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VG15008: VIRUSES OF NATIONAL IMPORTANCE TO THE VEGETABLE INDUSTRY

FACILITATORS:

Project VG15008 was completed by Denis Persley from the Queensland Department of Agriculture and Fisheries.

INTRODUCTION

The value of vegetables produced for human consumption in Australia in the 2014-15 financial year totalled $3.35 billion.

Viruses frequently cause economic losses in vegetable crops and these are difficult to estimate, particularly as crops vary in their susceptibility to virus.

For example, there was an estimated annual loss of $7.2 million in greenhouse and field grown capsicum in Australia from tomato spotted wilt virus, while cucumber green mottle mosaic virus caused an estimated loss of $45 million to the Northern Territory watermelon industry in 2014.

ABOUT THE PROJECT

Project VG15008 investigated the importance and impact of viruses in the vegetable industry and recommended strategies likely to deliver tangible economic benefits through a reduction in the impact of viruses in crops.

Denis Persley from the Queensland Department of Agriculture and Fisheries facilitated the project and said it reviewed the viruses that occurred in vegetable crops, determined which ones were the most important, and which crops were impacted most.

"It was largely a desktop review with a literature review of viruses that examined epidemiology, host range, transmission, economic impact and potential management methods," he said.

"Importantly the review also included a two-day workshop in May 2016 in Brisbane that was attended by 10 plant virologists from around Australia. This group developed a list of current and potential viruses important to the Australian industry and priority areas for future investment.

"Fifteen growers and agronomists from across Australia were also contacted to incorporate their views into our thinking and the final report. The input from these growers was extremely valuable. They work in the industry every day, they are the people who see what the problems are and they can provide feedback about control measures."

MAJOR FINDINGS

The two major outcomes of the research project were:

- Confirmation that viruses continue to cause economic impact to vegetable producers and the broader supply chain.
- Identification of potential RD&E aims to reduce the economic impact in the short-, medium- and long-term through improved diagnostic delivery, strategic disease management options and extension of new and relevant information to industry.

Other key findings included:

- The virus groups identified as having the most impact – and require future investment to reduce economic impact – were the tospoviruses (particularly tomato spotted wilt virus) and the potyviruses, in particular those infecting cucurbits.
- The need to develop, as a priority, projects based on the principles of area wide management of viruses and vectors as this could provide an opportunity for sustainable long-term management, allow greater cross-industry participation and provide ownership among participants, thus providing a better climate for adoption and change.
- Closer collaboration between the key virology diagnostic laboratories to provide a more coordinated delivery of diagnostic services to the vegetable industry.
- The provision of information on virus disease management is a high priority for future investment and should be provided where possible with other crop protection and agronomy packages to assist in effective delivery.

Mr Persley said a lack of detailed R&D on the major virus vectors was also identified as a gap in the industry's knowledge base and one that required increased investment.

"Given the vegetable industry's reliance on high levels of imported planting seed for all major crops, and the regular incursion of seed-transmitted viruses, further investment is recommended on investigating and mitigating the role of seed as a pathway for viruses," he said.

CONCLUSION

Mr Persley said the research project confirmed that viruses remained a significant cause of loss to the vegetable industry.

"There are viruses in Australia that have been with us for many years (since European settlement) that are still difficult to manage today," he said.

"There are also new viruses being uncovered like the cowpea mild mottle virus that was found in French beans grown for the fresh market last year and is spread by whitefly. This particular virus caused leaf mottling and pod discolouration, which in turn affected the packing line operation and meant some crops were not harvested.

"In just one area in south east Queensland, the financial impact was about $300,000."

Mr Persley said the loss not only impacted growers, but the broader supply chain and consumers through either disruption of supply or lower quality product being available on the market.

ACKNOWLEDGEMENTS

This project has been funded by Horticulture Innovation Australia using the vegetable research and development levy with co-investment from the Queensland Department of Agriculture and Fisheries and funds from the Australian Government.

VG12108: IMPROVING THE MANAGEMENT OF INSECT CONTAMINANTS IN PROCESSED LEAFY VEGETABLES

FACILITATORS:

Project VG12108 was completed by Dr Gordon Rogers from Applied Horticultural Research and Brad Giggins from Total Horticultural Consulting.

INTRODUCTION

Insects are potential contaminants of leafy vegetables. These insects are particularly problematic if they make their way from the field into packaged leafy vegetable mixes and to consumers, who have a very low tolerance for these unwanted bugs.

However, the issue is not straightforward – some insects, like lady beetles, can play a beneficial role. They can be natural predators of unwanted pests and therefore reduce the need for insecticides.

Interestingly, consumers are more tolerant of these beneficials in their leafy produce than they are of less attractive pests like grubs, snails or slugs.

Project VG12108 focused on finding ways for growers to remove insects from their leafy crops at or before harvest, and also what processors could do to remove insects before the product reaches the consumer.

ABOUT THE PROJECT

Under the management of Dr Gordon Rogers from Applied Horticultural Research, trials were conducted to determine whether current practices could be modified to reduce the number of insects in the crop at the point of harvest.

The trials included insect deterrent sprays, the use of insect attractants to lure insects away from the crops, floating row covers, and the use of harvesting technology to dislodge insects from crops at the point of harvest.

The project started at the customer and worked back through the supply chain.

Dr Rogers said a review into historic customer complaints about insects in leafy vegetable mixes revealed moths, soldier beetles and Rutherglen bugs were the most reported insect contaminant.

Spiders, red and blue beetles and beneficial insects like lady beetles comprised only a small portion of customer complaints.

MAJOR FINDINGS

Dr Rogers said the project tested the effectiveness of a number of methods for reducing insect contaminants in field-grown leafy vegetables, including baby leaf spinach and lettuce.

"Light traps were effective at reducing moth populations 50 metres from the trap, and floating row covers over spinach and lettuce also delivered quite good results," he said.

Dr Rogers said the most effective way to deal with the problem in the field was "harvester modifications" that dislodged the insects at harvest, and these showed promising results in field trials conducted as part of the project.

The harvester modifications tested were:

- Fans at the front of the tractor to blow insects out of the crop just before it was harvested.
- Chains attached to the front of the harvester and dragged through the crop to dislodge insects.
- A perforated conveyor belt (which carries the product from the cutters) that allows any foreign material like insects to fall through the holes in the belt.

Dr Rogers said the trials revealed the modifications worked best when used together.

"We specifically found them to be effective at reducing Rutherglen bug numbers in harvested baby leaf spinach," he said.

"They were also able to reduce overall insect contaminant levels in spinach."

Dr Rogers said from a processing perspective, factory trials confirmed that it was much easier to remove insects from product if they were dead, particularly moths.

"A short-term insecticide with low toxicity that can be applied relatively close to harvesting can have some beneficial effect in controlling moths," he said.

CONCLUSION

Dr Rogers said the project revealed that there were some methods that growers and processors could use to reduce the number of insects discovered at retail points that could be recommended for implementation.

"At a consumer level, there is an opportunity to better educate consumers if they want growers to use more natural methods of insect control," he said.

"For example, some growers use natural predatory insects like lacewings and lady beetles that feed on problem insects. Sometimes this means one of these predatory insects can be found on lettuce leaves in bags in the supermarket.

"The message needs to be that this is okay, as it means the vegetables have been grown more naturally, with benefits for everyone."

More information about this project can be found at soilwealth.com.au/resources/fact-sheets/managing-insect-contaminants.

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THE BOTTOM LINE: VIRUSES OF NATIONAL IMPORTANCE TO THE VEGETABLE INDUSTRY – VG15008

Project VG15008 investigated the importance and impact of viruses in the vegetable industry, and recommended strategies to reduce their impact and therefore deliver tangible economic benefits.

The two virus groups identified as having the greatest economic effect on the industry were tospoviruses and potyviruses. In particular, tomato spotted wilt virus was found to cause the most impact, particularly in capsicum crops, while several potyviruses have significant impact on melons, pumpkins and zucchinis.

Improving conventional control methods and new generation management techniques are required to get the industry to the next level in terms of developing virus resistance.

It is also important to ensure that Australia has diagnostic capacity in its laboratories to quickly identify diseases and recommend management systems to growers.

Virologists already have a strong understanding of viruses in an Australian context, but there is a need to keep interacting directly with industry and to advise growers of the best ways to apply this knowledge.

THE BOTTOM LINE: IMPROVING THE MANAGEMENT OF INSECT CONTAMINANTS IN PROCESSED LEAFY VEGETABLES – VG12108

Project VG12108 focused on the ways growers could remove insects from their leafy crops at or before harvest, and what processors could do to prevent insects from contaminating their product before it reaches the consumer.

Historically, consumers have had a very low tolerance for insects in vegetable products, with moths, soldier beetles and Rutherglen bugs the most reported insect contaminants.

The project found the most effective solution was to dislodge the insect at harvest using a combination of harvester modifications, such as fans or chains attached to the tractor or harvester, or using a perforated conveyor belt. From a processing perspective, a short-term insecticide with low toxicity can be applied relatively close to harvesting to make it easier to remove dead insects from a product.

There is also an opportunity to better educate consumers on the benefits of natural methods of insect control, particularly the reasons why a beneficial, non-harmful insect may be found occasionally in leafy vegetables at the point of sale.

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