Sugar cane zinc deficiency following liming in far north Queensland

J.R. Reghenzani

BSES, P.O. Box 566, Tully. Q. 4854.

Isolated patches of foliage yellowing were first observed in the sugar cane cultivar Q113, in the Mossman, Hambledon and Mulgrave mill areas in 1980. Liming to overcome calcium deficiency (1) appeared to induce symptoms in cane growing on lighter textured soils. Symptoms appeared in older leaves as a band of chlorotic leaf blade either side of the mid-rib, but not extending to leaf margins, except in severe cases. Stalks were stunted and rubbery. Micronutrient deficiency was suspected.

Methods

Foliar and soil samples were collected from the problem areas. As copper, zinc and manganese levels all appeared low, field trials were established to investigate the effects of adding these elements. Omission pot trials were also carried out in the glasshouse. Anaylses were carried out on soil and third leaf foliar samples collected from areas showing symptoms and adjacent unaffected areas at nine sites. Soil analysis was carried out using the following methods:

D 7.3 - DTPA, pH 7.3, 2 hours shaking, ratio 1:2 (2)
D 5.0 - DTPA, pH 5.0, 2 hours shaking, ratio 1:2
E - EDTA, 0.01M with 1N $(NH_4)_2CO_3$, pH 8.6, 2 hours shaking, ratio 1:2
H - HCl, 0.02N, 16 hours shaking, 1:10 ratio (2)
T - Total micronutrients by acid digest.

Results and Discussion

Initial foliar and soil samples did not give a clear indication of the cause of the yellowing. Because of the small areas involved and the variable nature of the problem, field trials also failed to produce conclusive results. The omission pot trials clearly demonstrated that lime induced zinc deficiency was the cause of the yellowing symptoms. Symptoms only occurred where lime had been applied and zinc omitted. This corresponded with field observations where yellowing appeared worse where higher rates of lime had been spread.

Foliar samples from the nine sites mentioned above showed lean third leaf zinc levels of 15.4 mg kg in healthy leaves and 11.1 mg kg in yellow leaves. Six sites had levels below 15 mg kg-1, the current critical level, in apparently healthy leaves. Two of the sites recorded lower levels of zinc in healthy leaves, when compared to adjacent yellow leaves.

Table 1. Mean soil zinc values for 9 sites by five analytical methods.

Symptoms	Soil zinc mg kg^{-1} (0-250 mm) D 7.3	D 5.0	E	H	T
Healthy (H)	0.24	0.22	0.51	1.16	63.67
Yellow (Y)	0.34	0.33	0.41	0.61	62.91
H > Y	3/9	3/9	6/9	9/9	4/9

The results from this limited survey indicate the superiority of the 0.02N HCl extract, in diagnosing zinc deficiency in sugar cane soils, over other extracts, including the routine BSES DTPA extract at pH 7.3. Work is continuing in order to explain anomalous results obtained by foliar analysis and to determine a critical zinc value for the 0.02N HCl extract. This value is tentatively placed at 0.9 mg Zn kg^{-1}.

1. Ridge, DER., Hurney, A.P. and Haysom. M.B.C. 1980. Proc. Aust. Soc. Sugar Cane Technol., 1980 Conf., 55-61.

2. Haysom, M.B.C. 1982. Proc. Aust. Soc. Sugar Cane Technol., 1962 Conf., 139-145.