

Research Paper :

Response and critical limits of zinc for cotton grown in medium black calcareous soils of Saurashtra region of Gujarat

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ABSTRACT

Pot culture experiment was conducted by using bulk soil samples collected from different Agricultural Research Station, Junagadh Agricultural university, Junagadh and were categorized as low, medium and high with respect to native soil fertility status of zinc. Three treatments with three replicated pots in each type of soil were imposed with common recommended levels of N and K and varied levels of Zn for Zn treatment experiment in the respective sets of pots under each of the low, medium and high fertility soils. Fertilization of zinc significantly increased seed cotton and stalk yields and Zn content in plant as well as in soil. The seed cotton yield response was 16.3 and 24.5 per cent at 5.0 and 10.0 mgkg⁻¹ Zn levels, respectively. Obviously, the yield response of cotton to added Zn was considerably higher in low Zn soils than in those of medium and high Zn status. The critical levels of available Zn 0.89 mgkg⁻¹ in soil and concentration of Zn in cotton 4th leaf at 30 DAS and at maturity in leaf were found to be 57.5 and 24.6 mgkg⁻¹, respectively.

Key words : Critical limits, Cotton, Zinc, Calcareous soils

The essential nutrient has certain specific role to play in the plant and their presence in above critical concentration is a must for a plant to complete its life cycle. The critical limits is quite often employed for a wide variety of soils and crops, even though these critical limits may be different not only for soils and crop species but it also differ with varieties of a given crop (Tandon, 1992,). The response of crop plants to the deficiency or sufficiency of specific nutrient has helps to generate information on the critical limits of each of the elements. The medium black calcareous soils considerably declined in available Zn, therefore, the crops respond to Zn application. There is need to establish a threshold level of Zn concentration in plant below which the crop may respond to Zn application. The critical limit of Zn in wheat and groundnut has been established. So far, such information is not available for the cotton crop in this region. Hence, an experiment was conducted with an objective to determine the critical levels of Zn in soils and plants (cotton).

MATERIALS AND METHODS

Twenty surface (0-15 cm) soil samples from (Typic Ustocrepts) a wide variation in soil properties were collected from different research station of Junagadh Agricultural University, Junagadh. Soils were selected on the basis of their DTPA-extractable Zn status (low < 0.5, medium 0.5-1.0 and high > 1.0 mgkg⁻¹) of collected soil samples and were used for a pot experiment, involving

cotton (cv.G.COT.Hyb.10) crop. For the investigation the soils were contained in polythene-lined earthen pots (10.0 kg soilpot⁻¹). Each soil received 0, 5 and 10 mg of Zn per kg air dry soil as ZnSO₄·7H₂O. The experimental design was a completely randomized block with three replications. Nitrogen and potassium were applied uniformly to all pots at the rates of 180 and 120 mgkg⁻¹.through Urea and KCl. Potassium was applied as basal while nitrogen was applied in three equal splits one at time of sowing, second at one month after sowing and third at two month after sowing. Two seeds of cotton variety G.COT.Hyb.-10 were sown in each pot and after germination, one healthy plant was maintained. Fourth leaf was collected from each pot. The crop was raised upto maturity. Seed cotton and plant were oven dried (60° C) to record seed cotton and stalk yield. The Zn content in 4th leaf at 30 DAS and in plant at harvest and soils after harvest of crop were determined by standard analytical methods (Lindsay and Norvell, 1978 and Jackson,1973) using Atomic Absorption Spectrophotometer.

The critical limit of soil Zn were determined by Bray's Per cent Yield plotted against soil available Zn. Similarly, critical limits of Zn content in leaf and plant were determined by plotting Bray's per cent yield against Zn content in leaf and plant, respectively using the scatter diagram and statistical methods as described by Cate and Nelson (1971).

Brays per cent yield was calculated using the formula: