

Lettuce Downy Mildew Model

Dr Elizabeth Minchinton and her team from DPI Knoxfield Victoria are investigating new options for controlling lettuce downy mildew under a HAL funded project 'Benchmarking disease predictive models' (VG07070).

Downy mildew

Downy mildew is a devastating fungal disease of lettuce especially in autumn and spring grown crops. In the worst cases, up to 100% of the crop can be affected (Fig 1). Disease resistant varieties are an important management tool for downy mildew, but the fungus usually overcomes this resistance so resistant varieties are continually being bred.



Fig 1 Downy mildew producing spores on the under surface of a lettuce leaf

There is a high risk of the fungus developing resistance to the most popular systemic fungicides, such as metalaxyl. This means that fungicides must be used much more judiciously to prevent the selection of fungicide resistant strains of the pathogen.

Downy mildew disease predictive model

The new project aims to test under Australian conditions a number of disease predictive models for downy mildew of lettuce that were developed overseas. These models use microclimate data collected by a weather station located in a crop to predict when conditions are conducive for disease and consequently, when to spray the crop with fungicides. If conditions are not conducive for disease, spraying will not be necessary. In this way the disease could be managed with fewer fungicide sprays.

The downy mildew model has two components, one that predicts when the fungus will produce and release spores from infected leaves, and one that predicts when the spores will infect healthy leaves.

To test the model we placed spore traps in two lettuce crops to track when spores are produced. Infection of the crop was tracked by placing lettuce seedlings amongst the crop plants for a 24 hour period at regular intervals throughout the life of the crop. The seedlings are good indicators of infection events because they are very susceptible to mildew. The spore release and infection data was checked against the models predictions of disease.



Fig 2 Spore trap and battery (front) and weather station with solar panel (back) located in a lettuce crop.

So, how well is the model working? In the two crops monitored so far, the model has not been accurate enough to predict all sporulation and infection events in the crops. It has not consistently predicted the disease that developed on the indicator lettuce plants. The model now needs to be adjusted and further tested to improve its accuracy. Ultimately the model will be an integral part of an IPM program for lettuce.



Fig 3 Trap plants (seedlings located in a cos lettuce crop heavily infected with downy mildew

Field trial of the downy mildew model for lettuce

A field trial was conducted in an iceberg lettuce crop ('Marksman') at Rosebud in Victoria in March and May 2009. Treatments included an untreated control, weekly fungicide sprays, spray applications based on the model predictions, weekly sprays of the biological control agent *Bacillus* and three applications of a chemical that induces disease resistance in plants (SAR, systemic acquired resistance) (Fig 4).

Downy mildew first appeared at week 5 in the unsprayed plants (Fig 5). The *Bacillus* treatment did not control mildew. The weekly and the model spray programs slowed the rate of development of mildew in the crop, but by week 11 most plants were diseased. Mildew is notoriously difficult to control at this time of the year. The results also indicated that the spray program could be improved (type of fungicide). In this case the model predictions had resulted in one less spray. The SAR treatment had reduced the incidence of downy mildew in the crop by 50% but proved to be very phytotoxic resulting in smaller, less well formed plants.



Fig 4 Lettuce trial site at Rosebud

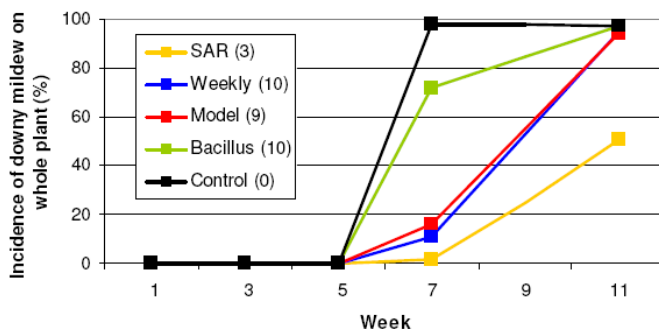


Fig 5 Incidence of downy mildew on whole lettuce plants during the field trial. Numbers in brackets are number of fungicide sprays applied to the various treatments.

Future directions – Downy Mildew Model

The model will be further developed and checked for accuracy using spore trapping and trap plants. Modifications to the model will be tested over several seasons on cos, coloured leaf and iceberg lettuce to increase control of downy mildew and reduce the number of sprays applied to the crop. Evaluation of soft pesticide options will continue. The economics of controlling the disease using the model will be compared against the weekly spray program and soft pesticides.

For more information on the project please contact Elizabeth Minchinton or Des Auer (03) 9210 9222.

Is there a market-pull for IPM?

This question was looked at in a session on the second day of the Vegetable Conference in Melbourne in early May. The session was introduced by Sandra McDougall, followed by the perspective of the Vegetable grower of the Year 2008 – Peter Schreurs, a ‘grower-processor’ perspective from Houston farms presented by Lee Peterson, a multinational processor perspective – GSF presented by Chris Burge, and Paul Horne [2009 Researcher of the Year] presented on the Australasian Biological Control Inc. IPM logo. We were to have a perspective by a marketing strategist but they were unable to attend at the last minute.

By way of introduction

IPM was defined as a pest management strategy that substitutes product for knowledge to build a farm system that is resistant to pest outbreaks and prioritizes pest management tools that are complementary to beneficial organisms. It is assumed that an IPM strategy is a more resilient pest management strategy with fewer long term pest problems. It is also assumed that an IPM strategy uses fewer broad-spectrum insecticides and has a lower risk to farm workers, non-target organisms and less of a residue risk for consumers.

Why are we interested in a Market-Pull for IPM?

From a survey 3 years ago we had 61% of lettuce growers self-identify as IPM growers – of those only 40% included beneficial organisms in their pest management decision making. Similarly Paul Horne and Jessica Page found 49% of vegetable growers surveyed self identified as IPM growers but probably only 28% would be classified IPM by them. Obviously we need an agreed definition. But this also points to IPM as being an ‘aspiration’ of most growers.

We also know from Paul & Jessica’s survey that growers who do adopt IPM usually stay with the strategy and that they successfully sell their produce in all market spheres. One of the top 3 reasons growers have given us in surveys on barriers to IPM adoption is “market specifications” or “market attitudes” – growers speak that

they ‘can’t afford the risk’ of having insect contamination. So if growers are not using an IPM strategy they are using a ‘pesticide-1st’ strategy and that doesn’t guarantee ‘insect-free’ either.

Pesticide resistance is a major barrier to the Pesticide-1st approach. Will the pesticide companies find new chemical solutions to control some of our insecticide resistant pests? What do growers do when the registered chemicals don’t work? – Western flower thrips (WFT) is a case in point as is Silverleaf whitefly (SLW), particularly with the new super-resistant biotype Q that has been found in QLD and NSW. Processors and supermarkets are faced with produce in some growing windows both having insect contamination and pesticide residues. An IPM strategy significantly reduces the pesticide residue potential and is likely to reduce unexpected insect contamination.

Market dilemma:

What is the relative risk of insect contamination vs pesticide residues? Do markets want suppliers who are developing long term pest management strategies that are less susceptible to pesticide resistance or chemicals losing registration?

Market is king – and unless we can have the whole supply chain moving in a similar direction we are wasting resources working at cross-purposes. So can the ‘market’ end of the supply chain stop being a barrier to IPM and help pull it along?

In the UK and Europe – there are a number of integrated ‘crop’ management programs that have market labelling – one example is the LEAF program. In the USA Wegmans supermarket has a line of IPM produce which is supported by an independently audited accreditation program. Is this the way to go or are there other options?



Peter Schreurs gave an inspiring history of the evolution of his families’ vegetable farm and of his own changes in understanding about how to successfully grow vegetables. He spoke of a two spotted mite outbreak in leeks that they could not control with chemicals and of his son, Darren seeking the assistance of Paul Horne and the initially shocking message “Don’t spray” to give the predatory mites time to multiply and do their job of eating the two spotted mites. He spoke of small trials Darren did to test the theory and then after their success applying it to the leek crop and after that success

expanding the concept to all their pest management on all their crops.

Peter talked of their adoption of IPM as the initial step that has prompted them to re-evaluate the sustainability of all aspects of their approach to farming. Since adopting IPM they have now changed practices to build on-farm biodiversity, enhance their soil, improve water-use efficiency and conserve energy. As a business they have embraced the concept to remain economically viable they must implement good environmental practices.

For more details on what they do see their website: www.leeks.com.au – we hope to have a dubbed version of his talk available for all to view.



Lee Peterson, Technical Director of Houston's Farms spoke of the expansion of the Houston's farm business as a fully integrated grower and processor of baby leaf fresh cut salad products based in Tasmania. He gave a history of the growth from one to three farms producing crops all year round. He outlined the challenges for IPM as:

1. maintaining continuity of supply,
2. zero tolerance of foreign bodies in the final product and
3. zero tolerance of leaf damage.

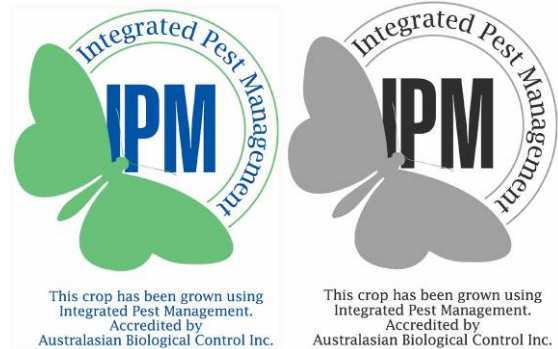
Lee then outlined some of the lessons they have learnt from Currant Lettuce aphid which was initially identified from their farm. He told that more pesticides make it worse, that they had to rapidly implement monitoring of crops, and to maintain market access to their mainland markets – they were supplying all states primarily through Woolworths – they were required to use Confidor® on all seedlings even Nas resistant varieties.

They participated in an IPM trial with Lionel Hill through the lettuce IPM project in 2005/6 and found that IPM worked most of the time but was not always adequate to meet market demands and that a loss of 20% can easily be their annual profit. What they have learnt is that IPM requires more forward planning with rotations and a higher human resource requirement for the planning, implementation and monitoring. That they have the important aphid beneficials – lacewings and hoverfly larvae in their crops. That there are issues arising with residues from Confidor and that new pests are around the corner.

So despite the challenges with an IPM approach, Lee said that Houston's farms was committed to adopting IPM and their approach is to minimise pesticide use, have highly integrated planning, diligently monitor their crops, have an integrated program using soft chemistry and to focus on sustainability.



Chris Burge, lettuce buyer for Golden State Foods, GSF spoke of being in a business that supplies fresh-cut produce to the food service sector with McDonalds being one of their major customers. He spoke of the imperative of zero tolerance for contamination in product. That they sell a ready-to-eat product and that zero tolerance is just not negotiable.



Paul Horne, Principal of IPM Technologies and member of the Australasian Biological Control Inc. [ABC], spoke of the IPM label. He also began by pointing out that using pesticides was certainly not guaranteed to satisfy “zero tolerance” and gave the example of Peter Schreurs' leeks and Houston's' spinach. The label is a registered trade mark, owned by Australasian Biological Control Inc. The label is issued to farmers wanting to show that they use IPM. To use the logo a farmer must be able to demonstrate that they use IPM to the ABC group's criteria by satisfying 3 assessors within the ABC. The criteria include:

1. Understanding the role of Beneficial species
2. Utilizing appropriate Cultural controls
3. Not using pesticides that disrupt the IPM strategy

Paul said the logo was not easy to get and they maintain their high standards. Farmers must be implementing IPM, not just have attended a course and their use is reviewed annually. Paul finished off the talk showing a NZ advertisement that champions the use of insects.



After the presentations there were questions and discussion. Some of the issues raised included:

IPM is not just about insects but includes disease management. Yes and on the first day of the conference Frank Louw, an extension plant pathologist from North Carolina, articulated that well. He spoke of the success of a farming systems management approach or IPM approach to develop vegetable farms that are resistant or resilient to diseases. Essentially he outlined the IPM strategy that we most commonly apply to insect pests of “know your enemy – know your friend”, use our understanding of ecosystem processes, use multiple complementary tactics to develop resilient systems as the key to managing diseases into the future.

Is an IPM logo the way to go or some sort of environmental branding? Was discussion of the potential to get Market pull via QA systems or EMS such as Enviroveg or Freshcare-Environmental.

Zero insects is not always possible with conventionally grown produce! – what is the way forward? Discussion centred on options for dis-infestation – removing insects just prior or after harvest.

Insect contaminants. LadyBird Organics like the NZ hothouse are successfully using insects as a positive marketing tool. Do we know how consumers respond to different insects as contaminants? Jenny Ekman submitted a project in the last funding round to conduct focus groups with consumers to assess attitudes and behaviour towards different types of insects as contaminants. [project was not funded]

Market is King

On the first day of the Vegetable Conference the first half of the day was devoted to speakers talking from a market-perspective and I found many of their comments indicating the potential for a market-pull for IPM.

Peter Perkorny, Coles’ General Manager for Fresh Food spoke at length about the need for partnerships along the supply chain, of an aligned industry, of trust in the product and that product meets specifications.

Jin Ju Wilder, President of Coast Produce Company – an LA produce wholesale, re-packer and marketing company spoke of the importance of ‘inspiring’ the consumer – ‘what is your food message’ – to me IPM is a great food message. She spoke of the growing sectors of organics, local product and lines marketed specifically for children.

Michael O’Keefe, a business strategy advisor’s message was that the Supermarkets set the ground rules –i.e. if we want to get a market pull with IPM we need to work with them.

David Hughes, Emeritus Professor of Marketing, Imperial College London, main message was that we see polarizing trends in the market place – trends towards ‘global, uniform, fast, cheap...’ but equally strong trends towards ‘local, natural, seasonal,...’ and ‘that consumers are not a

homogenous bunch’ that we need to specifically market our product to diverse consumer sectors with different motivations and requirements.

Joanne McMillan-Price, a high-profile Australian nutritionist and dietitian spoke of the universal agreement that we need to eat more vegetables and that research into why people don’t eat more listed “pesticides” as the 3rd major obstacle. She spoke of “ethical eating” as being an emerging trend and when proposing solutions her first solution was in finding a “middle ground between organic and conventional product” That, I suggest, could be IPM.

The next speaker was **Michael Kneebone**, a Director of Freshlogic who essentially supported David Hughes’ message that Australian consumers can be divided into a number of groups with different buying patterns. He also listed “ethical foodwares” as his third major trend.

My take-home from the market focused talks is that to get an IPM pull we do need to work with the supply chain, that we need to find common ground with the Supermarkets and they need to see it as a ‘great food message’ that is meeting the needs of one or more of the consumer sectors and the likely fit in global consumer trends is in the ‘local, ethical, healthy, middle ground between organic and conventional’ sector.

IPM acknowledged again!

IPM was acknowledged again in the 2009 Vegetable Industry Awards. Dr Paul Horne won the 2009 Syngenta sponsored Researcher of the Year Award and LadyBird Organics won the Brisbane Produce Market’s sponsored Innovative Marketing Award.

Chemical Permit

PER 10807 – Vertimec (abamectin) for use on field grown head lettuce to control Two Spotted Mite. It is now valid from 1/6/09 to 31/03/14 for all states

PER11472 – VectoBac WG Biological Larvicide (Bacillus thuringiensis) / protected cropping capsicum, cucumber, eggplant, herbs, lettuce, ornamentals (including potted plants & tomato / Fungus gnats: Mushrooms / Sciarids
Valid 18/06/09 to 30/05/14 all states

PER11474 – Ridomil Gold 25G (metalaxyl-M) / lettuce / Damping off Valid 1/07/09 to 30/06/11 all states

New Cucurbit guide

A new cucurbit ute guide has recently been published and it is being distributed **free** to all **levy paying cucurbit growers** in Australia. If you are a levy paying **cucurbit** grower and would like one of these books sent to you, could you fax or email your contact details to Tony Napier at YAI. Fax no. (02) 6951 2692 or email tony.napier@industry.nsw.gov.au

