

MODULE 1. - Essential knowledge

7. Managing pests & diseases



Many growers find that keeping pests and diseases under is one of their biggest challenges. This fact sheet contains a lot of information on how to tackle this successfully, including links to two videos featuring successful biological pest control programs on two capsicum farms in Virginia

Building an Integrated Pest Management program takes time and requires expert information and support. But it provides major rewards, especially with a crop that is so susceptible to Tomato Spotted Wilt Virus damage from Western Flower Thrips. Phuong has adopted the key practices of good Integrated Pest Management and achieved much better crop protection while greatly reducing his pesticide use.

A successful pest and disease management program MUST HAVE the following elements:

- [a. Good pest & disease knowledge](#)
- [b. High standards in crop hygiene](#)
- [c. Tight farm bio-security](#)
- [d. Regular crop monitoring](#)
- [e. A planned and effective pesticide program](#)



and may include ...

- [f. Biological control agents and strategies](#)

These practices have helped Phuong to control his pests and diseases very well under a pesticide based program. Even so, like most growers in Virginia he believes he will need to change to biological control because of increasing levels of resistance amongst key pests to the available chemicals.

When Phuong does switch to biological control (probably in the next crop) all of the skills he developed for a pesticide based program remain just as important. His crops will still need to be monitored, and actions taken at key points, which will sometimes still include the use of selected pesticides.

This fact sheet provides a brief summary regarding key IPM practices with a link to more detailed resources at the end.

a. Good pest & disease knowledge

Just relying on spraying chemicals whenever things look bad or to try and stop anything getting into your crop may work for a while but in the end pests and diseases will become resistant and chemicals will no longer be effective. Plants also suffer from overuse of pesticides and yields are reduced. Knowing how to reduce pest and disease pressure on your plants gives you an advantage which can reduce the need to spray. Knowing how to use chemicals effectively is another essential advantage. ***Both of these skill sets are based on a thorough***



Western Flower Thrips
Plague thrips
Onion thrips
Tomato thrips
Photo: Glenys Wood SARDI

knowledge of key pests and diseases including life cycles, favourable conditions, identification etc. This knowledge is vital to help you identify problems early and correctly and to know what to do to prevent and control problems before they cause serious losses.

b. High standards in crop hygiene

Crop and farm hygiene is aimed at regularly cleaning up reservoirs of pest and disease in and around the crop. This effort is aimed at five main sources of threat:

1. Weeds that allow pests and diseases to persist and breed on the farm must be controlled and kept at the lowest levels possible both inside and outside the greenhouse. They easily slip out of sight and out of mind but the pests will take advantage of such safe havens and invade crops whenever they can. These invasions will force growers to spray more often and make it harder to tell if a pesticide is working effectively because pests will keep popping up no matter how often you spray.



Weeds can be replaced by permanent plantings of native vegetation which may also host beneficial insects and mites to help control pests.

2. Worker hygiene is vital. As workers move from crop to crop they can transmit soil diseases and nematodes on their shoes, pest mites and some diseases (especially Tobamovirus, Botrytis and Powdery mildew) on hands and clothing. Procedures must be in place to minimise the avoidable spread of pests and diseases.
3. Virus infected plants need to be identified and removed as soon as possible. There are several viruses that may affect capsicum crops, the most common being Tomato Spotted Wilt Virus. Sick plants should be put into a plastic bag and removed from the farm or into an enclosed bin. If Tobamovirus is suspected you must wear gloves when pulling these plants out and put the gloves in the bin too as this virus is transmitted mostly by direct physical contact. Pest hot spots should also be cleaned up (sprayed or biologically treated) before they spread – eg whitefly infestations near doorways, spider mite, broad mite and aphid hot spots.
4. Old crops must be removed immediately harvesting stops rather than left standing to accumulate pests and diseases that will spread to other crops – yours and your neighbours. If pest levels are high when crops are pulled out then pest pressure on nearby crops ‘goes through the roof’, and thrips pupae will build up in the soil. Pest levels should be suppressed until crops are removed.



Infested plant waste in all its forms is a major threat to remaining plants – sick capsicum fruit with thrips on or carrying Tobamovirus, infected plants that have been pulled out and waste from old crops. You must have a bin or other solution where infested plant waste can immediately be secured away from production areas

c. Tight farm bio-security

Whereas farm hygiene is about controlling hot spots and threats on the farm, farm bio-security is about preventing the movement of threats onto your farm by various means including plants, vehicles and people. There are a number of design and signage features strongly recommended to make it harder for threats to penetrate your farm. These practices are very well covered in the *Keep it Clean manual* included in the Resource Index.



d. Regular crop monitoring

It is just as important to know when your plants do not have a problem as it is to detect an outbreak in the early stages. This requires regular and systematic checking at least once a week. It is also very important to compare pest levels before and after spraying to detect a spray failure and avoid relying on pesticides that are ineffective because of resistance, or to identify other possible causes of spray failure that can be corrected.

Effective monitoring requires knowing what to look for and where and when to check on the plants.

e. A planned and effective pesticide program

Phuong avoids spraying whenever possible because he strongly believes that the plants and flowers are healthier and more productive when spraying is reduced. This means higher yields and less effort taking care of struggling plants. It also means his chemicals are likely to last longer before his pests become resistant. This depends though on what might move in from neighbouring farms!

Fact sheets in the Resource Index provide information that can support the key elements of an effective spray program, but they come with a firm DISCLAIMER because information in these files is a guide only. Growers must verify and update all pesticide information for themselves to ensure that the intended use is approved and appropriate, and that the technical information is correct and up to date

f. Biological control agents and strategies

Pesticide based control programs are becoming increasingly unsustainable in Virginia. Growers face heavy pressure for Western Flower Thrips (WFT) and Tomato Spotted Wilt Virus (TSWV), combined with widespread pesticide resistance. During 2013 it became clear that biological control works much better than pesticides in capsicums. An additional bonus is that plants are healthier and more productive when not regularly sprayed with pesticides. Biological control trials began in Virginia in 2010. A high-tech hydroponic farm was used for two initial trials and the program was commercially transferred to about 20 low tech greenhouse farms in Virginia during the 2013 season. Two video case studies of successful bio-control in low tech structures are included in the resource list below.

Several key lessons were learned during the pilot programs which have made a big difference to controlling WFT and TSWV:

1. *Pesticides are largely ineffective on most farms in Virginia due to widespread resistance, including for spider mites and aphids.*
2. *Bio-control works better than pesticides in capsicums with much better pest control and healthier more productive plants.*
3. *Damage to plants from pesticide spraying is obvious when comparing two crops on the same farm – one sprayed and one using good bugs. When plants are sprayed the breathing pores on their leaves (stomata) close for several days.*
4. *TSWV infected WFT pupae persist for many weeks in fallow soil if the old crop was badly infected. They re-emerge as flying adult WFT when new crops are planted and can cause very high TSWV infection levels in young plants. Soil fumigation is required to break the cycle. Farms using well managed biological control have low WFT numbers at the end of each crop so any attack on the new crop is greatly reduced.*
5. *Do not leave TSWV infected fruit on the greenhouse floor. WFT can be found on this fruit in high numbers and will spread TSWV rapidly from infected fruit to healthy plants throughout the greenhouse.*
6. *Fine mesh curtains can be used in spring to protect young plants from WFT flights and lifted in summer for greater ventilation if necessary*

Costs and Benefits Related to IPM

Pest and disease losses can be near total, depending on local pest and disease incursion pressure and the threat posed by a particular pest or disease to your crops.

To see Phuong's priorities for change and their cost and benefit, and also create your own Cost-Benefit estimate for making the same changes. Click here for the [Module 4. Cost Benefit fact sheet](#) and '[Capsicum Calculator](#)' to see what this is about.

Additional Fact Sheets And Videos

Additional information on all the above topics can be found in the '[Resource Index](#)' under [7. Managing pests & diseases](#). **There is an easy checklist here called '[IPM checklist for priorities](#)' which makes it very easy to identify what you need to do.**



Horticulture Australia

This project has been funded by HAL using the vegetable industry levy and matched funds from the Australian Government

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