Brassica Integrated Pest & Disease Management

Managing Diamondback Moth

Diamondback Moth (DBM), *Plutella xylostella*, is a major pest of Brassica vegetable growing in Australia and it has the ability to rapidly become resistant to insecticides.

The National Diamondback Moth Project Team was established to research and communicate an integrated approach to managing this pest.

During the six years of project work the team has focused on limiting DBM's development of insecticidal resistance and facilitating the implementation of effective alternatives to insecticide-based control.

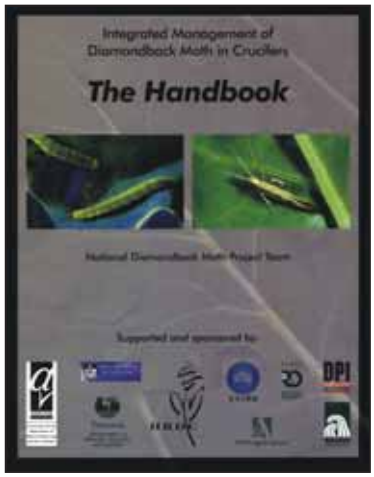
Significant tools have been developed to assist growers and consultants to better manage DBM and they are outlined below.

The Handbook

'Integrated Management of Diamondback Moth in Crucifers' was created by the team and distributed to all Brassica growers nationally.

The handbook has been evolving with insertable sections mailed out as they are developed.

The following modules are either included already, or nearing completion:



- Integrated pest management – what does it really mean?
- Crop monitoring – the key to informed decision making
- Insecticide resistance management – getting the best from your sprays
- The role of *Bacillus thuringiensis* in managing DBM
- Ensuring good spray coverage
- How fast does DBM develop
- Brassica information on the internet – pests, diseases & agronomy
- Information sources for Brassica crops
- Natural enemies of DBM
- Other Brassica pests
- Dispersal and movement of DBM
- Impact of insecticides on natural enemies chart.

The bottom line

- Follow the Insecticide Resistance Management (IRM) Strategies developed for your State (see overleaf).
- Practise the pest management tactics as outlined in the 'Handbook of Integrated Management of Diamondback Moth in Crucifers' (discussed above).
- Monitor (scout) crops, preferably using a Monitoring Guide (discussed overleaf) to allow well-informed control decisions.

Monitoring and Action Guide

It is well known that inspecting (monitoring) crops regularly is one of the most important activities that allows a grower to make sound pest control decisions.

A crop sampling guide, consisting of five different charts for different situations, has been developed to enable growers and advisors to be more cost efficient with their monitoring time.

The guide asks questions regarding – type of crop to be monitored (eg. cauliflower or broccoli), growth stage of the crop, market destination (eg. processing or fresh), chemical use in the crop and wasp parasitism rates of grubs. Once answered, the guide leads to a sampling chart that advises how many plants to sample for an accurate decision about whether to spray, not spray, or monitor again in five days.

Below a certain level of DBM presence, control will often cost more than the damage. The aim of the guide is to minimise insecticide sprays and time spent monitoring, while delivering a high quality crop. It is hoped that the guide will also 1) reduce spraying costs and 2) help growers move forward in integrated pest management (IPM) practice by providing them with a reliable tool to confidently advance.

The guide has been trialed around the country and will be available in Summer 2003 in both computer based and portable flip charts versions.

Insecticide Resistance Management (IRM) Strategy

An important component of the team's work is the development, distribution and updating of a 'two window' insecticide resistance management strategy, in collaboration with the Avcare Insecticide Resistance Action Committee.

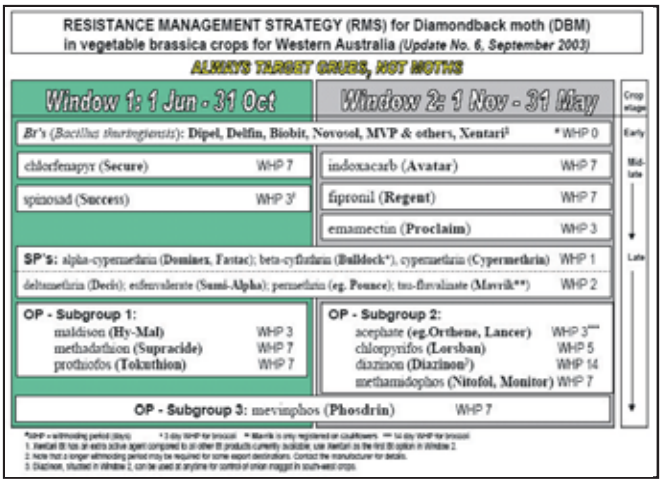
If adhered to, this strategy is likely to extend the effective life of insecticides by at least 2–2.5 times.

The strategy works on the principle of only using particular insecticides for a certain period of time in a year, before switching to those of a different mode of action.

Using insecticides in this way limits the exposure of the pest to products, since prolonged use can allow the pest generations to build up defences and become resistant.

The strategy has been customised for different regions to accommodate different growing conditions.

Examples of the IRM Strategies for the different States.



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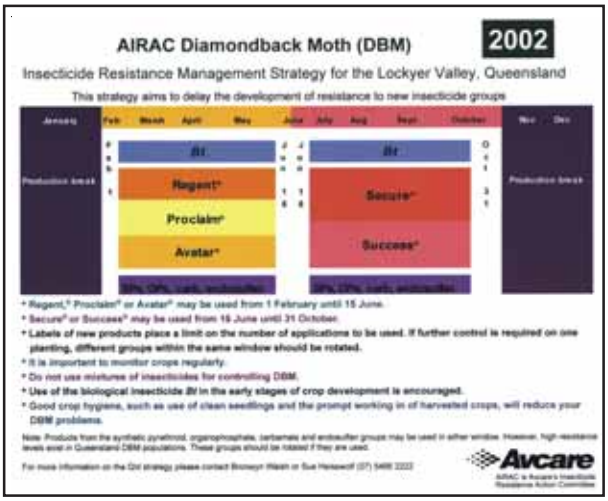

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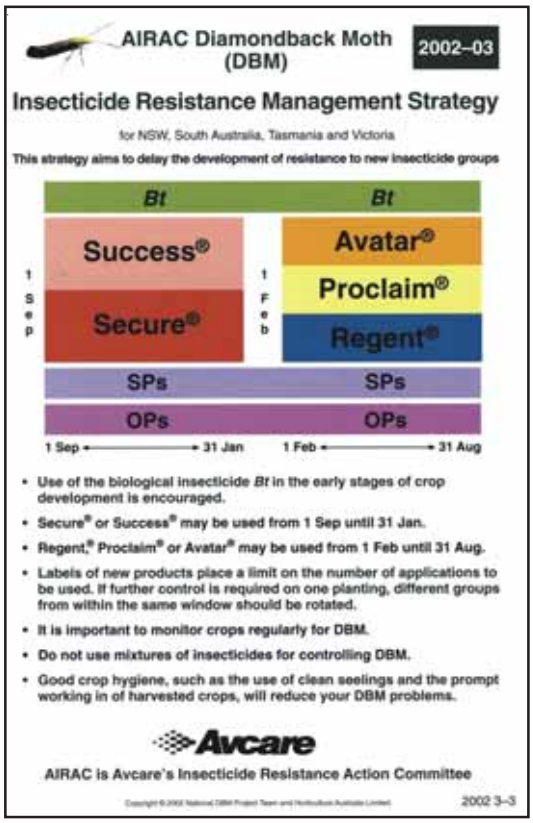

NSW, SA, Tas, Vic.

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Managing Clubroot

Clubroot, caused by the organism *Plasmodiophora brassicae,* affects crucifer plants including broccoli, cauliflower, Chinese cabbage, Brussels sprouts, bok choy, cabbage, Swedes, radish and turnips. It can also infect cruciferous weeds (eg wild turnip and wild radish).

Symptoms include wilting of plants during warm weather and the formation of enlarged galls on the roots. The galls prevent the uptake of water and nutrients, reducing the potential yield of the crop.

Above: Crop wilting due to clubroot infection.

Below L to R: Uninfected and infected roots of a broccoli plant.

Integrated management of clubroot

A minimum of approximately 1000 spores per gram of soil is required to cause root galling. The threshold can vary according to soil type and climatic conditions. Below the threshold symptoms become difficult to detect and yield is unaffected.

Integrated management of clubroot aims to achieve a soil environment that ensures the spore population remains below the threshold required for the disease. This is best achieved using a combination of management techniques.

1 Improve hygiene - nursery and farm

Spores can be transported by anything carrying soil or water including machinery, shared/contract labour and equipment, boots, livestock, pallets, transplants and dams receiving run-off from affected paddocks.

As a result, hygiene must focus on minimising soil movement and be practiced both on and between farms. High pressure washing of machinery and equipment is the most effective method of removing soil that may harbour clubroot spores.

2 Modify the soil

Environmental factors can be managed to create soil conditions that restrict disease development.

- Clubroot is less virulent in high pH soil. Apply lime to maintain a soil pH of 7.0 – 7.5. Burnt lime (quicklime) reacts quickly in acid soil, while agricultural lime (lime sand or ground limestone) takes at least three months to increase soil pH levels. Take care applying lime to soils with a low buffering capacity (eg. sands) and soils already close to pH 7.0.

  When soil pH is greater than 7.0, lime application is unnecessary. Excessive lime may increase soil pH too much (making it alkaline), which may affect the availability of some nutrients.
- Calcium and boron affect the growth and reproduction of clubroot and application should occur at transplanting and during the first four weeks of the life of the crop, to protect the vulnerable roots.
- Clubroot requires free water to assist with movement through the soil. Thus, good drainage in cropping areas is vital. Improve drainage by using raised beds for cropping or laser grading low lying areas. Avoid overwatering.

3 Rotate crops

Increase the duration between successive brassica crops to allow natural decay of the spores. Rotate with non-brassica crops and maintain crops free of cruciferous weeds.

Chinese cabbage is most susceptible to clubroot, followed by cauliflower, cabbage and broccoli. However, some cultivars within a species are tolerant (eg. Yates broccoli - 'Dome' is tolerant to some Australian isolates of clubroot).

The bottom line

- Australian growers have the world's first molecular diagnostic test to detect the clubroot fungus in soil and water.
- This test has helped trace and eliminate clubroot contamination in nurseries.
- Integrated management strategies have been developed for all States.
- On high risk soils, fluazinam alone (incorporated in transplant row) can increase yield by up to 80% or $10,200 per hectare (for cauliflower).
- Modified planters are now used to incorporate base fertilisers into the transplant row at planting.

Transplant equipment modified to include two small rotary hoes for incorporation of product into the transplant row.

4 Use fungicides wisely

Application of fungicide may also be necessary in paddocks with previously high levels of disease. It is important to evenly distribute fungicides around the transplant root zone.

This is best achieved by incorporating the fungicide into the transplant row at planting. In trials, this method increased the marketable yield of broccoli and cauliflower by at least 80%, compared with other commercial methods. It also required 80% less water and was more reliable and effective in a range of soil types.

5 Know the disease risk

Effective on farm application of integrated management techniques will require some estimation of likely disease risk and will depend on:

- Spore load - a commercial diagnostic test is available to determine the presence or absence of spores. Evaluation of a quantitative test (that provides an estimate of spore numbers) is under way. Until then, spore load must be estimated based on the severity of last infection, time since last infection and management strategies used. Consider:
  - Sowing time (high risk in warm months)
  - Soil type (clay - high, loam - medium and sand - low risk)
  - Drainage, soil pH, crop (including variety) and cruciferous weeds.

Risk

Low - no or mild infection in the past, with at least 5 years since the last infection.

Medium - moderate infection in the past with between two and five years since the last infection.

High - severe infection with less than two years since the last infection.

Acknowledgements

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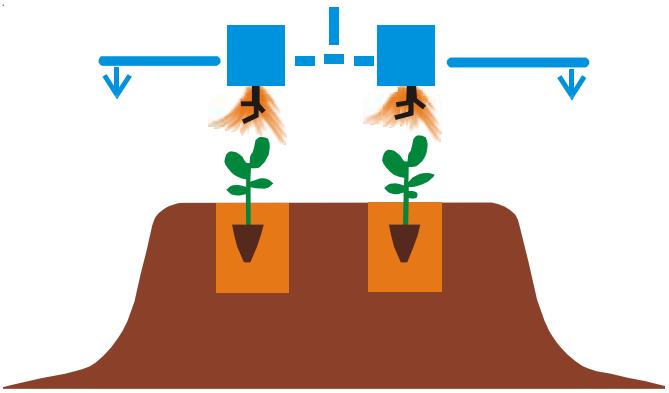

Even distribution of fluazinam around the root zone prevents phytotoxicity, minimises product waste and increases efficacy.

Further Reading

A guide to the prevention and management of clubroot in vegetable brassica crops

Clubroot Galls and All – the newsletter of the National Clubroot Project

Integrated Pest Management for Brassicas (Computer CD and Video)

www.dpi.vic.gov.au

Further Information

For more information regarding the information contained in this edition of VEGE*notes* please contact your Vegetable Industry Development Officer.

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