Subsurface soils in the central-western, low rainfall wheatbelt of NSW.

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Abstract

There is little data published on the chemical properties of soils, particularly subsoils, of central-western NSW. A collation of soil data, sampled between 1999 and 2001, produced a data set of about 300 soil test results of red soils at 10-20 cm depth to below 80 cm depth, in 20 cm increments. The soils were typically acidic in the surface tending to alkaline with depth. Sodicity and salinity both increased with depth whilst Ca:Mg decreased with depth. The results indicated that subsurface sodicity may affect water infiltration, and sodicity and salinity may decrease plant root growth.

Key Words

magnesium; exchangeable sodium percentage; calcium to magnesium ratio

Introduction

Soils of central-western NSW have been investigated by many (1,2,3,4) but with little information available on theeir chemical properties. In a project to develop soil management guidelines for the red soils of central-western NSW it was found that a collation of existing soil test results, from previous research, could address this knowledge gap. Once data collection had begun, soil tests from current projects were added. Information was collected from eleven subsets of data. Most of these had only 0-10 cm soil data, however 3 subsets contained subsurface soil data. The subsurface soil chemical properties of the red soils of central-western are thus reported here.

Methods

A collation of available subsurface soil data from the red soils of central-western NSW produced about 300 soil test results from the 10-20 cm depth, with a decreasing number of results with increasing soil depth. The samples were from soils collected and analysed between 1999 and 2001. The majority of the analyses were conducted by Pivot. In all, 6 different laboratories were used in the soil analyses, with most laboratories using similar methods. Ca:Mg is an indicator dispersion and if < 2, the soil tends to be more dispersive, which can exacerbate the nature of sodic soils. The exchangeable sodium percentage (ESP) is a measure of sodicity, where >6 is termed sodic. Electrical conductivity (EC) is an indicator of soil salinity.

Results

Changes in soil chemical properties with depth are shown in Table 1 and Fig. 1.

Table 1: Average subsurface soil chemical properties for red soils of central-western NSW

Soil Depth	pH_{Ca}	eCEC cmol/kg	Ca	Mg	K	Na	Al	ESP	Ca:Mg	EC dS/m
10-20 cm	5.43	11.46	6.94	2.92	1.12	0.39	0.19	2.81	3.14	0.05
20-40 cm	5.92	14.3	8.14	4.36	0.87	0.85	0.2	4.79	2.36	0.06
40-60 cm	6.38	17.42	9.12	5.92	0.84	1.48	0.15	6.90	1.81	0.11
60-80 cm	7.24	25.06	13.08	8.04	1.06	2.86	0.76	8.72	1.77	0.27
80+ cm	7.58	28.74	14.23	9.24	1.15	4.11	0.46	11.56	1.63	0.37

The majority of soils were moderately acidic at the surface (56% of 0-10 cm soils had pH_{Ca} < 5.0; data not shown) tending to alkaline with depth. Soil pH_{Ca}, ESP and EC all increased with depth, whilst Ca:Mg decreased with depth.

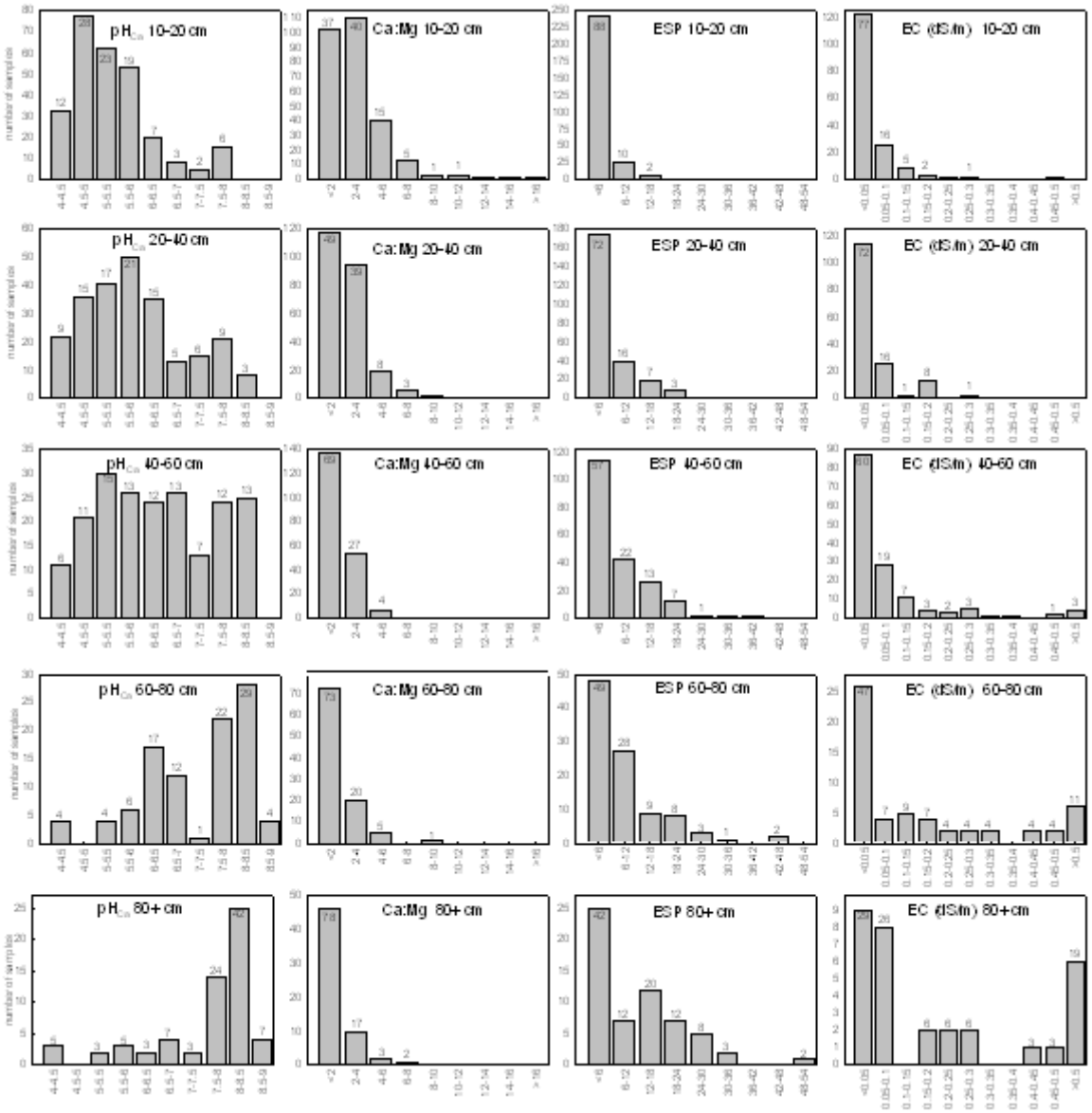

Figure 1: Changes with depth in the chemical properties of red soils of central-western NSW. Numbers above bars are the percentage of samples represented by that bar.

Conclusion

We concluded that increasing sodicity with depth was a major problem affecting the subsurface of over half the red soils of central-western NSW. Combined with the increased Ca:Mg with depth, this increasing dispersion at depth may affect water infiltration and plant growth. There was also increasing salinity with depth. A small proportion of soils (5%) were acidic to depth but this was regarded as a minor problem in the red soils of central-western NSW.

References

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