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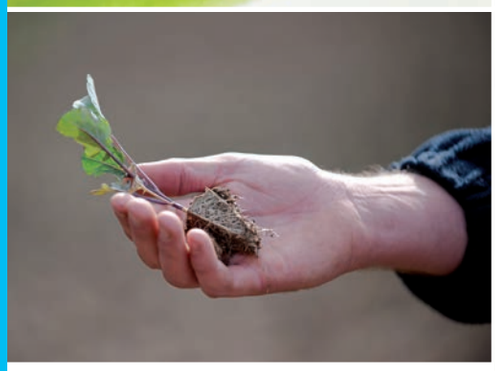
### HAL R&D project number: MT09068

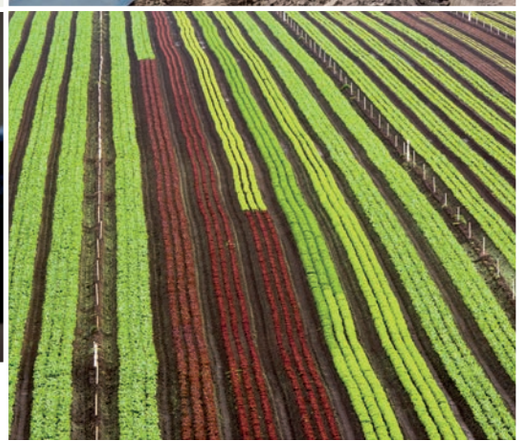
Project MT09068 investigated and compared several biodegradable mulch alternatives to polyethylene films commonly used in vegetable crop production.

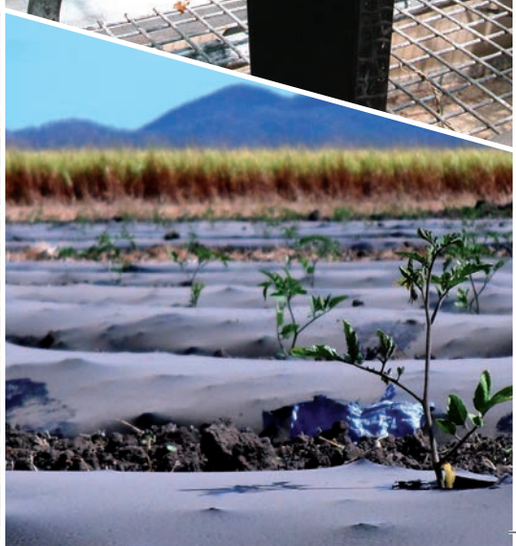
- **Investigations for mass rearing of *Orius armatus* for controlling Western flower thrips in the Australian vegetable industry.**

### HAL R&D project number: VG08186

Project VG08186 aimed to mass rear a species of miniature pirate bug to control Western flower thrips in vegetable crops, as part of an IPM system approach, and evaluated whether commercial pesticides would inhibit the IPM system.





# Comparison of biodegradable mulch products to polyethylene in irrigated vegetable, tomato and melon crops.

Biodegradable mulch in advanced commercial eggplant crop.

**Facilitators:**

The final report of project MT09068 was completed by Project Leader Sarah Limpus from the Department of Agriculture, Fisheries and Forestry Queensland (DAFFQ) with assistance from key project personnel: Sue Heisswolf and Ross Wright of the Bowen Research Facility; Denise Kreymborg of the Bowen-Gumlu Growers Association; and Warwick Hall and Sara Guerrini from Novamont.

## Introduction

Polyethylene mulch film is used throughout the vegetable industry to suppress weeds and conserve water in crop production. The disposal of polyethylene mulch film has become a major environmental issue consequently, the cost of disposal has risen significantly as the product is discarded into what are already overflowing landfill operations. This project sought to investigate and identify alternative mulch options for the vegetable industry. Biodegradable mulch exhibits several key traits which could be utilised by the vegetable, tomato and melon sectors. These include no disposal issues such as landfill and transport costs, toxic residues or build-up of plastic over time. Biodegradable mulch also offers weed suppression, water retention and crop and yield quality similar to that provided by standard polyethylene mulch film. The project compared the effectiveness of several biodegradable films and focussed on the on-farm advantages which they could offer.

Local grower Dale Williams of Euri Gold Farms discussing his experience with farm walk participants.

## About the project

With polyethylene disposal costs on the rise, numerous growers in key vegetable growing districts throughout Queensland began to seek mulch alternatives which could save on production and disposal expenses. “Many of the growers in the region were spending a lot of money on getting rid of polyethylene mulch films which has to be disposed of in landfill,” said Project Leader Sarah Limpus.

“The growers wanted a way to reduce their costs and help prevent some of the waste which was going into landfill. The local landfill stopped accepting the polyethylene film due to limited space and expansion. To accommodate the film over the next few years was too costly.”

Biodegradable films were investigated as they can be incorporated into the soil post-harvest. Evaluation and comparison of mulch alternatives took place through local on-farm screenings and trials held at the Bowen Research Facility. A number of biodegradable and degradable mulch films were evaluated for their performance and appropriateness for use in commercial vegetable production.

“We were looking for alternatives to replace the polyethylene films that still do a similar job,” Ms Limpus said.

## Major project findings

Pursuing particular data on the performance of biodegradable mulch, the research team at the Bowen Facility investigated the rate of degradation below ground; the longevity of mulch cover and its integrity; adequate suppression of weed growth and the elasticity and strength of the films.

At the time of the project, biodegradable mulch films were $160 more expensive per hectare as opposed to using and disposing of polyethylene mulch. Although higher in price, the alternative mulch options were found to fully biodegrade into carbon and other products that disappeared into the soil and didn’t leave toxic residue.

“We found that the biodegradable mulch alternatives completely biodegrade within six months and had an adequate lifespan to support the growing of the crops. There are also no disposal costs; growers can basically pull the drip tape up from the soil bed and then simply disc-in the biodegradable mulch with the crop,” said Ms Limpus.

“We only found one product that provided an adequate amount of coverage for the entire crop. All the other products were either not strong enough to provide that coverage and they split apart or, they degraded too quickly. Mater-bi® was the one that performed best out of all of the options.”

Ms Limpus noted through the involvement of growers in the

project, that in many cases during harvest the machinery would partially drive onto the soil bed, or when in wet conditions, the machinery would slip and damage polyethylene mulch films, adding to disposal costs.
"There was a lot involved in trying to pull up plastic mulch – whereas with the biodegradable mulch, it didn't matter if it was damaged because it didn't need to be pulled up. If the polyethylene films get damaged, growers have little pieces flying around in the paddock – they then have to pay people to go and pick up those little pieces. Many of the growers in the region are adamant that the extra costs spent on biodegradable mulch would be made back. The benefit of the product outweighs the extra cost."

## Conclusion

With vegetable yields and crop quality comparable to those produced with polyethylene mulch, the project has established that biodegradable mulch films are a viable option for successful production. Ms Limpus encouraged growers to trial biodegradable films in an effort to verify whether the option was economically viable for growers' respective businesses.
"Once people recognise the benefits and start to order more biodegradable mulch, I think the manufacturers will have a more reliable supply and other companies that are producing biodegradable film will then step up and produce more competition which, in turn, will push the price points down," she said.

### The Bottom Line: MT09068

- Project MT09068 sought to examine and compare several biodegradable mulch alternatives to polyethylene films commonly used in commercial vegetable crop production.
- Although higher in price, the alternative mulch options were completely biodegraded into carbon and other products that disappeared into the soil and didn't leave a toxic residue.
- Vegetables grown with the biodegradable mulch were comparable in terms of yield and crop quality to those crops grown with polyethylene mulch.

## Acknowledgements

This project has been funded by HAL using voluntary contributions from industry and matched funds from the Australian Government.

# Investigations for mass rearing of *Orius armatus* for controlling Western flower thrips in the Australian vegetable industry.

*Orius armatus.*

**Facilitators:**

The final report of project VG08186 was completed by Primary Investigator Lachlan Chilman of Manchil IPM Services Pty Ltd with assistance from key project personnel Sonya Broughton of the Department of Agriculture and Food Western Australia (DAFWA) and James Altmann of Biological Services.

## Introduction

Integrated Pest Management (IPM) is a strategy used to control pests, primarily based on a non-chemical preventative approach. The focus of IPM is on naturally occurring beneficial insects and mites, with the release of mass produced beneficial insects when required and the use of strategically applied chemical products. It has been noted that IPM has been adopted when conventional pesticide applications have failed due to over-use and a build-up of resistance. Project VG08186 was initiated due to the commercial failure of a pesticide based strategy against western flower thrips (WFT). A major pest of vegetables, WFT damage crops by feeding on leaves, flowers and fruit and by transmitting plant viruses, particularly Tomato spotted wilt virus (TSWV). The project investigated the possibility of mass rearing a species of miniature pirate bug, *Orius armatus*, to control WFT in a range of vegetable crops, including capsicum, and also evaluated whether commercial pesticides would inhibit the IPM system. This approach, which involved a primary control based on biological agents (miniature pirate bug) with aid from cultural management techniques and only strategic support from pesticides, then examined growers' reliance and decisions in relation to pesticide management over time.

## About the project

Project Leader Lachlan Chilman said the mass rearing system for the miniature pirate bug, *Orius armatus*, needed further development to enable commercial production for use in vegetable crops. "We wanted to develop a mass rearing system to be able to rear enough so growers could start putting out large numbers of *Orius*," said Mr Chilman.
"Miniature pirate bug is commonly used around the world in all developed countries to control Western flower thrips, especially in capsicum crops. They eat not just the larvae but the adult Western flower thrips and they are very vigorous feeders – they don't just kill for food they also kill to maintain their territory."
Capsicum was chosen as the initial trial crop as overseas research had indicated that pollen is important for *Orius* establishment. Other crops with high pollen counts include

eggplants, strawberries and ornamentals, which may be considered at a later stage.

"Another key component was evaluating how we could get the *Orius* to work best in the crop and evaluate whether the commercial pesticides would inhibit the IPM system. We set up many commercial field trials around the country to investigate," he said.

Extensive field trials were undertaken across Western Australia, Victoria, South Australia and Tasmania. All commercial trials had good results measured by the control of WFT. Testing of the effects of a range of insecticides on *Orius armatus* showed that the neonicitinoid group of chemicals were the most harmful to the insect, with some insecticides remaining in the soil residually and completely killing populations of *Orius armatus* for several years after application.

## Major project findings

Field trials revealed that the IPM system was able to reduce growers' reliance on spraying from one to two times a week for thrips and mites, to not spraying at all for the whole season once flowering began. The mass rearing was successful having increased from 1,000 at the beginning of the project to a weekly production of 400,000, which if released at two *Orius armatus* per square metre could cover 20ha per week.

"Capsicum presents a crop with a very high population of Western flower thrips and Two-spotted mite in greenhouse crops, so it has massive potential for IPM adoption," said Mr Chilman.

"We are lagging behind the rest of the world in IPM utilisation. If you look at the strawberry sector, 85-90% of the whole industry is under IPM using biological agents. You can go to countries like Holland, Israel or Spain where 90-95% of growers are using IPM. Australia is quite behind in the percentage of growers using an IPM system."

Acknowledging that there is a perceived risk in changing to an IPM system by growers, Mr Chilman said in most cases there are consultants to assist in the management and maintenance of an IPM approach.

"We don't just supply the predators, we supply consultants that check the crop each week with the grower. Hopefully we can minimise the risk of starting up an IPM program – a lot of it is just misidentification and not knowing what is out there in the crop and spraying the wrong things. Growers can still use some of the chemicals they currently spray in an IPM program; it is just a case of amending that," he said.

## Conclusion

By conserving beneficial insects, growers are more likely to kill pests hiding in places where insecticide coverage is poor according to Mr Chilman.

"Adoption rates are increasing and I think that will continue to happen as more and more insecticides become unusable due to resistance and consumers want fresh produce with fewer chemicals on them," he said.

"I think the main incentive though will come from consumers in the supermarkets wanting produce that has not been treated with as many chemicals, and then the growers will have to change. Overseas a lot of supermarkets are quite competitive on marketing low chemical produce. Once that starts to also take hold here in Australia then growers will need to adapt."

*Orius armatus* feeding.

### The Bottom Line: VG08186

- Integrated Pest Management (IPM) focuses on naturally occurring beneficial insects and mites, with the release of mass produced beneficial insects when required, and the use of strategically applied chemical products.
- Project VG08186 investigated the possibility of mass rearing a species of miniature pirate bug to control Western flower thrips in vegetable crops.
- Field trials revealed that the IPM system was able to reduce growers' need from spraying one to two times a week for thrips and mites, to not spraying at all for the whole season once flowering began.

## Acknowledgements

This project has been funded by HAL using the National Vegetable Levy and matched funds from the Australian Government.

**Photo credits:**
MT09068 photos credit: Sarah Limpus, Sue Heisswolf
VG08186 photos credit: Sonya Broughton

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