

Amelioration of hardsetting red duplex wheat soils with gypsum

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Red duplex (texture contrast) and non-friable red clay soils are widely distributed throughout the dryland cereal growing areas of south-eastern Australia. They are a major soil type in northern Victoria (about one million hectares), and are difficult to manage due to their poor structure. This is largely due to the breakdown of surface aggregates on wetting, although impeded profile drainage associated with swelling of the sodic subsoil is also involved. This paper reports some results from a long-term rotation experiment aimed at evaluating the value of gypsum as a soil ameliorant for wheat production.

Methods

The experiments were conducted during 1976-1985 on two sites in north-central Victoria (Glenloth, Raywood). The soils at both sites were hardsetting red brown earths with shallow (<10 cm) topsoils (1). Two cycles of a pasture-fallow-wheat-wheat rotation were used, with gypsum being applied at 0, 2.5, 5, 10 and 15 t/ha during the first fallow, and also (using a split plot design) to each main plot during the second fallow phase.

Results and discussion

Table 1. Average grain yields, and yield responses to gypsum (t/ha, mean of 6 crops, 1977-85) of fallow (F) and stubble-cropped (S) Olympic wheat

Site	Glenloth				Raywood			
	Grain yield		Yield responses		Grain yield		Yield responses	
	F	S	F	F+S	F	S	F	F+S
0	1.38	0.97	-	-	1.30	1.06	-	-
2.5	1.47	1.13	0.16	0.32	1.62	1.24	0.32	0.50
5	1.49	1.19	0.17	0.38	1.64	1.27	0.34	0.55
10	1.52	1.17	0.21	0.40	1.67	1.30	0.43	0.59
15	1.54	1.16	0.22	0.40	1.66	1.26	0.43	0.54

Seasonal variation in grain yields and yield response to gypsum, was associated with growing season rainfall. Whilst gypsum did increase crop establishment in some years, its greatest effect on grain yield was in years of above average spring rainfall; there were no significant increases in dry years. We suggest that these yield responses reflect increased crop water use efficiency, since during crop growth, the development of surface crusts was reduced (2,3) and water entry into the profile increased (1).

The recommended rates of gypsum for these soils are from 2.5 to 5 t/ha which should be effective for two successive crops (1). Based on our results, this would increase total wheat yields by an average of from 0.4 to 0.5 t/ha, and by up to 1 t/ha in favourable seasons.

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