VERSION 2
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Vegetable Industry
Development Program

Mega Pests

Managing Sucking Pests

Sucking pests include thrips, whiteflies, aphids, mites and bugs. The feeding activity of sucking pests can damage plant buds, leaves and vegetable fruit directly. Calendar-based spray programs to control these pests are expensive, and often ineffective due to insecticide resistance amongst the pest populations.

This fact sheet summarises the information you'll need to sustainably manage the sucking pests in your crops and outlines a capsicum grower's personal experience in adopting Integrated Crop Protection (ICP) and achieving success in managing western flower thrips (WFT) and tomato spotted wilt virus (TSWV).

ICP (also referred to as Integrated Pest Management (IPM)) considers the production system as a whole, including all pests, soil and plant health.

ICP tips for managing sucking pests

- Read the fact sheet: Mega Pests – The Basics of Protecting Your Crops
- Know your potential threats and the pests you are targeting
- Know which beneficial insects (natural and introduced) may be relevant to your cropping system
- Know the impact of your potential treatments on beneficials
- Maintain thorough site sanitation – remove and destroy weeds, infested plants and crop debris
- Use clean transplants – don't introduce pests and diseases on planting material, compost or growing media (hydro bags/soil/potting mix)
- Monitor regularly. Early detections increase the chance of success. Track changes in pest and beneficial populations
- Crop-free periods may work – have a collaborative district approach to achieving this
- Avoid crops of different ages in close proximity
- Understand 'soft' treatments options and how to achieve maximum coverage
- Use chemical insecticides only when necessary and do not rely on them
- Understand resistance management and rotating chemical groups
- Don't keep treating with something that is not working!

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What is the nature of sucking pests?

These pests suck nutrients out of plants they feed on. Some sucking pests (eg. broad mite and Silverleaf whitefly (SLW)) also inject toxic saliva while feeding. Some whiteflies and aphids like the green peach aphid, excrete a sugary sticky residue on which sooty mould later develops. During feeding, whiteflies, various aphids and thrips may introduce viruses on their mouthparts, to plants. As virus vectors these insects contribute to yield and quality problems, such as distorted leaves and fruit and uneven ripening. Viruses can't be controlled – so they must be prevented! WFT, onion and tomato thrips transmit TSWV; onion thrips may carry Iris Yellow Spot Virus (IYSV); and SLW transmits geminiviruses like tomato yellow leaf curl. Currant-lettuce aphids (CLA), although of most concern as contaminants of salad vegetables, may transfer cucumber mosaic and lettuce mosaic viruses.

To sustainably manage these pest-virus complexes it is important to know:

- how to identify and monitor the pests
- how to identify the symptoms of the diseases they may carry
- relevant management options

Effective management also relies on understanding the pest's life cycle and environmental conditions that favour population increases of the pests and beneficials. You will need an integrated approach to monitor and manage the pests and their natural enemies, and the introduced beneficials.

Experts in tailoring vegetable ICP programs and their implementation are available in Australia. A review by experienced ICP researchers and consultants of your production system and the threats to it is worthwhile. The valuable and specific guidance provided will motivate change, as evidenced by the Cafcakis capsicum case study.

How can I protect my crops from these sucking pests?

Growers have typically reported their most important steps toward ICP were seeking expert advice, and committing time, effort and resources to crop monitoring and planning.

Important early steps towards ICP

Clean up! Keep alert and keep scouting!

- Control broadleaf weeds and remove waste piles
- Create buffer areas or corridors of non-host vegetation around your sites
- Inspect all in-coming plants
- Restrict people and vehicle movement onto your farm and into your crops
- Walk through your crops often to spot outbreaks, check pest numbers, and effectiveness of all treatments

Why use an ICP approach?

In general, growers have measured their ICP success in terms of:

- Improved pest control and more reliable reduction in crop losses
- Reduced costs (for labour and chemicals)
- Improved farm occupational health and safety
- Improved awareness of their pests and the biological balance needed in a crop
- Increased market acceptance even though pack-out in a few cases has been lower in the establishment years
- Increased personal satisfaction as a result of significantly reducing the environmental impact of their practices

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If these sucking pests are already in my crops, what can I do?

Get started on an integrated management program. These programs utilise a range of management options and minimise reliance on chemicals. Take it step-by-step as suggested below.

Start monitoring. For thrips in young (not yet flowering) plantings, use blue or yellow sticky traps to capture flying adults. For SLW use yellow traps. For all sucking pests check with a hand lens under the young leaves for adults and nymphs/larvae, and whitefly pupae. Make weekly, or (in summer) twice weekly inspections. Checking for adult whiteflies is best done in the mornings at the edge of blocks. For CLA, check the inner leaves of lettuce, endive or radicchio. In flowering plants like capsicum, cucumber, tomato and eggplant check flowers as soon as flowering begins for adult and larval thrips. Many beneficials are pollen feeders so flowers are a good spot to check for them, and their prey.

Monitoring yellow sticky card in young capsicum crop

Working with experienced ICP specialists can be helpful and rewarding. Discuss with them the results of your monitoring and inform them fully on your crop history and growing environment.

Critical crop stages and pest thresholds that trigger a response action (eg. introducing parasitoids or predators; using 'soft' pesticides that protect beneficials), vary by pest and crop. Cucurbits for example are very sensitive to SLW and the action threshold is often based on the number of adults per leaf. In young crops ten adult SLW per trap in a week is a warning of high populations and a necessary treatment. The situation is similar with capsicums and thrips that may spread TSWV.

The successful management of several sucking pests has relied on the introduction of specific predators and parasitoids. The brown smudge bug (*Deraeocoris signatus*) is reportedly an effective predator of SLW. Parasitoid wasps *Eretmocerus hyati* and *Encarsia formosa* have significantly reduced SLW populations in some Queensland crops; and related parasitoids have been effective against greenhouse whitefly.

Predatory mites like *Amblyseius cucumeris* (cucumeris mite) are effective on immature and/or adult WFT and onion thrips, whereas the minute pirate bug, ***Orius armatus*** (referred to as 'Orius') is a very effective predator of adult thrips. A soilborne predatory mite, *Hypoaspis aculeifer*, has effectively preyed on thrips during their pupal stage in the soil.

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Case Study

ICP approaches for managing western flower thrips (WFT) in capsicums - the steps to success on the Cafcakis property, north of Adelaide

Awareness

The Cafcakis brothers' engaged a number of ICP experts on their property north of Adelaide to assist in protecting their hydroponic greenhouse capsicums. They had lost control of WFT in their crops and plant losses due to TSWV were exceeding 60 percent. This motivated the brothers to attend their first WFT management workshop in 2001.

At the workshop they realised their spray coverage needed review. With the assistance of an agronomist and SARDI a fluorescent dye was used to demonstrate that they had poor spray coverage and a significant amount of chemical was wasted through off-target application. Their first proactive step in overcoming major crop losses was to improve spray coverage. With changes in droplet size, jets and application pressure, they achieved better coverage and also improved pest control with 75% less chemical. This raised the growers' awareness of the multi-faceted nature of pest management, and of the commercial benefits that could be derived from an ICP approach. Their commitment to integrated practices and improved sustainability was firmly established.

Taking the first serious ICP steps

In August 2005, using expert assistance, the Cafcakis brothers undertook a farm clean-up and withheld some broad spectrum chemical applications. Their advisers recommended the introduction of cucumeris mites, WFT predators available commercially. Ladybird beetles and a parasitoid wasp introduced in low, non-commercial numbers also established well. The growers also committed considerable resources to roguing (i.e. removing and destroying) virus infected plants and this appeared to limit the spread of TSWV symptoms.

Capsicum with distinctive symptoms of TSWV

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Monitoring

Monitoring was thorough, with both sides of leaves and flowers on random plants carefully inspected by the growers and an entomologist. Yellow sticky traps were read weekly and results showed the unsprayed crop was not suffering greater losses than previous crops sprayed conventionally. In the unsprayed greenhouses, the number of native non-pests was higher, but so too was the population of green peach aphid. Aphid hot spots were treated with a soft pesticide and this allowed the predatory mite populations to increase in the flower buds. For several months the mites appeared to be controlling the thrips, but this was stalled by the arrival of hot weather in early summer when the new adult thrips emerging in the greenhouse, overwhelmed the available predators. Synthetic sprays were reluctantly used again. By 2008, a new 'high-tech' hydroponic house was in use and so too were conventional chemicals. However 70-80 percent of the first capsicum crop in the new house was lost to TSWV.

Releasing commercially-reared Predators

In 2009 the growers again provided voluntary funds for trials with a full array of beneficial organisms. They grew their own pesticide free seedlings and re-committed to extensive monitoring. When WFT was found soon after the crop was planted, it was suspected that the weed mat was infested with WFT pupae. The fumigant dichlorvos was applied to suppress the early WFT, and thereafter no broad spectrum pesticides were used.

Orius armatus was the new biological weapon trialed in capsicum crops. The minute pirate bug Orius, is an aggressive native bug. When released at sufficiently high rates (around 8/m2), it proved to be a very effective predator of WFT larvae and adults. The integrated practices expanded the focus from WFT alone, to include secondary pests (two-spotted mite and broad mite) that influence the success of biological WFT management. The 2009 and 2010 trials were successful, but the establishment of the WFT predators (especially Orius) was slow during the short days of late winter, and this allowed early WFT proliferation. It was

Orius in capsicum flower

learned that the establishment of Orius in capsicum crops is also dependent on flowering. Pollen is a food source capable of sustaining the development of the predators through periods of low pest presence.

On the basis of successful ICP demonstrations and crop management, the Cafcakis brothers now use a commercial biological control program for all capsicum crops and with on-going help from James Altmann and Lachlan Chilman they believe they will not return to synthetic pesticide-based management in either their low– or high-tech greenhouses. The program's success in low-tech greenhouses indicates the system is sufficiently robust to withstand regular seasonal and diurnal temperature and light variation.

Use of Advisers and Researchers

A number of advisers/researchers have also documented ICP successes in leeks and lettuce and strawberries for a range of pests including two-spotted mites, aphids and fungus gnats. There are many similar ICP success stories and in each, the contributions of experienced ICP consultants and researchers have been acknowledged.

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A selection of helpful resources

There are many additional useful resources that can be accessed within the secure area of the AUSVEG website. Go to the Technical Insights page and then to the R+D Insights Database (search engine) where you can initiate a Search using Key Words.

Available resources include:

1. **Predatory Bugs Enhance Bio-control in Australia.** 2010. Goodwin, S. and M. Steiner, in Practical Hydroponics and Greenhouses, No. 110, Jan-Feb 2010: pages 41-46.
2. **Keep it CLEAN – Reducing costs and losses in the management of pests and diseases in the greenhouse.** 2009. Badgery-Parker J. http://www.dpi.nsw.gov.au/agriculture/horticulture/greenhouse/pest-disease/general/preventing
3. **Insect pests of cucurbit vegetables.** 2009. Napier T. http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0005/290219/insect-pests-of-cucurbit-vegetables.pdf
4. **Thrips and tospovirus - a management guide.** 2007. Persley D. et al. http://www.dpi.qld.gov.au/4790_11607.htm
5. **Viruses in vegetable crops in Australia - Integrated virus disease management.** Persley D. et al. http://www.dpi.qld.gov.au/documents/PlantIndustries_FruitAndVegetables/Viruses-in-vegies.pdf
6. **Aphid-transmitted viruses in vegetable crops - Integrated virus disease management.** Persley D. et al. http://www.dpi.qld.gov.au/documents/PlantIndustries_FruitAndVegetables/Managment-of-aphid.pdf
7. **IPM Strategies for Silverleaf whitefly in Vegetables.** 2010. Vegenotes, Issue 16 (Siva-Subramaniam S. et al. DEEDI). This and other issues of Vegenotes can be accessed within the secure area of the AUSVEG website.
8. **Silverleaf whitefly management in vegetable crops** (web page). Siva-Subramaniam S. et al., DEEDI. http://www2.dpi.qld.gov.au/horticulture/18512.html
9. **National Strategy for control of WFT - Managing WFT in greenhouse and field crops.** 2002. HAL. http://www.hin.com.au/Resources/Western-Flower-Thrip-in-Vegetables
10. **Integrated disease management strategy for tomato spotted wilt virus in vegetable crops; in seedling nurseries; and in protected crops** (three fact sheets TSWVST01.PDF, TSWVST02.PDF and TSWVST03.PDF respectively). 2002. Coutts B & Jones R. http://www.hin.com.au/Resources/Western-Flower-Thrip-in-Vegetables
11. **Australasian Bio-control Group,** national suppliers of bio-control agents http://www.goodbugs.org.au

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Original text was prepared by Scholefield Robinson Horticultural Services Pty Ltd and Sandra McDougall (NSW DPI). This version was revised and updated by Scholefield Robinson in March 2012.