The Effect of Zinc on Yield of Sugar Beet (*Beta vulgaris* L.)

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INTRODUCTION

Sugar beet (*Beta vulgaris* L.) is an important cash crop in Iraq. Information regarding the requirements of sugar beet for primary nutrients is abundant, but research on micronutrients is less common even though sugar beet is moderately sensitive to deficiencies of most micronutrients (Draycott 1996). Zinc and B availability in calcareous soil is limited due to a high pH (>7.0), high free calcium carbonate and low organic matter content, and interrelationships with other elements (Steven and Mesbah 2004). Excess additions of P induce Zn deficiency. Boron also may be fixed under same conditions to some extent. More B appears to be required by plants growing in soils with high pHs (Singh et al. 1988). In addition, foliar applications are recommended sometimes to improve the efficiency of Zn and B assimilation (Stevens et al. 2004). The objective of our research was to highlight the effect of different levels of Zn and B fertilizer application on the quantity of sugar beet including total yield (t ha^{-1}) and weight per root (gm $plant^{-1}$).

METHODS

Field experiments were conducted at two agricultural sites Al-Sheikh Mohamel (L^1) and Caber AL-Abed (L^2) on an entisol and a aridsol, respectively, at Ninevah that varied in some physical and chemical characteristics. The field experiments were conducted at each site during the autumn season of 2002 - 2003 using randomized complete block design (RCBD) with three replicates.

The treatments included five Zn levels (0, 5, 10, 15, 20 ppm Zn) as $ZnSO_4$ and three B levels (0, 5, 10 ppm B) as H_3BO_3 and were given by foliar application onto the leaves of sugar beet. After harvesting, the effect on yield quantity was assessed by measuring total sugar beet yield and weight per root.

RESULTS AND DISCUSSION

The quantity of sugar beet increased significantly more by using Zn and B fertilizer in combination (together) than separately (alone) at both locations. The highest quantity of sugar beet roots was obtained with the application of 10 ppm Zn and 10 ppm B by increasing total yield and weight per root at both locations

The best responses to fertilizer application (Zn and /or B) in yield quantity, namely increased total yield and weight per root, were found at location L1 when compared to location L2.

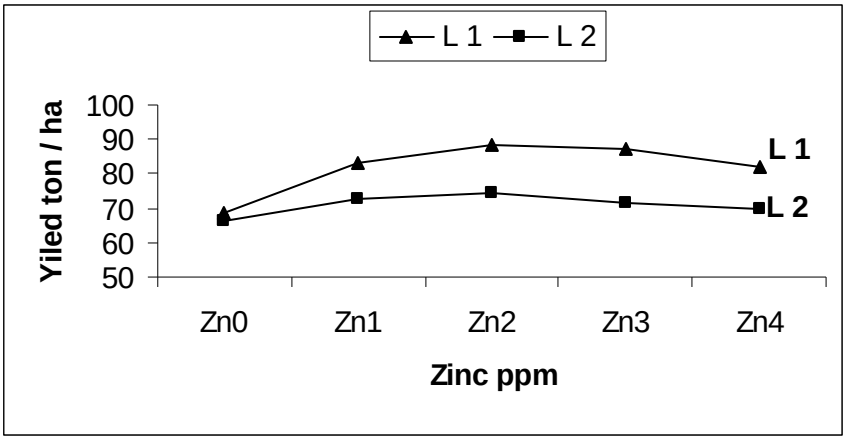

Fig. 1. Effect of Zinc on yield (t ha^{-1}) of sugar beet at two locations.

Table 1. The yield quantity of sugar beet at two locations.

Applied Zn ppm	Root weight gm plant^{-1}		Total yield t ha^{-1}	
	L^1	L^2	L^1	L^2
0	1113.32	1013.59	68.595	66.473
5	1253.18	1102.81	83.314	72.648
10	1285.81	1146.44	88.453	74.328
15	1282.047	1047.333	87.066	71.417
20	1218.88	1031.11	82.256	69.946

CONCLUSIONS

Best responses to Zn and/or B fertilization by foliar application onto the leaves of sugar beet were found in yield quantity, namely increased total yield and weight per root, in the soil at locations L1 when compared to location L2.

Zinc sulfate can be safely applied to sugar beets by foliar application onto the leaves of sugar beet.

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