Applying nitrogen to late sown wheat is a waste of money in South Australia

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Early sown wheat produces low grain yields in South Australia. The low yields are not generally due to frost damage at flowering, so some other factor must be limiting. The environmental conditions during the month before flowering have a large influence on the subsequent yield. For early sown wheat in S.A. this period occurs during July and August, when the soil is very wet. Drew and Sisworo (1) showed that the shoot uptake of nitrogen in barley dropped quickly when the soil was waterlogged, so it is possible that the wet conditions during winter are leading to nitrogen deficient crops. We set up a trial to examine whether nitrogen deficiency during the month prior to anthesis was causing the low yields of early sown wheat in South Australia.

Methods

Wheat was sown on five dates (May 2, May 21, June 13, August 4 and September 3) at Tailem Bend in 1986. Nitrogen, in the form of urea, was applied to the soil of half of the plots at rates of 15 kg N/ha at sowing, 10 kg N/ha at tillering and 10 kg N/ha at early booting. The trial was sown as small plots (8.3m*1.44m) at a rate of 100 seeds/m^2. The soil was a shallow sand (20cm deep) with limestone underneath and a pH of 7.6. Rainfall in the period from April to November was 307mm; most of it falling in winter.

Results and discussion

The biggest increase in yield from the nitrogen fertilizer was at the second sowing date, the highest yielding sowing date both with and without additional nitrogen (see Figure 1). The change in yield with applied nitrogen (in order of sowing date) was 0.24, 0.62, 0.20, -0.02 and -0.06 t/ha. The nitrogen fertilizer produced a relatively small increase in yield for the wheat sown on the first and third dates, and wheat sown after the end of June did not respond at all. It is clear that the date on which wheat is sown has a large effect on the crop's utilization of nitrogen and on the subsequent grain yield.

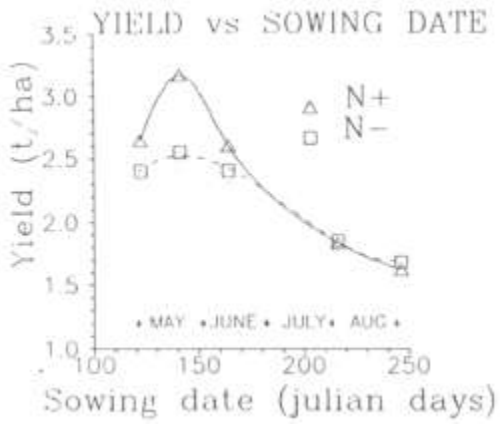

Figure 1. The relationship between grain yield and applied nitrogen, for wheat sown on different dates

Nitrogen deficiency prior to flowering did not appear to limit the yield of the early sown wheat, although the evidence to support this is of a circumstantial nature.

Shoot concentrations of nitrogen were not measured and the application of urea was assumed to overcome any deficiency of nitrogen.

1. Drew, M.C. and E.J. Sisworo (1979). New Phytol. 82: 301-314.