Effects of fallow length on sorghum and sunflower responses to P

M.N. Hunter[1], A.N. McCosker[1] and D.E. Hibberd[2]

[1] QDPI, Biloela Research Station - Biloela, Q. 4715
[2] QDPI, Government Offices - Emerald, Q. 4720

Responses to P of dryland sorghum and sunflower crops growing on the low P vertisols of central Queensland are variable (1, 2). Hibberd et al (3) suggest that fallow length may be important in affecting P response. Long fallows exacerbate P deficiency in wheat in the region (4). This study reports the relative effects of fallow length on responses of sorghum and sunflower to P.

Methods.

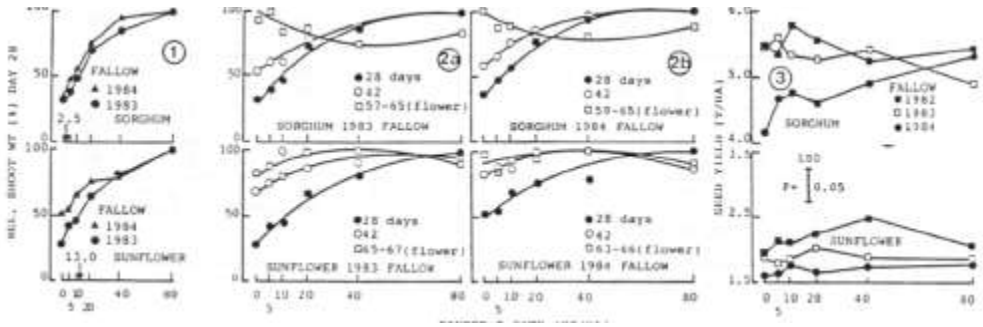
A low PB (5) vertisol (10 mg/kg P) adjacent to a previously reported experiment (6) was bare fallowed following sunflower in (i) June 1982, (ii) July 1983, (iii) July 1984. Prior to planting these fallows on 8/2/85, 50 kg N/ha was broadcast on (iii) to match N increase in the longer fallows. At planting, six rates of P (0, 5, 10, 20, 40, 80 kg/ha) were band applied to the side and below sorghum (E57 plus) and sunflower (Hysun 33) seed in 75 cm rows, to give final populations of 80 000 and 115 000 plants/ha for the respective crops. Dry matters were collected during growth and seed yield measured.

Results and discussion.

Short fallows masked early P deficiency in sunflowers more effectively than in sorghum (Figure 1). (Results from 1982 fallow similar to 1983 and not shown.) Despite a large reduction in early growth due to P deficiency, both crops had recovered by flowering (Figure 2). This recovery was aided by the additional time available to P stressed plants, resulting from the P deficiency induced delay in flowering (8 days in sorghum, 3 days in sunflower). Seed responses to P and fallow length varied significantly (P=0.07) between the two crops (Figure 3), possibly indicating differences in rooting pattern and soil N exploitation, as influenced by P supply.

Roots of both crops were mycorrhizal and recovery from P deficiency is attributed to the plant's accession of soil P via vesicular arbuscular mycorrhiza (VAM). VAM infectivity declines as fallows lengthen (7). Consequently P responses should also increase with increasing fallow length. Fallow effects on early growth suggest that sunflowers probably have greater dependence on VAM than sorghum at this soil P level.

Clarification of the responses of economic crops to P and their relative dependence on VAM is necessary in the low P soils of central Queensland where fallow length is uncertain.



Figs 1-3 Effect of P and fallows on performance of sorghum and sunflower.

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