Cotton Pathology

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Commercial cotton crops across NSW and Queensland were inspected in November-December 2008 and March-April 2009. The incidence and severity of those diseases present were assessed and field history, ground preparation, cotton variety, planting date and seed rate were recorded for each of the 73 and 55 fields that were surveyed in NSW and Queensland respectively. This represents the 26th consecutive season of quantitative disease surveys of cotton in NSW and the 7th consecutive season of cotton disease surveys in Queensland.

Most cotton production areas experienced near average seasonal conditions with the following notable exceptions. Cotton crops in the Burdekin received over 1.5 metres of rainfall during the season. The Emerald area experienced only 49% of the average number of days with temperatures >35°C and rainfall 25% higher than the seasonal average. In contrast Mungindi (+78%), Gunnedah (+44%), Hillston (+39%) and Griffith (+30%) received an above average number of days with temperatures >35°C. Rainfall recorded at Walgett, Bourke and Moree was 64%, 50% and 33% higher than the seasonal average. The number of day-degrees accumulated during the season at Hillston and Griffith was 13% and 14% above average.

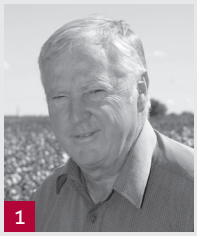
Cotton Industry Biosecurity Plan – Crop Surveillance for Priority Pests

During these surveys particular attention was given to the detection of Cotton Leaf Curl Virus, Blue disease, Phymatotrichopsis root rot, the hypervirulent strains of the bacterial blight pathogen, the defoliating strains of the Verticillium wilt pathogen and exotic strains of the Fusarium wilt pathogen. None of these pathogens were observed.

Seedling mortality

As part of the disease survey an estimate of the number of seeds planted per metre is compared to the number of plants established per metre. This comparison produces an estimate of seedling mortality which includes the impact of seedling disease (Rhizoctonia and Pythium etc.) as well as seed viability, the activity of soil insects such as wireworms, physical problems such as fertiliser or herbicide burn and the effects of adverse environmental conditions.

Mean seedling mortality *(Figure 1)* for the crops inspected in Queensland and NSW was 24.9% and 28.8%, respectively, (19.5% and 31% in 2007-08; 22.5% and 28.9% in 2006-07). The highest seedling mortality was observed in the Theodore area (41.2%) and in the Macquarie valley (38.8%) The low incidence of seedling mortality in crops on the Darling Downs (15.6%) reflects the warmer conditions for establishment that resulted from the later planting window. The very low incidence of seedling mortality in crops in the Burdekin (10.9%) results from planting dates in December. The warmer than normal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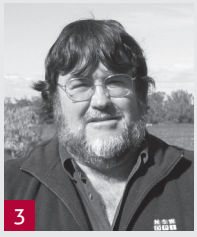
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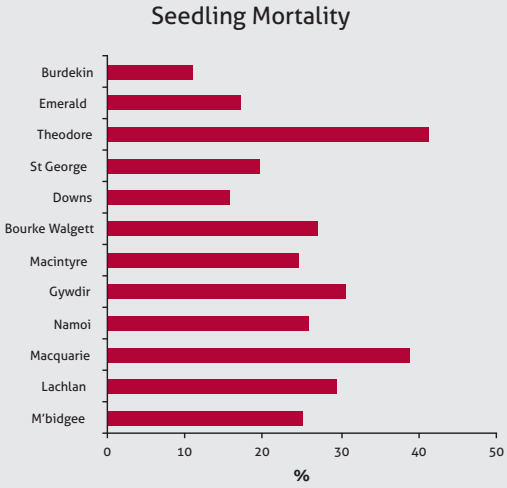

Figure 1. Seedling mortality of cotton in the 2008-09 season was relatively low in the Burdekin, Emerald, St George and Darling Downs areas and particularly high in the Macquarie Valley and Theodore area.

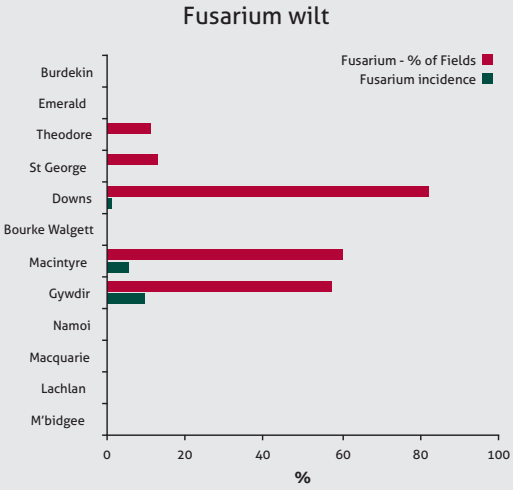

Figure 2. The average incidence and distribution of Fusarium wilt of cotton in the 2008-09 season. The average incidence declined in crops in the St George and Darling Downs areas but increased in crops in the Gwydir and Macintyre valleys.

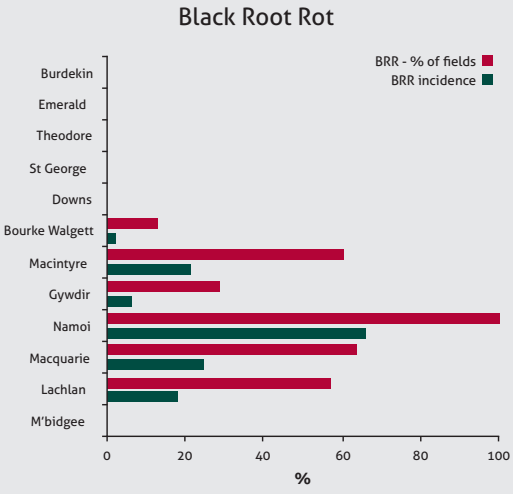

Figure 3. The incidence of black root rot of cotton in the 2008-09 season was highest in the Namoi Valley in NSW. Black root rot was not observed in cotton production areas of Queensland.

seasonal conditions in the Lachlan and Murrumbidgee valleys plus the inclusion of several fields relatively new to cotton production, resulted in lower than normal seedling mortality in this area.

Fusarium wilt

There were no new reports of Fusarium wilt from either NSW or Queensland this season. A fresh sample of affected plants was collected from a property near Mungindi. The results of tests on the original sample had indicated a possible new strain of the Fusarium wilt pathogen. The QPI&F diagnostic service at Indooroopilly are completing the tests.

Fusarium wilt was most common in crops on the Darling Downs of Queensland where the disease was found in 9 of the 11 crops inspected. However, the average incidence of fusarium wilt was reduced to only 1.4% of plants affected compared to 11.4%, 3.1% and 7.4% for the previous three seasons. Similarly, at St George, the average incidence of fusarium wilt was reduced to only 0.01% of plants affected compared to 1.9% and 3.2% in the last two seasons. In contrast, the average incidence of Fusarium wilt in the Gwydir and Macintyre valleys increased to 9.4% and 5.7% respectively.

Several factors could be responsible for contributing to these observed trends. Previous research has shown that delaying the sowing of the crop by just a couple of weeks can reduce disease incidence by up to 24% by avoiding the cooler spring conditions. More than half of the fields surveyed on the Darling Downs were planted in late October and early November. whereas, all of the surveyed fields in the Gwydir valley were planted in September and early October. Other factors could include the more widespread use of the new more resistant varieties and the more widespread use of the BION seed treatment in Queensland cotton production.

The BION seed treatment, which provides some control of black root rot and Fusarium wilt, was applied to 42% of cotton seed planted in Queensland and 23% of cotton seed planted in NSW. Use of the product in NSW would have been mainly directed at black root rot while use in Queensland would have been almost all directed at Fusarium wilt.
Though Fusarium wilt is known to be present and widespread in the Macquarie valley, upper Namoi valley and Bourke areas it was not detected in the 2008/09 disease survey.
It is important that growers and consultants confirm and declare if the disease is present in an area. The Fusarium wilt diagnostic service provided by the QPI&F is funded by the cotton industry and is free to growers. The majority of samples submitted return a negative result and some growers who are withholding samples could be worried unnecessarily. Early detection of the disease and establishment of a control program has proven to be the best approach.

Black root rot

Black root rot *(Figure 3)* has been recorded in all production areas of Queensland and NSW. The disease was observed in 65% of fields and 32% of plants surveyed in the major valleys in NSW (Macintyre, Gwydir, Namoi and Macquarie); compared to 58% and 14% respectively in the previous year. The Namoi valley was again the worst affected with black root rot present in all fields inspected and the mean incidence estimated to be 66% of plants affected.
The average incidence of black root rot continued to increase in most areas. The disease incidence exceeded 90% of plants affected in

the worst affected fields growing in the Namoi, Macquarie and Lachlan valleys!

Black root rot was not observed during surveys in Queensland production areas in the 2008/09 season. The disease has only been rarely observed in the Emerald and Theodore areas over the last six seasons. The late planting window was probably a significant factor for crops in the St. George and Darling Downs areas where many fields were planted in late October and early November.

Verticillium wilt

In March-April 2009, the average incidence of Verticillium wilt across NSW (Figure 4) was found to be 3.8% (11.2%, 4.9% and 3.4% in the previous three seasons). Verticillium wilt was present in 94% of fields inspected in the Namoi valley where the average incidence of the disease was 14% of plants affected (28.9%, 10.4% and 10.1% in the previous three seasons). Symptoms were present in 31% and 50% of plants in the worst affected fields.

Verticillium wilt was present in 50% of fields inspected in the Macintyre valley where the average incidence of the disease was 2.6% of plants affected. Although present in several other areas the incidence was < 1% of plants affected.

Boll rots and tight lock

Boll rots involve the complete collapse of the boll – 'boll wall and all' - and result from fungal infection that is sometimes assisted by insect damage. Tight lock describes the failure of locks to 'fluff out' when bolls open and is also caused by microbial infection that is sometimes assisted by insect damage. These microbes include both bacteria and fungi and can be introduced to the lock by rain splash from the soil, airborne spores from other plants or by insects feeding through the boll wall before the boll opens. Severe boll rot and tight lock occur when there is a coincidence of wet weather, maturing bolls and the appropriate fungi that can thrive on pure cellulose.

The average incidence of boll rots in NSW and Queensland cotton crops was estimated to be 2.7% and 1.9% respectively. Wet weather prior to harvest in the Emerald and Theodore areas of Queensland and in the Gwydir and Macintyre valleys contributed to mean incidences of 6.3%, 5.8%, 6.2% and 4.7% respectively with up to 25% of bolls affected in individual crops. *(Figure 5)*

Phytophthora boll rot develops when low bolls are inundated with flood or irrigation water or when soil is splashed up onto low bolls as they approach maturity. Boll rots caused by other pathogens tend to be more frequent in crops with tall dense canopies. Phytophthora boll rot was the most common boll rot observed in NSW production areas (2.6%).

Alternaria leaf spot

The pathogen that causes Alternaria leaf spot survives on crop residues from the previous season. Its survival is favoured by dry winter conditions and the retention of cotton crop residues on the soil surface. Alternaria leaf spot was observed in trace amounts in many, but not all, crops surveyed throughout NSW and Queensland in February-March 2009, with the mean severity (percentage of leaf area infected) estimated to be 0.8% in both the Macintyre valley and the Emerald area. One crop in the Emerald area had 2% of the leaf area affected with some defoliation.

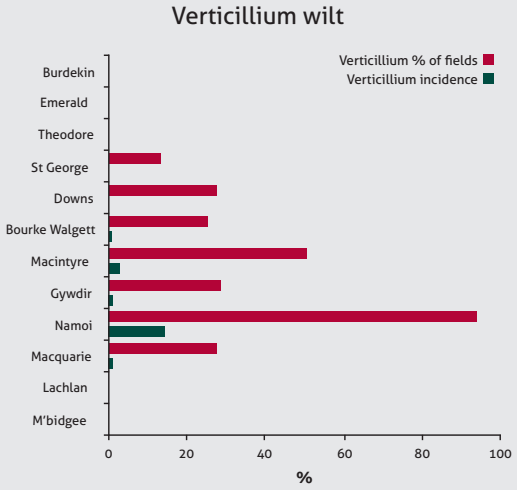

Figure 4. The incidence of Verticillium wilt in March 2008-09 was greatest in the Namoi Valley where it was found in 93% of the fields inspected.

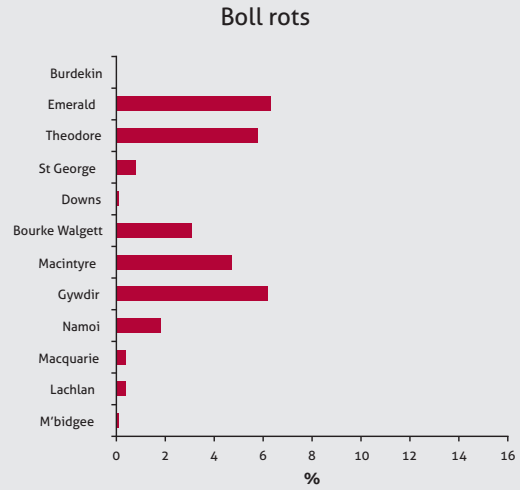

Figure 5. The incidence of boll rots, including those caused by Phytophthora and other fungi, in 2008-09 as assessed at time of survey. The incidence of boll rots is influenced by the timing of boll opening and periods of wet weather.

Cotton bunchy top

Symptoms of cotton bunchy top include small bolls, small leaves and short internodes, usually accompanied by a distinctive light-green angular mottle occurring around the margins of the leaves (the leaf mottle may be masked if infestation by aphids or mites is severe), and usually confined to a few plants or a distinct patch. Bunchy top was observed in crops near Theodore and on the Darling Downs. Symptoms were observed in 7% of crops inspected in Queensland and the average incidence of bunchy top in these crops was <0.1%. Bunchy top was observed in 11% of fields inspected during the NSW surveys where the average incidence was 0.2% of plants with symptoms. The incidence of bunchy top in three crops in the Lachlan Valley was found to be 5%, 4% and 1%.

Other diseases and disorders

Tobacco Streak Virus (TSV)

TSV was observed in 7 of 14 crops inspected in November and in 6 of 9 crops inspected in February in the Emerald area. It was not observed on cotton in any other area. However, it was detected in the weed, 'crown beard' (Verbesina encelioides) that was collected along the roadside just west of Theodore. The incidence of TSV varied from 0 to 50% in the November survey and from 0 to 2% in the February survey. In all affected crops the symptoms were limited to just one or two lesions per plant.

Seed Rot

In recent years there has been an increasing awareness of a seed rot caused by pathogens transmitted by sucking insect pests, feeding on developing seed, within young developing bolls. These bolls either drop off the plant or open prematurely with affected locks failing to fluff out properly and lint surrounding the affected seed discoloured. Overseas research has suggested that a Pantoea sp. could be one of the pathogens involved. Seed rot was observed in 11.7% of crops inspected in NSW and Queensland. It was particularly noticeable in crops in the Burdekin valley, the Darling Downs and the Lachlan/ Murrumbidgee area.

The Burdekin valley

The Burdekin valley is unique because of its tropical environment with high rainfall and the common rotation with sugar cane. A leaf spot with symptoms similar to 'wet weather blight' caused by Ascochyta sp. was observed on the cotyledons of seedlings and on the lower leaves of adult plants. Premature senescence was pronounced in some fields and accompanied by Alternaria leaf spot. The survey was too early to get an assessment of boll rots.

Acknowledgments

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