Pathogen of the month – September 2013

SEPT 13

Tomato spotted wilt virus (TSWV)

Fig. Tomato spotted wilt virus symptoms: a. Capsicum leaf; b. Green fruit; c. Peanut plants; d. Hyroponic lettuce

Disease: Tomato spotted wilt **Causal agent:** *Tomato spotted wilt virus*
Classification: F: Bunyaviridae G: Tospovirus

Tomato spotted wilt virus (TSWV) is the type species of the Tospovirus genus which contains plant infecting members of the family Bunyaviridae. All tospoviruses are transmitted by thrips (order *Thysanoptera*). Tomato spotted wilt was first reported and described from Victoria in 1919 and the causal agent shown to be a virus by Samuel and others working at the Waite Institute in 1930. Tospoviruses form pleomorphic, spherical particles, 80 to 120nm in diameter that are surrounded by a lipid envelope enclosing three nucleocapsids. The nucleocapsids contain three single-stranded linear RNA segments.

Host range and symptoms: TSWV has a very large and diverse host range with over 1000 natural and experimental hosts. The host range encompasses many plant families, with a large number of host species found in Solanaceae, Asteraceae and Fabaceae. TSWV causes a wide range of symptoms, depending on host plant, environmental conditions and virus strain. Symptoms include ringspots, mottling, chlorotic blotches and line patterns on leaves. Both leaves and fruit are often distorted with necrotic spots or ring patterns on fruit.

Distribution and impact: TSWV is widely distributed in north and south America, Europe, the Mediterranean, Africa and Australasia. The virus is present in Asia but tospoviruses in the *Watermelon silver mottle virus* group (serogroup IV) are more common and have greater economic impact in this region.
TSWV is among the 10 most damaging viruses infecting vegetable, legume and ornamental crops worldwide. The crops most frequently and severely affected are tomato, capsicum, lettuce, potato and peanut.

Transmission: All Tospoviruses are transmitted by thrips in a circulative and propagative manner. Less than 20 species of thrips are known to transmit tospoviruses. Transmission of tospoviruses, including TSWV, can only occur if they are acquired from infected plants by first or early second instar larvae thrips. More mature thrips, including adults, may acquire the viruses but the viruses cannot complete their life cycle within the insect to allow transmission. Tospoviruses are propagatively transmitted, so they must replicate within the thrips before they can be transmitted. The most prevalent thrips vector species for TSWV in Australia are the western flower thrips (*Frankliniella occidentalis*) and tomato thrips (*F. schultzei*).

Management: TSWV management aims to prevent or reduce the levels of disease in crops. Methods include crop and farm hygiene to destroy alternative hosts of both the virus and thrips vectors, thrips management through insecticides or biological control and using healthy planting material including virus free vegetable transplants.
Resistant varieties are available for capsicum, tomato and potato. The development of resistance – breaking strains regularly occurs, particularly with the *Tsw* gene in capsicum.

Further Reading: DM Persley, M Sharman and JE Thomas (2006). Tospoviruses-an Australian perspective. *Australasian Plant Pathology* 35, 161-180.
HR Pappu, RAC Jones and RK Jain (2009). Global status of tospovirus epidemics in diverse cropping systems. *Virus Research* 141,219-236.
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