An Emerging Endemic Plant Pest

Chilli Thrips (*Scirtothrips dorsalis*)

In the past 2-3 years production nurseries and plant retailers have reported a dramatic increase in the damage being caused by the chilli thrips (*Scirtothrips dorsalis*) across a range of hosts. Arriving in 2000, this pest has been prevalent in Western Australia for many years and may have spread interstate. It is time to refresh our memories and look at options that can be utilised to mitigate the damage this pest can cause in our nursery crops.

Figure 1. Adult S. dorsalis (DPIRD WA)

Background

Chilli thrips (*S. dorsalis*) is widely distributed along its native range in Asia including Bangladesh, Brunei Darussalam, China, Hong Kong, India, Indonesia, Japan, Republic of Korea, Malaysia, Myanmar, Pakistan, Philippines, Sri Lanka, Taiwan, and Thailand. Further south *S. dorsa*lis occurs in northern Australia and the Solomon Islands. On the African continent, the pest is reported from South Africa and the Ivory Coast, with plant health quarantine interceptions suggesting a wider distribution across West and East Africa (Kenya). *S. dorsalis* is established in Israel as well as in the Caribbean including Jamaica, St. Vincent, St. Lucia, Barbados, and Trinidad. In South America, *S. dorsalis* has been found causing serious damage to grapevines. It was first reported in North Western Australia approximately 20 years ago.

S. dorsalis are sap-sucking insects that can cause deformities in flowers, leaves, stems, and shoots and a known vector of groundnut chlorotic fan-spot virus, groundnut yellow spot virus, tomato spotted wilt virus, and tobacco streak virus. Also known as strawberry and/or yellow tea thrips *S. dorsalis* feeds on roses, all citrus (and their hybrids), as well as a wide range of fruit, vegetable, and home garden/indoor ornamental plants. The host list is quite extensive, however in Western Australia the damage has been mostly reported on roses.

Table 1. Host plant list for S. dorsalis.

Plant Name	Family	Plant Name	Family
Acacia spp.	Fabaceae	*Lablab purpureus* (hyacinth bean)	Fabaceae
Actinidia deliciosa (kiwifruit)	Actinidiaceae	*Mangifera indica* (mango)	Anacardiaceae
Allium cepa (onion)	Liliaceae	*Morus* (mulberry tree)	Moraceae
Allium sativum (garlic)	Liliaceae	*Nephelium lappaceum* (rambutan)	Sapindaceae
Anacardium occidentale (cashew nut)	Anacardiaceae	*Nicotiana tabacum* (tobacco)	Solanaceae
Arachis hypogaea (groundnut)	Fabaceae	*Passiflora edulis* (passionfruit)	Passifloraceae
Asparagus officinalis (asparagus)	Liliaceae	*Phaseolus vulgaris* (common bean)	Fabaceae
Beta vulgaris (beetroot)	Chenopodiaceae	*Populus deltoides* (poplar)	Salicaceae
Camellia sinensis (tea)	Theaceae	*Portulaca oleracea* (purslane)	Portulacaceae
Capsicum annuum (bell pepper)	Solanaceae	*Prunus persica* (peach)	Rosaceae
Capsicum frutescens (chilli)	Solanaceae	*Punica granatum* (pomegranate)	Punicaceae
Citrus spp.	Rutaceae	*Pyrus spp.* (pears)	Rosaceae
Citrus aurantiifolia (lime)	Rutaceae	*Ricinus communis* (castor bean)	Euphorbiaceae

Citrus sinensis (navel orange)	Rutaceae	*Rubus* (blackberry, raspberry)	Rosaceae
Cucurbita pepo (marrow)	Cucurbitaceae	*Solanum spp.* (nightshade)	Solanaceae
Dahlia pinnata (garden dahlia)	Asteraceae	*Solanum lycopersicum* (tomato)	Solanaceae
Dimocarpus longan (longan tree)	Sapindaceae	*Solanum nigrum* (black nightshade)	Solanaceae
Diospyros kaki (persimmon)	Ebenaceae	*Syzygium samarangense* (water apple)	Myrtaceae
Ficus spp.	Moraceae	*Tamarindus indica* (tamarind)	Fabaceae
Fragaria spp. (strawberry)	Rosaceae	*Viburnum spp.*	Caprifoliaceae
Glycine max (soyabean)	Fabaceae	*Vigna radiata* (mung bean)	Fabaceae
Gossypium (cotton)	Malvaceae	*Vitis spp.* (grape)	Vitaceae
Helianthus annuus (sunflower)	Asteraceae	*Vitis vinifera* (grapevine)	Vitaceae
Hydrangea spp. (hydrangeas)	Hydrangeaceae	*Zea mays subsp. mays* (sweetcorn)	Poaceae
Ipomoea batatas (sweet potato)	Convolvulaceae	*Ziziphus mauritiana* (jujube)	Rhamnaceae

This list is not exhaustive

S. dorsalis are very similar to the western flower thrips (*Frankliniella occidentalis*), Onion thrips (*Thrips tabaci*) and plague thrips (*Thrips imaginis*) currently established Australia wide.

Thrips are most active during spring, summer, and autumn. In Western Australia, periods of rainfall and higher humidity create conditions that are conducive to *S. dorsalis* feeding, spread and reproducing. Like most thrips, *S. dorsalis* feeds on the meristems, terminals, and other tender plant parts of the host above the soil surface which results in undesirable feeding scars, distortion of leaves, and discoloration of buds, flowers, and young fruits. The pest prefers young plant tissue and is not reported to feed on mature host tissues.

Life Cycle

The thrips lifecycle, comprising egg, larva, pre-pupa, pupa, and adult, lasts several weeks.

Figure 2. Instar S. dorsalis ©Vivek Kumar, UFL 2008

- Eggs are laid within plant tissues (eggs hatch more quickly in higher temperatures)
- Larvae emerge from the eggs and feed on surrounding tissues
- Larval stages complete in 8-10 days
- Pre-pupa drop to the soil where it takes 2 -3 days to complete the pupal stages
- Adults emerge to mate and lay next generation of eggs
- The life span of *S. dorsalis* is considerably influenced by the type of host they are feeding. For example, it takes 11 days to become an adult from first instar larva on pepper plants (capsicum) and 13 days on squash at 28°C. *S. dorsalis* adults can survive for 15 days on eggplant, but 13 days on tomato plants and roses. They can survive at minimal temperatures as low as 9.7°C and maximum temperatures as high as 33.0°C.

S. dorsalis can have many generations in a single year and populations can build up quickly over a relatively short time. Understanding the lifecycle of the pest will help with management options and schedules. Like most thrips species, *S. dorsalis* is most vulnerable while in the larval and adult stages therefore aligning methods of management to target those stages will be the most efficacious.

What to look for?

- Larvae of *S. dorsalis* are creamish white to pale in colour. Sizes of the first instars, second instars, and pupae range between 0.37-0.39, 0.68-0.71 and 0.78-0.80 mm

- Elongated, flat 'torpedo' shaped body
- The body of the adult is pale yellow in colour and are less than 1.5 mm in length with dark wings. The head is wider than long, stripes are seen dorsally on the abdomen
- Very difficult to distinguish from other thrips species with the naked eye.

S. dorsalis are difficult to see due to their small size and hide deep in the flower or on the undersides of the leaves, which become silvery on the upper surface after prolonged feeding.

Damage

Thrips larvae feed on plant tissues and are responsible for most of the plant damage.

- Early symptoms include a clear discoloration of the leaf with black dots (faecal secretions)
- Light brown spots on leaves, which may curl
- In cases of very severe infestation, the leaves may entirely dry up
- Wrinkled leaves with distinctive brown scarring along the leaf veins, flower buds, and the calyx or outer casing of fruit
- Mosaic patches on plants, in which the top layer of the tissue is undisturbed, and a window or clear tissue is evident. *S. dorsalis* cause this by sucking up the liquid from plant cells; mainly from the leaves, but also the petals, shoots, and fruits
- Adult thrips also feed on the underside of leaves
- Deformed shoots or flowers of affected plants, caused by toxic substances in the saliva of this pest.

Figure 3. *S. dorsalis* damage on new growth (DPIRD WA)

Figure 4. Under leaf *S. dorsalis* damage (DPIRD WA)

Management Strategies.

Implementation of an integrated pest management program (IPM) will underpin the effective management of this pest. Understanding its life cycle, host list and habitat is critical. Structured crop monitoring programs will ensure early detection and inform growers of the appropriate actions to take. Damage and loss of sales can be minimised, and growers will have the opportunity to use a wider range of options to manage this pest based on early detections.

Within the **Australian Plant Production Standard**, Greenlife Industry Australia has the industry plant protection and biosecurity program 'BioSecure HACCP' available for industry use. This program provides a documented system that assists production nurseries to implement the structured crop monitoring through validated procedures that provide a high degree of confidence that the effort employed will return accurate information supporting and driving management decisions.

BioSecure HACCP on-farm system content includes:

- Identification of pathways for plant pests
- Control points within the cropping system
- High health procedures reducing risks
- Recording process for managing risks
- Electronic document management

The BioSecure HACCP manual, (https://nurseryproductionfms.com.au/) contains templates that can be easily used to collect valuable data which includes, crop, area, frequency of monitoring, location of the pest, size of the incursion and the stage of the lifecycle the pest has reached.. This information forms the bases of any action that should be taken. (i.e., Chemical, Biological, or Cultural management).

The BioSecure HACCP record templates, including the crop monitoring record, are available to production nurseries moving into BioSecure HACCP certification program in an electronic format that can be completed in the field, on smartphones and tablets, and stored in the business's own on-line data folder. Businesses can access this stored data and generate reports and view trending data over time allowing informed decision making.

Pesticide Management

S. dorsalis could become resistance to certain insecticides if they are not used correctly or are being overused. Like many other thrips species, this pest lives within areas of the plant that provides it protection. Therefore, a contact insecticide will have limited effect as *S. dorsalis* doesn't readily move around the host.

Because S. *dorsalis* is a sap sucking insect, the use of a systemic or translocatable insecticide (absorbed by the host plant) will provide a greater level of management. Products that contain active ingredients such as imidacloprid, acetamiprid, spinetoram, or pyrethroids are effective against thrips, and are readily available. Refer to Table 2 below for examples.

Greenlife Industry Australia manages the nursery industry's pesticide *minor use permits* program which is updated regularly. A minor use permit outlines which pesticide growers can legally use to manage a certain pest, disease or weed. Please follow the link provided under "Further resources" to view the updated minor use permits for nursery stock.

There is continuing research and development of new chemistry that will become available pesticides in the future. The concerns relating to environment, social consciousness, chemical resistance, and the effect on non-target insects such as bees, is driving chemical manufacturers to investigate viable, safe, alternate options. Greenlife Industry Australia continues to update the industry on pesticide related requirements with businesses able to access up to date information by visiting the sites mentioned below in "Further resources".

As with all pesticides, please read the label and adhere to the directions within it.

Table 2. Pesticide options (APVMA PER81707)

Active Constituents	Group	Examples of Trade Names
Spirotetramat	23	Movento 240 SC
Alpha-cypermethrin	3A	Dominex Duo, Conquest Alpha Forte 250 SC
Fipronil	2B	Regent, Instar Granular
Chlorantraniliprole + Thiamethoxam	28+4A	Durivo Insecticide
Petroleum oils	N/A	Pestoil, Sacoa Summer oil

** Ensure to view an updated APVMA Permit to remain compliant**

It is important to remember that chemical management should not be the first tool that you use.

The old practice of "blanket spraying" is long gone. Following an IPM strategy would include other methods of managing the pest including cultural and biological options where appropriate.

Table 3. Botanical based registered pesticides

Active Constituents	Group	Examples of Trade Names
ethanol - denatured+pip.but.+ pyrethrins	Botanical	Richgro Pyrethrum Naturally Based
ethanol - denatured+pip.but.+ pyrethrins	Botanical	Beat-a-Bug Natural Pyrethrum Insect Spray
Fatty Acids – K salt (285g/l)	Botanical	Natrasoap Insecticidal Soap Spray
Fatty Acids – K salt (285g/l)	Botanical	Hitman Soap
Fatty Acids – K salt (285g/l)	Botanical	Searles Ecofend Natural Solutions
Fatty Acids – K salt (285g/l)	Botanical	Multicrop BugGuard

Cultural

S. dorsalis can build up numbers very quickly. Reduce the risk of large populations establishing by ensuring the production nursery / retail nursery is clean, weeds are controlled, production areas have either weed mat, gravel, concrete, or sealed floors. Following the NIASA guidelines on Best Management Practices will help setup and manage suitable production and surrounding areas.

Initiating a structured crop monitoring and site surveillance programs will alert businesses to incursions.

Figure 5. Typical *S. dorsalis* damage to roses (R. Melville)

Prune (if applicable) any host plants that are infested with *S. dorsalis*. Remove and destroy any heavily infested plant material. Do not allow pruning's to infest other areas as they are moved out of the production area.

Implement a structured import inspection procedure for plants that are being brought into the production nursery or retail nursery. Ensure there is a suitable dedicated quarantine area and only allow plants into the production nursery or retail area once they have passed quarantine requirements. Do not allow the source nursery's problems to become established and in turn your problems! Look for suppliers who are NIASA accredited.

Implement a staff training strategy that incorporates pest identification, crop monitoring, incoming stock inspection procedures, site surveillance, and quarantine procedures.

The use of blue sticky traps is an effective method in decreasing populations of certain pests including thrips. Not only are they good for detecting and monitoring, when long strips of the sticky trap are hung out, they capture many of the pests. This has been particularly helpful in protected cropping areas within production nurseries, where the impact on non-target species is minimised.

Biological

The use of beneficial insects to control *S. dorsalis* and other insect pests is becoming more prevalent in the nursery industry. Many production nurseries have implemented crop monitoring programs to allow data-driven management decisions which enables more effective management of the pest before insecticides are used. There is a growing list of businesses who have now substantially reduced the costs associated with pesticide applications due to being better informed of pest pressures. Structured crop monitoring has reduced pesticide and labour use and resulted in earlier crop availability for customers and a reduction in non-saleable stock, reducing throw-outs and other losses.

Table 4. Beneficial Insects used for biological control.

Neoseiulus cucmeris	Predatory mite
Dalotia coriaria	Rove Beetle
Coccinella transversalis	Predatory ladybird
Orius ssp	Pirate bugs
Hypoaspis mites	Predatory mite

These predatory insects are available in Australia from a number of suppliers. There are several companies who supply a quality product and have valuable knowledge on integrating beneficial insects into production nursery systems. The key to successful use is to have a structured crop monitoring program in place that informs you of pest pressures and the optimum time to release biological predatory insects.

S. dorsalis like any other pest can cause severe damage to the crops resulting in financial and reputation loss. It can however be managed, there are options available to businesses. The key however is to be informed. Understand the pest, collect data with structured crop monitoring. This enables you to align any actions taken to the life cycle of the pest, the pest prevalence and host infested resulting in greater and earlier management.

Further resources:
https://nurseryproductionfms.com/
https://nurseryproductionfms.com.au/minor-use-permits-mups-for-pesticides/
https://pestid.com.au/
https://portal.apvma.gov.au/pubcris/
https://www.biologicalservices.com.au/
https://bugsforbugs.com.au/

For further information please email Greenlife Industry Australia, *National biosecurity and sustainable plant production program' (NY20001) project team at:* biosecure@greenlifeindustry.com.au

Greenlife Industry Australia

The 'National biosecurity and sustainable plant production program' (NY20001) project is funded by Hort Innovation using nursery research and development levy and funds from the Australian Government.

Hort Innovation Strategic levy investment | NURSERY FUND

This project has been funded by Hort Innovation using the nursery research and development levy and funds from the Australian Government. For more information on the fund and strategic levy investment visit horticulture.com.au