1	M1
Copper Oxide, Copper Sulphate		Beans	Rust	1	M1
Copper Ammonium Complex, Copper Oxide, Copper Oxychloride. Copper Sulphate		Peas	Ascochyta blight	1	M1
Cyprodinil+fludioxonil (SWITCH^)		Beans, Green Peas	Grey mould (*Botrytis cinerea)*	14	9+12
Cyprodinil+fludioxonil (SWITCH^)		Beans, Green Peas	Sclerotinia minor and Sclerotinia sclerotiorium	14	9+12
Mancozeb		Beans, Peas	Ascochyta blight / late blight		M3
Mancozeb		Beans, Peas	Chocolate spot - Botrytis		M3
Mancozeb		Beans, Peas	Rust	7(H), 14(G)	M3
Mancozeb		Beans, Peas	Anthracnose	7(H), 14(G)	M3
Mancozeb		Beans, Peas	Angular leaf spot	7(H), 14(G)	M3

Active	Crop		WHP, days	Chemical group
Metalaxyl / Metalaxyl-M	Peas	Damping-off		
Metalaxyl / Metalaxyl-M	Peas (NSW, Tas, SA, WA)	Downy mildew		
Metiram (POLYRAM^)	Beans	Rust	7	M3
Metiram	Beans	Anthracnose	7	M3
Oxycarboxin (PLANTVAX^)	Beans	Rust	7	G
Phosphorous Acid (PER11951, expires Mar 2015)	Processing Peas	Downy Mildew	NR	_
Sulphur	Vegetables	Powdery mildew	NR	M2
Sulphur	Vegetables	Bean rust	NR	M2
Sulphur	Vegetables	Mite – Two spotted (red spider)	NR	
Tebuconazole	Beans	Rust	3(H, G)	3
Tebuconazole	Peas	Powdery mildew	3(H, G)	3
Thiram	Beans, Drench (Qld Only)	Damping off	7	M3
Thiram	Peas, Beans, Seed Treatment (Qld, Vic, Tas, SA Only)	Damping off		M3
Thiram	Peas, Beans, Seed Treatment (Qld, Vic, Tas, SA Only)	Seed decay, seedling rot		M3
Thiram	Peas, Beans, Seed Treatment (Qld, Vic, Tas, SA Only)	Damping off		M3
Thiram	Beans (Qld, NSW, Vic, Tas, SA, WA)	Septoria leaf spot		M3
Thiram+Thiabendazole	Peas, Seed Dressing	Black spot (leaf and pod spot and collar rot)	NR	M3+1
Thiram+Thiabendazole	Peas, Seed Dressing	Seedling root rots (Fusarium spp, pythium spp., Macrophomina phaseolina)	NR	M3+1
Triadimefon	Peas	Powdery mildew	14	C
Zineb	Beans	Anthracnose	7	Y
Zineb	Beans	Rust	7	Y
Zineb	Peas	Downy mildew	7	Y
Zineb	Beans	Anthracnose	7	Y

Appendix 3 – currently available insecticides in beans and peas.

Active		Crop		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
Bacillus thuringiensis subsp. kurstaki		Vegetables	Armyworm	NR	11
Bacillus thuringiensis subsp. kurstaki		Vegetables	Cabbage Moth	NR	11
Bacillus thuringiensis subsp. kurstaki		Vegetables	Cabbage White Butterfly	NR	11
Bacillus thuringiensis subsp. kurstaki		Vegetables	*Helicoverpa armigera* (Corn Earworm / Cotton Bollworm)	NR	11
Bacillus thuringiensis subsp. kurstaki		Vegetables	*Helicoverpa punctigera* (Native Budworm)	NR	11
Bacillus thuringiensis subsp. kurstaki		Vegetables	Lightbrown Apple Moth	NR	11
Bacillus thuringiensis subsp. kurstaki		Vegetables	Loopers	NR	11
Bacillus thuringiensis subsp. kurstaki		Vegetables	Vine Moth	NR	11
Botanical oil		Vegetables	Greenhouse whitefly	NR	
Bifenazate	(PER12906, expires Mar 2018)	Snake Beans	Mites-Two Spotted	1(H), *(G)	UN
Bifenthrin	(PER12947, expires Apr 2015)	Beans	Whitefly-Silverleaf	2(H), *(G)	3A
Chlorantraniliprole (CORAGEN^)		Legume vegetables	Helicoverpa	1	28
Chlorpyrifos	(PER14074, expires Mar 2014)	Beans, Snow Peas, Sugar Snap Peas	African Black Beetle	NR	1B
Chlorpyrifos	(PER14074, expires Mar 2014)	Beans, Snow Peas, Sugar Snap Peas	False Wireworms	NR	1B
Chlorpyrifos	(PER14074, expires Mar 2014)	Beans, Snow Peas, Sugar Snap Peas	Vegetable Weevil	NR	1B
Chlorpyrifos	(PER14074, expires Mar 2014)	Beans, Snow Peas, Sugar Snap Peas	Wireworms	NR	1B
Dimethoate		Beans, Peas	Aphids	7	1B
Dimethoate		Beans, Peas	Jassids	7	1B
Dimethoate		Beans, Peas	Miles	7	1B
Dimethoate		Beans, Peas	Leaf hoppers	7	1B
Dimethoate		Beans, Peas	Green vegetable but	7	1B
Dimethoate		Beans, Peas	Thrips	7	1B
Dimethoate		Beans, Peas	Wingless grasshoppers	7	1B

Active	Crop		WHP, days	Chemical group
Dimethoate	Beans, Peas	Cow pea aphid (NSW, WA)	7	1B
Dimethoate	Beans, Peas	Bean fly	7	1B
Dimethoate	Beans, Peas	Red legged earth mite (NSW, Vic, Tas, SA, WA)	7	1B
Dimethoate	Beans, Peas	Leafmining fly	7	1B
Dimethoate	Beans, Peas	Cucumber fly	7	1B
Dimethoate	Beans, Peas	Fruit fly	7	1B
Esfenvalerate	Green Beans, Garden Peas (Sthn NSW, Vic, Tas, SA, WA)	Thrips - plague	3 (beans) 14 (peas)	3A
Esfenvalerate	Green Beans, Garden Peas (Sthn NSW, Vic, Tas, SA, WA)	*Helicoverpa punctigera*		3A
Esfenvalerate	Garden peas (Qld)	Helicoverpa armigera		3A
Methidathion	Beans, Peas (Qld, Vic, Tas, SA, WA)	Aphids	7	1B
Methidathion	Peas (Qld, Vic, Tas, SA, WA)	Loopers	7	1B
Methomyl	French beans	Bean pod borer	3	1A
Methomyl	French Beans	Bean fly	3	1A
Methomyl	French Beans, Peas	Bean thrip	3	1A
Methomyl	French Beans, Peas	Helicoverpa	3	1A
Methomyl	French Beans, Peas	Looper	3	1A
Methomyl	French Beans, Peas	Green vegetable bug	3	1A
Methyl bromide (PER10145, expires Oct 2019, Tas)	Food Producing Plants (Not Persons Generally)	Thrips	3	8A
Methyl bromide (PER11092, expires Oct 2010, Qld)	Food Producing Plants (Not Persons Generally)	Thrips	3	8A
Nuclear Polyhedrosis Virus	Beans, Peas	Helicoverpa armigera & H. punctigera	-	-
Permethrin 40:60	Beans, Peas	Helicoverpa (green peas), H. armigera & H. punctigera (green beans)	3	3A
Paraffinic oil, petroleum oil	Beans	Aphids	1	
Paraffinic oil, petroleum oil	Beans	Leafhoppers	1	
Paraffinic oil, petroleum oil	Beans	Mites	1	
Paraffinic oil, petroleum oil	Beans	Thrips	1	
Potassium Salts Of Fatty	Vegetables	Aphids	NR	-

Active	Crop		WHP, days	Chemical group
Acids				
Potassium Salts Of Fatty Acids	Vegetables	Mealybug	NR	-
Potassium Salts Of Fatty Acids	Vegetables	Thrips	NR	-
Potassium Salts Of Fatty Acids	Vegetables	Two Spotted Mite / Spider Mite	NR	-
Potassium Salts Of Fatty Acids	Vegetables	Whitefly	NR	-
Propargite	Beans, vegetables	Mites – 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 (SUCCESS NEO^)	Beans, peas	Helioverpa Punctigera - Native Budworm	3(H), 14(G)	5
Spinetoram (SUCCESS NEO^)	Beans, peas	Cucumber moth	3(H), 14(G)	5
Spinetoram (SUCCESS NEO^)	Beans, peas	Thrips - Western Flower Thrips	3(H), 14(G)	5
Spirotetramat (MOVENTO^)	Beans, peas	Aphid – Green Peach	7(H), 7(G)	23
Spirotetramat (MOVENTO^)	Beans, peas	Whitefly – silverleaf	7(H), 7(G)	23
Spirotetramat (MOVENTO^)	Beans	Thrips – Western flower	7(H), 7(G)	23
Spirotetramat (MOVENTO^)	Beans	Thrips - tomato	7(H), 7(G)	23
Sulphur	Vegetables	Mite – Two Spotted (Red Spider)	NR	
Trichlorfon	Beans, Peas (Qld, NT only)	Cutworms	2	1B
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

Appendix 4 – currently available herbicides in beans and peas.

Active		Crop		WHP, days	Chemical group
Acifluorfen (BLAZER^)		Bean	Prince of Wales feather	28	G
Bentazone		Bean	Broadleaf-Various	35d	C
Bentazone	(PER12392, expires Sep 2014)	Processing Peas	Broadleaf-Various	35d	C
Chlorthal-dimethyl		Beans, peas	Grass and broadleaf weeds – various		D
Clomazone		Beans	Broadleaf - Various		Q
Cyanazine		Pea	Grass and broadleaf - various	NR	C
Diflufenican		Pea			F
Diflufenican	(PER14035, expires Mar 2023)	Green Peas	Broadleaf	NR	F
Dimethenamid-P		Beans, Peas	Grass and broadleaf	NR	K
Fluazifop-P		Beans, Peas	Grass weeds	NR	A
Glyphosate		Pre-crop fallow	Grass and broadleaf	NR	M
Metolachlor / S-Metolachlor		Bean	Grass and broadleaf - various	70	K
S-Metolachlor	(PER13626, expires Jun 2017	Green Beans	Grass And Broadleaf	NR(H), 56(G)	K
Metribuzin		Peas	Grass and broadleaf - various		C
Pendimethalin		Bean	Grass and broadleaf - various		D
Quizalofop		Beans, Peas	Grass and broadleaf - various		A
Terbutryn		Pea	Broadleaf		C
Terbutryn	(PER11404, expires Aug 2014)	Field Peas	Broadleaf-Label	28(H), 7(G)	C
Trifluralin		Beans, Peas	Grass and broadleaf		D