

The effect of lime and ripping on soil manganese and manganese in wheat

D.R. Coventry¹, G.R. Morrison¹, G. Rubenis² and K.K.H. Fung²

¹ Department of Agriculture, Victoria: a Rutherglen Research Institute

² State Chemistry Laboratory

Liming and deep ripping have produced large increases in grain yield of wheat in north-east Victoria (1). The soil in this study was strongly acid (pH 5.2; 0-10 cm) and had a compacted layer at 7.5-12.5 cm depth. In 1982 and 1981 soil and herbage were sampled regularly to determine the effect of lime and ripping on soil exch. Mn and herbage Mn concentration.

Methods

Wheat (cv. Oxley) was sown with 26 kg P/ha. Rainfall from sowing to harvest was 132 mm in 1982 and 504 mm in 1983. Soil samples (10 x 3.0 cm cores, 2.5 cm intervals) to a depth of 20 cm and herbage (10 x 0.5 m rows) were sampled every 2 weeks from sowing to mid-September for ?rip and ?lime (0, 2.5 t/ha) plots.

A single sampling was done when the soil was saturated (Sept. 9, 1983) for the ?rip plots treated with 5 lime rates (1). Soil samples and herbage were analysed for exch. Mn and total Mn respectively by atomic absorption spectroscopy.

Results and Discussion

In both seasons exch. Mn was highest at sowing (May), then dropped to constant levels in winter and spring. No increase was detected when the soil was saturated in August and September 1983. Lime rates of 2.5 t/ha or more were required to reduce ($P < 0.05$) the levels of exch. Mn (Fig. 1a) in both seasons at all sampling times. Ripping together with the use of high lime rates decreased exch. Mn at depths up to 17.5 cm. With the hardpan intact, exch. Mn at depths greater than 10 cm did not differ from unlimed soil (Fig. 1a). The pattern for Mn concentration in herbage on unlimed plots was similar in both seasons with an initial rapid increase in herbage Mn up to 10 weeks after sowing in 1982 (max. 420 ppm) and 8 weeks after sowing in 1983 (max. 300 ppm). Mn concentration then steadily declined, the rate of decline being more rapid in 1983. The pattern with limed soil was similar, but Mn concentrations were much lower (1982 max. 200 ppm; 1983 max. 140 ppm). The Mn concentration in herbage steadily decreased with liming up to 2.5 t/ha (Fig. 1b). There was no difference in wheat Mn concentration between ?ripped treatments. Little is known on levels of Mn in herbage, alone or in combination with other elements that would affect the growth of wheat. It is likely a combination of soil acidity factors have been changed by liming to give the large increases in grain yield at this site (1).

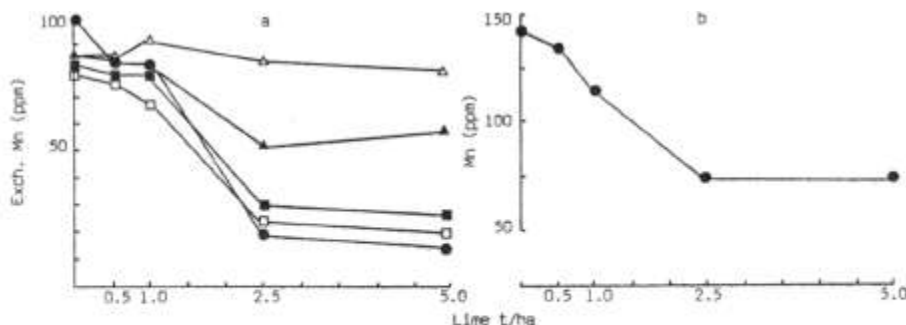


Fig. 1 a. Soil exch. Mn sampled at five depths in limed unripped plots, \square 0-2.5 cm, \bullet 2.5-5.0 cm, \blacksquare 5.0-7.5 cm, \blacktriangle 7.5-10.0 cm, \triangle 10.0-12.5 cm; Sept. 9, 1983
b. Herbage Mn concentration versus lime; Sept. 9, 1983

1. Coventry, D.R., Brooke, H.D., Burnett, V.F. and Reeves, T.C. (1985). Proc. 3rd Aust. Agron. Conf., Hobart.