Effect of cultivar, seed source and manganese supply on growth and manganese uptake of wheat (T. Aestivum).

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The alkaline calcareous sands of S.A. are extremely manganese (Mn) deficient. Barley is traditionally the cereal grown on these soils, being generally more tolerant than wheat; however, significant wheat cultivar differences have been observed in the field (1). In addition to monitoring varietal performance during the 1982/83 season, some controlled environment studies have been undertaken to determine more precisely the extent of genetic variation within wheat for Mn efficiency. Seed Mn content was found to be an important determinant of growth and varietal performance without added Mn, and thus seed source and seed soaking with $MnSO_4$ were other variables studies.

Methods

Plants were grown in small pots containing Mn deficient calcareous (pH 8.5, 80% $CaCO_3$) sand collected from Wangary, S.A., with 0-50 ppm added Mn. Experiments were conducted in a growth room at 15?C and plants harvested at approx. 4 weeks (early tillering). In addition, 30 wheat cultivars were screened at Wangary using plant breeders' plots (4 rows x 5 m) with a split plot application of foliar MnSO (1 kg ha). Effects of seed soaking were evaluated for wheat and barley By soaking for 6 hrs. with 1.5% $MnSO_4$ prior to sowing.

Results and Discussion

Without Mn, all cultivars showed no differences in growth and Mn uptake at 4 weeks (pots) but significant differences at 8 weeks in the field. With Mn supplied large cultivar differences were apparent at 4 weeks (Table 1). The source of this Mn could he soil applied or seed borne, the latter either natural (due to source of seed) or applied (seed soaking) (Table 2).

Table 1

Table 1

Cultivar	Shoot dw (mg pot^{-1})	Root dw (mg pot^{-1})	Total Mn content (µg pot^{-1})
Red Fife	913 ± 65	673 ± 89	31.17 ± 2.30
Bodallin	681 ± 46	328 ± 57	12.42 ± 1.76
Bayonet	506 ± 44	184 ± 26	6.55 ± 0.92

Table 2

Seed source (cv.Bayonet)	Shoot dw (mg pot^{-1})	Root dw (mg pot^{-1})	Total Mn content (µg pot^{-1})
Wangary, S.A.	20 ± 4	7 ± 1	0.17
Urrbrae, S.A.	177 ± 31	66 ± 12	2.14
Potting soil	360 ± 9	128 ± 13	6.17

We conclude that differences in genotype responses to Mn deficiency between pot and field experiments might be related to such soil variables as temperature fluctuations, rooting volume and moisture supply. Genetic variation in Nn efficiency may be related to functional requirements, translocation and redistribution as well as Mn absorption from the easily reducible pool of soil Mn. Use of Mn efficient varieties coupled with a suitable seed Mn content will lessen the need for Mn fertilisers.

1. Graham, R.D., Davies, W.J., Sparrow, D.H.B. and Ascher, J.S. 1983. In: *Genetic Aspects* of Plant Nutrition, Eds. M.R. Saric and B.C. Loughman, p. 339-345 (Martinus Nijhoff/Dr. W. Junk).