Horticulture Innovation Australia

Final Report

Generation of residue and crop safety data for pesticide minor-use permit applications in vegetable crops 2012 - CPR

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Crop Protection Research Pty Ltd

Project Number: VG12074

VG12074

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Summary

Growers of some horticultural crops are left exposed to greater production risk and can incur significant crop losses when pesticides are not registered for use on their crop(s); because insect pests, weeds and diseases are inadequately controlled.

This occurs when a cost-benefit analysis indicates that the cost of generating data and preparing data packages for product registration is significantly higher than the additional sales that may be generated from a new registration.

To address this situation, sometimes referred to as a market-failure, the Australian Pesticides and Veterinary Medicines Authority (APVMA), who regulate pesticide-use in Australia, developed a permit system whereby, they permit the use of a pesticide on a crop after reviewing less data than would otherwise be reviewed when a manufacturer registers a pesticide.

Because the amount of supportive data required for permits is typically much lower than is required for a full registration, growers and peak industry bodies sometimes contribute funds towards the generation of residue data and its submission to the APVMA to secure permits for their grower members.

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 relevant permits related to the data generation. The table also updates the progress of permit applications.

Project VG12074 was managed as 4 sub-projects, each of which was a single pesticide residue study and which were conducted in accordance with the OECD principles of Good Laboratory Practice (GLP).

Each of the 4 residue studies was designed to determine the residual level of pesticide active constituent(s), which remained in horticultural produce, following one or more applications of a commercially-formulated agrichemical product.

The active constituents studied, followed in parentheses by the crops treated with them, were: clethodim (chillies, paprika, eggplant, silver beet and spinach), emamectin (parsnip, swede, turnip, radish and leafy vegetables), triadimenol (alliums) and trichlorfon (eggplant, pepino and cape gooseberry).

A range of crops were treated with the pesticide in each of the studies with each crop located at different study-sites in most circumstances. Where possible, the study-sites were positioned in commercially-grown crops, otherwise they were grown specifically for the study at facilities or properties where staff were on hand to grow them in accordance with local Good Agricultural Practice (GAP).

Application of pesticides was completed using hand-held, gas-powered boom-sprayers fitted with hollow-cone nozzles.

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.

Pesticide	Crops	Relevant permit	Permit renewal status
Clethodim	chillies, paprika, eggplant, silver beet and spinach	PER11946	Five year permit renewal (PER13397) which is scheduled to expire 31 March, 2018
Emamectin	parsnip, swede, turnip, radish and leafy vegetables	PER11994	Five year permit renewal (PER14907) which is scheduled to expire 30 November, 2019
Triadimenol	Alliums	New permit	Five-year permit approved (PER14906) which is scheduled to expire 31 October, 2019.
Trichlorfon	Eggplant, pepino, cape gooseberry	PER12442	Permit renewal application submitted to the APVMA for consideration on 23 January, 2015. APVMA have acknowledged receipt of the application as number 101484. The application process is expected to be completed, and the outcome reported to HIA Ltd by 29 July, 2015.

At certain times after the application of pesticides was completed, samples from areas of non-treated crop, as well as treated crop, were collected, packaged to prevent contamination and deep-frozen to minimise residue degradation.

The samples were then sent to a pesticide-residue laboratory for analysis where they were unpacked, defrosted to the point where they could be sub-sampled and homogenised before residue extraction procedures were conducted on the homogenate.

Depending upon the pesticide, the extract was analysed using validated methodology, based on liquid or gas-chromatography and mass-spectrophotometry, to detect and quantify the residue(s).

When pesticides that were detected at levels higher than the limit of quantitation (LOQ), the results were recorded, and reported as milligrams of pesticide per of kilogram produce (mg/kg) which is equivalent to parts per million (ppm).

Each residue study was reported separately before being submitted, along with the appropriate minor-use permit application forms, to HIA Ltd for review before being sent to the APVMA for consideration and approval.

Keywords

APVMA, minor-use, permits, agrichemicals, residues, clethodim, emamectin, triadimenol, trichlorfon, chillies, paprika, eggplant, silver beet, spinach, parsnip, swede, turnip, radish, leafy vegetables, alliums, eggplant, pepino and cape gooseberry.

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 'wishlists' 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 VG12074 was managed as 4 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.

Clethodim (chillies, paprika, eggplant, silver beet and spinach)

Season 1 (2013)

A residue study conducted in accordance with the principles of Good Laboratory Practice (GLP) was undertaken across eight sites located in south-east Queensland and south eastern Victoria on commercially grown chillies (protected and un-protected), eggplant (protected and un-protected), spinach, silver beet and pea (fresh market and processing) crops.

All sites received a single application Chemtura Genie Herbicide (clethodim 500g/L) at 500 mL/ha that was made 28 days before typical commercial harvest (DBTCH). Regardless of study site, treatments were applied using a hand-held, gas-powered boom-sprayer.

Samples of chillies were collected at 21, 28 (commercial harvest) and 35 days after last application (DALA); those from eggplant, silver beet and spinach were collected at 14, 21 and 28 (commercial harvest) DALA and samples of peas were collected 28 (commercial harvest) 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 clethodim in accordance with the APVMA residue definition as at December 2013.

The analysis was completed using equipment and methods which utilised liquid chromatography 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 (post mail) on the 19 May, 2014. Subsequently, this was reviewed and forwarded to Growcom Ltd for final submission to the APVMA.

Advice received from the APVMA on 10 September, 2014 regarding the application, was that the laboratory analyses were not conducted to their satisfaction and that additional data was required. Thus, a second season of field-phase activities was required to regenerate samples that could be analysed for residues using the appropriate analytical methods and techniques.

Season 2 (2014) – Repeated sites

On instruction from the Australian Pesticides and Veterinary Medicines Authority (APVMA), due to unacceptable techniques/methods used during the laboratory-phase analysis of samples collected during season 1, the study was repeated.

The materials and methodology utilised during the field-phase of this repeat study were identical to those described for season 1 above.

However, the analytical-phase of this study was conducted by a different laboratory compared to that used during the first season. The new laboratory employed subtly different analytical techniques, albeit using the same equipment, than were used in the original study to ensure that the analyses were acceptable to the APVMA.

Upon completion of the repeated 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 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, via email, on 29 June, 2015.

Table 2. Project VG11028 was managed by separating it into 4 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
12-HIA-027(a)GLP (AVG1139, AVG840 & AVG776)	**clethodim**	chillies, paprika, eggplant, silver beet, spinach and peas	8	VIC (x4) and QLD (x4)
			8 (Repeated sites)	VIC (x6) and QLD (x2)
12-HIA-027(b)GLP (HIA2007, HIA1999 & HIA1994)	**emamectin**	parsnip, swede, turnip, radish and leafy vegetables	11	VIC (x4) and QLD (x7)
12-HIA-027(c)GLP (HIA1266)	**triadimenol**	alliums	6	VIC (x3) and QLD (x3)
12-HIA-027(d)GLP (HIA1894)	**trichlorfon**	eggplant, pepino and cape gooseberry	5	VIC (x1) and QLD (x4)

Emamectin (parsnip, swede, turnip, radish and leafy vegetables)

A residue study conducted in accordance with the principles of Good Laboratory Practice (GLP) was undertaken across eleven sites located in south east Queensland and south east Victoria on commercially grown brassicacae; swede, turnip, radish, rocket & Chinese cabbage, as well as the non-cruciferous crops parsnip and spinach.

All sites received four foliar applications of Proclaim® Insecticide (Emamectin 44 g/kg) at 300 mL/ha that were made at approximately 24, 17, 10 and 3 days before typical commercial harvest (DBTCH). Treatments were applied using a hand-held, gas-powered boom-sprayer.

Samples were collected from each site at 0, 1, 2 and 3 (commercial harvest) 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 Emamectin in accordance with the APVMA residue definition as at November 2013 (Table 3 Residue definitions (and marker residues), APVMA, 2013).

The analysis was completed using equipment and methods which utilised liquid chromatography 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 HIA 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 (email) on the 11th May, 2014.

Triadimenol (alliums)

A residue study conducted in accordance with the OECD principles of Good Laboratory Practice (GLP) was undertaken across three sites located in south east Victoria and three in southern Queensland on commercially-grown leeks, sHIAlots and spring onions.

Plots of leeks and sHIAlots received three foliar applications of Allitron™ SC Systemic Fungicide (triadimenol, 375 g/L) at 70, 49 and 28 days before typical commercial harvest (DBTCH). Spring onion plots received either three treatments at 70, 49 and 28 DBTCH, or two treatments at 49 and 28 DBTCH. All treatments were applied using a hand-held, gas-powered boom-sprayer at an application rate of 1.0 L/ha of Allitron at each application in a carrier rate of approximately 100 or 500 L/ha. At one of two sites, leeks and spring onions were sampled at 0, 7, 14, 21, 28 (commercial harvest) and 35 days after last application (DALA) of Allitron. At the second site, and at both sHIAlot sites, samples were collected at 14, 21 and 28 DALA (commercial harvest).

Samples were sealed in double-layered, heavy-duty plastic bags and stored frozen prior to and during transportation to the analytical laboratory (the Australian Wine Research Institute (AWRI)) where they were analysed for residual triadimenol in accordance with the APVMA residue definition.

Residue analysis utilised liquid chromatography coupled with tandem 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 HIA 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 (email) on the 11th May, 2014.

Trichlorfon (eggplant, pepino and cape-gooseberry)

A residue study conducted in accordance with the principles of Good Laboratory Practice (GLP) was undertaken across 5 sites located in south east Queensland and south east Victoria on commercially grown eggplant, cape-gooseberry and pepino.

Of the three eggplant sites, two were based in glasshouses (protected cropping) and one site was field-based. Cape gooseberries and pepinos were grown in the field.

Regardless of crop-type, plots received four foliar applications of Nufarm Lepidex 500 Insecticide (trichlorfon, 500 g/L) at approximately 23, 16, 9 and 2 days before typical commercial harvest (DBTCH). The first treatment (23 DBTCH) was applied at 250 mL/100 L, and three repeat sprays (16, 9 and 2 DBTCH) at 125 mL/100 L. All treatments were applied using a hand-held, gas-powered boom-sprayer in a carrier rate of approximately 500 L/ha.

Fruit was collected from plots at 0, 1, 2 (commercial harvest) and 3 days after last application (DALA). Samples were sealed in double-layered, heavy-duty plastic-bags and stored frozen prior to and during transportation to the analytical laboratory (the Australian Wine Research Institute (AWRI)), where they were analysed for residual trichlorfon in accordance with the current APVMA residue definition (Agricultural and Veterinary Chemicals Code Instrument No. 4 (*MRL Standard*) 2012; table 3).

Residue analysis utilised liquid chromatography coupled with tandem 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 HIA 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 (email) on the 12th May, 2014.

Results

Clethodim (chillies, paprika, eggplant, silver beet and spinach)

Season 1

The limit of quantitation (LoQ) was reported to be 0.05 milligrams per kilogram (mg/kg) in peas and 0.1 mg/kg in pea foliage, chillies, eggplant, spinach and silver beet.

Residual levels of clethodim were below the LOQ in samples collected from the non-treated areas of all eight study sites.

Residual clethodim in chillies (protected), eggplant (field-grown and protected), spinach and peas (foliage and fruit) were below the LoQ.

However, in silver beet collected 21 or 28 days after the last application (DALA) residual clethodim was 10 or 40% higher, respectively, than the LoQ (0.1 mg/kg) which is equivalent to the temporary maximum residue limit (tMRL). No residual clethodim was recorded in silver beet sampled at 14 DALA.

Similarly, residual clethodim was measured above the LoQ in chillies (field-grown) collected 21 DALA. There was no residue detected in chillies collected after this sampling time (28 or 35 DALA). Whilst residues above the LOQ were measured in samples collected at this time, the level of 0.14 mg/kg is well below the tMRL of 0.7 mg/kg for peppers.

An independent auditor reported that all-phases of the study were conducted in accordance with the principles of GLP. However, advice received from the APVMA on 10 September, 2014 regarding the application, was that the laboratory analyses were not conducted to their satisfaction and that additional data was required. Thus, a second season of field-phase activities was required to regenerate samples that could be analysed for residues using the appropriate analytical methods and techniques.

Minor-use permit PER11946, which allowed the use of clethodim in these crops expired before this study was completed. The APVMA issued a new permit (PER13397) on 15 November, 2013 for 13-months to accommodate the time needed to complete residue data generation activities. The new permit allowed the continued use of clethodim in these crops until it expires on 31 December, 2016. This was further extended to enable completion of the additional data generation activities. The extended permit allows the continued use of clethodim in these crops until it expires on 31 March, 2018.

Season 2

The limit of quantitation (LoQ) was reported to be 0.05 milligrams per kilogram (mg/kg) of clethodim in peas and 0.1 mg/kg of clethodim in chilies, eggplant, spinach and silverbeet.

Residual levels of clethodim were below the LoQ in samples collected from the non-treated and treated areas of all eight study sites.

The data generated during this project and the relevant minor-use permit application documentation and fees were provided to HIA Ltd (29 June, 2015) who reviewed the material before submission to the APVMA. The APVMA submission date was unknown at the time of writing this final project report.

Emamectin (parsnip, swede, turnip, radish and leafy vegetables)

The limit of quantitation (LoQ) was reported to be 0.010 milligrams per kilogram (mg/kg) of Emamectin in each of the crop matrices analysed.

Residual levels of Emamectin were below the LoQ in samples collected from the non-treated areas of all eleven study sites.

Mostly, residual Emamectin was below the reported LoQ in the root vegetables (swede, turnip, radish and parsnip) included in this study. However, residual Emamectin was above the LoQ in radishes collected from one site, on the same day of the last application of the product. Samples collected from the same site 24 hours or more had residual Emamectin lower than the LoQ.

Residues of Emamectin in leafy brassica vegetables included in the study (rocket and Chinese cabbage) decreased substantially over the 3 day sampling period but remained at or above the reported LoQ at all sample timings (0, 1, 2 or 3 days) after the last application was applied. Emamectin residue in rocket (1 site) was below the current temporary MRL (tMRL) of 0.05 mg/kg within 2-3 days of the last application being applied. The residual Emamectin in Chinese cabbage (2 sites) was substantially lower than the tMRL of 0.3 mg/kg immediately after the final application being applied (i.e. 0 day WHP).

In spinach, which is not a leafy brassica vegetable, residual Emamectin was consistently below 0.07 mg/kg 3 days after the last application.

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 19 June, 2014.

The APVMA considerations were completed and a minor-use permit (PER14907) was approved. This allows the use of emamectin on rocket, spinach, brassica-root crops and parsnip for 5-years until it expires on 30 November, 2019.

Triadimenol (alliums)

The limit of quantitation (LoQ) was reported to be 0.01 mg/kg was reported to be 0.005 milligrams of triadimenol per kilogram (mg/kg) of leeks, spring onions and shallots.

Where a consistent carrier rate was used, the residual level of triadimenol varied depending on crop type i.e. leeks, spring onions or shallot. Conversely, regardless of crop type, consistently and substantially higher residue levels persisted in samples where the highest water rate (500 L/ha) was used.

Generally, and regardless of crop type, residual triadimenol was higher where 3 applications of Allitron were applied rather than 2.

Further, residual triadimenol tended to increase with the time after last application to approximately 21-days before rapidly declining. This trend was evident regardless of the carrier rate used but was more pronounced where 500 L/ha, rather than, 100 L/ha, was used.

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 19 June, 2014.

The APVMA considerations were completed and a minor-use permit (PER14906) was approved. This allows the use of triadimenol on allium crops for 5-years until it expires on 31 October, 2019.

Trichlorfon (eggplant, pepino and cape-gooseberry)

The limit of quantitation (LoQ) was reported to be 0.01 milligrams per kilogram (mg/kg) of trichlorfon in each of the crop matrices analysed (eggplant, cape gooseberry and pepino).

Residual trichlorfon was below the temporary maximum residue limit (tMRL) of 0.5 mg/kg in all samples of eggplant and cape gooseberry.

However, residues were several times higher than the tMRL in the pepinos.

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 on 23 January, 2015. APVMA have acknowledged receipt of the application as number 101484. The application process is expected to be completed, and the outcome reported to HIA Ltd by 29 July, 2015.

Outputs

Project VG12074 generated 3 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 12-HAL-027(a)GLP for the conduct of clethodim residue data generation (season 1)
    b. Study plan 14-HAL-026GLP for the conduct of clethodim residue data generation (season 2)
    c. Study plan 12-HAL-027(b)GLP for the conduct of emamectin residue data generation
    d. Study plan 12-HAL-027(c)GLP for the conduct of triadimenol residue data generation
    e. Study plan 12-HAL-027(d)GLP for the conduct of trichlorfon residue data generation
2. Study plans. Five 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 12-HAL-027(a)GLP detailing the results of the clethodim residue data generation (season 1)
    b. Study report 14-HAL-026GLP detailing the results of the clethodim residue data generation (season 2)
    c. Study report 12-HAL-027(b)GLP detailing the results of the emamectin residue data generation
    d. Study report 12-HAL-027(c)GLP detailing the results of the triadimenol residue data generation
    e. Study report 12-HAL-027(d)GLP detailing the results of the trichlorfon residue data generation
3. Minor-use permit applications to the Australian Pesticides and Veterinary Medicines Authority (APVMA) seeking to allow the use of:
    a. Clethodim in chillies, paprika, eggplant, silver beet and spinach for the control of annual ryegrass and winter grass
    b. Emamectin in parsnip, swede, turnip, radish and brassica leafy vegetables for the control of various pests
    c. Triadimenol in allium crops for the control of white rot disease
    d. Trichlorfon in eggplant, pepino and cape gooseberry for the control of fruit fly.

Outcomes

The targeted outcome of project VG12074 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 outcomes have been achieved:

1. A permit (PER13397) allowing the use of clethodim in chillies, paprika, eggplant, silver beet and spinach for the control of annual ryegrass and winter grass was approved and is scheduled to expire 31 March 2018.

2. A permit (PER14907) allowing the use of emamectin in parsnip, swede, turnip, radish and brassica leafy vegetables for the control of various pests was approved and is scheduled to expire 30 November 2019.

3. A permit (PER14906) allowing the use of Triadimenol in allium crops for the control of white rot disease was approved and is scheduled to expire 31 October 2019.

A further outcome is pending successful review of a minor-use permit application by the APVMA:

1. A permit application which seeks approval for the use of trichlorfon in eggplant, pepino and cape gooseberry for the control of fruit fly, which included the technical data generated during this project, was submitted to Horticulture Innovation Australia Ltd (HIA Ltd). HIA Ltd reviewed, approved and submitted the application to the APVMA for consideration on 23 January, 2015. The APVMA have acknowledged receipt of the application as number 101484. The application process is expected to be completed, and the outcome reported to HIA Ltd by 29 July, 2015.

Evaluation and Discussion

This project should be considered highly effective as 3 of the 4 targeted outcomes have been achieved. The fourth outcome is pending a regulatory decision to be taken by the Australian Pesticides and Veterinarian Medicines Authority (APVMA).

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.