South West NRM

Case Study

Reducing pesticide resistance with IPM

Introduction

Pesticides are the backbone of crop protection systems. However, as this backbone becomes weakened by chemical resistance, product withdrawals and residue limits, some growers are combining chemicals with biological and cultural options in an integrated system where compatibility is the key.

Chemical resistance is a widespread issue that has inhibited control of major pests such as diamondback moth (DBM), one of the most destructive insect pests of brassicas in the world. Some brassica crops in the eastern states are now being sprayed with four different chemicals each week. Western Australia is less affected but not immune to DBM resistance.

Resistance can also be an issue for orchardists. For example, some species of mites that consistently damage deciduous fruit trees have developed resistance to different miticides, while western flower thrips are resistant to almost all chemicals in Victoria.

However, chemicals are not the only tool to control pests. There are also biological and cultural options, which when combined in a compatible manner with chemical options result in Integrated Pest Management (IPM).

According to IPM specialist Jessica Page from IPM Technologies, the advantage of using IPM is better pest control with less chemicals, improved market access and delayed development of insect resistance.

Jessica and fellow Principal at IPM Technologies, Dr Paul Horne, held a workshop for South West NRM in 2021 where they explained how to integrate chemical, cultural and biological options to manage pests.

"To optimise management, you need to consider what beneficial insects will eat the pest, how they can be encouraged, what cultural controls might help, and what chemicals are effective without impacting beneficials," Jessica said.

"If you use chemicals alone you are only using a third of the tools on offer."

Diadegma maggot inside a diamondback moth caterpillar.

Most beneficial insects occur naturally and are quite common, provided there is habitat, a food source, and they haven't been disrupted by pesticides. One of the most common biological controls for DBM is Diadegma semiclausum (Diadegma), a parasitic wasp that lays eggs into the developing larvae of the DBM.

"Diadegma is probably the most important parasitoid for DBM. It is difficult to see the level of parasitism they cause because they are hidden inside their host. However, if you pull the caterpillar apart you might find wasp maggots inside".

"You can pretty much guarantee Diadegma will be present if their host is there, as long as they aren't being killed or disrupted by pesticides.

"Other beneficials also have an effect like ladybirds and predatory bugs, particularly damsel bugs, which eat small caterpillars such as DBM."

For mite control in orchards, the small black ladybird Stethorus does a fantastic job of cleaning up large populations found in orchards towards the end of the season while the predatory mite Phytoseiulus persimilis (persimilis) is important for keeping populations of pest mites in check.

The second consideration for an IPM strategy is cultural controls. Sometimes more important than pesticides or biological controls and often enough on their own, cultural controls like crop rotation, hygiene, canopy management and variety selection are often specific to farm, situation and pest.

In terms of cultural controls for DBM, sequential planting can be really useful, particularly for Diadegma.

"Because there is a lag between when the pests arrive and when the beneficials arrive, the first planting is likely to get the most damaged. Sequential planting means that beneficials are already present and will move with the pests into the next planting. Similarly, a thin strip of sacrificial plants established before the crop is planted can help build beneficials."

It is also worth noting that DBM will preferentially target unhealthy plants.

Cultural controls of the two-spotted mite in orchards include reducing dust, increasing humidity and increasing habitat and nectar sources with flowering plants.

The last stage of an IPM plan is to consider chemical options.

"Pesticides are still used in IPM and are an important tool. The difference is how we use them and how we select them.

"So, we don't just select pesticides based on their efficacy. We also consider how they will impact beneficial species. We need to know what's safe and what's not safe.

"If possible, select the least disruptive product that does the job and protects the beneficials most important to your crop."

The small black ladybird Stethorus is the size of a pinhead and feeds on mites.

The predatory mite Persimilis is important for keeping populations of pest mites in check.

In the case of DBM, spinetoram is a common chemical but this kills Diadegma, whereas chlorantraniliprole (Coragen) and flubendiamide (Belt) have less impact.

For two-spotted mite, Acramite has little impact on beneficials. However, others like Omite and Paramite can be detrimental, although impacts are worse if used repeatedly.

"It's not to say you can never use these more detrimental pesticides, but the more you avoid them, the less disruption there will be. Knowing the effect on beneficials helps us make better pesticide choices, rather than if we only look at efficacy of pest control."

Jessica finished by urging growers to monitor for beneficials, not just pests, become familiar with juvenile stages of beetles that look different to adult forms, and give more consideration to encouraging and preserving beneficials, cultural management and the impacts of pesticides in their pest management strategies.

Crop-specific guides to relevant pesticides and beneficials are available through the Biological Research Company for an annual subscription of fee. Some guides are available for free through AUSVEG, while IPM information for apples and pears is available through the extension AUS website. Other information is also available from the Australian Biological Control Association Inc and Cesar Australia.

Australian Government | National Landcare Program

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All photos courtesy of **IPM Technologies**.