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Effect of variable doses of potassium, sulphur and calcium on pod yield of short duration summer groundnut (*Arachis hypogaea* L.)

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ABSTRACT
A study was carried out for two consecutive years during 2003-2004 at Zonal Agricultural Research Station, Mainpuri, C.S.Azad University of Agriculture and Technology, Kanpur. The main purpose was to findout the suitable dose of K_2O and S + Ca for irrigated summer groundnut to sandy soils of Uttar Pradesh. The summarized results of two years experiment indicate that summer groundnut responded to the application of 60 kg K_2O ha^{-1} which was registered significantly higher pod yield (29.02 q/ha^{-1}) over 45 kg K_2O ha^{-1} (25.90 q/ha^{-1}). Similarly, application of 45 Kg S + 60 kg Ca/ha^{-1} through gypsum gave significantly higher pod yield by 32.47 q/ha^{-1} compared with lower installments of S + Ca to summer groundnut under irrigated condition. The growth and yield traits noted in groundnut under variable doses of K_2O and S + Ca were concordant to the pod yield of groundnut. Therefore, integration of 60 kg K_2O + 45 kg S + 60 kg Ca with 20 kg N + 30 kg P_2O_5 ha^{-1} can be used for higher production of pods of groundnut during summer season.

Key words : Summer groundnut, Sulphur, Calcium, Gynophores, Pops, Black heart.

INTRODUCTION

Groundnut is a recent introduction in summer season after potato, mustard, vegetable pea and field pea in Gangetic alluvial soils of Uttar Pradesh. The productivity is remarkably higher (25-30 q/ha^{-1}) as compared to rainy season groundnut. In groundnut, flowers, pegs formation and developing pods are major yielding factors, thus, the application of potassium, sulphur and calcium is too essential for better production. Though potassium is not a constituent of any compound or structurally bound in groundnut, it is required for translocation of assimilates and involved in maintenance of water status of plant especially the turgor pressure of cells and opening and closing of stomata and increase the availability of metabolic energy for the synthesis of starch and proteins. Besides, it increased peg formation, nodulation, synthesis of sugar and starch and help in pod growth and filling. The productivity of groundnut under water deficit conditions increased due to K application. Though the response of K upto 100 kg K_2O ha^{-1} is observed depending upon the agro climatic situation and groundnut varieties, the recommended dose of K are 25 –45 kg K_2O ha^{-1} for rainy season and 40-75 kg K_2O ha^{-1} for post rainy season/summer season irrigated crop.

Sulphur is a constituent of protein and plays an important role in oil synthesis. Since groundnut is rich both in oils and protein, requirement of sulphur for this crop is substantial. In addition application sulphur in soil also regulates the pH and increase the availability of other nutrients. It improves nodulation and pod yield reduces the incidence of diseases. Sulhpur increases chlorophyll and decreases chlorosis. In most of the groundnut-growing tracts of South-Western Semi-Arid and Central Plain Agro-climatic zones of Uttar Pradesh, the level of available sulphur reaches below the limit and groundnut crop is bound to suffer on account of sulphur deficiency.

Calcium is more important of groundnut and often lack of Ca reduces the yield and quality more than any other elements. Calcium maintains the cell integrity and membrane permeability, enhances pollen germination, activates the number of enzymes for cell division and takes part in protein synthesis and carbohydrate transfer in groundnut. Recently it has been implicated as second messenger in certain hormonal and environmental responses and regulating enzyme activities. In its physiological effects Ca is usually regarded as counter part of K. In general, the calcium requirement is greater for pod filling than flowering and it is greater for flowering than vegetative growth. The high Calcium is required in the 5-10 cm of soil for groundnut.

The actual requirement of potassium, sulphur and calcium is not known for summer season groundnut to sandy soils of Uttar Pradesh because its cultivation recently introduced, therefore, the present experiment was planned and carried out.

MATERIALS AND METHODS

A field trial was carried out for two consecutive years during summer season of 2003 and 2004 at Regional Research Station, Mainpuri, C.S.Azad University of Agriculture and Technology, Kanpur. The soil of experimental site was sandy loam having pH 8.5, organic carbon 0.45%, total nitrogen 0.04%, available phosphorus 10 kg ha^{-1} and available potash 278 kg ha^{-1}, therefore, the fertility status of experimental soil was low. Groundnut crop was grown under four levels of sulphur and calcium (0+0, 15+20, 30+40 and 45+60 kg ha^{-1} in the integration of two levels of potassium (45 and 60 kg ha^{-1}). The experiment was conducted in factorial RBD with three replications. A uniform dose of 20 kg N + 30 kg P_2O_5 ha^{-1} was applied to crop with variable doses of K_2O, S & Ca. The full doses of NPK and half doses of S & Ca. were given at sowing and remaining half doses of S & Ca were top dressed after first irrigation and mixed in to soils at flower initiation stage. Well-