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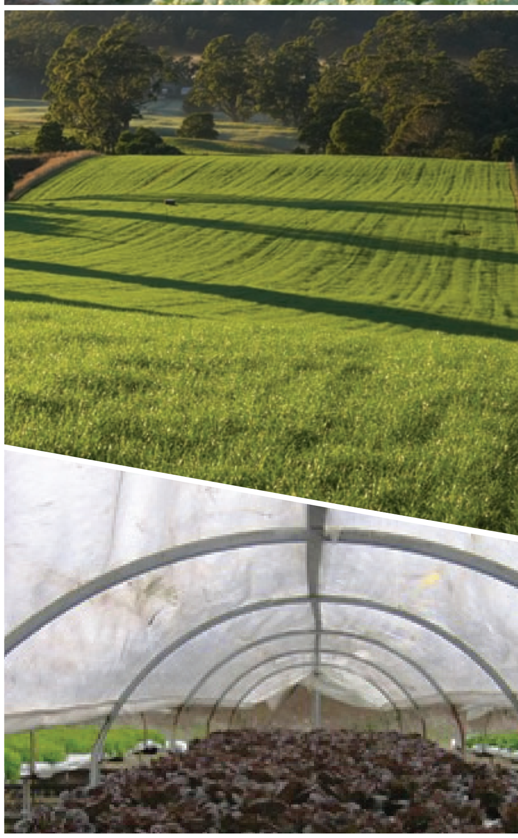
Generation of Pesticide Residue Data in Various Vegetables Grown Under Protected Cropping Situations

Project no: VG06111

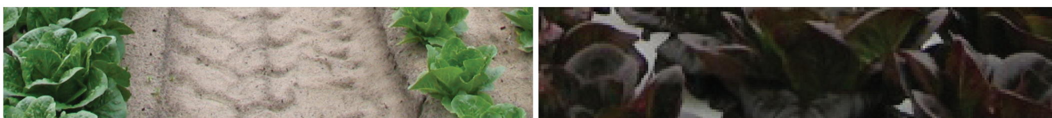
Scientific testing is helping to establish residue levels from various pesticide applications on greenhouse crops.



Best practice production models (lettuce, brassicas)

Project no: VG07110

Streamlining information on IPM implementation in order to achieve a whole of crop approach.



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Generation of Pesticide Residue Data in Various Vegetables Grown Under Protected Cropping Situations

Protected structure capsicum trails.

Introduction

Pesticides are widely used to improve the quality and variety of fruit and vegetable production by effectively controlling unwanted insects, weeds, and fungal disease. While national guidelines ensure that application levels and withholding periods are toxicologically acceptable and safe for human consumption, many of them have been developed using testing and analysis of pesticide formulations in outside cropping situations. When the same pesticide formulations are used in undercover growing conditions like greenhouses, the residue data obtained can vary.

In this study, Agrisearch Services Pty Ltd and Agrisearch Analytical Pty Ltd have conducted various trials and analysed and quantified the tissue residues of a series of formulations applied to capsicums, cucumbers and leafy lettuce grown in protected structures. The test sites were located in commercial operations which adhere to typical management practices for the growing of the target crop.

Project description:

This study was conducted to determine the tissue residue profile of chlorpyrifos, chlorothalonil, imidacloprid, mancozeb, methomyl, primicarb and procymidone when applied to capsicums, cucumbers and leafy lettuce grown in greenhouses operating under hydroponic conditions. Residues remaining on or in a crop commodity from a given method, timing and rate of pesticide application can vary with trial site and climate. This study consisted of six field sites at Keilor in Victoria, Virginia and Two Wells in South Australia, and Peats Ridge and Doyalson in New South Wales.

Treatment procedure

The methods used to apply the treatments mirrored typical growing and spraying conditions; treatments were applied by a horizontal or vertical boom spray in sufficient water to ensure even and thorough coverage of all parts of each plant. Residues were determined following pre-harvest applications of the candidate treatments with sampling conducted on various occasions after the last application of the treatments. In most instances, at least 12 fruit (weighing at least two kilograms in total) were sampled from 12 individual cucumber or capsicum plants for each treatment.

Similarly, at least 12 individual leafy lettuce plants with roots removed were collected from each treatment for each sample. The samples were taken from all parts of the plot with the exception of each end. On most occasions two replicate samples were taken from each treatment on each sampling date with one being the Primary Sample and the other the Reserve Sample.

On the basis of the large body of laboratory and large scale trial data, an AQIS-endorsed treatment schedule for disinfestation of quarantine pests has now been developed. This schedule has a lower dose rate than the label rate for Vapormate® and considerably reduces treatment costs while remaining completely effective.

Outcomes

The comparability of residue behaviour in different crops can not only be influenced by a range of factors but can vary under a different set of conditions. Nevertheless a number of key findings became apparent after this study:

Residues of chlorpyrifos greater than the limit of detection (0.005 mg/kg) were found in all of the treated samples of capsicums, cucumbers and leafy lettuce.

Residues of chlorothalonil greater than the limit of detection (0.05 mg/kg) were found in all of the treated samples of cucumbers grown in protected structures.

Residues of imidacloprid greater than the limit of detection (0.005 mg/kg) were found in all of the treated samples of leafy lettuce grown in protected structures.

Protected structure cucurbits trails.

Residues of mancozeb greater than the limit of detection (0.1 mg/kg carbon disulfide) were found in most of the treated samples of leafy lettuce and capsicums grown in protected structures. There were very few residues in the cucumber samples.

Residues of methomyl greater than the limit of detection (0.01 mg/kg) were found in all treated samples of leafy lettuce grown in protected structures, and most of the capsicum and cucumber samples. Residues of methomyl oxime were less than the limit of detection (0.02 mg/kg) for capsicum and cucumber samples but some samples of leafy lettuce contained residues greater than the limit of detection.

Residues of pirimicarb (sum of pirimicarb, pirimicarb desmethyl, and pirimicarb desmethyl formamido) greater than the limit of detection (0.01 mg/kg) were found in most of the treated samples of leafy lettuce grown in protected structures.

Residues of procymidone greater than the limit of detection (0.05 mg/kg) were found in all of the treated samples of capsicum grown in protected structures.

Conclusion

This study provided residue analysis data which will ultimately assist the protected cropping industry with indicators of withholding periods (WHPs) so that residue limits are not exceeded. The results have been lodged with the Australian Pesticides and Veterinary Medicines Authority who will review the data for the establishment of the maximum residue limits and withholding periods for the use of the various pesticides in these crops grown in protected structures.

The Bottom Line: VG06111

- Pesticide application guidelines and withholding periods are necessary in order to guarantee safe human consumption.
- Residue levels on field grown crops can often be different to the levels found on those same crops when grown in protected structures.
- A new study which identifies these differences will help the protected cropping industry ensure that residue limits are not exceeded.

Acknowledgements

This report is published by Horticulture Australia Ltd to pass on information concerning horticultural research and development undertaken for the vegetables industry. The research contained in this report was funded through Horticulture Australia Limited by the National Vegetable Levy with matched funding from the Australian Government. The primary investigator for the project was Les Mitchell from Agrisearch Servies Pty Ltd.

Hydroponic lettuce trial in protected structure.

Best practice production models (lettuce, brassicas)

Introduction

IPM has been identified as a high priority in the vegetable industry, and there is a recognised need to increase adoption of IPM practices in order to minimise insect pest numbers, disease pressure, weeds and other crop production problems to reduce economic crop loss. Implementation is a complex task, which calls for a combination of chemical, cultural and biological methods. While a large amount of information is available in order to facilitate more widespread and effective adoption, this project aims to build on the existing material and add value by integrating this into a user friendly format relevant to range of levels of understanding of IPM.

IPM Resources

Field guides, newsletters, fact sheets, electronic toolkits and websites have been produced to support the implementation of IPM and report on research outcomes. In the past, many of the control strategies have focused on specific insect pests and diseases such as white blister, clubroot and diamond back moth on brassicas, and Helicoverpa, lettuce aphid and Sclerotinia control in lettuce. This project aims to combine the existing detailed information for IPM into an integrated form that summarizes current knowledge for key pest issues.

Project Stages

The first stage of the project was to develop suitable information formats in consultation with industry, which were relevant to a range of levels of understanding of IPM. A series of posters and "Ute guides" were determined to be both easily accessible and simple to understand:

1. Overview Poster summarising the key generic issues and the application of an IPM system.
This was developed as a basic introduction to IPM and applies to both lettuce and brassica crops.

2. Posters for lettuce and brassica listing registered chemicals and their "IPM fit", including impacts on beneficial species and the environment.
The information includes chemical groups, Cornell University product toxicity ratings, Australian research findings, and has been colour coded for easy identification of the chemicals' suitability in an IPM system. The posters provide information that will facilitate selection of chemicals with a suitable "IPM fit". This has not been readily available to chemical users in the past. The poster format is advantageous for it can be easily updated and the poster can placed on the chemical shed wall.

3. A "Ute guide" style booklet in A5 format
Combines detailed information for management of key pests into a summary quick-reference format with recommendations for a

"whole of crop" approach to IPM. The "Ute guides" are robust enough to be carried around the farm and contain enough detail to be useful without overwhelming the reader with too much text. Adoption of the information provided in the "Ute guide" is likely to be driven by an individual's set of circumstances including farm context, business priorities, pest issues and whether or not there are production failures due to pests. This guide is intended to support the various field guides for pests and beneficials that are available for lettuce and brassica.

Summary

The project utilised national experts to provide the detail on effective control strategies for key pests and IPM practices. This information was combined and integrated into a holistic package for each crop, which summarises current knowledge for implementation of IPM. The products generated by this project will not directly facilitate adoption of IPM or best production practices but will help to provide information, education and the resources that will assist in the understanding and adoption of IPM in a whole of farm (or crop) context. It is anticipated that the users are likely to range from growers who already use IPM and just want to refine their system, through to farm workers who have little understanding of IPM but want to use the most appropriate chemical. The publications are currently being distributed to all levy-paying lettuce and brassica growers across Australia.

The Bottom Line: VG07110

- General adoption of integrated pest management (IPM) has progressed in recent years but is still relatively low.
- Implementation of IPM can be complex, and improved efficiency requires a "whole of crop" approach.
- Best practice production models for IPM in Lettuce and Brassicas combines existing information and research results for management of key pests into a whole of crop, user friendly format.

Hydroponic lettuce trial in protected structure.

Hydroponic lettuce trial in protected structure.

Acknowledgements

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VG06111 and VG07110 photos by Peter Melville

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