

Cotton disease biosecurity alert

● By Cindy Benjamin

GUAVA root-knot nematode, Ramularia leaf spot and target spot are emerging issues for the Australian cotton industry.

In January, Dr Linda Smith, principal plant pathologist, Queensland Department of Agriculture and Fisheries, attended the Beltwide Cotton Conference in Fort Worth, Texas, to learn more about these emerging diseases and others that have potential to impact Australian cotton crops. Linda also shared the latest Australian research findings on reoccurring wilt (novel *Eutypella* spp.) from the CRDC research project, 'Tactical management and surveillance of Verticillium, Fusarium and reoccurring wilts'.

Guava root-knot nematode (GRKN) causes significant damage to several vegetable and other crops, but the extent of the threat it poses to cotton is unclear. This nematode species was first detected in Australia in 2022, but so far it has not been found in cotton crops here.

Ramularia leaf spot (RLS) and target spot are the two most economically significant foliar diseases of cotton in the USA under the right conditions.

One of the fungal pathogens that causes Ramularia leaf spot (RLS) has been found in Australia, infecting cotton crops. Target spot was first detected in Australian cotton crops in 2023 at St George and the Tablelands region of Far North Queensland. The impact on cotton in St George was minor; but, in Northern Queensland, infection was severe, resulting in defoliation of crops with likely impact on yield.

Symptoms of both these fungal leaf diseases are potentially controlled with fungicides. The potential impact of these leaf spot diseases on yield in Australian cotton is not yet understood, so field trials of fungicide application strategies are being undertaken.

The development of fungicide resistance in Australian cotton is a real threat that researchers are keen to avoid. Dr Thomas Allen, Mississippi, USA is developing predictive tools to help growers take an integrated approach to managing cotton diseases to reduce the risk of fungicide resistance developing.

Linda says there are two potential new diseases of cotton, tobacco ringspot virus and a seedling disease caused by *Xylaria necrophora* that Australian pathologists are adding to their 'watch-list'. *X. necrophora* is particularly interesting because this pathogen belongs to the same order of fungi as *Eutypella*, which causes reoccurring wilt.

Guava root-knot nematode

Meloidogyne enterolobii is a highly pathogenic and invasive nematode species with a broad host range including cotton and many vegetable crops, ornamental plants and weeds. These nematodes cause galling on the plant roots, which reduces crop yield and increases the plant's susceptibility to secondary pathogens.

Like all nematode species, GRKN is easily transmitted with soil and plant material, so good farm hygiene is very important. In Australia, GRKN has been identified as a high



Root galling symptoms on cotton. (PHOTO: Adrienne Gorny, NCSU)

priority pest in the biosecurity plans for the ginger, papaya, potato, sweet potato and vegetable industries.

GRKN is present in Central and South America, Africa, Asia, and some European countries. It has been found in the Northern Territory (October 2022) and in Queensland (December 2022 and February 2023), but not in cotton crops.

Dr Terry Wheeler, Texas, USA is researching the races of GRKN present in the USA, as not all are infective on cotton. Similar research will be required in Australia. Currently, GRKN is considered a much lesser threat to cotton than reniform nematode (*Rotylenchulus reniformis*), which can cause greater than 50 per cent yield loss in cotton. However, GRKN is being closely monitored in case the threat to cotton becomes more serious. Reniform nematode was first detected in the Dawson Callide region of Central Queensland in 2012 and causes significant yield loss in infected fields.



Galls on cotton roots caused by GRKN. (PHOTO: Deltapine)

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Ramularia leaf spot

Other names include: grey mildew, frosty blight, false mildew or areolate mildew.

- The disease causes early defoliation and consequently reduces the photosynthetic capacity of infected plants;
- Yield and fibre quality are compromised; and,
- It produces lint yield loss up to 250 to 350 kg of lint per hectare.

Ramularia leaf spot is a foliar disorder caused by *Ramulariopsis sp.* (including *R. gossypii* and *R. pseudoglycines*). The presence of white to greyish spores on the underside of the leaf is a distinguishing feature of this disease in cotton. Affected leaves dry up from the margin and cup inward before turning yellowish-brown and falling off prematurely.

Ramulariopsis sp. prefer tropical conditions and has global distribution, wherever cotton is cultivated.

In Brazil, Ramularia leaf spot infection commonly occurs early in the season, resulting in major yield losses (up to 50 per cent) if left untreated. Several fungicide applications are required per season to protect yield.

In southeastern USA, Ramularia leaf spot is only problematic if infection occurs early (i.e., during the 3rd or 4th week of flowering) and causes premature defoliation. Later outbreaks act as a natural defoliant and chemical control is not warranted.

Ramularia leaf spot is managed in the USA with fungicides, but the effect on yield is variable. Dr Jeremy Kilcher and Dr Bob Kemeraite, Georgia, USA have evaluated fungicides for efficacious control of *Ramulariopsis sp.* Their studies in 2021 showed that the disease caused a one per cent decrease in crop value, worth USD \$10 million. There was an economic benefit to spraying one fungicide spray when RLS was a problem. When fungicide use is justified, failure to apply could result in the loss of up to 250 to 350 kg of lint per hectare.

In 2021, the fungicide Miravis (*pydiflumetofen*) significantly reduced defoliation and provided the best protection of cotton yield. In 2023, Miravis Top (*pydiflumetofen* and *difenoconazole*) and Revytek (*pyraclostrobin*, *fluxapyroxad*, and *mefentrifluconazole*) gave positive results with an application at 3rd week of bloom.

Dr Karamjit Kaur Baryah, Alabama, USA evaluated Fungicides Revytek and Quadris to control RLS. Quadris (azoxystrobin) applied 1st and 3rd week of bloom and Revytek applied 3rd or 5th week of bloom both reduced disease severity compared to untreated plots, but did not significantly affect yield.

Impact of RLS on yield was dependent on timing of disease onset, disease pressure and environmental conditions.

In Australia, *R. pseudoglycines* was detected in cotton crops in the Northern Territory and Western Australia. It has not been detected on cotton in Northern Queensland. An Emergency Use Permit to control RLS has been issued for Belanty (mefentrifluconazole) for use in Queensland, Northern Territory and Western Australia in high disease-pressure situations that can negatively affect yield.



Ramularia leaf spot early infection, NT.



Defoliation caused by Ramularia in the NT.

Target spot

Target spot is a foliar disease of cotton caused by the fungal pathogen, *Corynespora cassicola*. *C. cassicola* infects a broad range of plant species worldwide, including cotton.

Target spot is so named due to the formation of leaf lesions that are light to dark brown necrotic spots with concentric rings. Warm, wet weather and humid conditions are conducive to the development and spread of this disease. Early onset results in premature defoliation and yield losses under conducive conditions.

- Defoliation of lower leaves is not likely to negatively impact yield potential;

- If the infection moves upward to the middle of the plant target spot can cause boll abortion, resulting in loss of yield potential;
- Infection at the top of the plant can halt boll development, resulting in un-harvestable bolls; and,
- Lint yield loss on a susceptible cotton cultivar is estimated as high as 448 kg lint per hectare.

In northern Australia, target spot has potential to impact yield. Target spot was confirmed during field observations conducted toward the end of the cropping season in 2023 in the Tablelands region of Far North Qld. Samuel Krekeler, DAF based at Mareeba will conduct various fungicide field-efficacy trials in Northern Queensland as part of the CRCNA project 'North Queensland cotton-grains-cattle farming systems' between 2024 and 2026.



Premature defoliation from RLS in Georgia, USA. Plant on left was not treated. Plant on right was treated twice with a strobilurin fungicide.



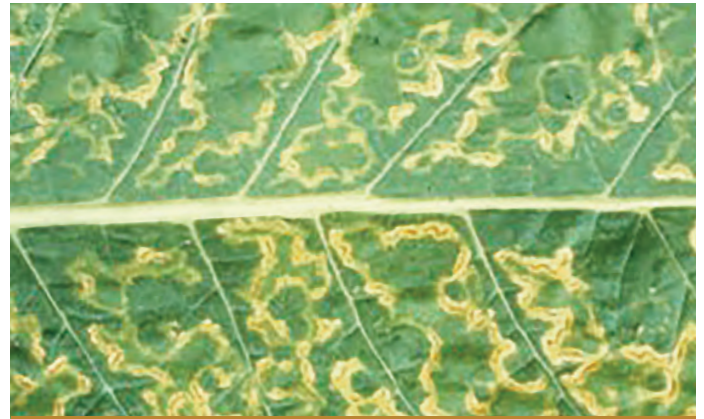
Interior defoliation is commonly observed with target Spot.

Watch-list diseases

Two new cotton diseases have been identified in the USA, and are now on the radar for cotton pathologists in Australia.

Tobacco ringspot virus (TRSV)

Dr Akhtar Ali, University of Tulsa, USA reported this new virus infecting cotton in the USA, first documented in 2021. Tobacco ringspot virus (TRSV) is transmitted in nature by the nematode vector *Xiphinema americanum*. *Thrips tabaci*, spider mites, grasshoppers and aphids have also been reported as possible vectors. The potential impact of this virus on cotton is unknown.



TRSV on tobacco.

Unnamed seedling disease of cotton

Dr Thomas Allen, Mississippi State University, USA reported a new seedling disease caused by *Xylaria necrophora*. *X. necrophora* is extremely pathogenic on cotton and also causes taproot decline of soybean in the southern USA.

Forty per cent of cotton fields sampled in Arkansas and Louisiana were found to have infected plants, causing a 1–14 per cent reduction in cotton yield, depending on seed treatment.

This pathogen is of particular interest to Linda because *X. necrophora* is a wood inhabiting and degrading fungus that belongs in the same order of fungi as *Eutypella*, which causes reoccurring wilt in Australia.



New seedling disease of cotton caused by *Xylaria necrophora*.

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