8. Zinc

Zinc is required for the function of a large number of enzymes and is essential for growth and reproduction in both plants and animals (Underwood 1977).

8.1 Occurrence of zinc deficiency in Victoria

Clinical signs of zinc deficiency in grazing livestock have not been confirmed in Victoria. However, skin lesions in calves which responded to zinc supplementation have been observed on four properties in the Dandenong district and on one property in the Camperdown district (Isaac 1982, Harris 1983), and an inherited parakeratosis has been re-ported in Friesian cattle in East Gippsland, the clinical effects being due to an impairment of zinc absorption (Jerrett and Morton, pers. comm. 1985).

Zinc deficiency in pasture and cereal crops has been studied extensively in Victoria (figure 8.1), mainly by trials with zinc fertiliser (North-Coombes 1982). Zinc responses in cereals were obtained in the Wimmera and Mallee regions in Victoria, on alkaline clays and alkaline sandy soils respectively, as early as 1936 (North-Coombes 1982). Zinc deficiency is associated with leached acidic sandy soils, alkaline soils with considerable calcium carbonate content and soils with high organic matter. Responses are also obtained from zinc application to citrus and vines on the alkaline sands of Sunraysia (NW Victoria). Zinc deficiency in Pinus radiata has been found on sandy soils in Victoria (Flinn 1977).

8.2 Signs of zinc deficiency

Marginal zinc deficiency in sheep and cattle is associated with sub-normal growth and fertility (Underwood 1977, Masters and Fels 1980). Crusty proliferations, cracking of the skin and loss of hair on the muzzle, vulva, anus, tail, head, ears, backs of the hind legs, knee folds, flank and neck are the main clinical signs in sheep and cattle.

In lucerne and clovers severe zinc deficiency is seen as a general or inter-veinal chlorosis. Bronze spots may occur in the middle leaves leading to white and necrotic areas. Other signs include a branching of small, dark green abnormally-shaped leaves in the centre of the plant—the "little-leaf syndrome" (Millikan 1958).

8.3 Diagnosis of zinc deficiency

8.3.1 Livestock

Plasma zinc concentrations less than 6 umol/l indicate inadequate dietary zinc intake in sheep and cattle (Underwood 1977).

Herbage zinc concentration required by animals is of the order of 15-25 mg/kg DM (Underwood 1977).

8.3.2 Plants

In Victoria, zinc concentration in clovers (both whole tops and leaf-petiole samples) has ranged from 15 to 105 mg Zn/kg DM, in grasses from 14 to 64 mg/kg DM, and in mixed herbage samples from 12 to 155 mg/kg DM (Brown 1982). The mean value for all samples is about 30 mg/kg. Pasture zinc values are at their lowest in autumn and highest in winter (Masters and Somers 1980).

Analysis of whole tops of sub clover showed no relationship between zinc concentration and dry matter yield (Millikan 1963). However, analysis of youngest open leaf of sub clover, without petiole, indicated a critical value of 12 to 14 mg/kg for adequate sub clover growth (Reuter *et al*. 1982).

Test strips receiving zinc (2 kg Zn/ha) should be used to confirm the existence of deficiency in pastures. For a test strip 20 m x 2 m apply 35g zinc sulphate. Zinc sulphate (22.5% Zn) can be applied in solution or mixed with sand or other non-fertiliser material to assist with uniform spreading.

8.3.3 Soil

Little is known of the value of soil analysis for indicating zinc deficiency in Victoria. Brown (1982b) found there was no relationship between EDTA zinc and soil pH or texture, despite the common occurrence of zinc deficiency in specific soils in Victoria. More recently, in a 1984 survey of soil and clover samples from 50 properties in the Heytesbury dairying district, no correlation was found between soil EDTA zinc and clover zinc concentrations (D. N. Conley, pers. comm.).

8.3.4 Analyses available

For livestock:

plasma zinc analysis is available through the Regional Veterinary Laboratories.

For plants:

zinc analysis is available through the State Chemistry Laboratory.

Soil analysis is not recommended for the diagnosis of deficiency in plants or animals.

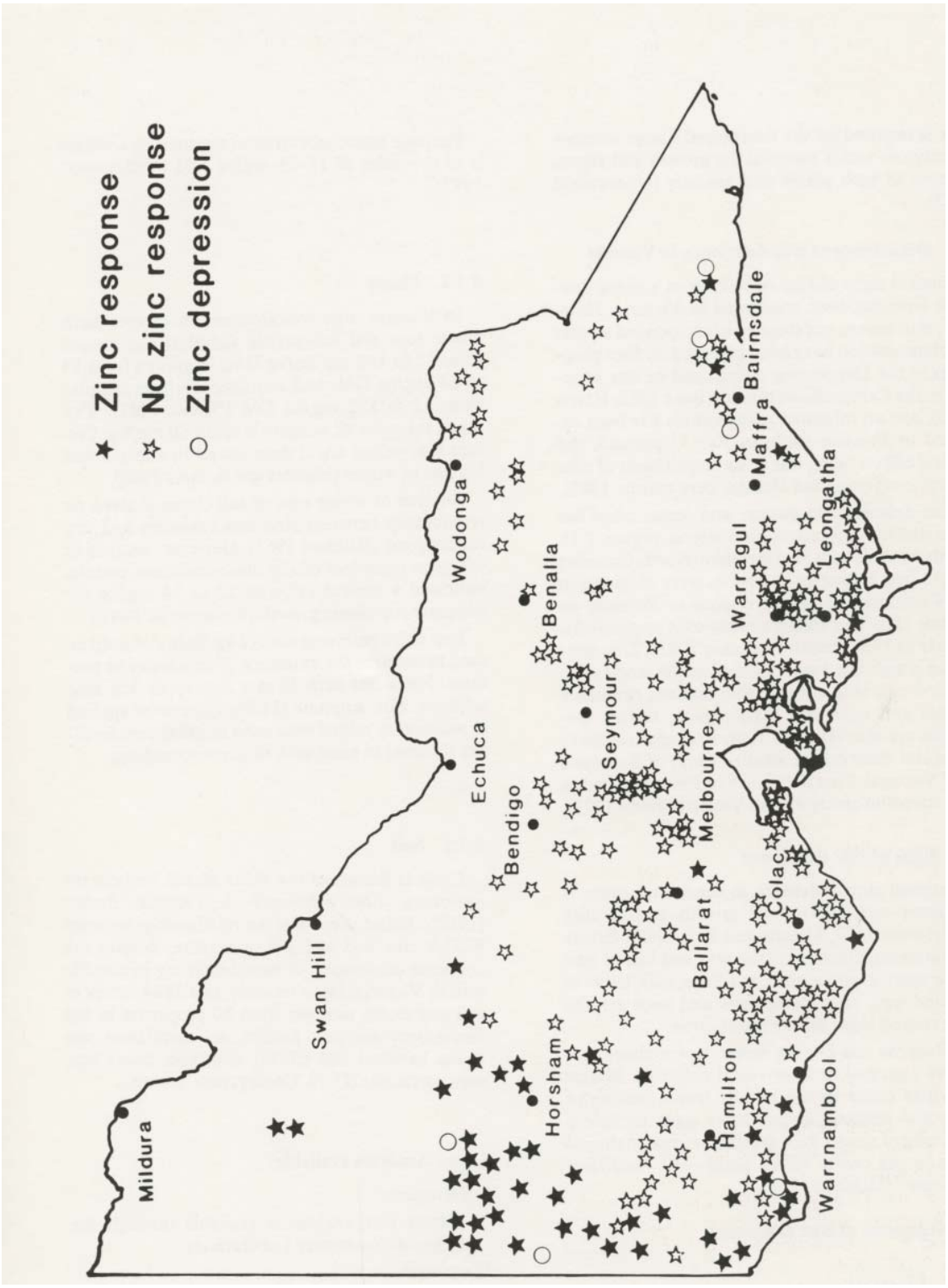

Figure 8.1: Location of pasture experiments with zinc in Victoria, indicating positive responses (★), depressions (☆) no response (o) North-Coombes 1982).

8.4 Treatment of zinc deficiency

Zinc as zinc oxide or zinc sulphate is available ready-mixed with other fertilisers in proportions of 0.5, 1.0, 1.5 and 2% zinc. Zinc is commonly applied at 2 kg/ha. An application interval of 4-6 years has been suggested for crops and associated pastures in the Wimmera (Jessop and Tuohey 1973). Foliar sprays containing zinc are available in Victoria but there is no data on their efficacy for pastures. Superphosphate contains zinc as a contaminant (0.03 to 0.04%), the concentration de-pending upon the source of rock phosphate. Christmas Island rock phosphate contains much less zinc than Nauru rock (David et al. 1978).

8.5 Toxicity

While studying the use of zinc supplements as a protective measure against facial eczema, it was found that oral doses of zinc sulphate greater than 40 mg per kg body weight were toxic to sheep.

The tolerance of livestock to zinc depends on the nature of the diet, especially its relative contents of calcium, copper, iron and cadmium, with all of which zinc interacts in the processes of absorption and utilisation (Underwood 1977).

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