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Effect of potassium and zinc on growth, yield and nutrient uptake by garlic

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ABSTRACT

A field experiment was conducted on fixed plot during *rabi* 2000-01 to 2003-04 on medium black calcareous soil (*Typic Ustocrepts*) with garlic cv. GG-3 to study the effect of potassium (three levels 0, 50 and 75 kg K_2O ha^{-1}), and zinc (two levels 0 and 25 kg $ZnSO_4$ ha^{-1}) and FYM (20 t ha^{-1}) in a RBD having three replications. Significantly the highest bulb yield, leaves yield and bulb weight were recorded under application of $ZnSO_4$ @ 25 kg ha^{-1} with potassium @ 75 kg ha^{-1}. Application of zinc and potassium also significantly increased the uptake of Zn and K by garlic. Available K and Zn progressively increased with increase in levels of respective elements.

Key words : Garlic, Potassium, Zinc, Bulb yield

Garlic a much maligned vegetable, used as a flowering seasoning in prepared food products such as soups, squashes and pickles. It is most important spices or condiment crop cultivated as cash crop that is cultivated 1.44 lakh hectare with production 6.59 lakh tones in India. In India, Gujarat state is stands first in area (20%), production (27%) and productivity of 7041 kg ha^{-1} (Anon., 2007).

In the Saurashtra region of Gujarat, the availability of potassium is depleted by 27 per cent in the last decade. Among the micronutrients, Zn deficiency is wide spread in Saurashtra region. Potassium plays an important role in maintenance of cell water potential because it regulates opening and closing of stomata (Sinha, 1978). Reports are also available that potassium facilitates water uptake by roots (Biebl, 1958) and reduces transpiration loss (Skoglay, 1976) in plant. Therefore, present investigation was under taken to study effect of Zn and K on yield nutrient uptake by garlic.

MATERIALS AND METHODS

A field experiment was conducted on fixed plot during *rabi* 2000-01 to 2003-04 on medium black calcareous soil (*Typic Ustocrepts*) with three level (0, 50, 75 kg K_2O ha^{-1}) of K, two levels (0, 25 kg $ZnSO_4$ ha^{-1}) of Zn and FYM @ 20 t ha^{-1} in a RBD having three replications. The experimental soil was low (171 kg ha^{-1}) in N, medium (41 kg ha^{-1}) in P, high (281 kg ha^{-1}) in K and medium (0.518 mg kg^{-1}) in DTPA extractable Zn. The bulbils of garlic variety GG-3 were sown at a distance of 10 x 10 cm @ 500 kg ha^{-1}. The representative plant samples were collected at maturity from each plot for chemical analysis as well as in soil were determined by standard methods.

RESULTS AND DISCUSSION

The data (Table 1) indicated that the bulb and leaves yields of garlic were significantly influenced by the different treatments during individual year as well as in pooled except in bulb and leaves yield during 2002-03 and bulb yield during 2001-02. Significantly the highest bulb yield (4356, 3140 and 3389 kg ha^{-1}) recorded with treatment T_6 (Zn_{25} + K_{75}) during 2001-02, 2003-04 and pooled, respectively. While leaves yield (679, 395, and 589 kg ha^{-1}) recorded with treatment T_6 (Zn_{25} + K_{75}) during 2001-02, 2002-03 and pooled, respectively, while in year 2003-04, it was higher with treatment T_7 (909 kg ha^{-1}) which was found statistically at par with treatment T_7, T_5 and T_4 in pooled results. Zinc is essential component and activator of many enzymes involved in auxin biosynthesis and photosynthesis (Romheld and Marscher, 1991) and their act as an important role in plant growth and yield. The results are in agreement with findings of Shrivastava *et al.* (2005) and Abbas *et al.* (1994).The application of Zn_{25} + K_{75} (T_6) produced significantly higher average bulb test weight (118 gm) of garlic, which was at par with remaining all the treatment except control. Improvement in physical characters might be attributed to the role of zinc in regulating the permeability of cell wall, which allowed mobilization of more water and minerals to sink resulting in increased size, was also reported by Kavitha *et al.* (2002).

The data in (Table 2) indicated that application of zinc and potassium significantly influenced the uptake of Zn and K by garlic. Maximum uptake of Zn and K by bulb (145.0 g $ha^{-1}$and 39.2 kg ha^{-1}) and by leaves (17.4 g