

## Interaction of manganese deficiency and cereal cyst nematodes on barley

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The cereal cyst nematode (*Heterodera avenae* Woll.) (CCN), a major pest of cereal crops in southern Australia, occurs throughout the cereal districts of South Australia over a wide range of soil types, but appears to cause more damage on calcareous sandy soils (1,2). These same soils are those which typically produce Mn-deficient cereals in South Australia and the question arises whether these two factors may interact in their effects on resistance and tolerance of the crop. A pot experiment was undertaken to test the hypothesis that altered Mn nutrition of barley affects the development of CCN and damage to the host.

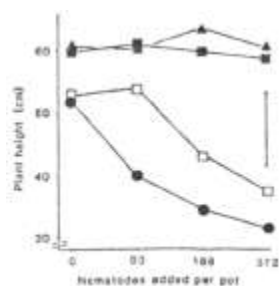
### Methods

A factorial pot experiment involving four rates of soil-applied Mn (0, 0.75, 7.5 and 75 mg Mn per pot), four levels of CCN (0, 93, 186 and 372 second stage juveniles per pot) and 12 replicates of one *Hordeum vulgare* cv. 'Clipper' plant per pot was carried out. Four replicates were harvested 28, 73 and 192 days after sowing and each plant was assessed at harvest for growth, Mn content and level of CCN infection. Several plant growth parameters were measured non destructively during growth.

### Results and Discussion

Resistance (ability of the pathogen to reproduce on the host) was not influenced by Mn nutrition of the host and equal numbers of nematodes invaded and developed to maturity on all plants despite Mn treatments resulting in plant Mn levels which ranged from severely deficient (0 Mn rate) and deficient (low Mn rate) to adequate (two highest Mn rates).

However, tolerance (endurance of disease without severe losses in yield or quality) was considerably reduced by the combination of low Mn supply and higher levels of CCN. Figure 1 shows that plant height was reduced by increasing CCN numbers only at the two lowest Mn rates. These trends were typical of those observed in all plant growth parameters measured in the final two harvests. These parameters included dry and fresh weight of roots and tops and total dry weight of grain produced per plant. Maturity was delayed in the severely affected plants.



Mn supply mg/pot: Ni1-●; 0.75 -□; 7.5- ■; 75- ▲

**Fig. 1** Interaction between Mn supply and CCN on height of pot-grOwn barley 66 days after sowing. Vertical bar represents LSD ( $p < 0.05$ ) for interaction term, Mn x CCN, developed in factorial ANOVA. Each point is the average of 8 replicates.

There is evidence that this interaction also occurs in the field so that farmers with both problems may benefit from higher Mn fertilizer rates or use of nematicides.

1. Meagher, J.W., Brown, R.H. and Rovira, A.D. 1978, *Aust. J. Agric. Res.* 29, 1127-1137.
2. Stynes, B.A. and Veitch, L.G. 1983. *Aust. J. Agric. Res.* 34, 167-181.