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Determining Residue Levels of Specified Chemicals in Fresh Herbs

by Jane Floyed

Peracto Pty Ltd

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Foreword

There are 18 major herb crops grown in Australia, yet all of them are considered to be minor crops according to the Australian Pesticides and Veterinary Medicines (APVMA) context. As such, they are very unlikely to be listed on crop protectant labels and therefore require individual minor use permits.

Currently, the Australian Herb and Spice Industry Association (AHSIA) has very few crop protectants available either by registration or minor use permits, to treat its major pests. This exposes the industry to crop failures and inconsistencies in market supply due to the lack of available management tools. It also presents a major risk of developing resistance to the present permitted crop protectants.

Research conducted for this project has generated residue data on the levels of eleven different chemicals in fresh herbs (basil and parsley) following various application regimes, to support permit applications for their use by the industry's producers.

This project was funded from RIRDC Core Funds which are provided by the Australian Government.

This report, an addition to RIRDC's diverse range of over 1800 research publications, forms part of our new plant industries R&D program, which aims to facilitate the development of new industries based on plants or plant products that have commercial potential for Australia.

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Peter O'Brien
Managing Director
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AgriSolutions Australia conducted the analytical work for the projects.

Peracto staff who contributed to this project include Kate Allen; Richard Porter, Janine Scott; Elizabeth Fields and Ryan Blackney.

Contents

Executive Summary

What the report is about

This report outlines the residue trials conducted to supply data to support the application of permits for various pesticides in fresh herbs.

Who is the report targeted at?

This report has been prepared for the herb industry as an overview of the project. Detailed field and analytical reports have also been prepared for each individual trial and these will be used by the AHSIA to support the permit applications submitted to the APVMA.

Background

A wide variety of herbs are currently being produced in Australia by AHSIA members. All the herb crops are classified as minor crops by the APVMA. There are a wide range of pest, disease and weed problems in herb crops, however, there are very few pesticides available to be used in the overall integrated management of these problems.

Aims/objectives

To conduct crop residue trials required to finalise the minor use permit applications lodged with the APVMA during project AUC4A.

Methods used

All residue data was generated in accordance with the OECD Principles of GLP using Peracto's systems and procedures. The trials were conducted in commercial herb crops using practicies to simulate commercial practice.

Results/key findings

A total of 38 trials were completed which provide data to support the application for 11 minor use permits.

Implications for relevant stakeholders for:

Finalisation of the minor use permit applications will allow growers to develop more sustainable and efficient pest management systems and ultimately, maintain a premium quality product with continuity of supply capable of competing successfully in the highly competitive domestic and global marketplace.

Recommendations

AHSIA to submit the data generated in this project to the APVMA to finalise the minor use permit applications.

Introduction

The Herb & Spice industry can be classed as a maturing industry with a current yearly domestic incremental growth of 20% and an increasing presence in overseas markets. Continued domestic expansion cannot be expected to last and the industry must aim towards increasing export capacity. Continued investment and better management practices are required to maintain a premium quality product with continuity of supply capable of competing successfully in a highly competitive global market.

The Australian Herb and Spice Industry has very few chemicals (either by registration or minor use permits) to treat its major pests - this exposes the industry to crop wipe out and inconsistencies in market supply due to the lack of available tools, but also to the major risk of developing resistance to the present permitted chemicals. The current limited number of permitted chemicals, if it were to continue, would present a long-term threat to industry viability.

The industry strategic plan for 2006-2011 identifies the registration of pesticides and the development of sustainable pest management strategies as major priorities for the industry.

A number of permit applications were submitted to the APVMA for various pesticides in herbs. On 30th May 2007 the APVMA advised the AHSIA that further data was required for these applications. This project was set up specifically to provide the data requested by the APVMA to AHSIA.

To address this issue, eleven residue studies were planned to generate data to support new minor use permit applications and finalise existing applications already lodged with the APVMA during project AUC4A. The studies were conducted by Peracto Pty Ltd under the Principles of Good Laboratory Practice (GLP) of the Organization for Economic Cooperation and Development (OECD). Proven and new reduced risk crop protectants were selected against the key target insect pests and diseases, with a focus on ensuring that those needs are addressed by more than one crop protectant from different chemical groups where possible. The studies were conducted in South Australia and Victoria, in basil and parsley grown in both greenhouse hydroponic and field cropping situations, in all categories pertaining to the requested use patterns.

This report provides an overview of the project, however, composite field and analytical reports were prepared for each study and these contain the complete set of residue results, trial details and methodology.

The principal aim of these minor use permit applications is to assist industry in managing the identified pests and diseases within the context of enhancing industry adoption of IPM and resistance management strategies.

Objectives

- To conduct crop residue trials required for the purpose of establishing the maximum residue level (MRL) likely to occur in fresh herbs (basil and parsley) when various products are used to the recommended use pattern for effective and reliable pest control.

- To provide the data to establish a new MRL for various products in fresh herbs.

- To finalise the minor use permit applications lodged with APVMA during project AUC4A.

- Increase the range of permitted crop protectant options available to growers, to assist the herb and spice industry in developing Best Management Practices that maintain sustainable production systems.

- Ultimately, maintain a premium quality product with continuity of supply capable of competing successfully in the highly competitive domestic and global marketplace.

Methodology

All residue data was generated in accordance with the OECD Principles of GLP, to facilitate recognition of standards in overseas markets and enhance local acceptance of manufacturers in registering those uses.

Studies AHSIA-0701, AHSIA-0702, AHSIA-0703, AHSIA-0704, AHSIA-0705, AHSIA-0707, AHSIA-0708, AHSIA-0709 and AHSIA-0711 were conducted as residue decline studies; the chemical was applied close to harvest and the samples were collected at regular intervals thereafter to show how the residue levels change with time. For studies AHSIA-0706, AHSIA-0710, the product was applied prior to, or at, planting, and treatments were sampled once at harvest maturity.

Treatment Applications

In order to encompass the maximum treatment regime, the studies were conducted using the maximum number of consecutive applications that may be made to the crop, and the products were applied at the maximum application rate which is likely to be recommended. Pesticide treatments were applied in a manner which simulated best commercial practice for the application of herbicides, fungicides, insecticides and miticides to the target crops. The methods used replicated how the co-operator farmers typically grow and spray the crop. Pre-harvest foliar treatments were applied on a dilute basis spraying all parts of the plant foliage either to the point of run-off or high volume (> 500 L/ha) broadcast application using a pressurised tank, hose and hand gun or lance. A horizontal hand-held boom was used for the field cropping situations. The total spray volumes varied depending on plant size and growing density.

Full application details were reported in the Final Report prepared for each individual study.

Sampling Procedures

Treatment sampling was carried out according to documented Standard Operating Procedures relevant to the crop and plant portion to be sampled and analysed. In general, a minimum of 500 g of foliage was collected from all areas within each plot for each sample taken. The end plants of each plot were not sampled.

Treatment sample timings were centred on WHP (withholding period), and were taken as follows:

- pre witholding period (WHP)
- WHP, and
- post WHP

For example, with a recommended WHP of 5 days, samples were taken at day 3, day 5 and day 7.

Analysis of Samples

Plant samples that were collected from each field site were sent frozen to AgriSolutions Australia Pty Ltd.

The samples were analysed and a laboratory report was generated for each study.

Table 1 - Study Details

GLP Study Number	Active Ingredient	Field	Hydroponics greenhouse	Treatment Application Method	Treatment Application Timing	Treatment Sampling Timing
AHSIA-0701	spiroxamine	Parsley & Basil	Parsley & Basil	Dilute application to the point of run-off	7 DBH	5, 7 and 9 DALA
AHSIA-0702	buprofezin	Parsley & Basil	Parsley & Basil	Dilute application to the point of run-off	10 and 3 DBH	0, 3 and 5 DALA
AHSIA-0703	chlorothalonil	-	Parsley & Basil	Dilute application to the point of run-off	24 and 14 DBH	14, 21 and 28 DALA
AHSIA-0704	etoxazole	Parsley & Basil	Parsley & Basil	Dilute application to the point of run-off	21 DBH	14, 21 and 28 DALA
AHSIA-0705	fenhexamid	Parsley & Basil	Parsley & Basil	High volume (> 500 L/ha) broadcast application to the soil	3 DBH	0, 3 and 5 DALA
AHSIA-0706	linuron	Parsley & Basil	-	High volume (> 500 L/ha) foliar spray - broadcast application	Pre-planting	Harvest maturity
AHSIA-0707	myclobutanil	Parsley & Basil	Parsley & Basil	Dilute application to the point of run-off	42, 28 and 14 DBH	7, 14 and 21 DALA
AHSIA-0708	pyriproxyfen	Parsley & Basil	Parsley & Basil	High volume (> 500 L/ha) foliar spray - broadcast application	15 and 1 DBH	0, 1 and 3 DALA
AHSIA-0709	chlorfenapyr	Parsley & Basil	Parsley & Basil	High volume (> 500 L/ha) foliar spray - broadcast application	13, 10 and 7 DBH	7, 10 and 14 DALA
AHSIA-0710	etridiazole	Parsley & Basil	Parsley & Basil	Root dip	Planting	Harvest maturity
AHSIA-0711	quinoxyfen	-	Parsley & Basil	Dilute application to the point of run-off	27, 17 and 7 DBH	7, 10 and 14 DALA

DBH = Days Before Harvest
DALA = Days After the Last Application

Test Site Locations and Details

Table 2 - GLP Study Number AHSIA-0701

Test Sites	1	2	3	4
Field Scientists	Liz Fields	Liz Fields	Liz Fields	Richard Porter
Co-operators Names	David Milburn	George Bobbin	George Bobbin	Herbivorous
Addresses	The Gordon Institute of Tafe Dairy Road Werribee 3030	14 Rowena Street Bendigo VIC 3550	14 Rowena Street Bendigo VIC 3550	Brookside Road Darlington SA 5047
Paddock IDs	None	Front Greenhouse	Front Greenhouse	Planting Block "A"
Soil Types	Clay loam	75% pinebark, 10% coco husks, 15% peat moss	75% pinebark, 10% coco husks, 15% peat moss	Sandy loam
Crops	Parsley	Parsley	Basil	Basil
Cultivars	Shamrock	Limerick	Genovese	Genovese
Environments	Field	Hydroponics greenhouse	Hydroponics greenhouse	Field
Planting Dates	28/11/07	17/12/07 from seed 07/01/08 into NFT	29/10/07 from seed 12/11/07 into NFT	21/11/07
Plot Sizes	5 m x 1.5 m (7.5 m^2)	T1 = 20 pots (0.36 m^2) T2 = 60 pots (1.08 m^2)	T1 = 20 pots (0.48 m^2) T2 = 60 pots (1.44 m^2)	10 m x 1 m (10 m^2)
Plot Design	Unreplicated	Unreplicated	Unreplicated	Unreplicated

Table 3 - GLP Study Number AHSIA-0702

Test Sites	1	2	3	4
Field Scientists	Liz Fields	Liz Fields	Liz Fields	Richard Porter
Co-operators Names	David Milburn	George Bobbin	George Bobbin	Herbivorous
Addresses	The Gordon Institute of TAFE Dairy Road Werribee VIC 3030	14 Rowena Street Bendigo VIC 3550	14 Rowena Street Bendigo VIC 3550	Brookside Road Darlington SA 5047
Paddock IDs	None	Front Greenhouse	Front Greenhouse	Planting Block "A"
Soil Types	Clay loam	75% pine bark, 10% coco husks, 15% peat moss	75% pine bark, 10% coco husks, 15% peat moss	Sandy loam
Crops	Parsley	Parsley	Basil	Basil
Cultivars	Shamrock	Limerick	Genovese	Genovese
Environments	Field	Hydroponics greenhouse	Hydroponics greenhouse	Field
Planting Dates	19/09/07	17/12/07 from seed 07/01/08 into NFT	29/10/07 from seed 12/11/07 into NFT	21/11/07
Plot Sizes	10 m x 1.5 m (15 m^2)	T1 = 20 pots (0.36 m^2) T2 = 60 pots (1.08 m^2)	T1 = 20 pots (0.48 m^2) T2 = 60 pots (1.44 m^2)	10 m x 1 m (10 m^2)
Plot Design	Unreplicated	Unreplicated	Unreplicated	Unreplicated

Table 4 - GLP Study Number AHSIA-0703

Test Sites	1	2
Field Scientists	Liz Fields	Liz Fields
Co-operators Names	George Bobbin	George Bobbin
Addresses	14 Rowena Street Bendigo VIC 3550	14 Rowena Street Bendigo VIC 3550
Paddock IDs	Front Greenhouse	Front Greenhouse
Soil Types	75% pine bark 10% coco husks 15% peat moss	75% pine bark 10% coco husks 15% peat moss
Crops	Parsley	Basil
Cultivars	Limerick	Genovese
Environments	Hydroponics greenhouse	Hydroponics greenhouse
Planting Dates	17/12/07 from Seed 07/01/08 into NFT system	29/10/07 from Seed 12/11/07 into NFT system
Plot Sizes	T1 = 20 pots (0.36 m^2) T2 = 60 pots (1.08 m^2)	T1 = 20 pots (0.48 m^2) T2 = 60 pots (1.44 m^2)
Plot Design	Unreplicated	Unreplicated

Table 5 - GLP Study Number AHSIA-0704

Test Sites	1	2	3	4
Field Scientists	Liz Fields	Liz Fields	Liz Fields	Richard Porter
Co-operators Names	David Milburn	George Bobbin	George Bobbin	Herbivorous
Addresses	The Gordon Institute of TAFE Dairy Road Werribee 3030	14 Rowena Street Bendigo Victoria 3550	14 Rowena Street Bendigo Victoria 3550	Brookside Road Darlington SA 5047
Paddock IDs	None	Front greenhouse	Front greenhouse	Planting Area 'A'
Soil Types	Clay Loam	75% pine bark, 10% coco husks and 15% peatmoss	75% pine bark, 10% coco husks and 15% peatmoss	Sandy loam
Crops	Parsley	Parsley	Basil	Basil
Cultivars	Shamrock	Limerick	Genovese	Genovese
Environments	Field	Hydroponics greenhouse	Hydroponics greenhouse	Field
Planting Dates	19/09/07	17/12/07 from seed 07/01/08 into NFT	29/10/07 from seed 12/11/07 into NFT	21/11/07
Plot Sizes	10 m x 1.5 m ($15\ m^2$)	T1 = 20 pots ($0.36\ m^2$) T2 = 60 pots ($1.08\ m^2$)	T1 = 20 pots ($0.48\ m^2$) T2 = 60 pots ($1.44\ m^2$)	8 m x 1 m ($8\ m^2$)
Plot Design	Unreplicated	Unreplicated	Unreplicated	Unreplicated

Table 6 - GLP Study Number AHSIA-0705

Test Sites	1	2	3	4
Field Scientists	Liz Fields	Liz Fields	Liz Fields	Richard Porter
Co-operators Names	David Milburn	George Bobbin	George Bobbin	Herbivorous
Addresses	The Gordon institute of TAFE Dairy Road Werribee VIC 3030	14 Rowena Street Bendigo VIC 3550	14 Rowena Street Bendigo VIC 3550	Brookside Road Darlington SA 5047
Paddock IDs	None	Front Greenhouse	Front Greenhouse	Planting Block "A"
Soil Types	Clay loam	75% pine bark, 10% coco husks, 15% peat moss	75% pine bark, 10% coco husks, 15% peat moss	Sandy loam
Crops	Parsley	Parsley	Basil	Basil
Cultivars	Shamrock	Limerick	Genovese	Genovese
Environments	Field	Hydroponics-Greenhouse	Hydroponics-Greenhouse	Field
Planting Dates	19/09/07	17/12/07 from Seed 07/01/08 into NFT	29/10/07 from Seed 12/11/07 into NFT	21/11/07
Plot Sizes	10 m x 1.5 m ($15\ m^2$)	T1 = 20 pots ($0.36\ m^2$) T2 = 60 pots ($1.08\ m^2$)	T1 = 20 pots ($0.48\ m^2$) T2 = 60 pots ($1.44\ m^2$)	16 m x 1 m ($16\ m^2$)
Plot Design	Unreplicated	Unreplicated	Unreplicated	Unreplicated

Table 7 - GLP Study Number AHSIA-0706

Test Sites	1	2
Field Scientists	Liz Fields	Richard Porter
Co-operators Names	David Milburn	Michelle Vidau
Addresses	The Gordon Institute of TAFE Dairy Road Werribee VIC 3030	Brookside Road Darlington SA 5047
Paddock IDs	None	Planting Area A
Soil Types	Clay loam	Sandy Loam
Crops	Parsley	Basil
Cultivars	Shamrock	Genovese
Environments	Field	Field
Planting Dates	19/09/07	21/11/07
Plot Sizes	7.5 m x 1.5 m (11.25 m^2)	10 m x 1 m (10 m^2)
Plot Design	Unreplicated	Unreplicated

Table 8 - GLP Study Number AHSIA-0707

Test Sites	1	2	3	4
Field Scientists	Liz Fields	Liz Fields	Liz Fields	Richard Porter
Co-operators Names	David Milburn	George Bobbin	George Bobbin	Herbivorous
Addresses	The Gordon Institute of TAFE Dairy Road Werribee VIC 3030	14 Rowena Street Bendigo VIC 3550	14 Rowena Street Bendigo VIC 3550	Brookside Road Darlington SA 5047
Paddock ID	None	Front greenhouse	Front greenhouse	Planting Block "A"
Soil Types	Clay loam	75% pinebark 10% Coco husks 15% peat moss	75% pinebark 10% Coco husks 15% peat moss	Sandy loam
Crops	Parsley	Parsley	Basil	Basil
Cultivars	Shamrock	Limerick	Genovese	Genovese
Environments	Field	Hydroponics greenhouse	Hydroponics greenhouse	Field
Planting Dates	19/09/07	17/12/07 from Seed Into NFT 07/01/08	29/10/07 from Seed Into NFT 12/11/07	21/11/07
Plot Sizes	10 m x 1.5 m (15 m^2)	T1 = 20 pots (0.36 m^2) T2 = 60 pots (1.08 m^2)	T1 = 20 pots (0.48 m^2) T2 = 60 pots (1.44 m^2)	10 m x 1 m (10 m^2)
Plot Design	Unreplicated	Unreplicated	Unreplicated	Unreplicated

Table 9 - GLP Study Number AHSIA-0708

Test Sites	1	2	3	4
Field Scientists	Liz Fields	Liz Fields	Liz Fields	Richard Porter
Co-operators Names	David Milburn	George Bobbin	George Bobbin	Herbivorous
Addresses	The Gordon Institute of TAFE Dairy Road Werribee VIC 3030	14 Rowena Street Bendigo VIC 3550	14 Rowena Street Bendigo VIC 3550	Brookside Road Darlington SA 5047
Paddock IDs	None	Front Greenhouse	Front Greenhouse	Planting Block "A"
Soil Types	Clay loam	75% pinebark 10% coco husks 15% peat moss	75% pinebark 10% coco husks 15% peat moss	Sandy loam
Crops	Parsley	Parsley	Basil	Basil
Cultivars	Shamrock	Limerick	Genovese	Genovese
Environments	Field	Hydroponics greenhouse	Hydroponics greenhouse	Field
Planting Dates	19/09/07	17/12/07 from seed 07/01/08 into NFT	29/10/07 from seed 12/11/07 into NFT	21/11/07
Plot Sizes	10 m x 1.5 m (15 m^2)	T1 = 20 pots (0.36 m^2) T2 = 60 pots (1.08 m^2)	T1 = 20 pots (0.48 m^2) T2 = 60 pots (1.44 m^2)	10 m x 1 m (10 m^2)
Plot Design	Unreplicated	Unreplicated	Unreplicated	Unreplicated

Table 10 - GLP Study Number AHSIA-0709

Test Sites	1	2	3	4
Field Scientists	Liz Fields	Liz Fields	Liz Fields	Richard Porter
Co-operators Names	David Milburn	George Bobbin	George Bobbin	Herbivorous
Addresses	The Gordon Institute of TAFE Dairy Road Werribee VIC 3030	14 Rowena Street Bendigo VIC 3550	14 Rowena Street Bendigo VIC 3550	Brookside Road Darlington SA 5047
Paddock IDs	None	Front Greenhouse	Front Greenhouse	Planting Block "A"
Soil Types	Clay loam	75% pinebark 10% coco husks 15% peat moss	75% pinebark 10% coco husks 15% peat moss	Sandy loam
Crops	Parsley	Parsley	Basil	Basil
Cultivars	Shamrock	Limerick	Genovese	Genovese
Environments	Field	Hydroponics greenhouse	Hydroponics greenhouse	Field
Planting Dates	19/09/07	17/12/07 from Seed 07/01/08 into NFT system	29/10/07 from Seed 12/11/07 into NFT system	21/11/07
Plot Size	10 m x 1.5 m ($15\ m^2$)	T1 = 20 pots ($0.36m^2$) T2 = 60 pots ($1.08m^2$)	T1 = 20 pots ($0.48m^2$) T2 = 60 pots ($1.44m^2$)	8 m x 1 m ($8\ m^2$)
Plot Design	Unreplicated	Unreplicated	Unreplicated	Unreplicated

Table 11 - GLP Study Number AHSIA-0710

Test Sites	1	2	3	4
Field Scientists	Liz Fields	Liz Fields	Liz Fields	Richard Porter
Co-operators Names	David Milburn	George Bobbin	George Bobbin	Herbivorous
Addresses	The Gordon Institute of Tafe, Dairy Road Werribee VIC 3030	14 Rowena Street Bendigo VIC 3550	14 Rowena Street Bendigo VIC 3550	Brookside Drive Darlington SA 5047
Paddock IDs	None	Front greenhouse	Front greenhouse	Planting area "A"
Soil Types	Clay loam	75% pine bark 10% coco husks 15% peat moss	75% pine bark 10% coco husks 15% peat moss	Sandy loam
Crops	Parsley	Parsley	Basil	Basil
Cultivars	Shamrock	Limerick	Genovese	Genovese
Environments	Field	Hydroponics greenhouse	Hydroponics greenhouse	Field
Planting Dates	28/11/07	19/12/07 from seed 14/01/08 into NFT	05/11/07 from seed 19/11/07 into NFT	21/11/07
Plot Size	5 m x 1.5 m (7.5 m^2)	T1 = 20 pots (0.36 m^2) T2 = 40 pots (0.72m^2)	T1 = 20 pots (0.48 m^2) T2 = 40 pots (0.96 m^2)	10 m x 1 m (10 m^2)
Plot Design	Unreplicated	Unreplicated	Unreplicated	Unreplicated

Table 12 - GLP Study Number AHSIA-0711

Test Sites	1	2
Field Scientists	Liz Fields	Liz Fields
Co-operators Names	George Bobbin	George Bobbin
Addresses	14 Rowena Street Bendigo VIC 3550	14 Rowena Street Bendigo VIC 3550
Paddock IDs	Front greenhouse	Front greenhouse
Soil Types	75% Pine bark, 10% coco husks 15% peat moss	75% Pine bark, 10% coco husks 15% peat moss
Crops	Parsley	Basil
Cultivars	Limerick	Genovese
Environments	Hydroponics greenhouse	Hydroponics greenhouse
Planting Dates	17/12/07 from seed 07/01/08 into NFT	24/12/07 from seed 07/01/08 into NFT
Plot Size	T1 = 20 pots, (0.36 m^2) T2 = 60 pots, (1.08 m^2)	T1 = 20 pots, (0.48 m^2) T2 = 60 pots, (1.44 m^2)
Plot Design	Unreplicated	Unreplicated

Results

GLP Study Number AHSIA-0701

This study was conducted to determine the presence and persistence of spiroxamine residues in fresh herbs following one (1) application of Prosper, seven (7) days before harvest.

The field phase was conducted by Peracto Pty Ltd at four (4) locations as follows:

Site 1 - Werribee, VIC (parsley, field)

Site 2 - Werribee, VIC (parsley, hydroponics greenhouse)

Site 3 - Werribee, VIC (basil, hydroponics greenhouse)

Site 4 - Darlington, SA (basil, field)

The analytical phase of the study was conducted by AgriSolutions Australia at their Deception Bay Laboratory, Queensland.

Tabulated below is a summary of residue results applicable for the harvest interval range for basil (hydroponics greenhouse and field) and parsley (hydroponics greenhouse and field) treated with the formulation under test.

Table 13 - Spiroxamine residues in Parsley and Basil

Specimen Number	Formulation Rate (g a.i./100 L)	Spiroxamine Residues (mg/kg)
Site 1 – Werribee, VIC – Parsley (field)		
AHSIA-0701/S1/T1	Nil	< LOQ
AHSIA-0701/S1/T2/5DAA	30	0.31
AHSIA-0701/S1/T2/7DAA	30	0.10
AHSIA-0701/S1/T2/9DAA	30	0.08
Site 2 – Werribee, VIC – Parsley (hydroponics greenhouse)		
AHSIA-0701/S2/T1	Nil	< LOQ
AHSIA-0701/S2/T2/5DAA	30	3.92
AHSIA-0701/S2/T2/7DAA	30	2.81
AHSIA-0701/S2/T2/9DAA	30	2.87
Site 3 – Werribee, VIC – Basil (hydroponics greenhouse)		
AHSIA-0701/S3/T1	Nil	< LOQ
AHSIA-0701/S3/T2/5DAA	30	4.13
AHSIA-0701/S3/T2/7DAA	30	2.66
AHSIA-0701/S3/T2/9DAA	30	1.84
Site 4 – Darlington, SA – Basil (field)		
AHSIA-0701/S4/T1	Nil	< LOQ
AHSIA-0701/S4/T2/5DAA	30	0.73
AHSIA-0701/S4/T2/7DAA	30	0.50
AHSIA-0701/S4/T2/9DAA	30	0.29

DAA = Days after Application

LOQ = 0.01mg/kg for spiroxamine in parsley and basil specimens.

GLP Study Number AHSIA-0702

This study was conducted to determine the presence and persistence of buprofezin residues in fresh herbs following two (2) applications of Applaud Insecticide at ten (10) and three (3) days before harvest.

The field phase was conducted by Peracto Pty Ltd at four (4) locations as follows:

Site 1 - Werribee, VIC (parsley, field)

Site 2 - Werribee, VIC (parsley, hydroponics greenhouse)

Site 3 - Werribee, VIC (basil, hydroponics greenhouse)

Site 4 - Darlington, SA (basil, field)

The analytical phase of the study was conducted by AgriSolutions Australia at their Deception Bay Laboratory, Queensland.

Tabulated below is a summary of residue results applicable for the harvest interval range for basil (hydroponics-greenhouse and field) and parsley (hydroponics-greenhouse and field) treated with the formulation under test.

Table 14 - Buprofezin residues in Parsley and Basil

Specimen Number	Formulation Rate (g a.i./100 L)	Buprofezin Residues (mg/kg)
Site 1 – Werribee, VIC – Parsley (field)		
AHSIA-0702/S1/T1	Nil	< LOQ
AHSIA-0702/S1/T2/0DALA	13.2	10.20
AHSIA-0702/S1/T2/3DALA	13.2	0.79
AHSIA-0702/S1/T2/5DALA	13.2	0.25
Site 2 – Werribee, VIC – Parsley (hydroponics greenhouse)		
AHSIA-0702/S2/T1	Nil	< LOQ
AHSIA-0702/S2/T2/0DALA	13.2	22.36
AHSIA-0702/S2/T2/3DALA	13.2	14.61
AHSIA-0702/S2/T2/5DALA	13.2	14.27
Site 3 – Werribee, VIC – Basil (hydroponics greenhouse)		
AHSIA-0702/S3/T1	Nil	< LOQ
AHSIA-0702/S3/T2/0DALA	13.2	12.82
AHSIA-0702/S3/T2/3DALA	13.2	11.58
AHSIA-0702/S3/T2/5DALA	13.2	13.44
Site 4 – Darlington, SA – Basil (field)		
AHSIA-0702/S4/T1	Nil	< LOQ
AHSIA-0702/S4/T2/0DALA	13.2	20.67
AHSIA-0702/S4/T2/3DALA	13.2	9.84
AHSIA-0702/S4/T2/5DALA	13.2	6.33

DALA = Days After Last Application

LOQ = 0.02mg/kg for buprofezin in parsley and basil specimens.

GLP Study Number AHSIA-0703

This study was conducted to determine the presence and persistence of chlorothalonil residues in fresh herbs following two (2) applications of Bravo Fungicide at 24 and 14 days before harvest.

The field phase was conducted by Peracto Pty Ltd at two (2) locations as follows:

Site 1 - Werribee, VIC (parsley hydroponics greenhouse)

Site 2 - Werribee, VIC (basil hydroponics greenhouse)

The analytical phase of the study was conducted by AgriSolutions Australia at their Deception Bay Laboratory, Queensland.

Tabulated below is a summary of residue results applicable for the harvest interval range for basil (hydroponics greenhouse) and parsley (hydroponics greenhouse) treated with the formulation under test.

Table 15 - Chlorothalonil residues in Parsley and Basil

Specimen Number	Formulation Rate (g a.i/ha)	Chlorothalonil Residues (mg/kg)
Site 1 – Werribee, VIC		
AHSIA-0703/S1/T1	Untreated	<LOQ
AHSIA-0703/S1/T2/14DALA	1656	13.1
AHSIA-0703/S1/T2/21DALA	1656	5.1
AHSIA-0703/S1/T2/28DALA	1656	2.7
Site 2 – Werribee, VIC		
AHSIA-0703/S2/T1	Untreated	<LOQ
AHSIA-0703/S2/T2/14DALA	1656	6.7
AHSIA-0703/S2/T2/21DALA	1656	5.5
AHSIA-0703/S2/T2/28DALA	1656	1.4

DALA = Days After Last Application

LOQ = 0.02mg/kg for chlorothalonil in parsley and basil specimens.

GLP Study Number AHSIA-0704

This study was conducted to determine the presence and persistence of etoxazole residues in fresh herbs following one (1) application of Paramite Selective Miticide, 21 days before harvest.

The field phase was conducted by Peracto Pty Ltd at four (4) locations as follows:

Site 1 - Werribee, VIC (parsley field)

Site 2 - Werribee, VIC (parsley hydroponics greenhouse)

Site 3 - Werribee, VIC (basil hydroponics greenhouse)

Site 4 - Darlington, SA (basil field)

The analytical phase of the study was conducted by AgriSolutions Australia at their Deception Bay Laboratory.

Tabulated below is a summary of results applicable for the harvest interval range for basil (hydroponics-greenhouse and field) and parsley (hydroponics-greenhouse and field) treated with the formulations under test.

Table 16 - Etoxazole residues in Parsley and Basil

Specimen Number	Formulation Rate (g a.i./100L)	Etoxazole Residues (mg/kg)
Site 1 – Werribee, VIC: Parsley (field)		
AHSIA-0704/S1/T1	Nil	<LOQ
AHSIA-0704/S1/T2/14DAA	3.85	0.23
AHSIA-0704/S1/T2/21DAA	3.85	0.16
AHSIA-0704/S1/T2/28DAA	3.85	0.21
Site 2 – Werribee, VIC: Parsley (hydroponics greenhouse)		
AHSIA-0704/S2/T1	Nil	<LOQ
AHSIA-0704/S2/T2/14DAA	3.85	0.64
AHSIA-0704/S2/T2/21DAA	3.85	0.22
AHSIA-0704/S2/T2/28DAA	3.85	0.14
Site 3 – Werribee, VIC: Basil (hydroponics greenhouse)		
AHSIA-0704/S3/T1	Nil	<LOQ
AHSIA-0704/S3/T2/14DAA	3.85	0.73
AHSIA-0704/S3/T2/21DAA	3.85	0.29
AHSIA-0704/S3/T2/28DAA	3.85	0.11
Site 4 – Darlington, SA: Basil (field)		
AHSIA-0704/S4/T1	Nil	<LOQ
AHSIA-0704/S4/T2/14DAA	3.85	0.41
AHSIA-0704/S4/T2/21DAA	3.85	0.06
AHSIA-0704/S4/T2/28DAA	3.85	0.04

DAA = Days after Application

LOQ = 0.02mg/kg for etoxazole in parsley and basil specimens.

GLP Study Numbe: AHSIA-0705

This study was to determine the presence and persistence of fenhexamid residues in fresh herbs following one (1) application of Teldor 500 SC, 3 (three) days before harvest

The field phase was conducted by Peracto Pty Ltd at four (4) locations as follows:

Site 1 - Werribee, VIC (parsley field)

Site 2 - Werribee, VIC (parsley hydroponics greenhouse)

Site 3 - Werribee, VIC (basil hydroponics greenhouse)

Site 4 - Darlington, SA (basil field)

The analytical phase of the study was conducted by AgriSolutions Australia at their Deception Bay Laboratory, Queensland

Tabulated below is a summary of residue results applicable for the harvest interval range for basil (hydroponics-greenhouse and field) and parsley (hydroponics-greenhouse and field) treated with the formulations under test.

Table 17 - Fenhexamid residues in Parsley and Basil

Specimen Number	Formulation Rate (g a.i./ha)	Fenhexamid Residues (mg/kg)
Site 1 – Werribee, VIC: Parsley (field)		
AHSIA-0705/S1/T1	Nil	<LOQ
AHSIA-0705/S1/T2/0DAA	500	4.42
AHSIA-0705/S1/T2/3DAA	500	0.03
AHSIA-0705/S1/T2/5DAA	500	0.02
Site 2 – Werribee, VIC: Parsley (hydroponic greenhouse)		
AHSIA-0705/S2/T1	Nil	<LOQ
AHSIA-0705/S2/T2/0DAA	500	4.01
AHSIA-0705/S2/T2/3DAA	500	2.51
AHSIA-0705/S2/T2/5DAA	500	2.60
Site 3 – Werribee, VIC: Basil (hydroponic greenhouse)		
AHSIA-0705/S3/T1	Nil	<LOQ
AHSIA-0705/S3/T2/0DAA	500	0.88
AHSIA-0705/S3/T2/3DAA	500	1.30
AHSIA-0705/S3/T2/5DAA	500	1.18
Site 4 – Darlington, SA: Basil (field)		
AHSIA-0705/S4/T1	Nil	<LOQ
AHSIA-0705/S4/T2/0DAA	500	7.83
AHSIA-0705/S4/T2/3DAA	500	3.88
AHSIA-0705/S4/T2/5DAA	500	2.64

DAA = Days After Application

LOQ = 0.02mg/kg for fenhexamid in parsley and basil specimens.

GLP Study Number AHSIA-0706

This study was conducted to determine the presence and persistence of linuron residues in fresh herbs following one (1) application of Linuron WDG prior to planting

The field phase was conducted by Peracto Pty Ltd at two (2) locations as follows:

Site 1 - Werribee, VIC (parsley, field)

Site 2 - Darlington, SA (basil, field)

The analytical phase of the study was conducted by AgriSolutions Australia at their Deception Bay Laboratory, Queensland.

Tabulated below is a summary of residue results applicable for the harvest interval range for parsley (field) and basil (field) treated with the formulation under test.

Table 18 - Linuron residues in Parsley and Basil

Specimen Number	Formulation Rate (g a.i./ha)	Linuron Residues* (mg/kg)
Site 1 – Werribee, VIC: Parsley (field)		
AHSIA-0706/S1/T1	Nil	<LOQ
AHSIA-0706/S1/T2/Harvest	500	0.18
Site 2 – Darlington, SA: Basil (field)		
AHSIA-0706/S2/T1	Nil	<LOQ
AHSIA-0706/S2/T2/Harvest	500	0.10

LOQ = 0.02mg/kg for linuron and 3,4-dichloroaniline in parsley and basil specimens.

*Note: Results are the sum of linuron plus 3,4-dichloroaniline, expressed as linuron equivalents.

GLP Study Number AHSIA-0707

This study was conducted to determine the presence and persistence of myclobutanil residues in fresh herbs following three (3) applications of Mycloss at 42, 28 and 14 days before harvest.

The field phase was conducted by Peracto Pty Ltd at four (4) locations as follows:

Site 1 - Werribee, VIC (parsley, field)

Site 2 - Werribee, VIC (parsley, hydroponics greenhouse)

Site 3 - Werribee, VIC (basil, hydroponics greenhouse)

Site 4 - Darlington, SA (basil, field)

The analytical phase of the study was conducted by AgriSolutions Australia at their Deception Bay Laboratory, Queensland.

Tabulated below is a summary of residue results applicable for the harvest interval range for basil (hydroponics-greenhouse and field) and parsley (hydroponics-greenhouse and field) treated with the formulations under test.

Table 19 - Myclobutanil residues in Parsley and Basil

Specimen Number	Formulation Rate (g a.i./100 L)	Myclobutanil Residues (mg/kg)
Site 1 – Werribee, VIC – Parsley (field)		
AHSIA-0707/S1/T1	Nil	<LOQ
AHSIA-0707/S1/T2/7DALA	3.1	0.23
AHSIA-0707/S1/T2/14DALA	3.1	0.09
AHSIA-0707/S1/T2/21DALA	3.1	0.04
Site 2 – Werribee, VIC – Parsley (hydroponics greenhouse)		
AHSIA-0707/S2/T1	Nil	<LOQ
AHSIA-0707/S2/T2/7DALA	3.1	0.79
AHSIA-0707/S2/T2/14DALA	3.1	0.72
AHSIA-0707/S2/T2/21DALA	3.1	0.31
Site 3 – Werribee, VIC – Basil (hydroponics greenhouse)		
AHSIA-0707/S3/T1	Nil	<LOQ
AHSIA-0707/S3/T2/7DALA	3.1	0.24
AHSIA-0707/S3/T2/14DALA	3.1	0.16
AHSIA-0707/S3/T2/21DALA	3.1	0.10
Site 4 – Darlington, SA – Basil (field)		
AHSIA-0707/S4/T1	Nil	<LOQ
AHSIA-0707/S4/T2/7DALA	3.1	0.12
AHSIA-0707/S4/T2/14DALA	3.1	0.13
AHSIA-0707/S4/T2/21DALA	3.1	0.07

DAA = Days after Application

LOQ = 0.02mg/kg for myclobutanil in parsley and basil specimens.

GLP Study Number AHSIA-0708

This study was conducted to determine the presence and persistence of pyriproxyfen residues in fresh herbs following two (2) applications of Admiral Insect Growth Regulator at 15 and 1 day(s) before harvest

The field phase was conducted by Peracto Pty Ltd at four (4) locations as follows:

Site 1 - Werribee, VIC (parsley, field)

Site 2 - Werribee, VIC (parsley, hydroponics greenhouse)

Site 3 - Werribee, VIC (basil, hydroponics greenhouse)

Site 4 - Darlington, SA (basil, field)

The analytical phase of the study was conducted by AgriSolutions Australia at their Deception Bay Laboratory, Queensland.

Tabulated below is a summary of residue results applicable for the harvest interval range for basil (hydroponics greenhouse and field) and parsley (hydroponics greenhouse and field) treated with the formulations under test.

Table 20 - Pyriproxyfen residues in Parsley and Basil

Specimen Number	Formulation Rate (g a.i./ha)	Pyriproxyfen Residues (mg/kg)
Site 1 – Parsley (field) – Werribee, VIC		
AHSIA-0708/S1/T1	Nil	<LOQ
AHSIA-0708/S1/T2/0DALA	50	0.68
AHSIA-0708/S1/T2/1DALA	50	<LOQ
AHSIA-0708/S1/T2/3DALA	50	0.16
Site 2 – Parsley (hydroponics greenhouse) – Werribee, VIC		
AHSIA-0708/S2/T1	Nil	<LOQ
AHSIA-0708/S2/T2/0DALA	50	0.56
AHSIA-0708/S2/T2/1DALA	50	0.62
AHSIA-0708/S2/T2/3DALA	50	0.57
Site 3 – Basil (hydroponics greenhouse) – Werribee, VIC		
AHSIA-0708/S3/T1	Nil	<LOQ
AHSIA-0708/S3/T2/0DALA	50	0.16
AHSIA-0708/S3/T2/1DALA	50	0.11
AHSIA-0708/S3/T2/3DALA	50	0.05
Site 4 – Basil (field) – Darlington, SA		
AHSIA-0708/S4/T1	Nil	<LOQ
AHSIA-0708/S4/T2/0DALA	50	3.42
AHSIA-0708/S4/T2/1DALA	50	0.86
AHSIA-0708/S4/T2/3DALA	50	0.44

DALA = Days After Last Application

LOQ = 0.02mg/kg for pyriproxyfen in parsley and basil specimens.

GLP Study Number AHSIA-0709

This study was conducted to determine the presence and persistence of chlorfenapyr residues in fresh herbs following three (3) applications of Secure 360 SC Insecticide-Miticide at 13, 10 and 7 days before harvest.

The field phase was conducted by Peracto Pty Ltd at four (4) locations as follows:

Site 1 - Werribee, VIC (parsley, field)

Site 2 - Werribee, VIC (parsley, hydroponics greenhouse)

Site 3 - Werribee, VIC (basil, hydroponics greenhouse)

Site 4 - Darlington, SA (basil, field)

The analytical phase of the study was conducted by AgriSolutions Australia at their Deception Bay Laboratory, Queensland.

Tabulated below is a summary of residue results applicable for the harvest interval range for basil (hydroponics greenhouse and field) and parsley (hydroponics greenhouse and field) treated with the formulation under test.

Table 21 - Chlorfenapyr residues in Parsley and Basil

Specimen Number	Formulation Rate (g a.i./ha)	Chlorfenapyr Residues (mg/kg)
Site 1 – Werribee, VIC – Parsley (field)		
AHSIA-0709/S1/T1	Nil	<LOQ
AHSIA-0709/S1/T2/7DALA	144	0.48
AHSIA-0709/S1/T2/10DALA	144	0.34
AHSIA-0709/S1/T2/14DALA	144	0.13
Site 2 – Werribee, VIC – Parsley (hydroponics greenhouse)		
AHSIA-0709/S2/T1	Nil	<LOQ
AHSIA-0709/S2/T2/7DALA	144	1.58
AHSIA-0709/S2/T2/10DALA	144	0.99
AHSIA-0709/S2/T2/14DALA	144	1.03
Site 3 – Werribee, VIC – Basil (hydroponics greenhouse)		
AHSIA-0709/S3/T1	Nil	<LOQ
AHSIA-0709/S3/T2/7DALA	144	1.68
AHSIA-0709/S3/T2/10DALA	144	1.18
AHSIA-0709/S3/T2/14DALA	144	0.97
Site 4 – Darlington, SA – Basil (field)		
AHSIA-0709/S4/T1	Nil	<LOQ
AHSIA-0709/S4/T2/7DALA	144	0.42
AHSIA-0709/S4/T2/10DALA	144	0.22
AHSIA-0709/S4/T2/14DALA	144	0.04

DAA = Days after Application

LOQ = 0.02mg/kg for chlorfenapyr in parsley and basil specimens.

GLP Study Number AHSIA-0710

This study was to determine the presence and persistence of etridiazole residues in fresh herbs following 1 application of Terrazole 350 WP as a soil drench or root dip at planting.

The field phase was conducted by Peracto Pty Ltd at four (4) locations as follows:

Site 1 - Werribee, VIC (parsley, field)

Site 2 - Werribee, VIC (parsley, hydroponics greenhouse)

Site 3 - Werribee, VIC (basil, hydroponics greenhouse)

Site 4 - Darlington, SA (basil, field)

The analytical phase of the study was conducted by AgriSolutions Australia at their Deception Bay Laboratory, Queensland.

Tabulated below is a summary of residue results applicable for the harvest interval range for parsley (hydroponics greenhouse and field) and basil (hydroponics greenhouse and field) treated with the formulations under test.

Table 22 - Etridiazole residues in Parsley and Basil

Specimen Number	Formulation Rate	Etridiazole Residues (mg/kg)
Site 1 – Werribee, VIC – Parsley (field)		
AHSIA-0710/S1/T1	Nil	<LOQ
AHSIA-0710/S1/T2/Harvest	49 g a.i./100 L	0.04
Site 2 – Werribee, VIC – Parsley (hydroponics greenhouse)		
AHSIA-0710/S2/T1	Nil	<LOQ
AHSIA-0710/S2/T2/Harvest	49 g a.i./100 L	0.65
Site 3 – Werribee, VIC – Basil (hydroponics greenhouse)		
AHSIA-0710/S3/T1	Nil	<LOQ
AHSIA-0710/S3/T2/Harvest	49 g a.i./100 L	0.09
Site 4 – Darlington, SA – Basil (field)		
AHSIA-0710/S4/T1	Nil	<LOQ
AHSIA-0710/S4/T2/Harvest	49 g a.i./100 L	0.11

DAA = Days after Application

LOQ = 0.02mg/kg for etridiazole in parsley and basil specimens.

GLP Study Number AHSIA-0711

This study was conducted to determine the presence and persistence of quinoxyfen residues in fresh herbs following three (3) applications of Legend Fungicide at 27, 17 and 7 days before harvest.

The field phase was conducted by Peracto Pty Ltd at two (2) locations as follows:

Site 1 - Werribee, VIC (parsley, hydroponics greenhouse)

Site 2 - Werribee, VIC (basil, hydroponics greenhouse)

The analytical phase of the study was conducted by AgriSolutions Australia at their Deception Bay Laboratory, Queensland.

Tabulated below is a summary of residue results applicable for the harvest interval range for basil (hydroponics greenhouse) and parsley (hydroponics greenhouse) treated with the formulation under test.

Table 23 - Quinoxyfen residues in Parsley and Basil

Specimen Number	Formulation Rate (g a.i./100 L)	Quinoxyfen Residues (mg/kg)
Site 1 – Werribee, VIC – Parsley (hydroponics greenhouse)		
AHSIA-0711/S1/T1	Nil	<LOQ
AHSIA-0711/S1/T2/7	6.25	1.36
AHSIA-0711/S1/T2/10	6.25	0.89
AHSIA-0711/S1/T2/14	6.25	0.56
Site 2 – Werribee, VIC – Basil (hydroponics greenhouse)		
AHSIA-0711/S2/T1	Nil	<LOQ
AHSIA-0711/S2/T2/7	6.25	0.51
AHSIA-0711/S2/T2/10	6.25	0.52
AHSIA-0711/S2/T2/14	6.25	0.73

DAA = Days after Application

LOQ = 0.02mg/kg for quinoxyfen in parsley and basil specimens.

Implications

Finalisation of the minor use permit applications will allow growers to develop more sustainable and efficient pest management systems and ultimately, maintain a premium quality product with continuity of supply capable of competing successfully in the highly competitive domestic and global marketplace.

Recommendations

AHSIA to submit the data generated in this project to the APVMA to finalise the minor use permit applications.

Glossary

AHSIA	Australian Herb and Spice Industry Association
APVMA	Australian Pesticides and Veterinary Medicines Authority
LOQ	Limit of Quantitation
LOD	Limit of Detection