COTTON PATHOLOGY 2006-2007

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Commercial cotton crops across NSW and Queensland were inspected in November 2006 and March 2007. The incidence and severity of those diseases present was assessed and field history, ground preparation, cotton variety, planting date and seed rate were recorded for each of the 62 and 44 fields that were surveyed in NSW and Queensland respectively. This represents the 24th consecutive season of quantitative disease surveys of cotton in NSW.

In most cotton production areas, minimum temperatures during October and November were 1-2°C warmer than average and stand establishment was generally good in most areas. Hail storms in November in the Boggabilla area affected some crops and some fields were taken out of production. The summer was milder than in previous years and cloudy weather in some areas tended to favour expression of symptoms of Fusarium wilt and Verticillium wilt. Apart from a cold snap in November and some cool weather at the end of December, temperatures were above average though not as extreme as in the 2005-2006 season.

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*) 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.

Seedling mortality was very low in Queensland and in most areas of NSW (Figure 1). Mean seedling mortality for the crops inspected in Queensland and NSW was 22.5 and 28.9%, respectively, (23.6 and 28.9% in 2005-06). Seedling mortality was high in the Murrumbidgee Valley (39.7%, Fig. 1) but was lower than the long-term average (41%) for that region. Conversely, seedling mortality in the Lachlan Valley (43.5%, Fig. 1) was substantially higher than the long-term average (35.5). In the other regions, seedling mortality was mostly lower than the long-term average, especially in Emerald and the Darling Downs. The low incidence of seedling mortality in crops on the Darling Downs reflects the warmer conditions for establishment that resulted from the later planting window. Six of the eleven crops inspected on the Downs were planted after 4 November.

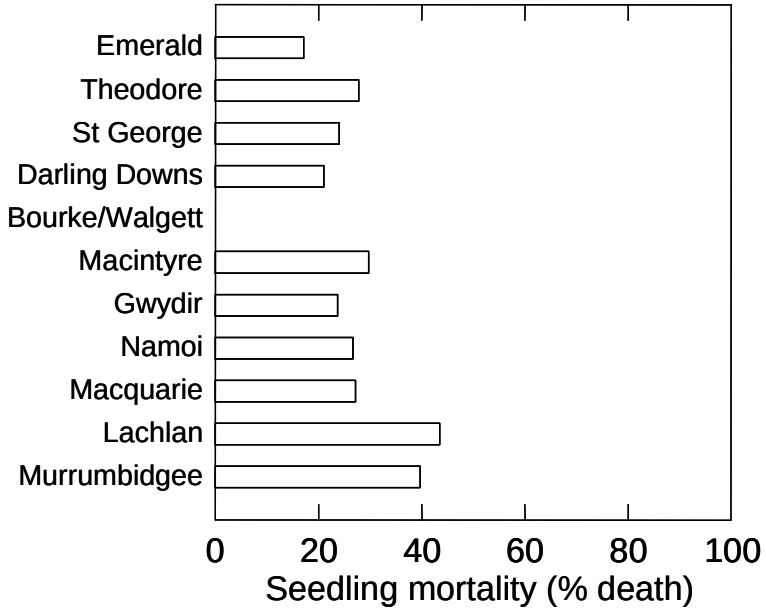

Figure 1. Seedling mortality of cotton in the 2006-07 season was relatively low in most areas except for the Lachlan and Murrumbidgee Valleys (Bourke and Walgett not assessed)

Fusarium wilt

There was one new case of Fusarium wilt from St George and two new cases of Fusarium wilt were reported in NSW; one in the Macquarie Valley and one in the Gwydir Valley, bringing the total count to 81 farms in NSW. The disease was observed on 36, 68, 73, 64 and 29% of fields inspected in the Gwydir, Macintyre, Darling Downs, St George and Theodore regions, respectively (Fig. 2). The incidence of the disease was generally similar to that of the previous season except for large increases in the % of fields affected in the Gwydir Valley and at St George. In successive surveys in NSW, Fusarium wilt has now been observed on 41% of the 44 farms inspected regularly by NSW DPI.

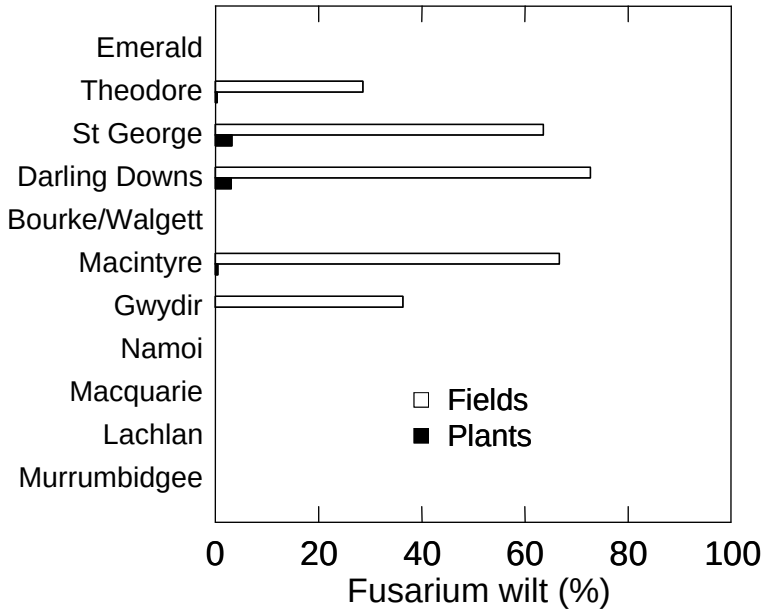

Figure 2. Incidence of Fusarium wilt of cotton in the 2006-07 season (Bourke and Walgett not assessed).

The rate of reporting of new cases of Fusarium wilt in NSW has declined, with only two new cases reported each year for the past four seasons. However, the fact that the distribution of the disease is still increasing indicates that the Fusarium wilt pathogen is more widespread than reported and is still spreading. The slower rate of reporting in recent years may reflect a combination of (i) farm hygiene measures, (ii) decreased cropping area due to drought and

(iii) increased use of less-susceptible varieties. However, the rate of discovery of Fusarium wilt in the set of farms used in the disease surveys in NSW has continued to increase at a steady rate (Figure 3). If the pathogen continues to spread at the same rate, then we can expect 100 % of the farms in the survey set to be affected by Fusarium wilt within 15 years. The future impact of Fusarium wilt on cotton cropping will depend on the extent to which growers deploy varieties with disease resistance.

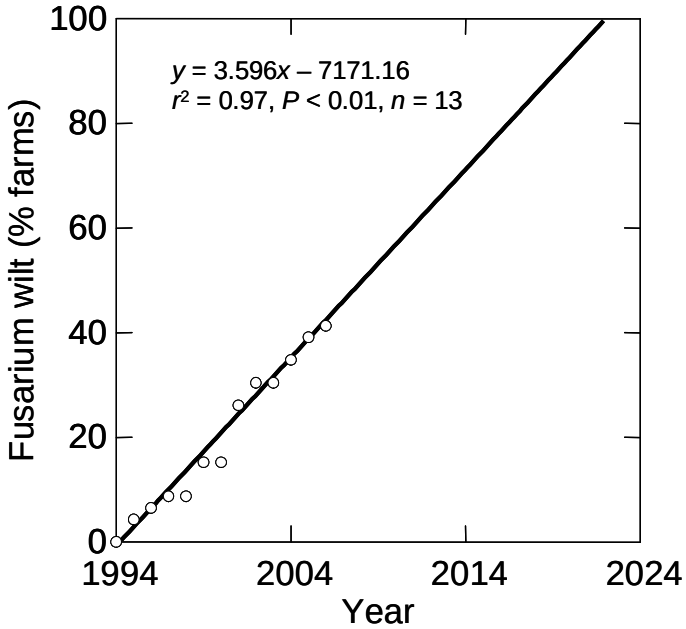

Figure3. The incidence of Fusarium wilt in the set of NSW farms surveyed annually by NSW DPI has increased steadily each year and, if the pathogen continues to spread at the same rate, may affect all farms within 15 years.

In the 2006-07 season, 100% of crops sown in NSW were with varieties that had an F-rank of 100 or more, compared to 89% in the previous season and only 12% in 1999-00. Most new cases reported in the past few seasons have been observed as either a few scattered plants or relatively small patches of dead plants. Given the wider use of higher-F-rank varieties, it seems unlikely that new cases will now be found as large sections of dead and dying plants within crops, as occurred in the 1990's. However, the use of resistant varieties alone will not prevent further spread of the pathogen and even the best varieties currently available will still succumb to the disease when the pathogen is present in sufficient numbers in the soil.

Fusarium wilt has now been observed on all farms visited in the St George area and on all irrigated farms visited on the Darling Downs. However, the average incidence of the disease in these two regions was only 3.2 and 3.1 per cent, respectively in 2006-07. One field in the St George area had an average incidence of 22% of plants infected with 78% of plants infected in a large area at one end of the field.

It is interesting to note that the incidence of Fusarium wilt in crops on the Darling Downs has decreased from 10.6% to 7.8% to 7.4% to 3.1% over the last four seasons. Some of the factors contributing to this decrease may include delayed planting associated with the later planting window, the use of more resistant varieties and less favourable climatic conditions in association with the current drought.

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 QDPI 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 now occurs in all production areas of Queensland and NSW. The disease was observed in 58% of fields and 14% of plants surveyed in the major valleys in NSW (Macintyre, Gwydir, Namoi and Macquarie); down from 60% and 28% respectively in the previous year. This decline may reflect the effects of drought, as many fields had extended periods of fallow. The Namoi and Macquarie valleys were again the worst affected (respectively, 80 and 76% of crops inspected, Figure 4). The distribution of black root rot has expanded in the Lachlan and Murrumbidgee Valleys in recent years. However, the disease was only observed in 20 and 25% of fields inspected in 2006 (Figure 4), compared to 67 and 50% in the previous year, respectively. The severity of black root rot increases with successive cotton crops. There are currently no adequate control measures for black root rot. Many farms do not have the disease and farm hygiene should be practiced to minimise further spread.

Black root rot was not observed during surveys in Queensland production areas. The disease has only been rarely observed in the Emerald and Theodore areas over the last five seasons. The late planting window was probably a significant factor for crops in the St. George and Darling Downs areas.

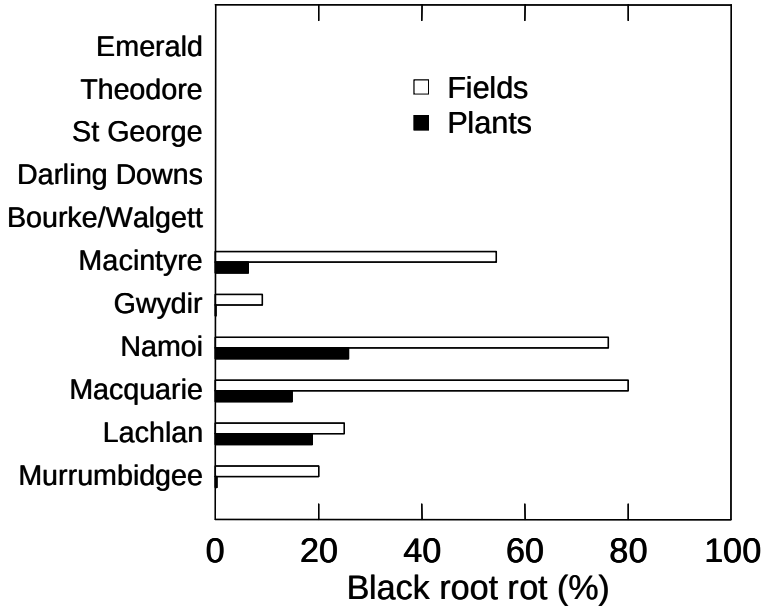

Figure 4. The incidence of black root rot of cotton in the 2006-07 season was high in the Namoi and Macquarie Valleys (Bourke and Walgett not assessed).

Verticillium wilt

In March 2007, the mean incidence of Verticillium wilt across NSW was 4.9% of plants, (3.4% in the previous season). The NSW mean includes the incidence of Verticillium wilt in the Namoi Valley, which was 10.4 % of plants in March 2007 (Figure 5). During the period from 1999-00 to 2004-05, an average of 43% of crops in the Namoi had a V-rank of less than 90 (i.e. susceptible), compared with 11% of crops in the five years preceding that. This trend for declining use of resistant varieties appears to have reversed. In the 2006-07 season, 88% of the crops inspected in NSW were moderately to highly resistant, having a V-rank of 90 or more (97% in the previous season). Verticillium wilt incidence may rise further in areas where resistant varieties are not used. Growers are urged to observe the distribution of Verticillium wilt on their farms and sow resistant varieties accordingly.

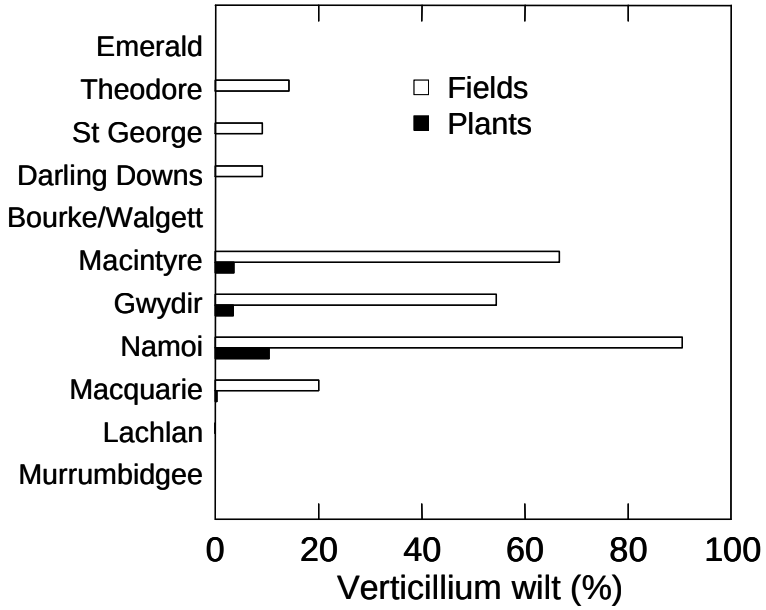

Figure 5. The incidence of Verticillium wilt in March 2006-07 was greatest in the Namoi Valley (Bourke and Walgett not assessed)

Boll rots

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 predominant type of boll rot in 2006-07. In NSW the average incidence of all boll rots was very low 0.5% (0.9% the previous season), with 4.5% in Queensland (1.4% the previous season).

The early planting in the Emerald area resulted in crops approaching maturity in January and early February. This coincided with over 200mL of rainfall during this period. As a consequence boll rots and tight lock were prevalent. The average incidence of affected bolls was 14.5% with 25% of bolls ruined in one crop. The tight lock symptoms result from exposure to wet weather and infection by fungi that can degrade cellulose. The locks fail to fluff out and remain compact, often falling to the ground. *Phytophthora* sp, *Colletotrichum* sp and *Fusarium* sp. appeared to be the most common fungi involved. The incidence of boll rots in other areas was generally low.

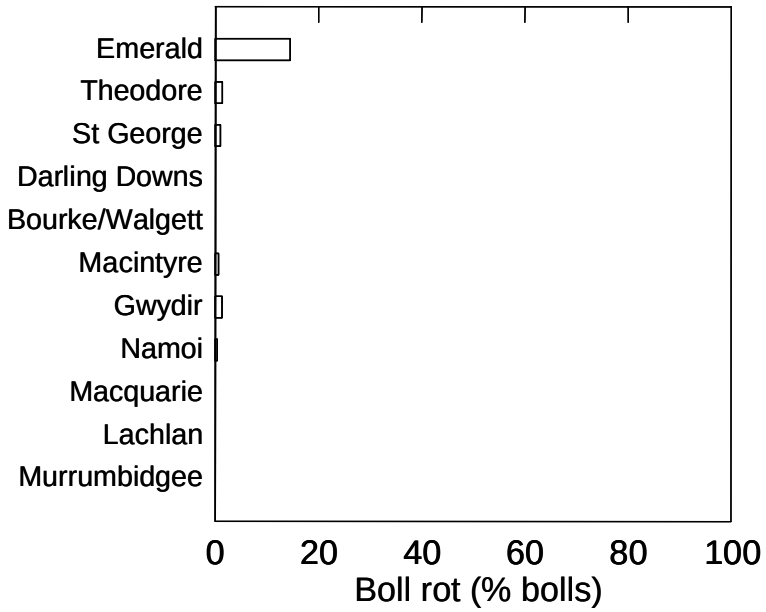

Figure 6. The incidence of boll rots, including those caused by *Phytophthora* and other fungi, in 2006-07 was very low except in the Emerald region where wet conditions were experienced during boll opening

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. Virtually no symptoms of *Alternaria* leaf spot were observed on cotton seedlings in the November 2006. Alternaria leaf spot was observed in trace amounts in many, but not all, crops surveyed throughout NSW and Queensland in February-March 2007, with the notable exception of crops in the Emerald area where another consequence of the early planting and exposure to wet weather in January and February was the prevalence of Alternaria leaf spot. On average 2.2% of the leaf area was affected with 7.5% of the leaf area affected and some defoliation in one crop. It is interesting to note that the field with the highest incidence of the disease was the field with the largest carryover of cotton crop residue from the previous season.

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. The leaf mottle symptoms occasionally occur unaccompanied by the bunchy growth habit if plants acquire the disease late in the season. Bunchy top was observed in only three of the eleven crops inspected in the Emerald area. The average incidence of bunchy top in this area was 0.03%.in 2006-07 and one plant with the leaf mottle symptoms was observed in the NSW surveys.

Other diseases and disorders

Sudden wilt was observed as isolated plants in a few crops in NSW but not in the plants assessed in the surveys. Sudden wilt is caused by ‘ordinary’ species of Fusarium that are usually non-pathogenic and it is often associated with waterlogging. Affected plants wilt, defoliate and die. Plants may produce regrowth in some situations. Sudden wilt does not re-occur in the same places in the following crop.

Dieback of the branches of a few cotton plants was observed in a crop in the Macquarie Valley and the fungus *Sclerotinia sclerotiorum* was isolated from those stems. The symptoms, included defoliation, rotting stems, and white mycelium (fungal growth) on the outside of the stems. The disease was only observed in patches of the crop that had completely lodged, with plants lying on the ground in a dense mat. Sclerotinia has occasionally been observed in association with boll rots in previous surveys but the problem usually only occurs when the canopy of the crop is dense enough to create very moist conditions. *S. sclerotiorum* is not likely to be a problem in crops with a normal canopy structure.

One crop in the Dirranbandi area of Queensland was developing slowly with ‘shiny’ pale leaves curved up at the margins when inspected in early December 2006. These symptoms were thought to be indicative of a mild zinc deficiency and a sample of roots was collected for determining the level of infection by mycorrhizal fungi. The field had come out of four years bare fallow with several cultivations for weed control. The roots that were sampled had only 5-10% colonisation by mycorrhizal fungi and this was considered low for 8 week old seedlings.

Acknowledgments

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