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What does IPM actually mean?

Integrated Pest (and disease) Management (IPM) is a combination of:

- Nursery hygiene and design features
- Regular pest monitoring and record keeping
- Analysis of pest monitoring results
- A selective and smart spray program
- Use of biological control options as appropriate.

Getting started in IPM involves a change in thinking from the more traditional 'blanket spray approach', a fairly simple but potentially very inefficient procedure, to collecting and analysing pest and disease information as well as combining physical, chemical, cultural and biological strategies and control practices.

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Simple integrated pest management (IPM) techniques

Preventing pest and disease is better than trying to cure outbreaks. This *Nursery Paper*, second in a series of three, looks at implementing some simple Integrated Pest (and disease) Management (IPM) techniques based on research tested by the Virginia Farm Trials project in South Australia.

The research showed that the following practices were effective in improving management of Western Flower Thrips (WFT) and other key pests:

- Designing an appropriate monitoring strategy
- Establishing a crop hygiene program
- Keeping routine, simple records of monitoring results
- Making a competent diagnosis of monitoring results
- Using monitoring data to guide a planned insecticide program
- Excluding pests by screening with fine mesh and double entry doors is a very important design feature, but can increase temperature and humidity to unacceptable levels. A climate control system may overcome this problem and increase the potential to use beneficial insects in place of insecticides for some nursery crops.

The turnover of nursery crops can vary considerably. As a result, it is important to realise that longer lasting crops are more prone



Western Flower Thrips (WFT) are one of the most important pests to monitor and manage as they have the potential to increase numbers rapidly, cause leaf damage and carry disease.

to the build up of pest infestations and insecticide resistance if pest control is ineffective. Insect eggs and pupae can build up on old plants to a very high level as they are generally not affected by insecticides. Rapid plant turnover is a positive factor in controlling the rate of pest increase from continuous breeding within the crop.

While the Virginia Farm Trials were largely based on vegetable and herb crops, the results are applicable to nursery crops as pest and disease problems, growing practices and infrastructure are often similar.

Table 1 (on the following page) provides examples of successful pest control methods achieved during the Virginia Farm Trials.

Table 1. Successful pest control methods discovered by the Virginia Farm Trials

Crop and infrastructure	Pest	Control Methods
Hydroponic cucumbers in polyhouse	Thrips	Conventional Insecticides
	Fungus gnats	Nematodes
	White fly	'Soft chemicals' and Botanical oil
	Two spotted mite	Miticides
Hydroponic tomato and cucumbers in polyhouse with fine mesh	Thrips	Fine mesh and 'Soft chemicals'
	White fly	Fine mesh, conventional and 'Soft chemicals'
	Two spotted mite	Conventional and 'Soft chemicals'
Various hydroponic savoury herbs, lettuces and Bok Choy in polyhouse with fine mesh	Diamond Backed Moth	Parasitic wasp
	White fly	Parasitic wasps and Botanical oils
	Fungus gnats	Nematodes
	Heliothis	Bacillus Thuringensis
	Aphids	'Soft chemicals'

Developing an effective pest control program

The example given below is an outline of the development of a successful pest management program for hydroponic tomato and cucumber production. Regular and systematic monitoring of pest levels was used to guide assessment and continually improve the pest management program.

- The production manager invited an IPM advisor to set up a clear and simple pest control program for his staff. They had been suffering significant commercial losses from Tomato Spotted Wilt Virus (spread by thrips) and sooty mould in tomatoes and whitefly infestations in cucumbers. Also, two spotted mites were often a problem in cucumbers and occasionally bronze, or tomato russett, mites in the tomatoes.
- The production manager and IPM advisor organised a meeting with staff to:
 - Discuss existing pest issues and review current management strategies, and
 - Design an improved pest management program with staff involvement.
- Staff were asked about the pest problems and activity patterns in the greenhouse. Monitoring tactics were then explained and discussed and a monitoring program developed using sticky traps and plant checks to keep on top of changes in pest activity and identify hot spots.
- The insecticide strategy was reviewed and spray management resources provided including:
 - A routine management cycle to follow for crop hygiene, monitoring, spray use and checking of spray results
 - A list of approved chemicals for key pests
 - A spray rotation planner to reduce the risk of insecticide resistance
 - A review of product labels and spray application principles to ensure optimum results and avoid problems due to incorrect use
 - A record sheet to connect chemical use with monitoring results.
- The IPM advisor worked with staff to develop their skills for recording and interpreting monitoring information by:
 - Demonstrating use of a hand lens to count thrips and whitefly on traps and leaves
 - Introducing staff to using a microscope to identify different thrips species
 - Setting up a graph of pest results inside the greenhouse to refer to
 - Discussing how to interpret monitoring results from plants and traps and review long term records to better understand pest behaviour and manage chemical use more effectively.

Regular monitoring enabled the manager and his staff to identify pest and disease problems earlier and with more confidence. They were then able to either treat or remove affected plants. Monitoring also strongly demonstrated the benefits of:

- Clearing outdoor weeds before mid spring
- Keeping a close watch on plants located near entry doors
- Identifying and removing disease infected plants as promptly as possible
- Not leaving old plant stock in houses, especially if they are not being sprayed!

Benefits of a monitored spray program

The following benefits from implementing a monitored spray program in hydroponic cucumbers were discovered in the Virginia Farm Trials:

- Thrips were easily kept at low levels. When numbers increased, a sample was sent to check for Western Flower Thrips (WFT) to see if increased spraying was required. Since there was only a very small number of WFT, spray applications were not increased and thrips numbers soon dropped again. The increase was mostly made up of plague thrips, probably flying in through the roof vents. They were easy to control without a heavy spray program.
- A whitefly explosion was stopped by a spray program that removed all stages of the lifecycle over a period of two weeks. Chemicals were selected and application rates and volumes were discussed to get the best possible result. The undersides of plant leaves at various growth stages were checked with the help of a hand lens after each spray to assess what was happening to the numbers of adults, pupae and eggs. This resulted in three spray applications, the last being a botanical oil, and the clean up was very effective.
- A highly effective biological control option was introduced for fungus gnats. Fungus gnats began to increase in late September and an aquatic nematode preparation was purchased and added to the hydroponic medium. Within a week the numbers of fungus gnats plummeted and never became a problem again in that crop.
- Proof that leaving old plants untreated in a house is not a cost saving. The results confirmed for the manager and staff the detrimental cost of leaving old plants untreated in a house, even if labour supply is a problem. New crops often developed pest problems more rapidly and severely in houses where old plants were also kept.
- Better control with fewer spray applications and more reliance on softer, less toxic chemicals. The manager and staff improved their

understanding of insecticide use, especially in regard to measuring spray effectiveness, restraining unnecessary chemical use, selecting chemicals more strategically and considering a wider range of technical points in spray application.

- Greater understanding of pest management, cause and effect. A range of questions were raised by using the monitoring results. Some were answered while others are part of an ongoing learning partnership between the manager, his staff and relevant experts interested in improving IPM practices. A key area to note is the difficulty in interpreting spray label rates and suitability of chemicals approved for low and high volume applicators when being used in other application technologies like foggers.

As a result of these benefits, the manager decided to continue with a monitored spray program as an essential part of his commercial operations.



Discussing with staff existing pest issues and reviewing current management strategies are important elements in producing an effective pest control program.

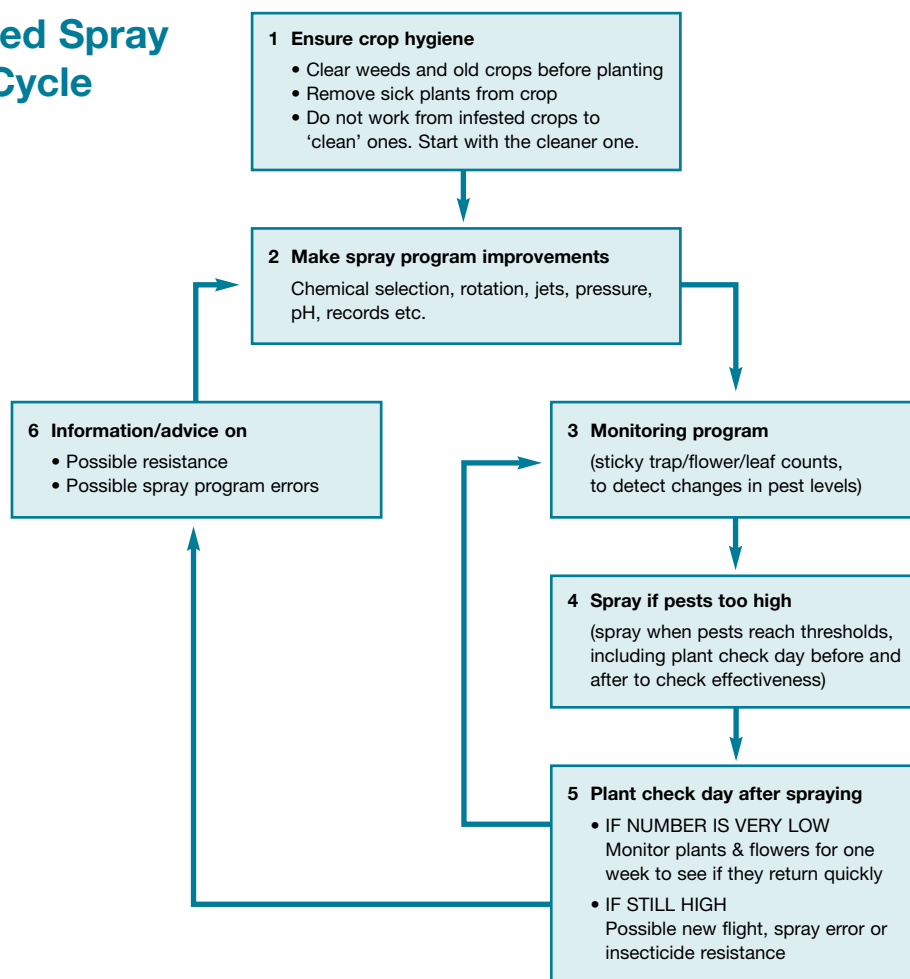


It's important that staff are shown how to use a hand lens to monitor, identify and count pests on traps and leaves.



A monitoring program using sticky traps and plant checks enables you to keep on top of changes in pest activity and identify hot spots.

Monitored Spray Action Cycle



Developing staff skills in the areas of recording and interpreting monitoring information is a key aspect of an effective pest control program.

For further information

This *Nursery Paper* is the second in a series focusing on improved pest and disease management for nurseries. The next *Nursery Paper* in the series will cover managing Western Flowers Thrips using IPM.

Integrated Pest Management in Ornamentals Information Guide, NSW Agriculture, second edition 2002. Available from NSW Agriculture or NGIA, phone 02 9876 5200.

The Good Bug Book, Australasian Biological Control Inc, second edition 2002. Phone 02 4570 1331.

Pest & disease – prevention is better than cure, *The Nursery Papers* issue number Technical 3, April 2004

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