

3. PLAN AND IMPLEMENT A CROP MONITORING PROGRAM

Monitoring needs to be based on a realistic, but effective system suited to your farm needs.

Firstly you must be clear about:

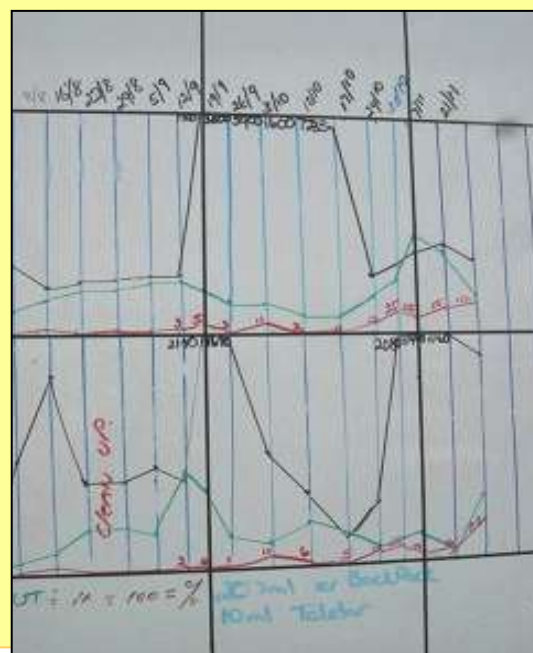
- ❖ *What pests (and diseases) you are monitoring for*
- ❖ *The decisions you want to be able to make using the monitoring results*
- ❖ *The information about plants and pests you need to collect to make these decisions*

Then you need a system that enables you to:

- ❖ *Collect the information easily that you need*
- ❖ *Use it to make decisions*

You must also decide at some point if:

- ❖ *You will manage all of this yourself, include staff, or use a consultant*



Pest Monitoring Will Save You Money

Routine spraying without checking pest levels or spray effectiveness is very hit and miss and is likely to result in increased levels of resistance where WFT, whitefly and other persistent pests are a problem. Routine spraying is also likely to take more time and money than necessary and give poor results a lot of the time.

Effective pest management depends on identifying changes in pest (and beneficial) insect activity in and around the crop in time to keep damage levels low. Crop monitoring is the only way to know what you need to do, including NOT spraying, and what you are, or are not achieving. It is the backbone of reliable crop protection whether using chemical or non-chemical/biological strategies.

Setting up a suitable monitoring program is probably initially time consuming but it is the essential risk management tool for protecting all other investments made in the business. If the initial set-up is done well and then fine-tuned and maintained it quickly becomes highly effective and easier to run.

Introducing a good monitoring program will cut crop losses and unnecessary chemical costs and identify hidden weaknesses in the pest control program. If you want to also incorporate beneficial insects into your pest control program good crop monitoring is absolutely essential.

The notes that follow describe some of the common methods (yellow sticky cards and plant checks) that can be used in a monitoring system and how the information gathered can be used to make decisions, especially for Western Flower Thrips.

What two growers have said:



❖ *Virginia tomato grower: I do much less spraying now that I check the crop first. I am much happier working in the crop without the chemicals there all the time and I save a lot of time not spraying.*

❖ *Virginia capsicum grower: You have got to know what is going on in the crop. Unless you have a good look you can't tell. I've saved a lot of money now that I know what to look for. Its taken out a lot of the guesswork.*



These days because of a new and effective WFT predator I have changed over to biological control in my new hydro systems because I was losing too much money relying on chemicals to do job. My pest control is now the best it has ever been. Sure it costs a more, but my crop is protected and I can sleep at night because I am not losing big money to thrips.

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METHOD 1: Yellow Sticky Traps Or Cards



Thrips on a sticky trap

Sticky traps are useful as a way of keeping an eye on flying pests like thrips, whitefly and aphids. They attract these insects because of their colour in the same way that white and yellow flowers do. Thrips are attracted to yellow, blue, and even white. Yellow traps attract thrips, whitefly and aphids. ***They are very useful for detecting***

arrival of these flying insects in the cropping area and also help to keep an eye on pest levels in the crop. They

also a useful way of sending samples away for identification of thrips species etc.

However they do not give a complete picture of pest dynamics in the crop. Adult insects may settle into the crop after flying in and juvenile non-flying stages (eggs, pupae and possibly larvae if coverage is not good) may survive spray applications but will not show up on the traps.

	Door	
x	x	x
	x	x
x		x
Example map of sticky trap sites (2,500 m ²)		

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How to use Sticky traps

Sticky traps should be changed or checked at least weekly. They need to be placed just above the growing tips of the plants to catch insects hovering above them and to avoid getting stuck and lost in the crop

Sticky trap in cucumber crop just above growing tips (15cm)



Sticky Trap over seedlings (5cm above)



Sticky traps can be inspected in three ways:

1. with the naked eye - to get a rough impression of the number of insects building up
2. with a hand lens - to be certain how many thrips, whitefly etc are there
3. with a microscope - to see what species of thrips or other pests are present.

Changes in pest numbers for different species can be estimated providing important information about the level of threat to your crop and whether or not action is required.

It is important to note and record changes and, if concerned, send traps away for insect identification for Western Flower Thrips.

Whitefly on a sticky trap



Thrips on a sticky trap



METHOD 2: Walking Through and Checking Crop Plants and Weeds

Sampling flowers and leaves in the crop can tell you much more than a sticky trap including:

1. The presence or absence and levels of non-flying juvenile stages (eggs, larvae, pupae)
2. The presence/absence and levels of non-flying adult insects (mites snails etc.)
3. The early stages and extent of pest damage



Thrips in a cucumber flower

This information is much more powerful assessing pest levels, accurately predicting trends and checking the effectiveness of control measures. It is essential for making decisions and following up on the results. It will also reveal a lot about the behaviour of pests beneficial insects that will help you to manage problem pests. Depending on the where it feeds, hides and breeds you will



Thrips under cucumber leaf

to check flowers, leaves, fruit etc. The pattern, frequency and level of sampling depends on the crop, pests of concern and beneficial insects of interest and the time of year.

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METHOD 3: Checking weeds close to the crop for pest and disease levels

Weeds near to your farm/crop will build up large numbers of pests in spring. Inspecting the weeds can keep you in touch with how the local pest pressure is building up. Better still remove the weeds before the pests build up on them !

Aphids and Whitefly on thistles just outside the greenhouse



Mustard weed is an absolute thrips factory

Monitoring Program supplement

- A. Using crop monitoring to guide pest control decisions**
- B. Examples of interpreting thrips monitoring results**
- C. Example monitoring record sheet**

A. Using crop monitoring to guide pest control decisions

WHAT'S GOING ON IN MY CROP ?

If sticky traps, plant scouting or plant damage show that thrips have started to appear in your crop you should check two things:

- *use a small lens to check a sufficient sample of plants to thoroughly assess what is happening by looking at flowers, shoots and leaves for thrips levels and estimating the relative proportions of adults and larvae (adult thrips have wings and 'jump' or fly, larvae are slower and can't fly)*
- *get the thrips species identified by an expert to find out if they are WFT*

If the thrips present are mostly larvae then they are breeding steadily in the crop. If they are all adults they have just flown in from outside or from another area in the crop where they are breeding. If they are WFT it is important to begin control early whereas other thrips species can be 'knocked back' fairly easily once they reach a level that causes commercial concern.

HOW DO I KNOW WHEN TO SPRAY ?

In some plant species and climates thrips breeding rates may not be significant and spraying is unnecessary even though low numbers of adult WFT may be present. Thrips control is more of a priority with seedlings and plants that are susceptible to Tomato Spotted Wilt Virus that is spread by several thrips species including WFT, tomato and onion thrips.

If adult and larval thrips numbers are low and you are not sure what to do you may decide to monitor the situation more closely and wait. If the situation remains unchanged and you are confident that your monitoring is giving an accurate picture it is safe to hold back on spraying. If monitoring identifies either a sudden or a steady increase in thrips levels then you should again consider getting the thrips species identified, especially if a reliable report can be quickly obtained. This should be done if you are considering using an application of 3 sprays to try to 'knock out' a suspected breeding population of WFT or if damage levels are higher than normal. If Western Flower Thrips are not the culprit then one, or perhaps two sprays should be enough to gain control.

A sudden increase in adult thrips numbers may be due to a wave of thrips flying in (not necessarily WFT), whereas a steady increase despite a spray program indicates a probable infestation of resistant Western Flower Thrips. A shift from cool to warm temperature can also stimulate thrips breeding rates. This will cause a noticeable increase in thrips larvae first and then in adults a few days to one week later. A heat wave may bring the numbers down if temperatures rise above 45deg.

If adult thrips numbers are high and you are not sure what to do you should spray and monitor the results.

DECIDING IF THE SPRAY APPLICATION WORKED

If there were high levels of WFT breeding steadily in the crop large numbers of thrips may reappear just a few days after a spray application. This does not mean that the chemical has failed but that more thrips have emerged from eggs and pupae that were not killed by spray applications. One or two more spray applications will be required 3-6 days apart. ***If however the spray is not effective in killing most adult thrips and larvae in 1-2 days then there is clearly a problem with the spray program to be diagnosed and repaired !***

WHAT ABOUT OTHER PESTS ?

These monitoring principles will give you a much better basis for making spray decisions concerning most pests. Watch the pest levels and try to determine their breeding activity from the proportion and distribution of different life stages present in the crop (adult, larvae, egg, pupae etc.). Look for signs of any spray failure to alert you to the need to take corrective action.

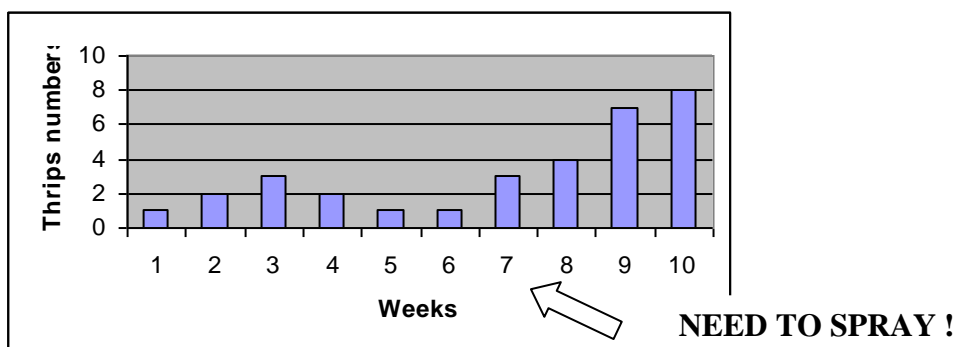
B. Examples for diagnosing management of flying pests (thrips and whitefly)

1) FIND OUT WHEN AND WHERE PEST NUMBERS ARE INCREASING IN THE CROP TO KNOW IF YOU NEED TO TAKE ACTION.

To check for any new pest populations moving into the crop you can use yellow sticky traps for thrips and whitefly. To see if they are already breeding in the crop it is better to inspect flowers for adults, and leaves for adults, eggs, pupae or larvae. This information can tell you when and where to keep a closer watch or if you need to treat now.

ACTION:

- If pests (thrips or whitefly) remain below action threshold (*) on sticky traps, flowers and leaves, no problem !
- If there is a gradual increase they are probably breeding in crop. Spray when thrips exceed maximum limit decided for crop safety !!!!!



2) CHECK THE LEVEL OF PEST KILL AFTER APPLYING CHEMICALS TO SEE IF IT HAS BEEN EFFECTIVE

Pest levels generally behave in about 3 different ways after a spray application

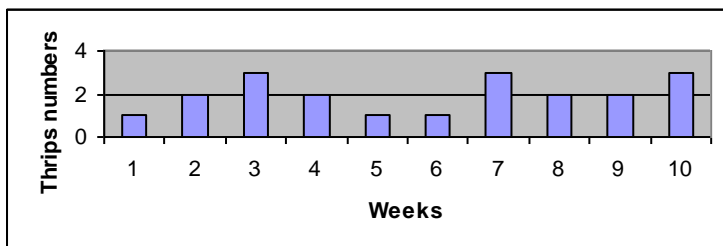
1. Plant checks show that pest numbers are low the day after spraying and they remain low
2. Pests numbers are low after the spray but go up again within the week
3. Pest numbers are still too high the day after the spray

This critical information still needs to be interpreted to know what is actually happening and what the best course of action is. Here is a guide for how to interpret changes in Western Flower Thrips levels (similar for whitefly)

ACTION:

Check flowers and leaves to see if any pests have survived.

- If thrips levels are very low stop spraying and keep checking flowers/sticky traps every 2-3 days



NO NEED TO SPRAY !

- If thrips are still high then you need to identify and fix problems by making adjustments to your spray program. There could be an error or fault in some part of the spray application methods. If the chemical has been working well before but suddenly has no effect this is most likely. This is not uncommon. Poor spray coverage can arise in many ways including worn spray jets, pressure too high or low, correct chemical rate/ha but wrong water volume, inefficient control of spray direction. The only way to be sure that your coverage is good is to do a dye test. Tank mixing problems can weaken chemical effectiveness. *(see insecticide diagnosis and correction)*

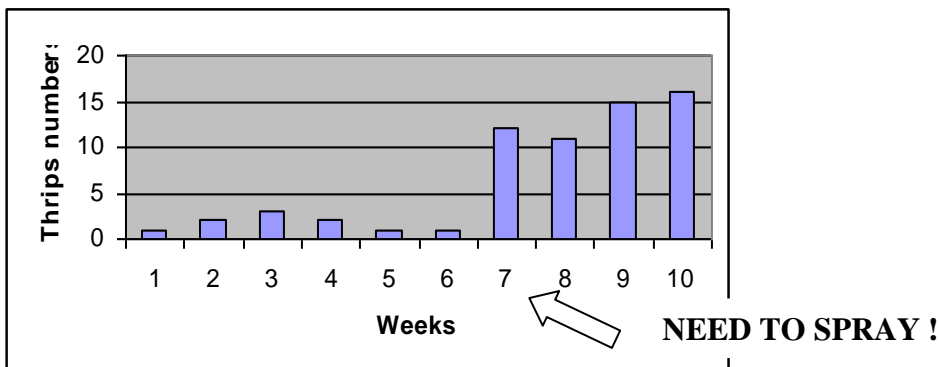
Spray program weaknesses are more likely than resistance as a cause of spray failure. Resistance would usually show as a gradual failure of the chemical and spray program error would usually show as a sudden failure of chemical that has been working well. However there may have been a long-term flaw in the spray program causing inconsistent results.

3) KEEP CHECKING TO SEE IF PESTS INCREASE AFTER A SUCCESSFUL SPRAY APPLICATION

ACTION:

Keep monitoring, especially on leaves and flowers to see how quickly pest levels increase again.

- If they increase significantly in the next 2-5 days it is likely they are emerging from a build up of eggs and pupae in the crop, especially if they have been left to build up in the crop for a while. If this happens 2 more sprays of the same chemical are needed close together
- If they increase later than one week after spraying there has probably been a new flight of pests into the crop. If you spray soon enough one spray should kill the new adults before they start breeding. Keep monitoring to see if this cleans them up.



Sudden increase, probable new flight into crop

4) IF NONE OF THESE IMPROVE PEST CONTROL THEN PROBABLY YOU HAVE A RESISTANCE PROBLEM, ESPECIALLY IF YOU HAVE NOT BEEN ROTATING YOUR CHEMICAL GROUPS CAREFULLY ENOUGH OR TANK MIXING DIFFERENT GROUP