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Project VG13055 aims to reduce the cost of compliance for the construction of Greenhouse and Grow Structures for growers.

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# HAL R&D project number: VG12109

Project VG12109 is investigating the resistance status and movement of green peach aphid across Australia to establish new control options.





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Lettuce grown (hydroponic) under a large 'low tech' grow structure.

#### Facilitators:

Project VG13055 is being completed by Project Leader Marcel Olivotto and Project Administrator Eric Peter Osborn, both from Osborn Lane Consulting Engineers QLD.

#### Introduction

The anticipated outcome for project VG13055 is to reduce the cost of compliance for the construction of Greenhouse and Grow Structures (G/GS) and to provide guidelines for a consistent building approval approach across Australia. The investigations and documentation, which are expected to be completed by 31 August 2014, will determine where cost reduction measures can be implemented to economically assist the protective cropping industry and provide a defined approval process throughout Australia.

# About the project

Project Leader Mr Marcel Olivotto and Project Administrator Mr Eric Peter Osborn, both from Osborn Lane Consulting Engineers, will provide two documents as part of their final submission to Horticulture Australia Limited. The first will be a technical-based document outlining literary review on national and international codes, consultation with building surveyors and fire engineers, success and failures and information gathered during field investigations. The second document will contain practical guidelines and recommendations to potentially reduce G/GS cost of compliance. These include a risk assessment procedure associated with fire and egress, practical farm management techniques to reduce risk of fire, structure design, building set out and cost reduction protocol. The practicality of this



document enables it to be used by growers and has the option to be submitted to Standards Australia as a guideline for any future related standard publications.

# **Preliminary Findings**

Mr Olivotto said field investigations conducted in Victoria, Queensland, New South Wales, Tasmania, Western Australia and South Australia had revealed a willingness by growers to share their personal experiences with local council, designers and the overall development process.

"Field investigations have found that most of the grower angst is based around the inexperience or inconsistency of council officers involved with council regulation and approval processes for Greenhouse and Grow Structures," he said.

"For example, if onerous fire and egress requirements were initially requested by council, growers have had to work through reduction requirements via discussions with council or the appointment of fire engineers."

"Growers have made it clear that their largest hope for this project is to provide local council with documentation that will allow councils Australia-wide to efficiently and consistently approve Greenhouse and Grow Structures."

Mr Olivotto said this would enable growers to economically continue development within the protective cropping industry.

"Growers recognise and appreciate the need for building regulation, however, they are perplexed as to why Building Code of Australia 'Class 8' building requirements are continually imposed on their structures," he said.

While all sites visited had structural certification completed on the G/GS by a certifier, issues had been identified on several of the sites where engineers have not had adequate design experience in the structural certification of low-tech hooped greenhouses.

"We found that high and medium-tech greenhouses are usually designed by an experienced engineering firm that works closely with the industry, whereas low-tech greenhouses are often certified by the geographically closest engineering service that may not have ample experience in designing greenhouse structures," Mr Olivotto said.

"Durable materials, such as steel, aluminium and glass, are the most effective due to their longevity and accommodation to the application of the Australian Standards Loading Codes, as compared to hooped impermeable plastic membrane structures."

"Industry experience is absolutely vital when designing and certifying greenhouse structures - engineers are required to have a strong understanding of the relevant standards."

Lettuce grown under a greenhouse.

### **Next steps**

"The risk assessment procedure we are currently developing is modelled on that used by the United States of America National Greenhouse Manufacturers Association," Mr Olivotto said. "The document will aim to highlight areas of risk and areas where risk is negligible or low. For instance, if a greenhouse or grow structure is identified as having a high fire risk, steps could be taken by obtaining the services of a fire engineer to provide expert opinions for a specific project, instead of relying on government documentation that cannot be universally applicable to every Greenhouse or Grow Structure."

Consultation with relevant organisations is a continuing process and will help provide a foundation for the recommendations and approval guidelines.

Consultation with building certifiers and fire engineers is also necessary for preparing the Recommendations and Guidelines document to determine if information is applicable for the certifier or council adoption in the future.

#### THE BOTTOM LINE: VG13055

- With ever-increasing global and local populations, increased variability of the environment and consumer demand for high quality produce, it is vital that growers are encouraged to develop Greenhouse and Grow Structures.
- This project encourages development by creating an interstate "Code of Practice" providing guidelines for safe and economically responsible G/GS design, regulation and operation in regards to building classification and fire and egress should be explored.

# **Acknowledgements**

This project is funded by HAL using the National Vegetable Levy with matched funds from the Australian Government.



# Management of insecticide resistance in the green peach aphid.

#### **Facilitators:**

Project VG12109 is being completed by Dr Paul Umina and the team from cesar Australia Pty Ltd.

# Introduction

The green peach aphid (GPA) is a widespread species attacking a broad range of horticultural crops including capsicum, eggplant, tomato, broccoli, potato and lettuce. Unfortunately, this species has a high propensity to develop insecticide resistance and within Australia, resistant GPA populations are becoming common. Achieving adequate control of resistant GPA is particularly challenging, with recent reports suggesting huge market failure across several horticultural commodities.

# About the project

Project VG12109 is investigating the resistance status and movement of GPA across Australia, in addition to exploring new approaches to controlling aphids using insecticides. This information will be used to inform an expert working group that will establish Resistance Management Strategies for GPA.

To date, the project team has begun several areas of research, which include mapping the current levels of insecticide resistance in GPA, understanding the current management strategies among Australian growers, and understanding the broad-scale movement of aphids and likely spread of insecticide resistance.

Since 2013, Project Leader and cesar director Dr Paul Umina and his research team have collected multiple GPA

GPA has developed resistance to a range of insecticides.

populations from fields in Queensland, South Australia and Victoria to establish cultures. With field populations so far collected comprising capsicum, chilli, snapdragons, eggplants and cauliflower, it has become vital that culturing techniques continue to be optimised for a diverse range of plant host populations.

"Our team has established new testing methodologies for multiple insecticides including laboratory bioassays for pymetrozine and spirotetramat which we are preparing to validate across a number of GPA populations over the coming months," Dr Umina said.

"We have also optimised genetic tests for other insecticides focusing on key resistance mechanisms that are already characterised. This genotyping work involves determining which genetic variants an organism (or in this case, an individual aphid) possesses."

"This means we should have bioassays available to screen populations against a range of insecticides such as synthetic pyrethroids, organophosphates, carbamates, spirotetramat and pymetrozine."

# **Major findings**

Through a combination of pesticide bioassays and resistance mechanism genotyping, Dr Umina's team has commenced screening several GPA populations to assess their resistance status.

Resistance to a host of insecticides has since been uncovered across the majority of populations collected - particularly those

surrounding the Bowen, Gumlu, Burdekin and Bundaberg regions of Queensland.

"Levels of resistance to carbamates and synthetic pyrethroids especially, are quite high in these regions and are no doubt contributing to control difficulties and grower frustrations," Dr Umina said.

"One Victorian population (collected near Robinvale) has also been found to have resistance to carbamates, synthetic pyrethroids and organophosphates, while several South Australian populations have exhibited resistance to several insecticide groups."

Surprisingly, of the aphid populations genetically screened none have shown to possess the most common mechanism that confers resistance to synthetic pyrethroids.

"We can assume that resistance to pyrethroids identified in these populations is almost certainly due to another resistance mechanism, which is something we have begun exploring," Dr Umina said.

"While screening efforts have suggested some variation between Queensland populations in their response to the insecticide imidacloprid, we cannot yet confirm if this is due to insecticide resistance but we are continuing to refine our screening for this chemical group."

# **Next steps**

A key consideration for project VG12109 is the maintenance of the GPA populations currently in culture and the screening of these to all necessary chemical groups identified through paddock history information. Additional GPA populations would also be collected nationally and used to establish cultures in the laboratory.

"These individual field populations will be mass-reared and screened against different insecticides," Dr Umina said.

"We will also continue to develop and refine screening assays (phenotypic and genetic) for particular chemical groups, as well as explore opportunities for new insecticide molecules and registrations by working with agro-chemical companies."



Beneficial insects such as ladybirds can suppress aphid populations if left unsprayed.

The project team will continue collecting populations from vegetable and broad acre crops across Australia. The genetic make-up of all populations will be assessed through the development of GPA-specific DNA tools to better understand the movement patterns of aphids on a regional level, and between horticultural and broad acre crops.

An industry survey to help identify resistance drivers and further inform Resistance Management Strategies for GPA has been developed and implemented through a number of grower groups and industry networks.

#### THE BOTTOM LINE: VG12109

- Green peach aphid is a widespread and damaging pest in a broad range of horticultural crops. Growers need to have resistance management strategies in place for this pest.
- High levels of resistance to synthetic pyrethroids, carbamates and organophosphates are widespread across Australia.
- Due to the way aphids reproduce, resistant individuals can soon dominate a landscape with widespread use of the same insecticide.
- Incorporating non-chemical control methods is critical to GPA management.

# **Acknowledgements**

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#### Photo credits:

VG13055 photos credit: Marcel Olivotto VG12109 photos credit: Paul Umina

Please contact Jamie Racicos at AUSVEG on 03 9882 0277 or email jamie.racicos@ausveg.com.au to submit topics for potential inclusion in future editions of **vege**notes.

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