Controlling the environment - what limits yield?

SUMMARY
This trial looked at protecting the crop from excessive sun and wind during the spring when crops are flowering and setting seed by covering it in shade cloth in early September. It was expected that this would improve yield and grain size but in fact it had the opposite effect with reduced yields and poor grain quality.

The aim was to investigate as many possible factors which limit wheat yield.

BACKGROUND

The 'Six tonne crop' trial in 1995 identified the main limiting factor to wheat production on the Birchip plains as sub-soil limitations. Boron, high ESP (exchangeable sodium percentage) and high EC (electrical conductivity) were found at 40cm depth which was insufficient to give the crop sufficient rooting depth to supply the crop with sufficient water during the critical grain filling phase.
This trial looked at protecting the crop from excessive sun and wind during the spring when crops are flowering and setting seed by covering it in shade cloth in early September

METHOD

Frame wheat was sown on May 15. The treatments were low and high input.

Low input: Mallee Mix 1 at 80kg plus Urea pre-drilled at 80kg
High input: Mallee Mix 1 at 80 kg, Urea pre-drilled at 80kg, Urea top-dressed at the 5 leaf stage at 60kg, Pivot Top Foliar (a multiple nutrient foliar spray) applied twice (five leaf and pre-booting) at 1L plus a foliar fungicide (Folicur at 290ml) at the end of tillering.

Shade cloth was erected over the sown low and high input treatments (not the broadcast treatment) prior to flowering. The reason for the shade cloth treatment was to observe whether reducing the high incidence of sunlight (solar radiation) and wind, yields could be increased.

The trial is a demonstration only, treatments were not replicated.

RESULTS

Input system	Shade cloth	Yield (t/ha)	Protein (%)	Screenings (%)
low	none	2.32	13.3	0.5
high	none	2.44	14.3	0
low	covered	1.98	13.8	4.0
high	covered	1.88	14.5	3.0

INTERPRETATION

- No difference in yield between the low and high input systems (the extra N applied, foliar nutrients and fungicide in the high input system were of no value)
- The treatments covered with shade cloth yielded less compared to the non-covered areas. This was surprising since the covered crop was slightly taller during grain fill and looked a better crop. It appears that by reducing the incidence of wind and solar radiation there are no real benefits to be made.
- Protein increased by approximately 1.0% with the addition of urea at the five leaf stage
- The grain in the shade cloth treatments looked pinched and shrivelled and had the highest screenings. The shade cloth treatments had 3.0% defective grain, compared to 0.6% in the open area. The falling number for the shade cloth treatment was 396 secs whilst for the open treatments it was 435 secs (both are above the minimum standard of 300 secs).