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Impact of *in-situ* moisture conservation and sulphur nutrition on yield, quality and nutrient uptake by groundnut

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ABSTRACT
A field study was conducted during the rainy (*kharif*) seasons of 2002 and 2003 at Junagadh (Gujarat, India) to evaluate subsoiling, land configuration and sulphur nutrition effects on yield, quality and nutrient uptake by groundnut (*Arachis hypogaea* L). The results explicate that between-row subsoiling and broad bed and furrow significantly increased pod and haulm yield along with higher protein content and N content in pod over flat bed control. The contents of P, K and S in haulm were significantly less with between-row subsoiling and broad bed and furrow as compared to flat bed whereas, N content in haulm, P content in pod and haulm, K and S content in pod remained unaffected due to moisture conservation practices. Significantly higher uptake of N, P, K and S by pod and haulm were recorded with between-row subsoiling over flat bed. Application of sulphur @ 50 and 25 kg ha^{-1} significantly increased pod and haulm yields over control. Sulphur fertilization significantly enhanced the oil and protein content as well as N content in pod, K and S content in pod and haulm over control, whereas depressed the P content in pod and haulm. Sulphur nutrition significantly accelerated the uptake of N, K and S by pod and haulm over control, but did not influence P uptake.

Key words : Moisture conservation, Sulphur, Groundnut, Soil profile.

INTRODUCTION

The presence of hard pan in soil profile impedes root growth and exploitation of water and nutrients. Subsoil tillage shatters the hard pan and increase infiltration of rainwater in soil. Broad bed and furrow (BBF) configuration maintains loose and porous soil condition. Both these practices result in better storage of rainwater and extensive root system and there by better water and nutrient uptake by crop. Sulphur as a plant nutrient is becoming increasingly important in dryland agriculture as it is the master nutrient of all oilseed crops and pulses and is rightly being called the "Fourth Major Nutrient". With these points in view, the present experiment was undertaken to evaluate subsoiling, BBF and sulphur effects on yield, quality and nutrient uptake by groundnut (*Arachis hypogaea* L.).

MATERIALS AND METHODS

A field investigation was carried out during rainy (*kharif*) seasons of 2002 and 2003 at Department of Agronomy, Junagadh Agricultural University, Junagadh. The soil was clayey in texture and slightly alkaline in reaction (pH 8.0 and EC 0.28 dS m^{-1}) with available N 258 kg ha^{-1}, available P_2O_5 27.5 kg ha^{-1}, available K_2O 236 kg ha^{-1} and available S 19.5 kg ha^{-1}. Field capacity and permanent wilting point were 28.4 and 12.8%, respectively, whereas bulk density was 1.42 Mg m^{-3} with 45.3% porosity. There were 5 main plots assigned to moisture conservation practices viz., M_1- flat bed (FB), M_2- alternate between-row subsoiling (ABRS), M_3- between-row subsoiling (BRS), M_4- in-row subsoiling (IRS) and M_5- broad bed and furrow (BBF) and 3 sub-plots allocated to sulphur levels viz., 0, 25 and 50 kg ha^{-1}. The experiment was laid out in split plot design with 4 replications. Subsoiling to a depth of 30 cm was carried out by subsoiler, while a bed of 150 cm width with furrow of 30 cm width and 15 cm depth was formed by BBF former after preparatory tillage and before sowing. The crop was fertilized with 12.5 kg N and 25 kg P_2O_5 ha^{-1}. Sulphur in the form of gypsum was applied at sowing in furrows as per treatments. The groundnut variety 'GG 20' was sown at a row spacing of 60 cm on 1st July, 2002 and 20th June, 2003 and harvested on 22nd October, 2002 and 15th October, 2003. The total seasonal rainfall of 540 and 1275 mm was received in 22 and 42 rainy days during 2002 and 2003, respectively. The oil content of seed was determined using Nuclear Magnetic Resonance Spectrophotometer (Model Oxford 4000 NMR analyzer). The content of N, P_2O_5, K_2O and S in seed and stalk was analysed by modified Kjeldahl's method, Vanadomolybdo phosphate yellow colour method, flame photometric method and turbidimetric method, respectively.

RESULTS AND DISCUSSION

Moisture conservation practices

The between-row subsoiling (M_3) and broad bed and furrow (M_5), both being statistically alike, produced significantly higher pod and haulm yields (Table 1) over flat bed (M_1). Despite moisture conservation practices did not influence the oil content, between-row subsoiling (M_3) recorded significantly the highest protein content but it was at par with in-row subsoiling (M_4) and broad bed and furrow (M_5). The N content in pod as well as contents of P, K and S in haulm were significantly less with between-row subsoiling (M_3) as compared to flat bed (M_1) due to dilution effect of higher yield. Whereas, N content in haulm and contents of P, K and S in pod remained unaffected due to moisture conservation practices. Significantly higher uptake of N, P and S by pod and haulm as well as total uptake of these nutrients (Table 2) were recorded with between-row subsoiling (M_3) and broad bed and furrow (M_5) over flat bed (M_1). The K uptake by pod followed the same trend,

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