

IN THIS ISSUE:

- **Production of fish feed from vegetable waste.**

HAL R&D project number: VG13050

Project VG13050 examined the potential use of vegetable waste to rear insect larvae for aquaculture feed.

- **Vegetable industry workplace health and safety resources.**

HAL R&D project number: VG13053

Project VG13053 will provide 'Practical Workplace Health and Safety' resources and training to growers, to increase WHS compliance in the vegetable industry, resulting in safer vegetable farms.





Production of fish feed from vegetable waste.

Facilitators:

Project VG13050 was completed by project leader Dr Jenny Ekman, from Applied Horticultural Research Pty Ltd.

Introduction

Australian consumption of seafood has doubled in the past 10 years and this growth is predicted to continue. But with most wild fisheries already maximised or in decline, the only way to meet this demand is through increased aquaculture. Currently, one factor limiting aquaculture is the continued reliance on wild caught fish to produce fishmeal. Much research has focused on replacing fishmeal with animal and/or plant-based products, however, with only partial success.

Researchers have found that insect-based protein meals offer an alternative to plant and animal-based fish food as ingredients in fish food for aquaculture. High in protein and fat, insects can be reared on waste products, have a high conversion rate and are part of the natural diet of some carnivorous farmed fish species.

About the project

Project VG13050 examined the potential use of vegetable wastes to grow insect larvae, which can be used in animal or aquaculture feeds.

Led by Dr Jenny Ekman of Applied Horticultural Research Pty Ltd, the project reviewed what is known about cultivation of these insects in terms of lifecycle, reproduction and feed use efficiency.



Larvae.

Initially, a desktop study was conducted on four species with known potential - black soldier fly (BSF), yellow mealworm, superworm and housefly. Of the insects studied, BSF appeared to be a clear frontrunner.

“The black soldier fly’s larvae can live on vegetables alone, ‘self-harvesting’ when they are fully mature,” Dr Ekman said.

“Another benefit is that adult flies are found naturally in Australia. They are not pests and don’t carry diseases, and they usually just live long enough to mate and lay eggs.”

A series of small trials were conducted examining the issues involved in setting up a BSF colony, testing suitable vegetables to use as feedstocks and analysing the quality attributes of the dried meal produced compared to the commercial fishmeal.

Main Findings

An immediate challenge faced by Dr Ekman and her team was encouraging the adult insects to mate and lay eggs under the controlled conditions.

“Although adults have been widely reported to not eat, our flies only mated and laid eggs once they were provided with cut apples (a sugar source). They also preferred to lay their eggs into vegetable wastes rather than other materials,” Dr Ekman said.

Feeding trials with larvae showed that pumpkin, carrot, eggplant, capsicum and even processed vegetable sludge were all readily consumed.

“We found that the larvae could live on lettuce for only a short time and that these larvae were effectively bloated compared to those fed other foods. Meanwhile, cauliflower and broccoli were not found to be suitable, and sweet potato was non-preferred,” Dr Ekman said.

For the research team, calculating the exact amount of food required to produce the maggots was also difficult.

Despite this, estimated feed conversion rates were obtained, with larvae conversion found ranging from 4.9:1 to 2.0:1 - the average being 3.3:1 (dry weights).

“Basically, this means that around 25 grams of fresh pumpkin or 30 grams of fresh carrot would be needed to produce one gram of dried larval meal,” Dr Ekman said.

“Importantly, the ratio could be improved further simply by adding ground flax seeds to the diet. This doubled the rate of weight gain and reduced the volume of fresh feed required by around 70 percent.”

Next steps

This project has demonstrated that BSF larvae can be reared successfully on a range of different vegetable crops.

Dr Ekman said that while some of the results were definitely promising, this area of research was still in its infancy.

“More needs to be known about the effects of diet on nutritional attributes of the larvae, as well as how to optimise the process for different aquaculture feeds, if this is to make the big jump to commercialisation,” she said.

“Although investment in BSF would currently be a risky venture for an individual vegetable farmer, this industry has considerable potential and may well develop in the future as fishmeal prices continue to rise.”

Dr Ekman said commercial facilities were being developed in other countries, which would help provide better guidance about how Australia can grow and use these animals.

“But such a large research project needs to be funded using university or national-based funding - preferably involving a large commercial partner such as one of the aquaculture feed suppliers, and possibly overseas expertise.”

THE BOTTOM LINE: VG13050

- Black soldier fly can be reared on a range of different vegetable wastes and could potentially be valuable additions to aquaculture feeds. However, rearing methods and processing need to be refined to allow commercialisation.

Acknowledgements

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



Vegetable industry workplace health and safety resources.

Facilitators:

Project VG13053 is being completed by RM Consulting Group (RMCG) and Advanced Viticulture & Management (AV&M).

Introduction

The high rate of death and serious injury for people who live, work on and visit farms is significant, and continues to be widely recognised as an area for concern.

The Australian Centre for Agricultural Health and Safety (ACAHS) reported 59 on-farm deaths and 81 non-fatal farm injuries in 2011 for all agricultural properties, including vegetable farms. Vegetable growers broadly accept the importance of providing a safe workplace, however, confusion remains a major problem.

In particular, growers are confused about their responsibilities, and where and how to implement a workplace health and safety (WHS) system.

About the project

Managed by RM Consulting Group (RMCG) (in conjunction with AV&M), and led by Luke Rolley of RMCG, Project VG13035 will provide practical WHS resources and training to growers to increase WHS compliance in the vegetable industry, resulting in safer vegetable farms.

In the early stages of the project, a series of case studies were developed through consultations with vegetable growers in Victoria and South Australia.

RMCG consultant Jackie Scally said the information gathered would help shed light on the main WHS issues faced by growers.

“The case studies were carried out to show examples of ‘good’ and ‘bad’ WHS in farms across Victoria, South Australia and Queensland,” she said.

“These will be used as tools to not only promote WHS and the importance of addressing these issues, but to encourage growers to participate in the various activities we have planned as part of this project.

“Specifically, the activities include training sessions and farm risk assessment walks for growers which will be conducted in a number of states around Australia towards the end of the year.”

Ms Scally said another main component of the project was the provision of a package of customisable WHS resources.

“We are currently preparing a manual which will be available to vegetable growers and will focus on practical things they can do to improve their WHS practices on-farm, and identify and manage risks on their property,” she said.

“The manual will identify a number of risks associated with farming covering all elements of the production systems, from what’s happening out on the field and in packing sheds, to hiring contractors and handling chemicals.

“Within each of these key areas, WHS policies and risk assessment frameworks will be developed to help growers improve their practices.

“This will be made possible through a review of current industry WHS practices and state legislative requirements which we recently completed.”

Main findings

Through general discussions and targeted questions, the project team has defined the main barriers to adoption of WHS practices, which Ms Scally said could be “relatively easily overcome”.

“One of the main barriers described by businesses, both with some form of WHS capacity and those without, is that ‘WHS is complex and I don’t know where to start,’” she said.

“Resources are another issue. Many growers have family businesses in what is a very intensive agricultural sector. Therefore, the amount of time available to some businesses to consider WHS, let alone implement change, is limited.

“A further barrier to adoption is cost, which we believe is perceived rather than real. There is a common sentiment between growers that a WHS system is ‘expensive’ and will require significant expenditure on new equipment.”

Ms Scally said the interviews revealed that most businesses had a mix of permanent and casual labour.

“In the majority of cases, the businesses are managed by the family owners of the business,” she said.

“Among these owners, challenges were reported with managing permanent and casual staff, not only in the application of WHS but also in regard to general people management.”

Other barriers for vegetable growing businesses included dislike of compliance, negative experiences with previous WHS (typically as a result of an accident or work safety authority audit) and the belief that WHS is “not really necessary” and only relevant to “big business”.

Next steps

RMCG will be conducting free farm risk assessment walks and WHS workshops in 2015 in Queensland, New South Wales, Victoria, South Australia and south-west Western Australia.

To learn more about the Project VG13053, or to register your interest in a free workshop or farm walk, contact Jackie Scally at RMCG on 0468 813 609 or email jaclynes@rmcg.com.au.

THE BOTTOM LINE: VG13053

- Vegetable growers are positively engaged with the issue of WHS and are keen to improve WHS performance.
- The project team has defined the barriers to adoption and how extension can overcome these barriers.
- There is more harmonisation, rather than less, between the states, making a package of resources reasonably efficient to deliver.
- There has also been good support in promoting the project from the peak industry body.

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*Please contact Shaun Lindhe at AUSVEG on 03 9882 0277 or email shaun.lindhe@ausveg.com.au to submit topics for potential inclusion in future editions of **vegenotes**.*

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