

Thrips & Tospovirus Resources

Western Flower thrips (WFT) and Tomato Spotted Wilt Virus (TSWV) are serious pests of a wide range of vegetables.

Western flower thrips is one of a number of thrips species that causes direct feeding damage to vegetables. Some of the most sensitive include: cucumbers, silverbeet, spring onions and shallots and a range of herbs. It is a more serious problem than many other thrips in that it has developed high levels of insecticide resistance.

Tomato Spotted Wilt Virus is the most widespread and damaging virus affecting Australian vegetable crops. It is a tospovirus and is transmitted by WFT, Onion thrips, Tomato thrips and Melon thrips. It is a serious disease of tomatoes and other solanaceous crops such as capsicums, eggplant and potato. It can also devastate lettuce crops and cause significant damage in peas and celery.

Capsicum chlorosis virus (CaCV) and Iris yellow spot virus (IYSV) are two other tospoviruses new to Australia. CaCV is vectored (i.e. carried and transmitted) by Melon thrips and Tomato thrips in capsicums and tomatoes. IYSV is vectored by Onion thrips in onions and leeks.

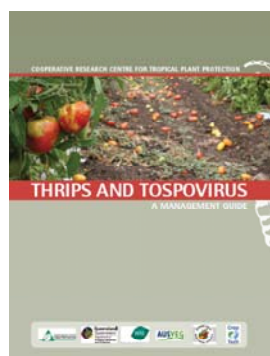
To effectively manage these pests it is important to understand some key points about their biology and management, namely:

- **Sanitation is critical.** Avoid getting thrips or TSWV in seedlings, reduce chances of them coming into your crop and remove and destroy any diseased plants.
- Not all thrips transmit viruses and different tospoviruses are transmitted by different thrips species.
- For an adult thrips to transmit the virus(es) it vectors, it must have developed on an infected plant.
- WFT and TSWV both have very broad host ranges and both are found on a range of weed species
 - ⇒ therefore weed management around crops is a critical factor in managing these pests.
- WFT is resistant to many insecticides and not all thrips vector TSWV
 - ⇒ therefore being able to identify WFT and other thrips species is critical to the development of sound management strategies.
- Viruses can not be cured – only prevented.
- A chemical-first or chemical-only strategy will fail.
- Maintaining an environment in which viruses are absent or at very low levels and a range of the natural enemies of thrips are present will keep damage below economic levels.

An integrated strategy, using knowledge about the thrips and the tospoviruses as well as the natural enemies that are present and how they move around the environment, is essential to effectively manage both pests.

Below is a selection of information resources that can assist in managing thrips and tospoviruses in vegetables. A brief description is given along with a web link or information on where copies may be obtained.

BOOKLET



Thrips and Tospovirus – a management guide (2007)

This 18 page guide covers each of the tospoviruses and thrips species found in Australia that affect vegetable crops and includes tables of host crops, excellent photos of virus symptoms and basic management information.

http://www.dpi.qld.gov.au/4790_11607.htm

http://www.dpi.qld.gov.au/documents/Biosecurity_GeneralPlantHealthPestsDiseaseAndWeeds/Thrips-Tospovirus-Booklet-lorez.pdf



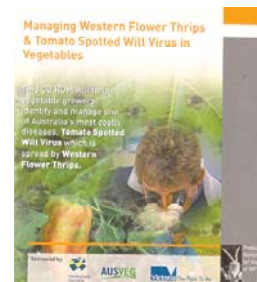
Horticulture Australia

CD-ROM

Managing Western Flower Thrips and Tomato Spotted Wilt Virus in Vegetables (2003)

This CD has a series of 4 short videos in English or in Vietnamese covering the following topics:

1. Identifying the pest
2. How the damage is caused
3. Non-chemical control
4. Chemical control

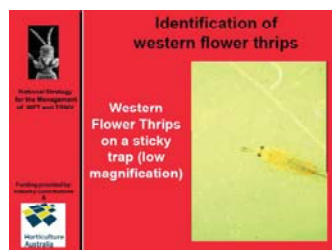


It also has a section with fact sheets on WFT and TSWV, including an extensive list of TSWV hosts.

To order the CD, go to the bottom of the web page and in the “Feedback” area (boxes within an orange border) type in your Full Name and Email Address and in the box for “Feedback and comments” state that you wish to obtain 1 copy of the “Western Flower Thrips CD-ROM” and also state whether you are a levy-paying vegetable grower or how you are associated with the vegetable industry (eg IPM consultant, R&D service provider or agronomist working with growers). Then give your complete postal address so the CD can be mailed to you. It might pay to also include your phone number. Once you’ve typed in all of the required information, click the “Submit” button.

http://www.vgavic.org.au/communication/research_and_development_shop/western_flower_thrips_cd_rom.htm

IDENTIFICATION RESOURCES



Identification of western flower thrips (2002)

An informative PowerPoint presentation that shows the key features that enable identification of Western flower thrips (WFT) versus the other thrips that are commonly found in vegetable crops.

<http://www.hin.com.au/Resources/Western-Flower-Thrip-Identification>

Which thrips is that? (2005)

This factsheet contains information, photographs, and diagrams to assist with the correct identification of the different thrips species that are found in vegetable crops. The guides also show examples of thrips damage and show where to look for damage on plants.

<http://www.dpi.nsw.gov.au/agriculture/horticulture/pests-diseases-hort/multiple/thrips/which-thrips-is-that>

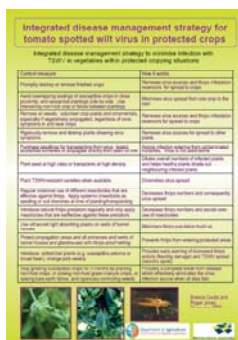


SUMMARY FACT SHEETS

Integrated disease management strategy (2002) for tomato spotted wilt virus in:

1. vegetable crops
2. seedling nurseries
3. protected crops

Three one-page fact sheets that provide an integrated disease management strategy to minimise Tomato spotted wilt virus (TSWV) infections in open field vegetable crops, seedling nurseries and protected crops.



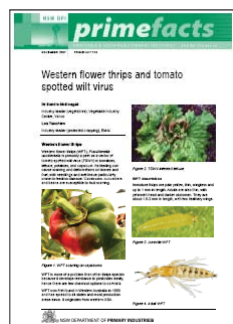
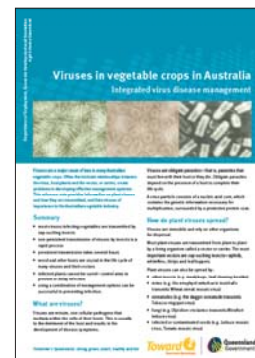
<http://www.hin.com.au/Resources/Western-Flower-Thrip-in-Vegetables>

Viruses in vegetable crops in Australia (2009)

This 6 page factsheet covers the range of viruses found in vegetable crops in Australia, how they are spread and basic management strategies to avoid viruses in vegetable crops.

http://www.dpi.qld.gov.au/26_19759.htm

http://www.dpi.qld.gov.au/documents/PlantIndustries_FruitAndVegetables/Viruses-in-vegies.pdf



Western flower thrips and tomato spotted wilt virus (2007)

This 5 page fact sheet covers basic biology and management information for vegetable growers.

<http://www.dpi.nsw.gov.au/agriculture/horticulture/pests-diseases-hort/multiple/thrips/wft-and-tswv>

Management of thrips and tomato spotted wilt virus (2007)

This 4 page fact sheet covers thrips and TSWV identification, symptoms and management for vegetable growers.

http://www.agric.wa.gov.au/objtwr/imported_assets/content/pw/ins/pp/hort/fn069_2004.pdf



Western Flower Thrips (2004)

This 2-page fact sheet gives basic lifecycle and management options for Western flower thrips.

http://www.vegetablesvictoria.com.au/communication/vege_notes/western_flower_thrips.htm

Capsicum virus diseases (2005)

This 2 page fact sheet covers capsicum virus diseases including the tospovirus Capsicum Chlorosis Virus (CaCV) and strategies to avoid virus infection in capsicums.

http://vgavic.org.au/communication/vege_notes/capsicum_viruses.htm



RESISTANCE MANAGEMENT FOR WFT

Western flower thrips (WFT) insecticide resistance management plan

This series of web pages gives basic information on WFT resistance management and provides a list of the permitted insecticides for several crops.

<http://www.dpi.nsw.gov.au/agriculture/horticulture/pests-diseases-hort/multiple/thrips/wft-resistance>

The screenshot shows a web page titled "Western flower thrips (WFT) insecticide management plan - Lettuce". It includes a navigation menu with categories like Home, Agriculture, Fishing and aquaculture, Forests, Minerals and petroleum, and About us and our services. The main content area lists "Chemicals approved by the APVMA for off-label use in LETTUCE, Effective to 29 February 2010." Below this is a table with columns for Chemical group, Active ingredient, Product concentration, Product rate, and Comments.

Controlling Spinosad Resistance with WFT (2009)

Spinosad is one of the few chemicals registered or permitted to control WFT. However, WFT has now developed high levels of resistance in some production areas. This 4 page fact sheet covers the mechanisms of resistance development and strategies for using spinosad in ways that will prevent resistance build-up.

www.ausveg.com.au > grower portal > search Vegenotes



OTHER USEFUL RESOURCES

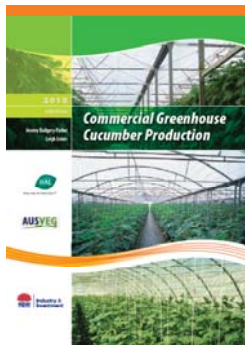
The following resources have some useful information about thrips and tospoviruses and using an integrated pest management strategy for managing crop pests.

Information Guides/Manuals

Keep It Clean (2009)

Comprehensive guide for greenhouse growers that lists and describes more than 70 management practices that can significantly reduce the costs and losses that can result from pests and diseases. A series of summary fact sheets and example record sheets are also available to download. Manual can be downloaded or a hard copy can be ordered.

<http://www.dpi.nsw.gov.au/agriculture/horticulture/greenhouse/pest-disease/general/preventing>



Commercial Greenhouse Cucumber Production (2010)

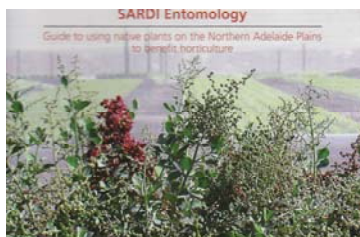
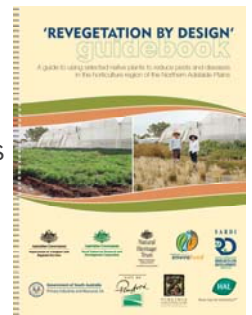
This 216 page growing guide for greenhouse cucumber growers includes sections on managing crop pests. This manual can be purchased.

<http://www.dpi.nsw.gov.au/aboutus/resources/bookshop/commercial-greenhouse-cucumber-production>

Revegetation by design guidebook (2006)

Weeds in and around crops can be major sources of WFT or TSWV. Work in the Northern Adelaide Plains with native vegetation has found that many native plant species are not hosts for either pest. This 76 page guide covers information on property planning, pests and natural enemies and establishment and maintenance of native vegetation including indicative costs.

http://www.sardi.sa.gov.au/__data/assets/pdf_file/0008/44945/reveg_by_design_guidebook.pdf



Guide to using native plants on the Northern Adelaide Plains to benefit horticulture (2009)

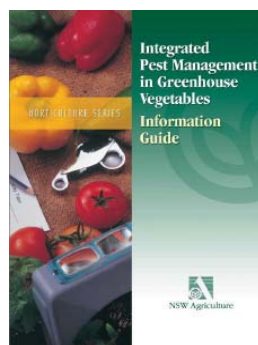
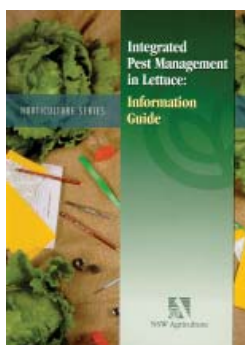
A field guide style of publication covering the information on the native plants that have the best potential as substitutes to bare ground or weeds in and around crops to reduce sources of WFT or TSWV and increase potential beneficials.

http://www.sardi.sa.gov.au/__data/assets/pdf_file/0005/103469/SARDI_Reveg_Guide_2009.pdf

Vegetable Integrated Pest Management (IPM) in Tasmania (2004)

This 200+ page manual covers vegetable IPM and practices, diseases, insects, and weeds for the key vegetables grown in Tasmania: potatoes, carrots, beans, peas, broccoli and onions. It is available for purchase as a CD or a manual or can be downloaded.

<http://www.dpiw.tas.gov.au/inter.nsf/WebPages/TTAR-68Q6CX?open>



Integrated pest management in lettuce: information guide (2002) 150 pages

<http://www.dpi.nsw.gov.au/aboutus/resources/bookshop/ipm-lettuce-infoguide>

Integrated pest management in greenhouse vegetables: information guide (2002) 216 pages

<http://www.dpi.nsw.gov.au/aboutus/resources/bookshop/veg-ipm-info-guide>

Both information guides provide information about IPM, what it is, recognising and monitoring of pests, beneficials, diseases and weeds (lettuce only), spray application and record sheets.

Queensland Primary Industries Agrilink series

Although many of these were produced in the late 1990s they are still relevant and contain good information on crop production, answers to common questions, problem solving guides and other information. Very few are still available for purchase, but pdfs can be downloaded from the DEEDI archive site.

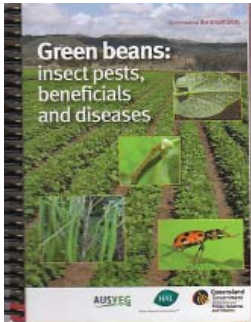
Lettuce Information Kit: a growing manual.
<http://era.deedi.qld.gov.au/1660/>

Capsicum and Chilli Information Kit: a growing manual.
<http://era.deedi.qld.gov.au/1651/>



Field ID/Ute Guides

These guides are excellent resources for taking into the field to assist in identifying invertebrate pests and beneficials, plant diseases and in some cases nutritional deficiencies.

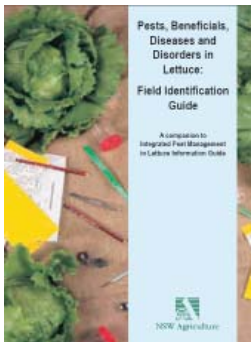


Green beans: insect pests, beneficials and diseases 2008 - The Ute Guide

<https://www.bookshop.qld.gov.au/ProdView.aspx?popup=1&Category=SXXC306030&Product=9780734503954>

Insect Pest Guide: a guide to identifying vegetable insect pests and their natural enemies in the dry tropics

contact John.Brown@deedi.qld.gov.au

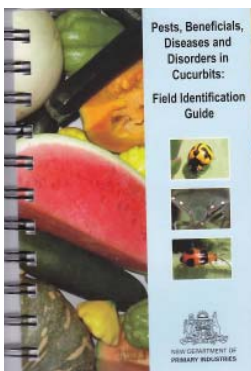
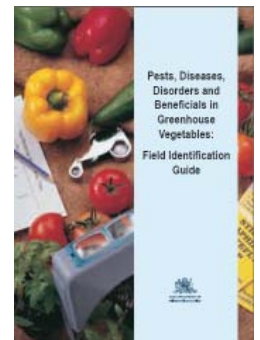


Pests, beneficials, diseases and disorders in lettuce

<http://www.dpi.nsw.gov.au/aboutus/resources/bookshop/ipm-lettuce-field-id-guide>

Pests, diseases, disorders and beneficials in greenhouse vegetables

<http://www.dpi.nsw.gov.au/aboutus/resources/bookshop/veg-ipm-field-id-guide>



Pests, Beneficials, Diseases and Disorders in Cucurbits

<http://www.dpi.nsw.gov.au/aboutus/resources/bookshop/cucurbits-field-id-guide>

Chemical Impact on Beneficials

All organisms have their natural enemies (organisms that prey on them). When invertebrate pests are feeding on a crop their natural enemies are usually not far behind and may control your pests without the need for any other control method.

These resources provide knowledge of the impact of pesticides on non-target beneficial insects and mites, which is essential for planning and implementing IPM programs.

The following three one-page tables detail the effects of pesticides on beneficials:

1. Insecticide effects on beneficial insects and mites
2. Insecticide compatibility with non target beneficials
3. Fungicide and herbicide effects on beneficial insects

From project: VG06087 Pesticide Effects on Beneficial Insects and Mites in Vegetables (2009)

http://www.ipmtechnologies.com.au/index.php?option=com_content&view=article&id=14&Itemid=21

www.ipmtechnologies.com.au > IPM tools> Insecticide compatibility

Fungicide Product & active ingredient	Beneficial species						
	Brown lacewing	Thrips (leafhopper)	Unspotted leafhopper	Common spotted leafhopper	Canopy bug	Diabro (predatory beetle)	Tetraneura (predatory mite)
Amistar azoxystrobin							
Banck chlorothalonil							
Film benzaldehyde							
Mankocide copper hydroxide							
Nominal VIG cuprous oxide							
Penncozeb DF mancozeb							
Polyram imidacloprid							
Rebound xyp propab + oxadiazyl							
Thion elemental sulphur							
Herbicide Product & active ingredient							
Select clothodim							

KEY: ■ Low ■ Moderately harmful ■ Harmful

Colour coded tables detail insecticide impact on greenhouse biological control agents under the following headings:

1. Pesticide residues on foliage
2. Pesticide residues in media
3. Pesticide residues on greenhouse plastic
4. Side-effects of pesticides on natural enemies

From project VG3109 Extension to Greenhouse IPM Program (2007)

www.ausveg.com.au > grower portal> Technical Insights database> search for VG3109 – download the final report, go to pages p173-183

PESTICIDE RESIDUES ON FOLIAGE				
IMPACT ON <i>P. PERSIMILIS</i> AND <i>T. MONTDRENSIS</i>				
	harmless 0-25% reduction	slightly harmful 25-50% reduction	moderately harmful 50-75% reduction	very harmful 75-100% reduction
	<i>Phytoseiulus persimilis</i>		<i>Typhlodromps montdrensis</i>	
	Adults	Progeny	Adults	Progeny
	0 7 14	0 7 14	0 7 14	0 7 14
Talstar	●●●●	●●●●	●●●●	●●●●
Nitofol	●●●●	●●●●	●●●●	●●●●
Lannate	●●●●	●●●●	●●●●	●●●●
Confidor	●●●●	●●●●	●●●●	●●●●
Success	●●●●	●●●●	●●●●	●●●●
Vertimec	●●●●	●●●●	●●●●	●●●●
Perimar	●●●●	●●●●	●●●●	●●●●
Dithone	●●●●	●●●●	●●●●	●●●●

IMPACT OF INSECTICIDES ON NATURAL ENEMIES FOUND IN BRASSICA VEGETABLES

Information provided is based on the current best information available from research data.

Use of insecticides should always be based on the latest information from pest control agents & firms, and on local pest conditions, both regarding pest populations and insecticide resistance.

Insecticide	Phytoseiulus persimilis				Typhlodromus montdrensis			
	Adults	Progeny	Adults	Progeny	Adults	Progeny	Adults	Progeny
Amistar	●	●	●	●	●	●	●	●
Banck	●	●	●	●	●	●	●	●
Film	●	●	●	●	●	●	●	●
Mankocide	●	●	●	●	●	●	●	●
Nominal VIG	●	●	●	●	●	●	●	●
Penncozeb DF	●	●	●	●	●	●	●	●
Polyram	●	●	●	●	●	●	●	●
Rebound xyp	●	●	●	●	●	●	●	●
Thion	●	●	●	●	●	●	●	●

Impact of insecticides on natural enemies found in brassica vegetables (2004)

This is a two-page factsheet detailing the impact of insecticides on natural enemies found in brassica vegetables.

http://www.sardi.sa.gov.au/__data/assets/pdf_file/0011/44876/toxchart.pdf

Many of the above resources can be obtained from the “login” area of the AUSVEG website (www.ausveg.com.au), where you can also find ordering instructions for “hard copy only” resources.

Once you have logged in, click on “Technical Insights”. Then go to the Search Engine where you can type in key words or the entire title of the resource.

