Brassica IPM

NATIONAL NEWSLETTER

Issue 3 July 2003

Welcome to issue three. This newsletter is an initiative of the National Diamondback moth (DBM) Project Team of researchers and extension personnel, who operate with levy funding from Horticulture Australia. Items for future editions are welcome from other Brassica Horticulture Australia funded projects. Contact Dijana Jevremov using details at the back of this issue.

RESISTANCE TO Bt (BACILLUS THURINGIENSIS) PRODUCTS IN AUSTRALIAN DBM

By Greg Baker – Entomologist, South Australian Research and Development Institute (SARDI).

What is the Risk?

We know that DBM in the USA and Asia have developed resistance to Bt in the field, so the potential of a similar development in Australia is real. A common forerunner to resistance is reduced susceptibility to the particular insecticide in populations of the pest. Recent studies of the susceptibility to Bt of Australian DBM have shown shifts towards lower susceptibility in some of the field populations tested. However, the scale of the shifts observed so far is relatively small and not presently capable of affecting control with commercial Bt sprays.

What can be done to Manage This Risk?

Unfortunately the difference between the Bt products available in Australia is not sufficient to benefit from an IRM rotation strategy. Therefore, to help conserve the Bt products against the risk of resistance, growers should carefully plan when and how often to spray with Bt. For good resistance management growers should consider having a break once or several times per year when they don't spray with any Bt products for at least one DBM generation time (4 weeks in summer to 10-12 weeks in winter).

To obtain the greatest IPM benefit from Bt spraying avoid the use of these products when DBM pest pressure is high. Do not mix Bt products with synthetic pyrethroids or other insecticides used to control caterpillar pests, and consider favouring the Bt products when scouting indicates that beneficial activity is high.

WHAT IS A RESISTANCE MANAGEMENT STRATEGY?

The last newsletter gave a top ten list of strategies for managing insecticide resistance so please refer to them again (or ring the editor for a copy). A key component of that list of ten was the use of an insecticide rotation system based on mode of action.

It is the 'mode of action' of the insecticide products that makes all the difference to the rotation system being effective. AIRAC (Avcare Insecticide Resistance Action Committee) has developed the DBM rotation strategy to group insecticides for DBM control according to their mode of action based on classification. It is updated regularly with new products as necessary. It is therefore important to have the latest issue of the strategy for your State.

Call your Vegetable Industry Development Officer or DBM team member in your State if you don't have this years issue.

Why does the window strategy vary for some States?

There is an AIRAC strategy for DBM for use in VIC, SA, TAS, and NSW. Separate AIRAC strategies have been developed for QLD and WA. This is because they take into account climate and growing time frames applicable to those States specifically.

What if you suspect you have resistance?

If you believe the problem isn't caused by poor spray technique or timing, and the water quality used for the mix is fine, then you may have an insecticide resistance problem. Take this up with your consultant or reseller store in the first instance. They may contact the manufacturer to confirm actual resistance to the product applied. Don't repeat an application with a chemical of the same class until you find out the cause of your control failure.

NEXT ISSUE

A CONSULTANTS VIEW ON SCOUTING AND IPM

This is an article by Paul Horne, Director of IPM Technologies Pty Ltd, a private company created to conduct entomological research, particularly in the area of sustainable agriculture. IPM Technologies also provides crop-monitoring services with the aim of increasing adoption of IPM.

Paul has a PhD in entomology and has worked for 20 years on aspects of entomology in many parts of the world. For 10 years prior to starting IPM Technologies, Paul worked for the Department of Agriculture, Victoria where he was a team leader and senior entomologist, specialising in IPM and biological control.

"IPM to me is an approach to controlling pests in any crop, and is based on biological control and management (cultural) methods. The term IPM, in my opinion, is much abused and is being used by some to describe anything that involves pest control, including pesticide resistance management strategies and simple pest monitoring.

IPM in Brassicas to me means making decisions on what actions to take, each week, on a paddock by paddock or planting by planting basis, taking into account the level of beneficial species that are present to combat pests. Insecticides are applied only when necessary, and are selected on the basis of what effect they will have on beneficial species as well as on pests.

The part of IPM that is most often forgotten is the "Integrated" component. Not only do all methods need to be used to control a pest such as Plutella (DBM), but all methods for control of ALL pests need to be integrated. That is, contorl measures taken for aphids, thrips, cutworms, cabbage white butterfly, loopers and fungal diseases all need to be compatible and not interfere with each other. That is, there is no point trying to encourage beneficials to control Plutella and at the same time spraying broad-spectrum sprays for aphids.

Growers accustomed to controlling pests just with pesticides can recognize pests such as Plutella and aphids and know what happens if they miss a spray when pests are present. So it is a big step for growers to begin trusting insect predators and parasites that they have never seen and do not know how to manage. The approach that IPM Technologies takes is to show growers beneficial insects in their own crops, and encourage the growers to begin making decisions based on what they find in weekly monitoring.

Darren Schreurs (left), of Peter Schreurs & Sons Victoria, with Paul Horne and a box bearing an IPM logo.

Growers using IPM have been able to achieve far better quality in their produce, and have done so using less pesticide. When pesticides have been applied, they have been much safer for beneficial species, users and consumers.
Experienced growers have been both surprised and pleased about this change and plan to keep IPM the basis for their crop protection. For example, Anthony Agosta of Werribee South intends to promote his produce as grown using an IPM approach by stating so on his boxes of cauliflowers.

Anthony has this to say " IPM works for me. My normal program would wipeout everything. Now I spray less often and I have learned that the timing of when I spray is the critical thing. Knowing when the eggs of pests have hatched is important now. I save time and application costs, use safer chemicals, it gives me confidence to know what is actually happening in the crop. I sleep better at night and have peace of mind. I haven't done the sums but there would be a saving in dollars. Spraying when not really effective is a waste of money."

Con Ballan, also of Werribee South, grows a range of brassicas and other lines, and uses an IPM approach to protect them all. Darren Schreurs (of Peter Schreurs & Sons, Devon Meadows, Victoria) has seen a massive benefit in using IPM and he has eliminated some of his (previous) worst pest problems by using this system. He also has included an IPM logo on all boxes of produce grown using IPM. All of these growers know that IPM depends on regular monitoring and not on pre-determined or calendar decisions."

THIS ISSUE

KEY CONTACTS FROM THIS ISSUE

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BLACK ROT PATHOGEN – SAMPLES NEEDED

By Dr. Tracey Berg – Project Officer, NSW Agriculture.

Black rot of Brassicas can cause severe crop losses when only one seed among 10,000 is infected with the bacterial pathogen, Xanthomonas campestris. This is due to the rapid growth and spread of these bacteria under favourable conditions, particularly on wet leaves and crowded plants in seedling production. Techniques currently used to culture campestris from infected seed are time-consuming and labour intensive.

Left to right, Dr Tracey Berg, Len Tesoriero and Dr Deb Hailstones of the Black Rot research team.

Researchers at NSW Agriculture's Elizabeth Macarthur Agricultural Institute, supported by levy funding from Horticulture Australia Ltd, are developing an assay test that will provide a rapid and sensitive means for screening batches of Brassica seed for the black rot pathogen. The technique can also be used to rapidly confirm infections in plants grown in seedling nurseries and field crops.

The assay test readily detects the target gene directly from infected leaves and stems, and is presently being optimised for use in the presence of seed extracts. The sensitivity of the assay has been evaluated using artificially infected seeds, and currently one infected seed can be detected among 5,000 clean seeds.

Ultimately, NSW Agriculture aims to offer a diagnostic test for seed that will detect one contaminated seed in greater than 10,000 whether the bacteria are carried within the seed (infection) or simply associated with the surface (infestation), without compromising the viability of seed in the testing process. This test will enable growers to be confident that they are using clean planting material, which is an integral part of an IPM strategy aimed at reducing the incidence of black rot.

Commercially produced Brassica seedlings with both blackened veins and leaf spots have been observed during the study, and X. campestris was isolated from these seedlings in the laboratory. Other cultures previously isolated from both black rot and leaf spot lesions have produced typical black rot symptoms in greenhouse trials. This suggests that the various symptoms exhibited by affected plants may reflect the means of entry of the pathogen rather than distinctions between pathogens. *Growers or consultants are asked to contribute black rot and leaf spot affected samples from all over Australia to the research team, to assist in the clarification of this issue and to validate the detection assay.* **To participate in this research project or find out more, please contact Len Tesoriero on (02) 4640 6428.**

STUDYING MOTH MOVEMENT AND INSECTICIDE RESISTANCE USING MOLECULAR MARKERS

By Nancy Endersby – Entomologist, Institute for Horticulture Development, Knoxfield, Victoria.

Diamondback moth (DBM) continues to cause problems for the Brassica vegetable industry in Australia and, in recent years has also had devastating effects in canola and forage Brassica crops. Management of insecticide resistance is critical to the industry and relies on knowledge of resistance status of populations and moth movement.

Molecular markers (microsatellites) are being isolated from DBM to begin the investigation of moth dispersal in a three year project that began in July 2001. Microsatellite markers are found in the DNA of plants and animals including DBM. They are stretches of DNA that consist of repeats of a simple sequence of nucleotide molecules. We can score the number of repeat units that a moth has at a given location in its DNA. If we can score many different microsatellites for each moth, we can build up a genetic fingerprint and see if we can find particular patterns of repeat lengths that will show us which populations of moths are isolated and which have been interbreeding.

The aim of the project is to use molecular markers to differentiate between invasive and local populations of DBM. A second project aims to use DNA-based methods for rapid diagnosis of insecticide resistance in moth populations so that appropriate control measures and effective insecticide management strategies can be implemented.

Molecular markers will be used to help answer the following questions that growers have raised:

- Have moths invaded from a distant population?
- Can I have a rapid assessment (24-48 hours) of whether my moths are resistant?
- If I need to apply an insecticide, which chemical group will be effective?

In the future, molecular markers may be used to answer these questions:

- Are resistant moths moving into my crop?
- What is the best regional strategy for managing insecticide resistance?

The project will be completed in July 2004 and the findings will be reported via this newsletter as soon as they become available. The studies are being funded by an Australian Research Council (ARC) Strategic Partnership with Industry – Research and Training (SPIRT) grant, and the Grains Research and Development Corporation.

The following people are involved in the work:

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ALL ABOUT INSECTICIDE RESISTANCE

For the foreseeable future, crop protection products will stay as the safety net for preserving yields and controlling pests in an IPM program for Brassica growing.

In the last newsletter we heard from Thomas Sparks, Senior Research Scientist in Discovery Research at Dow AgroSciences USA, commenting that " the future replacement of any of the current products is increasingly problematic," "the loss of any of the new chemistries potentially represents an irreplaceable resource."

If we take this information as a prediction, then it makes sense to preserve the current suite of effective insecticides we have, for as long as possible.

Insecticide resistance, as the words imply, is where the insecticide that is being used is no longer effective in killing the target pest because those pests have evolved a self-protection to that product. This occurs when insecticides are used too frequently.

We have had regional resistance develop in DBM populations in Australia in recent years, so this isn't something that has only happened overseas. It is important in the first instance to not automatically assume the worst, since the problem could be poor spray coverage or water quality. If it is true resistance, the images at right show how it came about:

PREVENTING INSECTICIDE RESISTANCE

The most important thing to remember is that prevention is an individual responsibility and regardless of what your neighbour is doing, it benefits each grower of Brassicas to have a program in place.

One of the reasons for this is that in the case of DBM, studies of the local movement of the moth have revealed that this pest is quite sedentary. In actively growing crops most DBM moths remain within several tens of metres of where they emerged.

However, the best management strategies cover large regions and offer the most security for long-term effectiveness of insecticide products.

In Australia we have such a regional strategy for DBM, aimed at promoting a coordinated use of insecticides across industry that is promoted in each State.

The national implementation of this strategy is called 'The AIRAC "two-window" DBM insecticide resistance management strategy' and is a first for the Australian vegetable industry, and aims to substantially extend the effective life of the new DBM insecticides by limiting the selection pressure for resistance.

IN SUMMARY – ***insecticide resistance occurs due to the selection pressure from over using an insecticide.***

HOW INSECTICIDE RESISTANCE EVOLVES

In any pest population, a few individuals may have genetic traits which allow them to survive exposure to a particular insecticide.

These individuals will have offspring which inherit these resistance traits.

If each generation of the pest is sprayed with the same insecticide family, the number of resistant individuals in the population will increase.

Eventually the pest poulation will consist mostly of individuals that are resistant to the insecticide.

Continued use of the same insecticide will fail to control the pests.