

## Leaf acid phosphatase and the phosphorus status of wheat

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For diagnostic tests, the plant growing in situ provides the best integration of the interaction between available soil nutrient and climate. The possibility arises that changes in some plant metabolic product may reflect marginal differences in nutrient status before changes in the amount of an element are registered. Leaf acid phosphatase was associated with P deficiency in wheat in sand culture(1). The present study examined the relation between this enzyme activity and P status in field grown plants.

### Methods

Wheat plants from cultivation X P level experiments at Wagga and Yass were sampled several times during crop development. The 4 replications used provided 48 plots at Wagga and 40 at Yass for each sampling. Plot size was 140 and 70 m respectively, and 20 and 16 plants respectively were sampled from each plot. Leaf acid phosphatase, extracted from the youngest fully emerged leaf with 0.2M sodium acetate-acetic acid buffer (pH 5), was reacted with p-nitrophenyl phosphate in the same buffer(2) for 1 h. The reaction was terminated with 2N NaOH and the optical density (OD) of the solution determined at 405nm. P was determined on the acid digest of the dried plant tops using a sulfo-molybdc acid method(3).

### Results

Wheat responded to the levels of applied P at each site ( $P < 0.001$ ). The increase in grain yield of 100 and 600% at Wagga and Yass respectively reflected the original available soil P status. Increased grain yield was always associated with increased applied P level.

Phosphatase activity and P concentration (%) accounted for a major portion of the variation in the relation with grain yield in the early samplings but were less sensitive at later harvests (Table 1). The continuing effect with P content ( $\text{mg plant}^{-1}$ ) reflected the positive response to P on both soils.

Table 1  
 $R^2$  values (%) for the relation with grain yield ( $\text{t ha}^{-1}$ )

Site	Sampling	Phosphatase	P%	P content
Wagga	4-5 leaf	79	70	72
	tillering	74	86	72
	booting	<2	6	66
	anthesis	<2	33	70
Yass	4-5 leaf	74	78	78
	booting	43	1	77
	anthesis	25	<1	87

Reasons for the loss in sensitivity in later harvests remain unanswered. Later droughting may have had an influence. Nevertheless, phosphatase activity, a simple, rapid, direct measurement, assessed P status early in crop development at a time when nutrient amendment has the greatest effect on final yield.

1. Besford, T.R. 1979. J. Sci. Food Agric. 30: 281-5.
2. McLachlan, K.D. 1976. Aust. J. Agric. Res. 27: 323-41.

3. Bray, R.H., and Kurtz, L.T. 1945. Soil Sci. 59: 39.