

Brassica IPM

NATIONAL NEWSLETTER

Issue 2 February 2003

THE FUTURE OF INSECTICIDE CONTROL continued...

"There are no "silver bullets" when it comes to pest insect control, since no one technology is appropriate or suitable to every pest problem. Because insecticides provide a predictable, effective, and timely means to address pest problems, they are likely to remain a key component of IPM programs for the Diamondback moth, and most other important insect pest species.

In light of DBM's long history of resistance development, a true integration of control tactics is essential to the long-term availability of control options for DBM.

There is a real need / responsibility to make the best use of the new products we have. For a variety of reasons, including the continuing rapid consolidation of the agrochemical industry worldwide, the future replacement of any of the current products is increasingly problematic. New product development can take 8-12 years and is increasingly expensive to do. A cost of \$US100 million dollars to develop is not uncommon. The loss of any of the new chemistries potentially represents an irreplaceable resource."



Tom Sparks, with the Editor at the International Workshop on Crucifer Pests in Melbourne

USEFUL WEBSITES

www.brisbane.tafe.net/Library/horticulture
General growing one-stop-shop site that acts like a library catalogue.

www.nre.vic.gov.au/agvic/ihd/projects/dbm.htm
www.sardi.sa.gov.au/entomology/index.html
Note that the SA site is under reconstruction.

www.waite.adelaide.edu.au/Teaching/Diagnosis/welcome.htm
Diagnosis of problems in brassica vegetables.

www.nre.vic.gov.au/farming/index then select 'Horticulture', 'Agnotes', then the triangle next to 'Vegetables' for notes on:
Clubroot of cruciferous crops
Downy mildew of Brassicas
Cabbage growing
Integrated pest management tactics for DBM.

www.goodbugs.org.au
Biological control of pests in Australasia.

www.nysaes.cornell.edu/ent/biocontrol/
Biological control/IPM, Cornell University, USA.

NEXT ISSUE

- ALL ABOUT RESISTANCE
- What it is
- Why it happens
- What to do about it.
- DBM MOVEMENT RESEARCH
- PLUS MORE

Do you want a speaker?

If you have an industry gathering coming up, keep in mind that members of the DBM team and others referred to in this newsletter, may be available to give a presentation. Contact direct or via Dijana Jevremov using details below.

KEY CONTACTS FROM THIS ISSUE

For the contact details of the State DBM Team members, refer to issue one of this newsletter or contact Dijana Jevremov below.

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This newsletter compiled and edited by Dijana Jevremov



Welcome to issue two. This newsletter is an initiative of the National Diamondback moth (DBM) Project Team of researchers and extension personnel, who operate with funding from Horticulture Australia.

REPLY TO A GROWER QUESTION

Do DBM come from canola and what is their resistance to chemicals?

By Greg Baker - Entomologist, South Australian Research and Development Institute.

Movement of DBM between different cropping regions and host-plants is very important. It has implications for good pest management such as pinpointing key risk times for crop invasion, the choice of control options, etc. For insecticide resistance management (IRM) a strategy that is coordinated between the canola and Brassica vegetable industries may be necessary. However DBM movement is still poorly understood. What do we currently know?

DBM primarily feed on plants from the family Brassicaceae that includes Brassica vegetables, canola, and weeds such as wild turnip, shepherd's purse, alyssum, cresses, mustards, rockets, radishes and charlocks.

Over the past several decades, researchers have learnt that a major influx of DBM into Brassica vegetable crops occurs in the spring in most years across southern Australia. This influx of adult moths coincides with the haying off of the winter hosts of DBM, such as canola crops and Brassica weeds, which suggests these hosts may be primary sources of these DBM invaders. These invasions were observed to occur before the 1990's explosion in canola cropping across southern Australia. The extent to which these spring invaders are currently sourced from canola crops remains unknown. At these times DBM moths can fly long distances,

THIS ISSUE

- REPLY TO GROWERS QUESTIONS
DBM in Canola
- THE FUTURE OF INSECTICIDE CONTROL
A chemical company perspective.
- PROFESSOR TONY SHELTON'S VISIT
Key points
- WHITE BLISTER/RUST UPDATE
- USING INSECTICIDES ON MOTHS
Research results
- NEW DBM SCOUTING GUIDE
New format
- NEW INSECTICIDE TOXICITY CHART
- USEFUL WEBSITES

and in 2002 are thought to have crossed Bass Strait into Tasmania from the mainland in larger numbers than previously recorded.

Nancy Endersby, a Victorian member of the Horticulture Australia national DBM project, is conducting PhD work to determine if populations of DBM are isolated, or are inter-mixing at different times in the year.

Over the past several years DBM has caused major losses to many canola crops in WA, SA, NSW and VIC. Frequent spraying with synthetic pyrethroid (SP) insecticides has been a common response, and moderate levels of SP resistance were recorded in 2001 in DBM collected from canola crops. Interest in obtaining canola registration for the 5 new insecticides registered for DBM control in Brassica vegetable crops is now mounting in some sections of the canola industry.

If DBM populations in vegetable and canola crops are inter-mixing, this has major implications for our long-term ability to limit the evolution of resistance to these new products for DBM in vegetable crops. These developments reinforce the importance of improving our understanding of the interplay between DBM populations in vegetable crops, canola and weeds.

If you have a question you would like answered about Brassica pest or disease management, send them to Dijana Jevremov using the contact details on the back page. We will aim to answer as many as we can in future editions.

NEW INSECTICIDE TOXICITY CHART

Bronwyn Walsh has taken the lead from the DBM Team and produced a chart that characterises the toxicity of current insecticides to both pests and natural enemies. The chart is in table form and includes active ingredients and their impact on pests and beneficials, a persistence rating and an IPM rating.

The chart has been produced for use by growers and consultants as a tool to guide their selection of insecticides, in conjunction with the information from scouting. Referring to the chart will make the choice of product to preserve beneficials easier.

The information comes from laboratory and field tests, and was generated from research in Brassicas and cotton (Narrabri, NSW). Look out for this tool in the post by April.

Further enquiries direct to Dijana Jevremov using details on back page.



Bronwyn Walsh, Senior Entomologist, Queensland Department of Primary Industries.

WHITE BLISTER/RUST UPDATE

By Dr Elizabeth Minchinton – Researcher, Dept of Primary Industries, Victoria



Fig. Swollen floret on broccoli caused by white blister.

The current outbreak of white blister/rust on broccoli was first reported from Werribee, Victoria during the summer of 2001/02. It has now been found on broccoli in most other Victorian growing regions and was recently found on broccoli in Tasmania. In the past it has been reported in NSW, but there have been no reports of it on broccoli in Queensland or SA.

The disease is caused by a fungus, which appears as a white blister. The blister contains masses of white dust-like spores on swollen broccoli florets (see Fig) and on the undersurface of leaves. Wind, rain, insects, boots and equipment spread these spores. The fungus can also cause swellings on roots and stems and distortion of shoots.

Ten races of white blister have been named. Of these, Race 7 occurs on Brassica rapa (chinese cabbage, pak choi), Race 9 on Brassica oleracea (broccoli, cauliflower, chinese broccoli and kohlrabi) and Race 4 on shepherd's purse, a common weed. In the glasshouse, Races have been reported to cross from one host to another.

Horticulture Australia, the vegetable industry levy, Plant Standards Victoria and the Department of Primary Industries Victoria, are establishing a study to find the source(s) of the epidemic and management options for white blister/rust on Brassicas.

For more information contact Dr Elizabeth Minchinton, DPI, Knoxfield (03) 9210 9222.

USING INSECTICIDES TO KILL MOTHS

By Nancy Schellhorn - Entomologist, South Australian Research and Development Institute.

Growers often ask what insecticides they can use to kill moths rather than grubs, and whether it is an effective strategy. We conducted a study where we, 1) reviewed previous research, 2) sprayed non-toxic fluorescent dyes on field populations of DBM to ask a) what proportion of moths and beneficial insects are hit during a spray, and b) does the time of day that the spraying is done, matter? The results are as follows.

The Experiment

Using non-toxic fluorescent dyes as a marker, we sprayed field populations of moths in the morning and evening at different times and assessed the proportion marked.

Table 1. Highest percentage of moths and wasps that were hit by the fluorescent spray during December 2001 & April 2002

	Percentage Marked
DBM	
Morning	41%
Evening	20%
Diadegma (wasp) species	
Morning	68%
Evening	20%

Our results showed that the highest percentage of moths that were either hit by or came into contact with the dye was 41%. For parasitoids, it was 68%, and both occurred in the morning. The results for the evening spray showed that only 20% of moths and parasitoids were hit by the spray.

Summary of Findings

Less than half of the moth population was hit by dye spray, and of those, most only had trace amounts. With Synthetic Pyrethroids such as Ambush® and Dominex®, a wide range of pests including DBM are mostly repelled by them rather than killed by them. This means that the majority of moths avoid the spray, or receive only a little as they move away from it, then recolonise later. Due to the low-dose of insecticide that is delivered to the moth, it can increase the rate of resistance.

In the lab when permethrin was sprayed onto cocoons of DBM, only 5% died, but 65% of the beneficial insect, Diadegma spp., died. Killing off a high percentage of the beneficial insects locks a grower into a heavy spray program. The most effective use of insecticide is to target the grubs!

For more information contact Nancy Schellhorn on (08) 8303 9543 or email: schellhorn.nancy@saugov.sa.gov.au

NEW SCOUTING GUIDE FOR DBM

It is well known that crop scouting is one of the most important activities that a grower can do to make sound decisions about pest control. The current scouting guide you may be using, developed by the National IPM for DBM Project is about to be superseded.

Dr. Nancy Schellhorn (SARDI Entomology) and Dr. Andrew Hamilton (DNRE Victoria) have developed the new crop sampling guide to help agronomists and growers make more informed decisions about pest control.

The guide is set up as a decision tree that asks a grower / scout such questions as - the type of crop they are scouting (eg. cauliflower or broccoli), growth stage of the crop, market destination (eg. export, processing, fresh), chemical use in the crop, and wasp parasitism rates of grubs. Parasitism is determined by simply pulling the grub apart under a magnifying glass or microscope, to reveal the presence of the wasp larva inside the grub. Agronomists are being trained to quickly dissect the grubs (10 in 10 minutes), and to use the sampling guide.

Once key questions are answered, the reader is led to a sampling plan that tells them how many plants to sample to

make an accurate decision about whether to spray, not spray, or scout again in five days.

Currently the plan is being trialed and refined for specific conditions in NSW by Mary Cannard and Robert Spooner-Hart in Richmond and Gus Campbell in Bathurst, in WA by Françoise Berlandier, SA by Nancy Schellhorn and John Jeffs, and soon to be tried in Tasmania. Nancy Schellhorn recently visited Lionel Hill, Felicity Wardlaw and Kellie Gillespie in Devonport, TAS to determine what adjustments needed to be made to the plan so that it will work in Tasmania.

It is hoped that the scouting guide will, 1) save money for Brassica growers by reducing spraying costs while still producing a high-quality crop, 2) help growers move forward in IPM practices by providing them with reliable tools to confidently advance. The guide will be distributed widely in late April.

PROFESSOR TONY SHELTON'S VISIT

This is a condensed version of a presentation given to growers and consultants by Professor Tony Shelton in Adelaide last year. Tony is Professor of Entomology & Assoc. Director of Research for the College of Agriculture and Life Sciences at Cornell University in upstate New York. He has many years experience with DBM and is recognised as a world leader in DBM management. The full transcript is available from Dijana Jevremov.



Professor Tony Shelton (right) with grower Kevin Niemeyer in Adelaide

DBM Control

"We now have the tools to manage DBM worldwide. I will outline the relevant ones for yourselves.

- Natural enemies such as parasitoids and predators. In Queensland, research by Mike Furlong estimates that anywhere from 10-70% of predation of eggs, larvae and pupae of DBM can be attributed to predators such as spiders, birds etc.
- We have diseases or pathogens of DBM such as Bacillus thuringiensis (Bt) that is a bacterium that you spray on the crop that releases a protein that the insect ingests & then dies.
- Make sure that your transplants are pest free before you put them in the ground. Those moths may have resistance to many insecticides from what has been used at the nursery.
- Rotation of crops or host-free periods is a control strategy.
- Use insecticides that are compatible with natural enemies - Bt's, Success, Avatar and perhaps some others. Wherever I have gone and seen outbreaks of DBM, more than half the time I can attribute that outbreak to the destruction of the

natural enemies by the use of OP and SP insecticides.

- How you apply insecticide is as important as what insecticide you choose. The effectiveness of your sprayer is very important.
- Scouting gives the information a grower needs to reduce insect populations. By knowing what is out there, you are able to time when you spray better, and can select the treatment better and so the results are better.

Resistance

With DBM you always need to be on guard for resistance. It has developed resistance in some populations, to organophosphates, pyrethroids, carbamates, proteins in Bt, insect growth regulators and spinosad, and so we need to ask ourselves what is next.

Tony's Top Ten For Insecticide Resistance Management

1. Integrate chemical control with other tactics.
2. Use insecticides that are soft on beneficials.
3. Time product application for the most susceptible insect stage.
4. Only use the recommended rate. Not less or more. That goes for water volume too.
5. Scout your field and treat only when needed.
6. Don't tank mix insecticides for the same target insect. If you are treating for DBM and you are using a Bt, don't mix it with something else because that will just exacerbate the problem of resistance developing to all the products at once, and is not cost effective.
7. Rotate insecticides - use your AIRAC 2 window strategy.
8. Apply the insecticide only to the areas of a field that need it.
9. Aim to rely on your beneficial insects.
10. In the event of a control failure - check your method of spraying first.

The Future

- We have done tests on a broccoli variety where the leaf has been engineered to produce Bt and so contains the same protein that you spray when you use a Bt. We believe that this is a very powerful tool for controlling DBM.
- Trap cropping is something that is being studied by us at Cornell. Trap crops are all about planting something different to attract the DBM so it will spend time in it, and leave the major crop alone. In WA I saw a grower who has been doing it for 3 years. In about 4 years time I will have some more answers on these crops based on our research.
- There may also be some tools to assist growers to determine the parasitism levels on their properties. This can then further guide whether to spray or not.

For sustained management of DBM you need to combine tactics to have control in individual fields, but you also need a coordinated effort among farmers in a region."

THE FUTURE OF INSECTICIDE CONTROL

This article is an extract of a talk given in Australia by Thomas Sparks, Senior Research Scientist in Discovery Research at Dow AgroSciences USA. (Dow manufacture spinosad / Success) He was an invited speaker at the 'Fourth International Workshop on The Management of Diamondback Moth and Other Crucifer Pests' held in Melbourne a year ago.