

Super wheat crop demonstration

SUMMARY

The target of a six tonne wheat crop was not achieved at all three sites. The dry spring reduced the yield potential of Frame, hence the most limiting factor was water. The demonstration showed little consistencies for treatment responses across the three sites.

A crop's potential is only as great as its most limiting factor and this demonstration sets out to find out exactly what that might be. Each treatment increases the amount of inputs to observe how much is needed to achieve maximum yield, under optimum conditions.

The demonstration was first conducted in 1996. In that year it became clear early on that the target yield of six tonne would not be reached despite above average rainfall and high soil nitrogen levels. Take-all, CCN and *Pratylenchus* levels were tested, they were all too low to affect yield. Soil tests taken to 130cm revealed that boron levels below 50cm were extremely toxic. Boron levels above 15ppm are thought to be toxic to plant growth. Test results indicated that at 50cm levels were above 19ppm. Exchangeable sodium percentage (ESP), a measure of sodicity was greater than 30% further inhibiting plant growth. In both 1997 and 1998, rainfall was the limiting factor.

METHOD

At all three sites (Birchip, Sea Lake, and Charlton) Frame wheat was used (80kg/ha). The source of phosphorous used was Mallee Mix I.

Table 4.6 Treatments and costs (\$/ha)

No	Description	Cost (\$/ha)
C	30kgN predrilled, 20kgP with seed	64.50
1	40kgN predrilled, 20kgP with seed, 30kgN topdress	86.50
2	40kgN predrilled, 20kgP with seed, 30kgN topdress, + foliar nutrients	90.10
3	40kgN predrilled, 20kgP with seed, 30kgN topdress + foliar fungicide (folicur)	112.60
4	40kgN predrilled, 20kgP with seed, 30kgN topdress + foliar nutrients (Pivot Top foliar) + foliar fungicide	116.20
5	40kgN predrilled, 20kgP with seed, 30kgN topdress + nematicide (Counter*)	139.50
6	40kgN predrilled, 20kgP with seed, 20kgN topdress every 3 weeks between Z15-32	103.00

*Counter not applied at Sea Lake and Charlton

RESULTS

Table 4.7 Birchip yield results for Frame wheat

No	Yield (t/ha)	Pro	Scr	WUE	Grade
C	4.76	13.5	-	31.9	HAPW
1	4.79	13.2	-	32.1	HAPW
2	4.25	14.3	-	28.5	HAPW
3	4.42	14.0	-	29.6	HAPW
4	4.60	14.0	-	30.8	HAPW
5	4.90	13.7	-	32.8	HAPW

6	4.66	14.1	-	31.2	HAPW
---	------	------	---	------	------

Birchip: The yields from Birchip plots show very little difference between treatments. Soil available nitrate nitrogen was very high (154kg/ha). Certain treatments (No's 2,3,4 and 6) yielded less than the control. Moisture conditions early in the season were ideal for plant growth. Frame grew very rapidly and was unable to maintain itself during the dry spring. Many of the heads were pinched suggesting that the crop hayed-off. *Pratylenchus* levels at sowing were reasonably high at 29RLN/g soil. The nematicide treatment (No. 5) yielded the best suggesting that *Pratylenchus* was also a limiting factor at the site. Water use efficiency for all treatments was very high.

Table 4.8 Sea Lake yield results for Frame wheat

No	Yield (t/ha)	Pro	Scr	WUE	Grade
C	2.68	10.2	4.7	25.9	APW
1	2.59	11.8	4.8	25.0	APW
2	2.89	10.6	4.0	27.9	APW
3	3.28	11.0	3.5	31.7	APW
4	2.89	12.2	4.0	27.9	HAPW
5 ¹	2.82	11.9	4.5	27.2	APW
6	2.53	14.1	8.0	24.4	GPI

¹ Counter was not applied

Sea Lake: Initial soil nitrogen levels were 67kg/ha, with mineralisation of 30kg/ha the crop had a potential yield of 2.5t/ha based on an average season. GSR was 167mm (decile 2.1). This reduced the yield potential to 2.0t/ha. Treatment 3, highest input yielded the highest and had the best WUE.

Table 4.9 Charlton yields for Frame wheat

No	Yield (t/ha)	Pro	Scr	WUE	Grade
C	2.71	9.6	4.0	15.0	ASW
1	3.03	11.3	2.7	16.8	APW
2	3.42	10.9	4.2	18.9	APW
3	3.18	10.6	3.4	17.6	APW
4	3.24	11.0	2.9	18.0	APW
5	2.54	10.7	2.7	14.1	APW
6	2.46	11.5	1.4	13.6	APW

Charlton: The six tonne crop was not achieved for all treatments. No treatment yielded the season potential of 3.6t/ha (based on decile 2.5 season). WUE on the heavy, brown clay loam soils were low. They were below the target potential WUE of 20kg/mm/ha. Following autumn rains the crop was subject to waterlogging, additional gypsum would have improved the soil structure problem. Later in the season crown rot was evident in the trial further contributing to lower yields.

OBSERVATIONS

It is important to remember that this trial is a demonstration only and does not have replicated plots. Across all three sites no treatment reached the target of six tonnes. There was little improvement from additional nitrogen inputs at sites where

nitrogen levels were high. The extra nitrogen reduced yields when rainfall was limited later in the season.

Lighter soils in the Mallee have much higher WUE in drier seasons than heavier soils.