The application of phosphorus fertilizers to cotton at Emerald and Boggabilla

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The limited use of phosphorus (P) fertilizer on cotton in Australia is probably due to the apparent high fertility of the recent alluvial soils used widely for cotton growing. However, a cotton crop of 1,125 kg lint ha -1 requires at least 21 kg p ha ^{1}, of which about 12 kg ha ^{1} is removed in the lint and seed (1). Soil analysis data have shown the soils of most cotton-growing districts to be low to very low in 0.5 M $NaHCO_3$ extractable phosphorus (2) (Consolidated Fertilizers Limited - unpublished data). Responses to mono-ammonium phosphate (MAP 12.3% N, 22% P) have been reported under commercial conditions at St George, Queensland.

Methods

The response of cotton to phosphorus fertilizer was examined on sites which received 150-180 kg N ha^{-1}. The phosphorus was applied as MAP or triple superphosphate (19.2% P). Four replicated field trials were conducted near Emerald (1978-79), and one trial at Boggabilla (1980-81). Three of the Emerald sites had extractable (2) P levels of less than 10 ug g ^{1} in the topsoil (0-10 cm) and received 0, 19.8 and 27.5 kg P ha ^{1} as MAP. The fourth Emerald site had a topsoil P level of 15 ug g ^{1}, and received 0 and 25 kg P ha ^{1} as triple superphosphate. At Boggabilla, the topsoil P level was 11 ug g^{-1}; MAP was applied at 0, 30 and 60 kg P ha^{1}. P was applied in a band 5 cm below and/or 5 cm to the side of the seed.

Results and Discussion

MAP increased seed cotton yields at Emerald by 1,000, 1,070, and 2,260 kg ha $^{-1}$ from control yields of 2,700, 1,940 and 1,520 kg ha^{-1} respectively. The largest response occurred on a site with only 2 ug P g^{-1} soil (0-60 cm) and 8 ug P g^{-1} soil (0-10 cm). At the fourth site, the cotton did not respond to P, but yielded as well as the P-treated plots at the other sites (3,800 kg ha $^{-1}$). At Boggabilla, 30 kg P ha ^{1} increased seed cotton yield by 500 kg ha -1 (control yield 3,500 kg ha $^{-l}$) with no further response from 60 kg P ha $^{-1}$.

These data suggest that, at Emerald and Boggabilla, cotton will respond to P fertilizer when topsoil P levels are less than 11-12 ug g^{-1}. The effects of P fertilizer and soil P sorption capacities on cotton will be studied in the Boggabilla and Moree areas in future projects.

1. Lancaster, J.D. 1977. Crops and Soils Magazine.

2. Colwell, J.D. 1963. Aust. J. exp. Agric. anim. Husb. 3: 190.