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Effects of sulphur and zinc on groundnut in vertisols

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ABSTRACT

A pot culture experiment was conducted in Vertisols to study the effects of levels of sulphur and zinc, separately and their combination on yield, oil, protein content and uptake of sulphur and zinc by *kharif* groundnut (cv. PHULE PRAGATI). Application of 120 kg S ha^{-1} recorded significantly the highest dry pod yield, oil and protein content as well as sulphur uptake by groundnut and it was *at par* with 80 kg S ha^{-1} application. While, 80 kg S ha^{-1} application recorded highest zinc uptake. As regards zinc application, 40 kg Zn ha^{-1} recorded significantly the highest pod yield, protein content and zinc uptake by groundnut whereas application of 20 kg Zn ha^{-1} recorded the highest oil content and sulphur uptake by groundnut. Interaction effect were found to be non significant.

Key words : *kharif* groundnut, Oil, Sulphur, Protein, S uptake, Vertisol, Zinc, Zn uptake.

Oilseed crops give the second largest agricultural produce in India next to food grains. Groundnut *(Arachis hypogea* L.) is one of the most important oilseed crop in Indian farming and is grown on variety of soils. A very little attention was paid towards the secondary nutrients and micronutrients which are of prime importance for the nutrition of groundnut. From the nutrition point of view, sulphur, one of the secondary nutrients is very important to oilseed crops. Sulphur, is now recognized as the fourth major nutrient in addition to nitrogen, phosphorus and potassium. In recent years, sulphur deficiency has been frequently observed due to several reasons *viz.* increased removal of sulphur by the crop, high yielding fertilizer responsive crop varieties, increased cropping intensity and extensive use of sulphur free fertilizers (Pasrich and Aulukh,1986). Similarly, micronutrient also plays an important role in groundnut nutrition. Zinc plays an important role in oilseed and legume crops in increasing yield, nodule development and nitrogen fixation (Bhanavase and Patil, 1993). The very little work has been done on the application of sulphur and zinc on groundnut under this conditions. Therefore, the present investigation was carried out to study the effects of sulphur and zinc on the yield, oil and protein content and uptake of these nutrients groundnut kernel.

MATERIALS AND METHODS

The soil of the experiment was Vertisol clay loam texture with pH 7.90, EC 0.47 dSm^{-1}, organic carbon 6.8%, $CaCO_3$ content 7%, available N 242 kg ha^{-1}, available P_2O_5 25 kg ha^{-1}, available K_2O 363 kg ha^{-1}, available sulphur 5 ppm and available zinc 0.5 ppm. A pot culture experiment was conducted at College of Agriculture, Pune with *kharif* groundnut (cv. JL-24) as test crop. The cement pots were prepared by adding 10 kg soil sieved through 2 mm sieve with polyethylene lining for the experiment. A basal dose of 20 kg N and 40 kg P_2O_5 ha^{-1} through urea and single super phosphate, respectively, was given before sowing to all the treatments. Calculated quantities of sulphur @ 0, 40, 80 and 120 kg ha^{-1}as elemental sulphur and zinc @ 0, 20, 40 and 60 kg ha^{-1} as zinc oxide were given before sowing by thoroughly mixing with soil. The experiment was conducted in a factorial completely randomized block design with sixteen treatments replicated twice. Two seeds of groundnut per pot were grown upto maturity with proper watering, weeding and adopting proper plant protection measures. At harvest, pod yield was recorded. The kernel were digested in HNO_3 : HCIO4 (9:4) mixture (Johnson and Ulrich, 1959) for the determination of S and Zn. Plant sulphur was determined by Colorimetry method (Palaskar *et al.*, 1981) and Zn by Atomic Absorption Spectrometry (Lindsay and Norvell, 1978) method. Kernels were used to determine protein content (N concentration x 6.24 = protein percent) and oil content by Nuclear Magnetic Resonance.The data was statistically analysed as per the methods described by Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

Yield:

The data presented in the Table 1 revealed that the pod yield was increased with increase in S levels. Application of 120 kg S ha^{-1} recorded significantly highest pod yield (8.98 g $plant^{-1}$) and it was *at par* with 80 kg S ha^{-1} treatment (8.61 g $plant^{-1}$), which was 28.95% and