

## Prediction of yield response by soybeans in the South Burnett, Queensland, using soil-tests

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Many soils of the South Burnett are deficient in phosphorus and reliable soil test predictions of soybean response to superphosphate would be of value to growers. Correlations between responses to superphosphate and soil P tests provide the basis for determining soil critical values below which responses to P fertilizer should be obtained.

Yield data from 19 field trials carried out over 3 seasons were used to correlate P responses with soil P tests measured on 0-15 cm samples taken prior to planting. Soil tests used were 0.005 M H<sub>2</sub>SO<sub>4</sub> (Kerr and von Stieglitz 1938), 0.5 M NaHCO<sub>3</sub> (Colwell 1963), 0.001 M CaCl<sub>2</sub> (1:5, 18 h extraction) and equilibrium phosphorus concentration (E.P.C.) determined by constructing P sorption curves (White and Haydock 1968).

At each site, a replicated factorial trial incorporating 4 superphosphate rates (0, 20, 40 and 60 kg P ha<sup>-1</sup>) was conducted and the relative yield value was calculated from the response curve as  
$$R.Y. = \frac{100 \times \text{Po yield}}{\text{Estimated maximum yield}}$$

A square root quadratic function was fitted to relative yield data and each of the 4 soil tests. Coefficients of determination (R<sup>2</sup>) and critical values for 90% of relative yield are shown in table 1.

**TABLE 1. Coefficients of determination and critical values for soil tests**

	0.005 M H <sub>2</sub> SO <sub>4</sub>		0.5 M NaHCO <sub>3</sub>		0.001 M CaCl <sub>2</sub>	E.P.C.
R <sup>2</sup>	0.227	N.S.	0.107	N.S.	0.632**	0.83***
Critical Value	-		-		0.165 µg P g <sup>-1</sup> soil	0.016 ppm

As E.P.C. is an unequivocal measure of intensity (White and Haydock 1968), our results indicate that soybean grain yield response is governed primarily by the concentration of phosphorus in the soil solution. As indicated by its close correlation with E.P.C. (r = 0.89\*\*), CaCl<sub>2</sub> extractable P also estimates intensity. This extractant is more suited to routine determination than the former as it requires only one measurement per sample while the determination of E.P.C. requires at least four.

Colwell, J.D. (1963). Aust. J. exp. Agric. Anim. Husb. 3:190.

Kerr, H.W. and von Stieglitz, C.R. (1938). Bur. Sug. exp. Stn Qld Tech. Comm. No. 9.

White, R.E. and Haydock, K.P. (1968). Aust. J. exp. Agric. Anim. Husb. 8:561.