

Disease survey summary for 2023/24 season**Early season disease survey**

In total, we visited 68 fields across the Border Rivers, Gwydir, Namoi, Macquarie, Murrumbidgee and Lachlan valleys. With a warm September, a significant number of fields benefited from early planting in the last week of September window. Many fields in Macquarie established to the ideal 12-14 plants/m (Figure 1). Disease pressure in those early planted crops also appeared mild during our visit in the first week of November (Figure 2). However, many other fields still experienced a significant infection with black root rot, which is prevalent across NSW (Figure 3).

Alternaria leaf spot was very minor this year, while Fusarium wilt was prevalent in the Border Rivers and Gwydir valleys (Figure 4).



Figure 1: Seedling establishment at the near ideal 12-14 plants/m in an early planted crop in north Warren (Macquarie valley).



Figure 2: Seedlings with relatively healthy root systems.



Figure 3: Characteristic symptoms of black root rot, which remains a pandemic seedling disease across NSW.



Figure 4: Death of seedlings were probably associated with *Fusarium* infection.

Lachlan

We visited a total nine fields around Forbes, Condobolin and Hillston for early season disease surveillance. Crops were established well, average seedling stands per meter ranged from 9.9 to 14.3. Black root rot incidence varied between 0 to 99.5% (mean 57.4%) (**Table 1**); the disease severity was from 0 to 53.3% (mean 22.9%, which was half of that recorded in 2022/23 season). Mild infection of *Rhizoctonia* was detected in the

Lachlan with the incidence ranging from 16 to 98% (mean 52.4%); the disease severity was from 1.8 to 15.9% (mean 4.8%). Alternaria leaf spot was not detected in the surveyed fields.

Table 1: Summary of plant stand and disease incidence (%) and severity (%) recorded during the early season disease surveys in NSW in 2022/23 and 2023/24 seasons.

Valleys	Plant Stand/m	Fov incidence (%)	Black root rot		Rhizoctonia rot		Alternaria leaf spot	
			Incidence (%)	Severity (%)	Incidence (%)	Severity (%)	Incidence (%)	Severity (%)
2022/23 season								
Border Rivers	10.4	1.7	27.6	8.2	66.7	5.7	43.9	1.4
Gwydir	10.5	2.0	65.5	21.8	87.8	11.5	76.8	0.2
Namoi	10.5	0.0	21.5	5.5	83.3	7.1	49.7	0.6
Murrumbidgee	12.5	Detected	48.9	30.4	76.7	12.7	30.9	1.0
Lachlan	12.6	Detected	65.9	45.8	51.9	11.5	25.9	0.9
2023/24 season								
Border Rivers	10.4	0.4	20.1	7.2	86.5	11.1	7.2	0.05
Gwydir	10.1	6.0	47.2	8.9	81.4	6.3	16.1	0.07
Namoi	10.3	0.0	30.4	4.5	96.4	8.5	3.6	0.03
Macquarie	12.8	0.6	27.1	11.4	85.1	7.7	6.2	0.15
Murrumbidgee	10.6	0.0	32.2	13.6	45.9	3.2	2.1	0.02
Lachlan	11.2	0.0	57.4	22.9	52.4	4.8	0.0	0.00

Murrumbidgee

A total 11 fields were surveyed in the Murrumbidgee. Average seedling stands per meter ranged from 8 to 14.4. Black root rot incidence varied between 6.5 to 93% (mean 32.2%) (**Table 1**); the disease severity was from 1.6 to 49.8% (mean 13.6%). Rhizoctonia rot incidence ranged from 7 to 96.5% (mean 45.9%); mild infection was detected with mean severity of 3.2%. Alternaria leaf spot was detected in six fields. Alternaria leaf spot incidence ranged from 0 to 11.5% (mean 2.1%) and the severity was mostly less than 0.5%.

Macquarie

A total of 10 fields were surveyed in the Macquarie. Average seedling stands per meter ranged from 6 to 17.3. Black root rot was detected in all surveyed fields. The incidence varied between 1.5 to 100% (mean 27.1%); the disease severity ranged from 0.2 to 66.9% (mean 11.4%). Rhizoctonia rot incidence varied from 55 to 100% (mean 85.1%); severity varied from 1.7 to 18.9% (mean 7.7%). Alternaria leaf spot was minor in all surveyed fields, with the incidence was from 0 to 52% (mean 6.2%) and the severity was mostly less than 0.5%. Fusarium wilt on seedling was detected in one field with the incidence up to 6%.

Namoi

A total of 15 fields were surveyed in the Namoi. Average seedling stands per meter ranged from 7.7 to 13. Black root rot was detected in all surveyed fields. The incidence varied between 3.5 to 78% (mean 30.4%); the disease severity ranged from 0.4 to 15.6% (mean 4.5%). Rhizoctonia rot incidence varied from 80 to 100% (mean 96.4%); severity varied from 1 to 24.5% (mean 8.5%). Alternaria leaf spot was prevalent in all surveyed fields, with the incidence was from 0 to 9.5% (mean 3.6%) and the severity was mostly less than 0.5%.

Gwydir

A total of 12 fields were surveyed in the Gwydir. Average seedling stands per meter ranged from 6.9 to 11.6. Black root rot incidence varied between 1 to 96% (mean 47.2%); the disease severity varied from 0.9 to 27.5% (mean 8.9%). Rhizoctonia rot incidence varied from 33 to 100% (mean 81.4%); severity varied from 3.2 to 14.2% (mean 6.3%). Alternaria leaf spot was prevalent in many surveyed fields, with the incidence ranging

from 1 to 25.5% (mean 16.1%) and only minor pin head lesions were observed in most fields and the severity was below 0.5%. Fusarium wilt on seedlings was detected in seven fields with the disease incidence varied from 0.5 to 26% (Figure 4). The mean incidence in the Gwydir was 6%, increasing three times compared to that of last season.

Border Rivers

A total of 11 fields were surveyed in the Border Rivers. Average seedling stands per meter ranged from 6.4 to 12.8. Black root rot incidence varied between 2.5 to 96.5% (mean 20.1%); the disease severity varied from 0.3 to 59.1% (mean 7.2%). Rhizoctonia rot incidence varied from 57.9 to 100% (mean 86.5%); severity varied from 4.5 to 20.1% (mean 11.1%). Alternaria leaf spot was prevalent in all surveyed fields, with the incidence ranging from 1.5 to 27.5% (mean 7.2%); the disease severity was less than 0.5%. Fusarium wilt on seedlings was detected in three fields with the disease incidence lower than 1%.

Late season disease survey

A total of 67 fields were visited during our late season disease survey. Most surveyed crops performed well during our visits. The disease pressure recorded during our late season survey was relatively low. Foliar symptoms associated with Alternaria, Fusarium and Verticillium infection were mild (Figure 5). Again, cotton bunchy top disease was detected many valleys (Table 2). However, the disease was highly sporadic and may not cause yield loss concerns. Additionally, black necroses of the pith and surrounding woody tissue associated with black root rot infection were detected more often this season (Figure 6). However, a severe black root rot infection early in the season did not warrant a vascular infection later in the season.

We also updated here a preliminary data for plant parasitic nematodes that were recovered from soil samples collected during our early and late season disease survey trips. Two known nematodes such as spiral (*Helicotylenchus* sp.) and lesion (*Pratylenchus* spp.) were detected in cotton soil in NSW and appeared to be associated with geographic distribution. A small number of stunt nematodes were also recovered in several fields. In this update, we only focus on spiral and lesion nematodes. Detection of these parasitic nematodes may not pose additional concern at the moment since these common nematodes, especially the *Helicotylenchus* species require a very high number to cause damage on the crop. However, it appears that cotton can be a suitable host for these species.



Figure 5: Relatively mild foliar symptoms such as yellow mottling and necroses associated with *Verticillium* infection, which were commonly observed during late season disease survey in 2023/24 cropping season.



Figure 6: Profound black necroses of the pith and surrounding woody tissue were associated with black root rot. These necroses were commonly localised around the collar area.

Lachlan

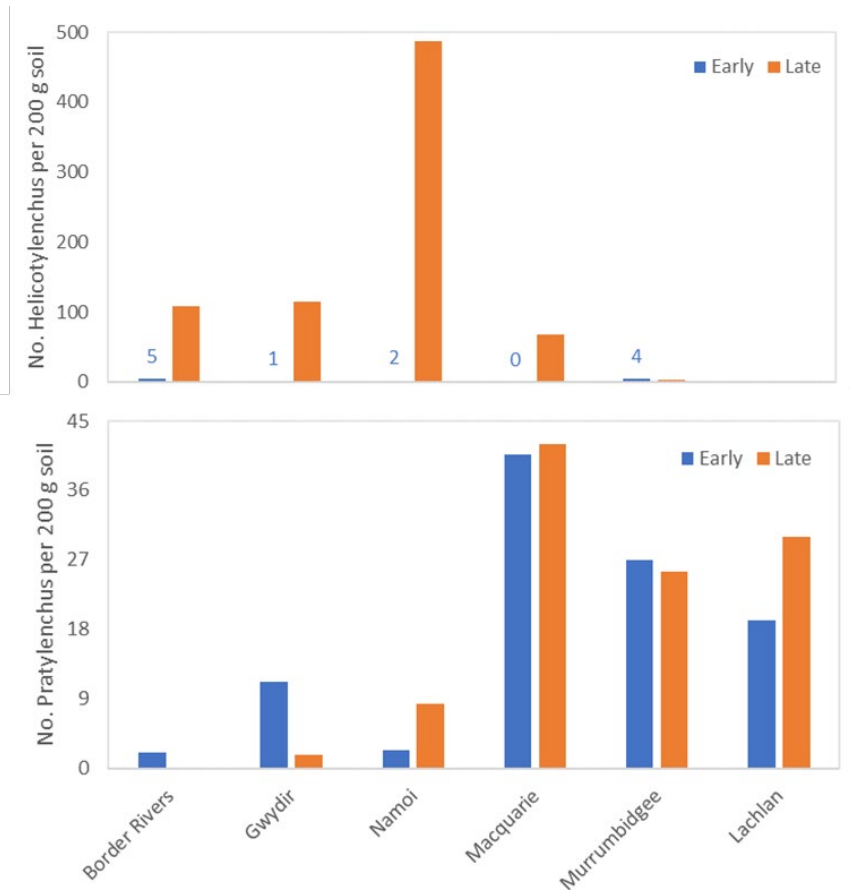
Verticillium wilt was detected in four of the nine surveyed fields with the incidence below 2%. However, *Verticillium* wilt caused a real concern for a grower in Forbes when the disease continued to spread within an infested field after four years without growing cotton. *Fusarium* wilt was detected in one field with the incidence below 10%. *Alternaria* leaf spot was evident on the top half of the canopy in all nine surveyed fields; the disease severity was mostly around 1% (**Table 2**). Low incidence of boll rot and tight lock was detected in the lower canopy. Evidence of black root rot colonised the woody tissue was detected in one field. Cotton bunched top was detected in two fields. *Eutypella* wilt were not detected in the surveyed fields this season.

No spiral nematode was detected in the surveyed fields. Lesion nematode was detected in five fields with the average number of 19.2 and 30 nematodes/200 g soil for early and late season samples, respectively (Figure 7).

Murrumbidgee

The surveyed crops in the Murrumbidgee performed well this year and the late season disease pressure was low (**Table 2**). Mean *Alternaria* leaf spot severity was at 1.5%. Boll rot and tight lock were not detected in the surveyed transsects. *Verticillium* wilt was only recorded in one surveyed field near Hay with the incidence of 4%. However, *Verticillium* wilt disease in another non-surveyed field located west of Griffith appeared increasing rapidly since its the first detection in a small isolated batch in 2020 season (Figure 8). *Fusarium* wilt was detected and confirmed in four fields, including two that did not have a previous history of *Fusarium* wilt, mean incidence 0.4%. Same as the last cropping season, cotton bunchy top and *Eutypella* wilt were not detected in the surveyed fields this season.

Spiral nematode was detected in one surveyed field with only 4 and 3 nematodes/200 g soil of early and late season samples, respectively. Lesion nematode was detected in six fields. The averaged number/200 g soil decreased from 27 in early season sample to 25.5 in late season sample (Figure 7).



b

Figure 7: Numbers of *Helicotylenchus* sp. and *Pratylenchus* sp. per 200 g of soil recorded early and late in the season across NSW in 2023/24 cropping season. The data were only counted and averaged from nematode infested fields.



Figure 8: Verticillium wilt in a field near Griffith appeared to spread rapidly along and across planting rows from a small, isolated batch which was detected the first time in 2019/20 cropping season.

Table 2: A summary of disease incidences of boll rot, tight lock and bunchy top, and severity of Alternaria leaf spot recorded during the late season disease survey in the 2022/2 and 2023/24 seasons.

Valleys	2022/23 season				2023/24 season			
	Alternaria	Boll rot	Tight lock	Bunchy top	Alternaria	Boll rot	Tight lock	Bunchy top
Border Rivers	0.6	1.6	0.8	Detected	0.5	5.3	1.9	Detected
Gwydir	0.8	1.8	1.0	0.2	0.1	0.9	2.2	Detected
Namoi	0.2	2.0	0.1	0.2	0.6	0.6	0.6	0.1
Macquarie	1.2	1.4	0.8	0.3	2.3	2.2	0.7	Detected
Murrumbidgee	0.7	0.2	0.0	0.0	1.5	0	0	0
Lachlan	0.2	0.2	0.0	0.0	1.0	0.1	0.4	0.1

Macquarie

Verticillium was detected in five out of nine surveyed fields; the disease incidence varied between 3 to 47% (mean across valley 5.4%). Fusarium wilt was detected in two surveyed fields, including one that did not know of a previous history. The disease incidence up to 58% (mean across valley 6.4%) (Figure 9). Eutypella wilt was detected in one field where there was no known history previously (Figure 10). Alternaria leaf spot was prevalent; the mean disease severity was recorded at 2.3% (**Table 2**). Boll rot and tight lock were detected at low level in all surveyed fields with the mean incidence of 2.2 and 0.75, respectively. Cotton bunchy top was detected out of surveyed transects in four fields.

Spiral nematode was only detected in five soil samples collected late in the season, with the average of 67.8 nematodes/200 g soil. Lesion nematode was detected in three fields. The averaged number/200 g soil slightly increased from 40.7 in early season sample to 42 in late season sample.

Namoi

No Fusarium wilt was detected in the valley during the late season disease survey. Verticillium wilt was detected in all surveyed fields in the valley. The disease incidence was higher than that of the 2022/23 season (Figure 9). However, most crops performed well and the Verticillium wilt expression was relatively mild. The disease incidence varied from 0.5 to 86% (mean 33.2%). Eutypella wilt was only detected in two fields, including one virgin field with the incidence below 1%. Alternaria leaf spot was minor. The disease severity was most below 0.6%. Boll rot and tight lock were detected at low level with the mean incidence of 0.6% compared to 2% in the 2022/23 season. Cotton bunchy top was detected at low level in three surveyed fields; the mean incidence was below 0.1%.

Spiral nematode was detected in eight fields. The averaged number/200 g soil increased from 2 in early season sample to 486.8 in late season sample. It is noted that spiral nematode in one upper Namoi field was counted to 2724 individuals/200 g soil collected late in the season, increasing over 200 folds compared to that in the early season sample. Similarly, number of lesion nematode also increased from 2.3 to 8.3, and was also detected in eight fields. However, only three fields were detected with both nematodes.

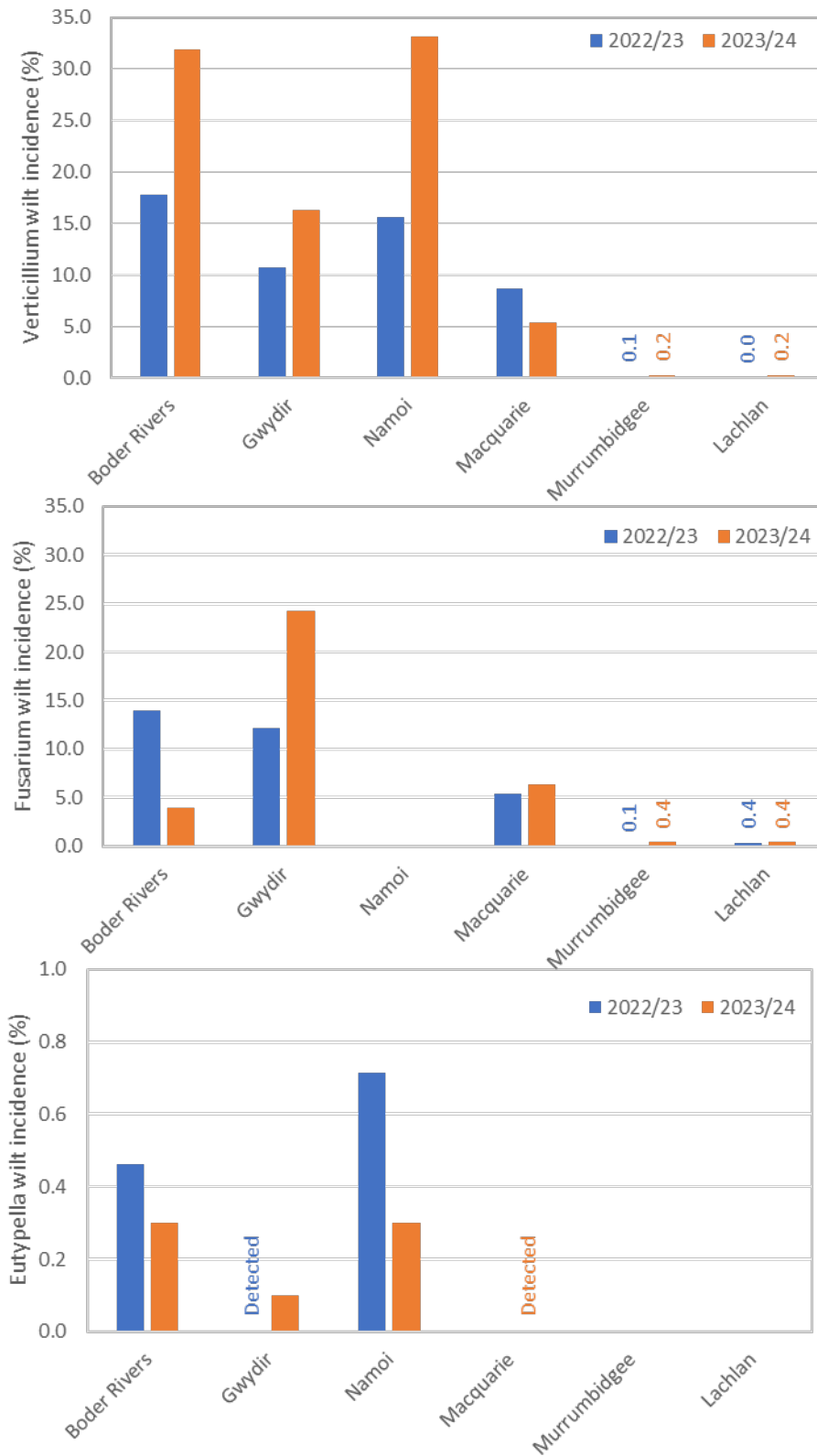


Figure 9: Disease incidence (%) of Eutypella, Fusarium and Verticillium wilts recorded in two seasons between 2022 and 2024.



Figure 10: Characteristic wedge-shaped vascular discoloration induced by *Eutypella* infection. **Note:** *Eutypella* infection also induced necroses and death of the outer bark, which was not observed in those infected with either *Fusarium* or *Verticillium*.

Gwydir

Again this year, *Fusarium* wilt was highly prevalent in the Gwydir valley. The disease was detected in 10 out of 12 surveyed fields. However, most *Fusarium* infested fields had low incidence around 15%. Only three fields had the disease incidence over 45%. The mean incidence across the valley was at 24.2% (Figure 9). *Verticillium* was detected in 10 fields with the incidence mostly below 15% (mean 16.2%). A total of nine fields were detected with both wilt diseases. *Eutypella* wilt was detected in three fields, including one virgin field. *Alternaria* leaf spot was minor, the mean incidence across the valley was 0.1%. Boll rot and tight lock were detected at low level, the mean incidence was at 0.9 and 2.2%, respectively (Table 2). Only two cotton bunchy top plants were detected outside of surveyed transects in two fields. Evidence of black root rot colonised the vascular tissue was observed in seven surveyed fields.

Spiral nematode was detected in eight fields. The averaged number/200 g soil increased from 1 in early season sample to 115.3 in late season sample. In contrast, number of lesion nematode also decreased from 12.2 to 1.8, and was also detected in five fields.

Border Rivers

Fusarium wilt was prevalent and detected in eight surveyed fields; however, the incidence only varied from 0.5 to 20% (mean 4%). Similarly, *Verticillium* wilt was prevalent and detected in nine out of 11 surveyed fields with the incidence varying from 1 to 76% (mean 31.8%). Though *Fusarium* and *Verticillium* wilts were prevalent in the surveyed fields, most had relatively low level of foliar expression which was detectable upon stem cut examination. *Eutypella* wilt was detected in four fields with low incidence below 1%. *Alternaria* leaf spot was minor, mean disease severity was scored at 0.5%. Boll rot and tight lock were at low level with the

mean incidence of 5.3% and 1.9%, respectively. Cotton bunchy top was detected outside of surveyed transects in one field.

Spiral nematode was detected in two fields. The averaged number/200 g soil increased from 5 in early season sample to 108 in late season sample. In contrast, number of lesion nematode also decreased from 2 to 0, and was also detected in two fields.