Fertilizer requirements of irrigated linseed at Emerald II. the interaction of N, P and Zn with long fallow.

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The experiment reported in the previous paper (1) was repeated in 1983 with limited success. The observations recorded and possible reasons for their occurrence are discussed in this paper.

Methods

The site selected had been under 18 months fallow. A soil dressing of zinc sulphate monohydrate (15 kg Zn ha^{-1}) was broadcast four months before sowing. The experiment consisted of four rates of N as nitram (0, 40, 80 and 120 kg N ha^{-1}) and three rates of P as double super (0, 20 and 80 kg P ha^{-1}) in a factorial design with four replicates. Plot size was 22.5 m^2. Linseed cultivar Glenelg was sown on the heavy black cracking clay soil (Ug 5.12) on June 16, 1983. The crop was sprayed twice with a 1% solution of zinc sulphate heptahydrate. Growth rankings were taken on three occasions during the flowering period. The crop was spray irrigated to eliminate the possibility of moisture stress.

Results and Discussion

This soil typically has 0.5 ppm Zn (0-10 cm) and a pH of 7.5 (2). The soil dressing of zinc failed to preclude the expression of deficiency symptoms (6). and subsequently the zinc sprays failed to eliminate them entirely, but increased plant growth relative to unsprayed areas. Mean growth rankings over the flowering period are presented in Table 1. Statistically significant responses to nitrogen phosphorus and their interaction occurred. Better growth was observed on average at intermediate levels of phosphorus (20 kg P ha^{-1}) and low levels of nitrogen (0 kg U ha^{-}). In the absence of applied phosphorus, growth was improved by the application of 120 kg N ha^{-1}, but at the highest rate of phosphorus, the highest rate of nitrogen reduced growth. Grain yields of only 220 kg ha^{-1} resulted (data not presented)˙ with response patterns similar to the growth rankings shown.

Zinc deficiency was likely to be a problem, since symptoms may occur on soils with < 0.8 ppm Zn and pH >7.0, especially after long fallow (3). The failure of the soil zinc dressings to eliminate deficiency symptoms may be attributable to the rate (4) and timing of application (5), and to the distribution of applied zinc through the soil (5). The zinc sprays were applied too late in the life cycle (6) to fully correct the problem. High rates of fertilizer have been reported to adversely affect soil zinc availability (7), which may explain the poorer growth at high N and P levels. Adequate zinc supply through either soil or early aerial application (6) is essential for the attainment of high yields in this sensitive crop.

Table 1. Growth Rankings (1 poor, 2 = average, 3 = good).

Rate of Applied P	Rate of Applied Nitrogen (kg N ha^{-1}) 0	40	80	120	Statistical Significance		LSD 5%	LSD 1%
0 kg P ha^{-1}	2.0	2.0	1.7	2.5	N	*	.3	.4
20 kg P ha^{-1}	2.8	2.8	2.3	2.5	P	**	.2	.3
80 kg P ha^{-1}	2.3	1.8	2.2	1.3	NxP	**	.5	.6

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