Horticulture Innovation Australia

Final Report

Generation of Residue Data for Pesticide Minor-Use Permit Applications in Vegetable Crops 2013 - CPR

Dale Griffin
Crop Protection Research Pty Ltd

Project Number: VG13028

VG13028

This project has been funded by Horticulture Innovation Australia Limited using the vegetable industry levy and funds from the Australian Government.

ISBN 0 7341 3801 6

Published and distributed by:
Horticulture Innovation Australia Limited
Level 8, 1 Chifley Square
Sydney NSW 2000
Tel: (02) 8295 2300
Fax: (02) 8295 2399

Contents

Summary....2
Keywords....1
Introduction....2
Methodology....3
Alpha-cypermethrin (protected and field-grown cucumbers)....3
Bifenthrin (Brassica vegetables, beans and lettuce)....5
Cyprodinil and fludioxonil (alliums)....6
Propachlor (leafy brassica vegetables and alliums)....6
Bifenazate (Peas)....7
Results....9
Alpha-cypermethrin (protected and field-grown cucumbers)....9
Bifenthrin (Brassica vegetables, beans and lettuce)....9
Cyprodinil and fludioxonil (alliums)....10
Propachlor (leafy brassica vegetables and alliums)....11
Bifenazate (Peas)....12
Outputs....14
Outcomes....16
Evaluation and Discussion....17
Recommendations....18
Scientific Refereed Publications....18
Intellectual Property/Commercialisation....18
References....18
Acknowledgements....18
Appendices....18

Summary

This report summarises the work undertaken by Crop Protection Research Pty Ltd to generate residue data and to prepare and submit permit applications for the use of a range of agrichemicals in a variety of crops. Table 1 details the pesticides for which data was generated in each crop and briefly outlines the status of relevant permits related to the data generation.

Table 1. The pesticides and crops for which residue data was generated during project VG12074. The data was generated to support renewal of off-label permits.

Study	Pesticide	Crops included in study	Relevant permit	Crops covered by permit	Target pest(s)	Permit renewal status
13-HAL-018(a)GLP	**α-cypermethrin**	Protected & field-grown cucumbers	PER14433	Cucumber, Rocket, Silverbeet, Spinach, Brassica Leafy Vegetables, Radish	Loopers, Vegetable weevil, Plague thrips, Redlegged earth mite, cabbage white butterfly, Cluster caterpillar, heliothis	Permit renewal application submitted to the APVMA for consideration on 27 August, 2015. APVMA have acknowledged receipt of the application as number: DC21-51308783. It is expected that the review of this permit application will be completed by 24 March, 2016.
13-HAL-018(b)GLP	**bifenthrin**	Brassica vegetables, beans & lettuce	PER12947	Cucumber, Brassica vegetables, Lettuce, Beans, Peppers, Eggplant and Peas	Specified whitefly and mite species	Permit renewal application submitted to the APVMA for consideration on 6 May, 2015. APVMA have acknowledged receipt of the application as number: DC21-66294292. It is expected that the review of this permit will be completed by 15 March, 2016
13-HAL-018(c)GLP	**Cyprodinil & fludioxonil**	Spring onions, shallots	New permit (PER80501)	Alliums (other than onions) - Spring onions, shallots, leeks, chives	Black mould & Grey mould /Botrytis rots	PER80501 was approved and released by the APVMA on 20 July, 2015. This permit allows for the use of cyprodinil and fludioxonil on allium crops (excluding bulb onions and garlic) for the control of certain fungal diseases.
13-HAL-018(d)GLP	**Propachlor**	Brassica leafy vegetables and alliums	PER12008	Lettuce, spinach, silverbeet, rocket, Brassica leafy vegetables, spring onions and shallots	Annual grasses and broadleaf weeds	Permit renewal application submitted to the APVMA for consideration on 4 June, 2015. The permit was extended to cover use until 30 November, 2020. Further data submitted to the APVMA 21 January 2016 which was acknowledged as application number DC21-78672133.
13-HAL-018(e)GLP	**bifenazate**	Peas	PER80558	Snow peas & Sugar snap peas	Pest mites	PER80558 was approved and released by the APVMA on 10 November, 2015. This permit allows for the use of bifenazate on sugar snap and snow peas for the control of pest mites.

Keywords

APVMA, minor-use, permits, agrichemicals, residues, alpha-cypermethrin, bifenthrin, cyprodinil, fludioxonil, propachlor, bifenazate, cucumber, protected cropping, brassica vegetables, beans, lettuce, alliums, peas.

Introduction

In Australia, before an agrochemical product can be sold or used, the Australian Pesticides and Veterinary Medicines Authority (APVMA) must register it. This only occurs following a review of a comprehensive package of data that includes efficacy, crop safety and residue data. The manufacturer of the product must supply this information to the APVMA before this process can begin.

The cost of generating and collating such data packages is high, often costing many hundreds-of-thousands of dollars. These costs must be recouped by the manufacturer through sales of their product.

However, only small areas of many horticultural crops are grown and manufacturers consider it too difficult or impossible to recoup their registration costs. Thus, manufacturers will rarely spend resources on generating the data or preparing the associated applications.

As a result, horticulturalists are often placed in situations where they risk severe crop losses from insects, weeds and diseases because the agrochemical tools needed to protect their crops from these pests are not registered for their situation. On the other hand, they could spray their crops with pesticides that are not registered and risk buyers rejecting their produce and potentially-face severe penalties for pesticide miss-use.

The need to gain minor-use permits and new registrations has come about due to loss of some agrochemical products and/or registered uses because of chemical reviews and product rationalisation.

The APVMA's permit system adds some flexibility to the lengthy registration process and legalises the availability of products for minor-use purposes, not specified on the product label. However, off-label permits issued by the APVMA still must be applied for along with information and data that verifies that the permitted use will be effective and will not have any harmful effects on humans, the crops or the environment.

In early 2000, the vegetable industry undertook a national approach to permits by working with industry generated 'wish lists' for new pesticide uses, but this led to congestion in Australian Pesticide & Veterinary Management Authority (APVMA) system and dissatisfaction amongst growers and grower groups. This was in part due to widespread duplication of the requests made for permits in the absence of a truly co-ordinated system and concern over the priority assessment for each pesticide. This approach was also unable to give relevant priority to new pesticide technologies and available Integrated Pest Management (IPM) friendly pesticides that were outside the industry's experience.

A new approach to address the current and future pesticide requirements for horticultural crops has been developed using the Strategic Agrichemical Review Process (SARP). This approach had the benefit of IPM compatibility, where possible, improved scope for resistance management, sound biological profile and residue and trade acceptance domestically and for export.

This review process provides the vegetable industry with sound pesticide options for the future that the industry can pursue for registration with the manufacturer, or minor-use permits with APVMA for clearly identified crop protection needs, many of which will also assist the expansion of effective IPM strategies. All of the residue studies reported in this project have been identified through that SARP.

Methodology

Project VG13028 was managed as 5 separate residue studies (Table 2); a separate study for each of the active constituents (pesticides) included in the project.

In accordance with the OECD Principles of Good Laboratory Practice (GLP), each residue study was identified using a unique GLP residue-study ID. Each study included several crop types and/or were conducted across multiple study-sites.

Before each residue study began, an audited, GLP-compliant study plan was prepared. This document provided all the details necessary to complete the field and laboratory-phase activities of each study.

The auditing was completed by an independent, third party quality assurance (QA) expert (MAS Consulting Pty Ltd) to ensure the study plan complied with the principles of GLP.

Because the combination of pesticide active-constituent(s) and crops included in each study were unique, the methods used, particularly the laboratory-based methods, varied from study to study. Brief details of the specific materials and methods used in each are provided in sections 4.1 to 4.5 below.

Alpha-cypermethrin (protected and field-grown cucumbers)

A pesticide residue study conducted in accordance with the principles of Good Laboratory Practice (GLP) across 4 sites; located in central Victoria, south western New South Wales and south east Queensland. Three sites (2, 3 and 4) had an incorrect amount of treatment applied originally; these were repeated and re-numbered as study sites 5, 6 and 7.

The study was conducted on protected and field-grown cucumbers. Crops at each site received 2 applications of Alpha-Scud® Elite Insecticide (alpha-cypermethrin, 100 g/L) at either 400 or 800 mL/ha, approximately 8 and 1 days before typical commercial harvest. Treatments were applied using a hand-held, gas-powered boom-sprayer fitted with hollow-cone nozzles.

Whole fruit samples were collected immediately before the last application (IBLA), 0 (after the final spray had dried), 1 and 3 days after last application (DALA). As samples were collected, they were packaged into heavy-duty plastic bags, labelled, and stored in freezers before being shipped to the analytical laboratory where they were analysed for residual alpha-cypermethrin. At each sampling event, the crop was surveyed for evidence of phytotoxicity attributable to the application of Alpha-Scud® Elite Insecticide. No adverse, phytotoxic effects were recorded at any of the 4 sites.

Analysis of alpha-cypermethrin was conducted in accordance with the APVMA residue definitions as detailed in Table 3 of the MRL Standard, published by the Australian Pesticides and Veterinary Medicines Authority (APVMA). Residue analysis was completed using equipment and methods which utilised liquid chromatography in tandem with mass spectrometry (LC/MS/MS).

Upon completion of the field and analytical-phases of the study, all records, including the GLP-study final report, were forwarded to the quality assurance consultant for auditing to ensure compliance with the principles of GLP.

The audited, final GLP report was forwarded to Horticulture Innovation Australia Ltd (HIA), along with the completed permit renewal application documents and the appropriate application fee, for review and submission to the APVMA. The documents were forwarded to HIA on 5 August, 2015. Subsequently, this was reviewed and forwarded to Growcom Ltd for final submission to the APVMA which occurred on 24 Aug, 2015.

Table 2. Project VG13028 was managed by separating it into 5 sub-projects (GLP Studies). In accordance with the OECD Principles of Good Laboratory Practice, each of these was identified uniquely. The sub-projects included a single active constituent, usually included several crops and were conducted across multiple study sites.

CPR residue-study ID (HIA reference)	Pesticide active constituent	Crops included in study	Number of study sites	Locations by State
13-HAL-018(a)GLP (HAL1788)	**Alpha-cypermethrin**	Protected & field-grown cucumbers	7	VIC (1), NSW (2) and QLD (x4)
13-HAL-018(b)GLP (AVG1067)	**bifenthrin**	Brassica vegetables, beans & lettuce	25	VIC (x11), NSW (x6) and QLD (x8)
13-HAL-018(c)GLP (HAL1718)	**Cyprodinil & fludioxonil**	Alliums	4	VIC (x3) and QLD (x1)
13-HAL-018(d)GLP (AVG468, AVG911 & AVG862)	**Propachlor**	Brassica leafy vegetables and alliums	6	VIC (x3) and QLD (x3)
13-HAL-018(e)GLP	**bifenazate**	Peas	3	VIC (x2) and QLD (x1)

Bifenthrin (Brassica vegetables, beans and lettuce)

A pesticide residue was conducted in accordance with the principles of Good Laboratory Practice (GLP) on 7 different crops. 4 brassicaceae crops (broccoli, cauliflower, cabbage and Brussels sprouts) and 3 non-cruciferous crops (green bean, leafy lettuce and head lettuce) were included.

Five green bean, 4 leafy lettuce and 3 head lettuce study sites were situated across major horticultural districts in 3 states, in south eastern, central and north western Victoria, central New South Wales and southern Queensland.

Crops at each site received 2 applications of Out of Bounds® All Purpose Insecticide and Termiticide (Out of Bounds®, 100 g/L bifenthrin) 7 days apart. Treatments were applied with a hand-held, gas-powered boom-sprayer, in a carrier rate of 500 to 800 L/ha to simulate commercial practice.

Commercially harvestable crop samples were collected from each site at multiple intervals up to 10 ± 1 days after the final application of treatments. At each sampling event, the crop was surveyed for evidence of phytotoxicity as a result of treatment application. No adverse (phyto-toxic) effects were recorded at any site, indicating that Out of Bounds® is safe to use on these crops.

As samples were collected, they were packaged into heavy-duty plastic bags, labelled, and stored in freezers before being shipped to the analytical laboratory where they were analysed for residual bifenthrin. Analysis of bifenthrin was conducted in accordance with the APVMA residue definitions as detailed in table 3 of the MRL Standard as published by the Australian Pesticides and Veterinary Medicines Authority (APVMA) for June 2014 (APVMA, 2014).

Residue analysis was completed using equipment and methods which utilised liquid chromatography in tandem with mass spectrometry (LC/MS/MS).

Upon completion of the field and analytical-phases of the study, all records, including the GLP-study final report, were forwarded to the quality assurance consultant for auditing to ensure compliance with the principles of GLP.

The audited, final GLP report was forwarded to Horticulture Innovation Australia Ltd (HIA), along with the completed permit renewal application documents and the appropriate application fee, for review and submission to the APVMA. The documents were forwarded to HIA on 1 May, 2015. Subsequently, this was reviewed and forwarded to Growcom Ltd for final submission to the APVMA which occurred on 4 May, 2015.

Cyprodinil and fludioxonil (alliums)

A pesticide residue study conducted in accordance with the principles of Good Laboratory Practice (GLP) was undertaken across 4 sites; 3 of those were located at Tyabb, Victoria, the fourth at Centenary Heights, Queensland. The study was conducted on the following crops: spring onions (Victoria), shallots (Victoria) and leeks (Victoria and Queensland)

The crops at each site received two applications of Switch® Fungicide (375 g/kg cyprodinil and 250 g/kg fludioxonil) at 1.0kg/ha, approximately 28 and 21 days before typical commercial harvest (DBTCH). Treatments were applied using a hand-held, gas-powered boom-sprayer fitted with hollow-cone nozzles.

Samples of crop were collected from each site at 0, 7, 14, 21 and 28 days after last application (DALA). As samples were collected, they were packaged into heavy-duty plastic-bags, labelled and stored in freezers before being shipped to the analytical laboratory where they were analysed for the residual cyprodinil and fludioxonil. Analysis of cyprodinil and fludioxonil was conducted in accordance with the APVMA residue definitions as detailed in table 3 of the MRL Standard as published by the Australian Pesticides and Veterinary Medicines Authority (APVMA) for June 2014 ((APVMA, 2014).

Residue analysis was completed using equipment and methods which utilised liquid chromatography in tandem with mass spectrometry (LC/MS/MS).

Upon completion of the field and analytical-phases of the study, all records, including the GLP-study final report, were forwarded to the quality assurance consultant for auditing to ensure compliance with the principles of GLP.

The audited, final GLP report was forwarded to Horticulture Innovation Australia Ltd (HIA), along with the completed permit renewal application documents and the appropriate application fee, for review and submission to the APVMA. The documents were forwarded to HIA on the 13 November, 2014. Subsequently, this was reviewed and forwarded to Growcom Ltd for final submission to the APVMA which occurred on 18 November, 2014.

The APVMA approved and released minor-use permit, PER80501 was approved and released by the APVMA on 20 July, 2015. This permit allows for the use of cyprodinil and fludioxonil on allium crops (excluding bulb onions and garlic) for the control of certain fungal diseases.

Propachlor (leafy brassica vegetables and alliums)

A pesticide residue study conducted in accordance with the principles of Good Laboratory Practice (GLP) was undertaken across 6 sites; located at south east Queensland, southern and central Victoria. The study was conducted on bok choi, rocket, spring onion and shallots. Crops at each site received 1 application of Ramrod® Flowable Herbicide (Ramrod®; propachlor, 480 g/L) at 9 and 12 L/ha immediately after planting. These rates reflect the range of rate application allowed via permit PER12008. Treatments were applied using a hand-held, gas-powered boom-sprayer fitted with flat fan nozzles.

Crop samples were collected from each site at various intervals. At each sampling event, the crop was surveyed for evidence of phytotoxicity attributable to the application of propachlor. No adverse, phytotoxic effects were recorded at any of the 6 sites.

Samples were collected 7 and 0 days before typical commercial harvest. As samples were collected, they were packaged into heavy-duty plastic bags, labelled, and either stored in freezers or shipped directly to the analytical laboratory, where they were analysed for residual propachlor. Analysis of propachlor was conducted in accordance with the APVMA residue definitions as detailed in Table 3 of the MRL Standard as published by the Australian Pesticides and Veterinary Medicines Authority (APVMA).

Residue analysis was completed using equipment and methods which utilised liquid chromatography in tandem with mass spectrometry (LC/MS/MS).

Upon completion of the field and analytical-phases of the study, all records, including the GLP-study final report, were forwarded to the quality assurance consultant for auditing to ensure compliance with the principles of GLP.

The audited, final GLP report was forwarded to Horticulture Innovation Australia Ltd (HIA), along with the completed permit renewal application documents and the appropriate application fee, for review and submission to the APVMA. The documents were forwarded to HIA on 3 June, 2015. Subsequently, this was reviewed and forwarded to Growcom Ltd for final submission to the APVMA which occurred on 4 June, 2015.

Bifenazate (Peas)

A pesticide residue study conducted in accordance with the principles of Good Laboratory Practice (GLP) was undertaken across 3 sites; 2 were located at Boorool, Victoria, and the third at Centenary Heights, Queensland.

The study was conducted on field-grown sugar-snap peas (Victoria) and snow pea (Victoria and Queensland). Crops at each site received a single application of Acramite® Miticide (480 g/L bifenazate) at either 65 or 130 mL / 100 L, approximately 7 days before typical commercial harvest (DBTCH). Treatments were applied using a hand-held, gas-powered boom-sprayer fitted with hollow-cone nozzles.

Crop samples were collected from each site at various intervals. At each sampling event, the crop was surveyed for evidence of phytotoxicity attributable to the application of bifenazate. No adverse, phytotoxic effects were recorded at any of the 3 sites, indicating that Acramite® Miticide is safe to use on sugar-snap and snow peas at these rates.

Forage samples were collected at 0 and 7 days after last application (DALA). Pod samples were collected at 0, 1, 3, 7 and 10 DALA (sites 1: sugar-snap peas; and 3: snow pea) or 0 and 7 DALA (site 2: snow pea). As samples were collected, they were packaged into heavy-duty plastic bags, labelled, and stored in freezers before being shipped to the analytical laboratory where they were analysed for residual bifenazate. Analysis of bifenazate was conducted in accordance with the APVMA residue definitions as detailed in table 3 of the MRL Standard as published by the Australian Pesticides and Veterinary Medicines Authority (APVMA) for June 2014 (APVMA, 2014).

Residue analysis was completed using equipment and methods which utilised liquid chromatography in tandem with mass spectrometry (LC/MS/MS).

The audited, final GLP report was forwarded to Horticulture Innovation Australia Ltd (HIA), along with the completed permit renewal application documents and the appropriate application fee, for review and submission to the APVMA. The documents were forwarded to HIA on the 21 November, 2014.

Subsequently, this was reviewed and forwarded to Growcom Ltd for final submission to the APVMA which occurred on 4 December, 2014.

The APVMA approved and released minor-use permit, PER80558 was approved and released by the APVMA on 10 November, 2015. This permit allows for the use of bifenazate on sugar snap and snow peas for the control of pest mites.

Results

Alpha-cypermethrin (protected and field-grown cucumbers)

Mature crop samples were collected from each site at various intervals. At each sampling event, the crop was surveyed for evidence of phytotoxicity attributable to the application of Alpha-Scud® Elite Insecticide. No adverse, phytotoxic effects were recorded at any of the 4 sites.

Whole fruit samples were collected immediately before the last application (IBLA), 0 (after the final spray had dried), 1 and 3 days after last application (DALA). As samples were collected, they were packaged into heavy-duty plastic bags, labelled, and stored in freezers before being shipped to the analytical laboratory where they were analysed for residual alpha-cypermethrin. Analysis of alpha-cypermethrin was conducted in accordance with the APVMA residue definitions as detailed in Table 3 of the MRL Standard, published by the Australian Pesticides and Veterinary Medicines Authority (APVMA).

Residue analysis was completed using equipment and methods which utilised liquid chromatography in tandem with mass spectrometry (LC/MS/MS). The limit of quantitation (LoQ) was reported to be 0.010 milligrams per kilogram (mg/kg) of alpha-cypermethrin. The limit of detection (LoD) was reported to be 0.005 mg/kg in each matrix.

Residual alpha-cypermethrin was below the LoQ in all untreated samples.

There is a temporary maximum residue limit (tMRL) of 0.3 mg/kg cypermethrin in cucumber. Alpha-cypermethrin residues were below the tMRL in all samples, regardless of rate of application, number of applications, time since application or whether the crop was field-grown or protected.

Following a review of study records, an independent auditor reported that all-phases of the study were conducted in accordance with the principles of GLP.

The data generated during this project and the relevant minor-use permit application documentation and fees were provided to HIA Ltd who reviewed the material before submission to the APVMA. The APVMA acknowledged receipt of the material on 24 August, 2015.

Bifenthrin (Brassica vegetables, beans and lettuce)

Samples of mature, harvestable produce were collected from each site at 0, 3, 7 and 10 days after last treatment application (DALA). Further, at each sampling event, the crop was surveyed for evidence of phytotoxicity as a result of treatment application. No adverse effects attributable to treatment application were recorded at any site, indicating that Out of Bounds® is safe to use on these crops.

Analysis of bifenthrin was conducted in accordance with the APVMA residue definitions as detailed in table 3 of the MRL Standard as published by the Australian Pesticides and Veterinary Medicines Authority (APVMA) for June 2014 (APVMA, 2014). Residue analysis was completed using equipment and methods which utilised liquid chromatography in tandem with mass spectrometry (LC/MS/MS). The limit of detection (LoD) was reported to be 0.005 mg/kg bifenthrin in all cruciferous crops, and the limit of quantitation (LoQ) 0.010 mg/kg. Likewise, the limit of detection (LoD) was reported to be 0.005 mg/kg bifenthrin in all the non-cruciferous crops, and the limit of quantitation (LoQ) 0.010 mg/kg.

Residual levels of bifenthrin were below the LoD in all the untreated samples collected from the cruciferous and non-cruciferous crop types.

Broccoli, cauliflower and Brussel's sprouts have a temporary MRL of 1 mg/kg bifenthrin. The tMRL for bifenthrin in head cabbages is 7 mg/kg. All treated samples, regardless of crop, study site, or time after last application, had residual bifenthrin below the relevant tMRL.

Different sample types were harvested for green beans. Bean pods were collected at 0, 2 ± 1, 3 ± 1 and 7 ± 1 days after last application (DALA), and forage at 0, 2 ± 1 7 ± 1 and 14 ± 1 DALA. Forage samples were analysed both as fresh (wet-weight) and dry (dry-weight) samples in order to replicate different possible end uses. For dry-weight samples, the moisture content was calculated, and the residue content extrapolated. Bifenthrin residues varied between study sites.

At 0 DALA, residual bifenthrin was highest in pods collected from site 18, at 0.434 mg/kg, falling to 0.069 mg/kg at 7 DALA (typical commercial harvest). Residual bifenthrin was highest in forage samples collected from site 15. In wet-weight samples at 0 DALA, bifenthrin residues of 6.264 mg/kg were found, falling to 1.565 mg/kg at 14 DALA. In the respective dry-weight samples, bifenthrin was present at 32.887 mg/kg at 0 DALA, decreasing to 8.911 mg/kg 14 DALA.

Green bean pods are covered under the common bean temporary maximum residue limit (tMRL), which is 1.0 mg/kg bifenthrin. Residues were well below the tMRL in all pod samples. There is no maximum residue limit (MRL) for bifenthrin in green bean forage.

Bifenthrin residues varied between leafy lettuce study sites. At 0 DALA the highest residues were found in samples from site 20, with 4.239 mg/kg, decreasing to 2.428 mg/kg at 3 DALA, 1.543 mg/kg at 7 DALA and 0.859 mg/kg at 10 DALA.

Residues of bifenthrin also varied in head lettuce samples. Site 25 recorded the highest residues, with 3.841 mg/kg bifenthrin at 0 DALA, 2.173 mg/kg at 3 DALA, 2.252 mg/kg at 7 DALA and 1.186 mg/kg at 10 DALA.

Following a review of all the project records, an independent auditor reported that all-phases of the study were conducted in accordance with the principles of GLP.

The data generated during this project and the relevant minor-use permit application documentation and fees were provided to HIA Ltd who reviewed the material before submission to the APVMA. The APVMA acknowledged receipt of the material on 4 May, 2015.

Cyprodinil and fludioxonil (alliums)

Samples of crop were collected from each site at 0, 7, 14, 21 and 28 days after last application (DALA). As samples were collected, they were packaged into heavy-duty plastic-bags, labelled and stored in freezers before being shipped to the analytical laboratory where they were analysed for the residual cyprodinil and fludioxonil.

Analysis of cyprodinil and fludioxonil was conducted in accordance with the APVMA residue definitions as detailed in table 3 of the MRL Standard as published by the Australian Pesticides and Veterinary Medicines Authority (APVMA) for June 2014 ((APVMA, 2014).

Residue analysis was completed using equipment and methods which utilised liquid chromatography in

tandem with mass spectrometry (LC/MS/MS). The limit of quantitation (LoQ) was reported to be 0.01 milligrams per kilogram (mg/kg) of both cyprodinil and fludioxonil in each of the 3 matrices analysed (spring onion, shallot and leek). The limit of detection (LoD) was reported to be 0.005 mg/kg in each crop matrix.

Residual levels of both analytes were below the LoD in untreated samples from all matrices.

The Australian Pesticides and Veterinary Medicines Authority (APVMA) has a recommended maximum residue limit (MRL) of 0.2 mg/kg of both cyprodinil and fludioxonil in green onions and bulbing onions.

In spring onion, residues of both cyprodinil and fludioxonil were lower than the MRL immediately after final application (0 DALA) (Table 1; APVMA, 2014). Residual levels of both analytes were below the LoD by 7 DALA.

In shallots, residual cyprodinil and fludioxonil were quantifiable and above the current MRLs of 0.2 mg/kg at 0, 7 and 14 DALA. Analytes were at (cyprodinil – taking into account the estimated measurement uncertainty of ~12%) or below (fludioxonil) the MRL at 21 DALA. At 28 DALA, both analytes were found to be present at levels below the MRL of 0.2 mg/kg.

Residue levels in leeks varied between the 2 sites. At site 3, residues of both analytes were found to be below the MRL in all samples (0 – 28 DALA). At site 4, residues of cyprodinil and fludioxonil did not fall below the MRL until 21 DALA.

Following a review of all the project records, an independent auditor reported that all-phases of the study were conducted in accordance with the principles of GLP.

The data generated during this project and the relevant minor-use permit application documentation and fees were provided to HIA Ltd who reviewed the material before submission to the APVMA who acknowledged receipt of the material on 4 May, 2015.

Following a review of the residue data, the APVMA approved and released minor-use permit PER80501 on 20 July, 2015. This permit allows for the use of cyprodinil and fludioxonil on allium crops (excluding bulb onions and garlic) for the control of certain fungal diseases.

Propachlor (leafy brassica vegetables and alliums)

Crop samples were collected from each site at various intervals. At each sampling event, the crop was surveyed for evidence of phytotoxicity attributable to the application of propachlor. No adverse, phytotoxic effects were recorded at any of the 6 sites.

Samples were collected 7 and 0 days before typical commercial harvest. As samples were collected, they were packaged into heavy-duty plastic bags, labelled, and either stored in freezers or shipped directly to the analytical laboratory, where they were analysed for residual propachlor. Analysis of propachlor was conducted in accordance with the APVMA residue definitions as detailed in Table 3 of the MRL Standard as published by the Australian Pesticides and Veterinary Medicines Authority (APVMA).

Residue analysis was completed using equipment and methods which utilised liquid chromatography in tandem with mass spectrometry (LC/MS/MS). The limit of quantitation (LoQ) was reported to be 0.010 milligrams per kilogram (mg/kg) of propachlor in all matrices (bok choi, rocket, spring onion and shallot). The limit of detection (LoD) was reported to be 0.005 mg/kg in each matrix.

Residual levels of propachlor were below the LoD in all untreated samples.

The APVMA has a temporary maximum residue limit (tMRL) set at or about the limit of analytical quantitation for propachlor in leafy brassica vegetables (bok choi) and rocket, being 0.05 mg/kg. In bok choi, samples treated with the low rate (9 L/ha) had residual propachlor less than the tMRL at both 7 and 0 days before typical commercial harvest (DBTCH). Samples treated at the high rate (12 L/ha) retained residual propachlor at 0.228 mg/kg at 7 DBTCH, and 0.087 mg/kg at 0 DBTCH. In rocket, all samples contained propachlor at levels higher than the tMRL. At 7 DBCTH, propachlor persisted at 0.354 mg/kg and 0.534 mg/kg in samples treated at the low and high rates respectively, with levels falling to 0.146 and 0.182 mg/kg at 0 DBCTH.

Residual levels of propachlor were below the tMRL of 1 mg/kg for spring onion and shallots in all samples regardless of application rate or sampling interval.

Following a review of all the project records, an independent auditor reported that all-phases of the study were conducted in accordance with the principles of GLP.

The data presented in version 01 of this report was used to support an application to renew APVMA minor-use permit PER12008, submitted in June 2015. This has since been accepted and the permit extended to 30-Nov-2020.

New data from study site 5 included in this report also supports this extension. This data, along with the appropriate APVMA permit application forms, was submitted to HIA Ltd on 18 January, 2016.

Bifenazate (Peas)

Crop samples were collected from each site at various intervals. At each sampling event, the crop was surveyed for evidence of phytotoxicity attributable to the application of bifenazate. No adverse, phytotoxic effects were recorded at any of the 3 sites, indicating that Acramite® Miticide is safe to use on sugar-snap and snow peas at these rates.

Forage samples were collected at 0 and 7 days after last application (DALA). Pod samples were collected at 0, 1, 3, 7 and 10 DALA (sites 1: sugar-snap peas; and 3: snow pea) or 0 and 7 DALA (site 2: snow pea). As samples were collected, they were packaged into heavy-duty plastic bags, labelled, and stored in freezers before being shipped to the analytical laboratory where they were analysed for residual bifenazate. Analysis of bifenazate was conducted in accordance with the APVMA residue definitions as detailed in table 3 of the MRL Standard as published by the Australian Pesticides and Veterinary Medicines Authority (APVMA) for June 2014 (APVMA, 2014).

Residue analysis was completed using equipment and methods which utilised liquid chromatography in tandem with mass spectrometry (LC/MS/MS). The limit of quantitation (LoQ) was reported to be 0.005 milligrams per kilogram (mg/kg) of bifenazate in all matrices (sugar-snap pea and snow pea forage and pods). The limit of detection (LoD) was reported to be 0.002 mg/kg in each matrix.

Residual levels of both analytes were below the LoD in all untreated samples.

The APVMA has a temporary maximum residue limit (tMRL) of 0.5 mg/kg bifenazate in peas. Currently, there is no tMRL for podded peas. Bifenazate residues were below the pea tMRL in pea pods of both sugar-snap peas and snow peas in all samples, including from 0 DALA samples and from crop treated at the high application rate (130 mL / 100 L). A tMRL for podded peas matching that of peas (0.5 mg/kg) could be established based on the data presented in this report.

Pea straw is commonly used as an animal feedstock. Forage samples were harvested at 0 and 7 DALA and analysed for residues. The moisture content of the forage was then calculated, and the dry-weight residue content extrapolated. There is no tMRL or MRL for bifenazate in pea straw (forage) stipulated by the APVMA, therefore interpretation of these results is not possible. However, the data presented in this report supports the establishment of a tMRL in field pea forage (green) of 10 mg/kg.

Following a review of all the project records, an independent auditor reported that all-phases of the study were conducted in accordance with the principles of GLP.

The data generated during this project and the relevant minor-use permit application documentation and fees were provided to HIA Ltd who reviewed the material before submission to the APVMA who acknowledged receipt of the material on 4 December, 2014.

Following a review of the residue data, the APVMA approved and released minor-use permit, PER80558 was approved and released by the APVMA on 10 November, 2015. This permit allows for the use of bifenazate on sugar snap and snow peas for the control of pest mites.

Outputs

Project VG13028 generated 4 categories of outputs:

1. Study plans. Five separate audited GLP study plans which contain all the relevant information necessary to complete each of the residue studies included in this project.
    a. Study plan 13-HAL-018(a)GLP for the conduct of a-cypermethrin residue data generation
    b. Study plan 13-HAL-018(b)GLP for the conduct of bifenthrin residue data generation
    c. Study plan 13-HAL-018(c)GLP for the conduct of cyprodinil & fludioxonil residue data generation
    d. Study plan 13-HAL-018(d)GLP for the conduct of propachlor residue data generation
    e. Study plan 13-HAL-018(e)GLP for the conduct of bifenazate residue data generation
2. Study reports. Six separate audited GLP study reports which detail all the relevant details and results generated during the conduct of each of the residue studies included in this project.
    a. Study report 13-HAL-018(a)GLP for the conduct of a-cypermethrin residue data generation
    b. Study plan 13-HAL-018(b)GLP for the conduct of bifenthrin residue data generation (cruciferous crops)
    c. Study plan 13-HAL-018(b)GLP for the conduct of bifenthrin residue data generation (non-cruciferous crops)
    d. Study plan 13-HAL-018(c)GLP for the conduct of cyprodinil & fludioxonil residue data generation
    e. Study plan 13-HAL-018(d)GLP for the conduct of propachlor residue data generation
    f. Study plan 13-HAL-018(e)GLP for the conduct of bifenazate residue data generation
3. Minor-use permit applications to the Australian Pesticides and Veterinary Medicines Authority (APVMA) seeking to allow the use of:
    a. Alpha-cypermethrin on protected and field-grown Cucumber, Rocket, Silverbeet, Spinach, Brassica Leafy Vegetables, Radish for the control of Loopers, Vegetable weevil, Plague thrips, Redlegged earth mite, cabbage white butterfly, Cluster caterpillar, heliothis
    b. Bifenthrin on Cucumber, Brassica vegetables, Lettuce, Beans, Peppers, Eggplant and Peas for the control of whitefly and mites.

c. Cyprodinil & fludioxonil on allium crops excluding bulbing onions and garlic for the control of certain fungal diseases.

d. Propachlor on Lettuce, spinach, silverbeet, rocket, Brassica leafy vegetables, spring onions and shallots for the control of annual grasses and broadleaved weeds.

e. Bifenazate on snow peas & Sugar snap peas for the control of certain pest mite species.

4. APVMA approved, minor-use permits:

a. Minor-use permit, PER80501, was approved and released by the APVMA on 20 July, 2015. This permit allows for the use of cyprodinil and fludioxonil on allium crops (excluding bulb onions and garlic) for the control of certain fungal diseases.

b. Minor use permit, PER80558 was approved and released by the APVMA on 10 November, 2015. This permit allows for the use of bifenazate on sugar snap and snow peas for the control of pest mites.

c. Minor use permit 12008 which allows for the use of propachlor on various crops to control weeds has been extended by 5 years to cover use until 30 November, 2020.

Outcomes

The targeted outcome of project VG13028 is approval of minor-use permits by the Australian Pesticides and Veterinary Medicines Authority (APVMA) which allow the use of agrichemicals in vegetable crops.

In this regard, 3 of 5 potential outcomes have been achieved:

1. Minor-use permit, PER80501, was approved and released by the APVMA on 20 July, 2015. This permit allows for the use of cyprodinil and fludioxonil on allium crops (excluding bulb onions and garlic) for the control of certain fungal diseases.

2. Minor use permit, PER80558 was approved and released by the APVMA on 10 November, 2015. This permit allows for the use of bifenazate on sugar snap and snow peas for the control of pest mites.

3. Minor-use permit 12008 was extended to allow the use of propachlor on leafy brassica vegetables and alliums for the control of weeds until 30th November, 2020.

A further two outcomes are pending review of minor-use permit applications by the APVMA:

1. A permit application which seeks approval for the use of bifenthrin in cruciferous and non-cruciferous crops.

2. A permit application which seeks approval for the use of a-cypermethrin in protected and field-grown cucumber crops.

Evaluation and Discussion

The evaluation of this project is difficult at this stage as some of the potential outcomes of this project are pending regulatory decisions to be taken by the Australian Pesticides and Veterinarian Medicines Authority (APVMA) as detailed in 'Outcomes' section of this report.

Nevertheless, 3 of the 5 regulatory decisions have been achieved.

Recommendations

There are no specific or general recommendations to provide in relation to this project

Scientific Refereed Publications

No scientific refereed publications were prepared as part of this project.

Intellectual Property/Commercialisation

No commercial IP generated was during this project

References

No references required for the conduct of this project.

Acknowledgements

Crop Protection Research Pty Ltd wishes to gratefully acknowledge the assistance provided by all the pro-active vegetable growers who provide access to their crops for the conduct of the residue studies reported here. Without this assistance the conduct of project would be significantly more difficult – thankyou.

Appendices

No appendices attached.