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INFLUENCE OF SOIL-MOISTURE STRESS AT DIFFERENT STAGES OF GROWTH ON YIELD RESPONSE AND NUTRIENTS IN GROUNDNUT

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To optimize the returns of limited water resources, information on water stress at different growth stages of groundnut is needed. Patel and Padalia (1980) reported that groundnut yield and nutrient uptake progressively decreased with increase in soil moisture stress from 1/3 to -10 bar soil water potential. An investigation was, therefore, undertaken to assess the nutrient absorption and yield of groundnut under moisture stress at different growth stages of groundnut.

A field experiment in split plot design, with four replications, was conducted on a calcareous medium black clay soil at Gujarat Agricultural University, Junagadh during summer 1980. The top soil (0-30 cm), had average value of $CaC0_3$ 2.26%, organic carbon content 0.81%, available K 320 kg K_2O ha^{-1} and Olsen's P, 23.04 kg P_2O_5 ha^{-1}. The crop was fertilized uniformly with 25 kg N through urea and 50 kg P_2O_5 through single super phosphate, per hectare. The treatments constituted moisture stress during early vegetative stage (M_1), late vegetative stage (M_2), flowering period (M_3), pegging (M_4), and pod development period (M_5). Water applied at -2 bar soil water potential (M_6) treated as control in main plots and varieties GAUG-1 and TG-17 in subplot. Moisture stress of -14 bar was imposed in all the treatments, except for the control (M_6), by with holding the irrigation. Based on gravimetric moisture determination, soil water potential in bars was read out from a soil moisture retention characteristic curve of the soil which was constructed by using pressure plate/membrane apparatus. Crop was sown in last week of February and harvested in second week of June. There was no rain during the cropping period. All recommended agronomic practices were uniformly followed in raising the experimental crop. Pod and haulm yields were recorded and analysed separately for N, P, K, Ca and Mg using standard method (Jackson, 1967).

Maximum haulm yield of 5406 kg ha^{-1} was obtained under the treatment of-2 bar soil moisture tension (M_6), which was 48 and 41 per cent higher than that produced under soil-moisture stress at flowering (M_3) and pegging stages (M_4), respectively (Table 1). Moisture stresses at late vegetative and pod development stages were at

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par. Moisture stress reduced the leaf area of groundnut which consequently reduced the haulm yield (Patel et al., 1983). Variety TG-17 produced significantly higher yield (4059 kg^{-1}) than that of GAUG 1 (3819 kg ha^{-1}). The interaction between moisture and variety was non-significant.

Table 1 Effect of soil moisture stress at different stages of growth on haulm and pod yield (kg/ha^{-1}) of two varieties of groundnut

Soil moisture stress	Pod			Haulm		
	GAUG 1	Tg 17	Mean	GAUG 1	Tg 17	Mean
M_1	1899	2109	2004	4954	5139	5047
M_2	1622	1893	1757	3403	3750	3577
M_3	1383	1703	1593	3148	3260	3206
M_4	1230	1405	1318	2639	2986	2823
M_5	992	1116	1054	3449	3681	3565
M_6	2304	2481	2395	5278	5533	5406
Mean	1589	1784	—	3819	4059	—
		Variety moisture V x M		Variety moisture V x M		
CD 5%	22	40	36	69	289	NS

The highest pod yield of 2395 kg ha^{-1} was recorded from control treatment (M_6), which was 127 and 82 per cent higher than the yield recorded with treatments involving moisture stress at pod development (M_5) and pegging stages (M_4), respectively (Table 1). Moisture stress during early vegetative stage (M_1) reduced pod yield by 16 per cent only, whereas stress during late vegetative and flowering stages resulted into 19 and 36 per cent yield reduction in comparision to that of 2 bar soil moisture potential. Polara et al. (1984) reported that pod yield of groundnut decreased when moisture stress (-14 bar) was applied during vegetative, flowering, pegging and pod development stages.

Variety TG 17 yielded significantly higher pods than GAUG 1. The interaction between moisture and variety showed that TG 17 gave consistently higher pod yield at all soil moisture stress in comparison to GAUG 1.

Nutrient contents

Content of N, P, K, Ca and Mg in shoot and pod significantly increased under respective soil-moisture stresses applied at vegetative, flowering, pegging and pod development stages, in comparison to the control (M_6), except N where its content in shoot decreased (Fig. 1). The greatest N reduction in shoot was observed when moisture stress was given at pegging and pod development stages. Plant water status decreased with increase in soil moisture stress and there are evidences that N fixation by nodules decreased with increase in plant moisture stress (Hume et al., 1976). N and P content was maximum in pod followed by shoot, while reverse was true in

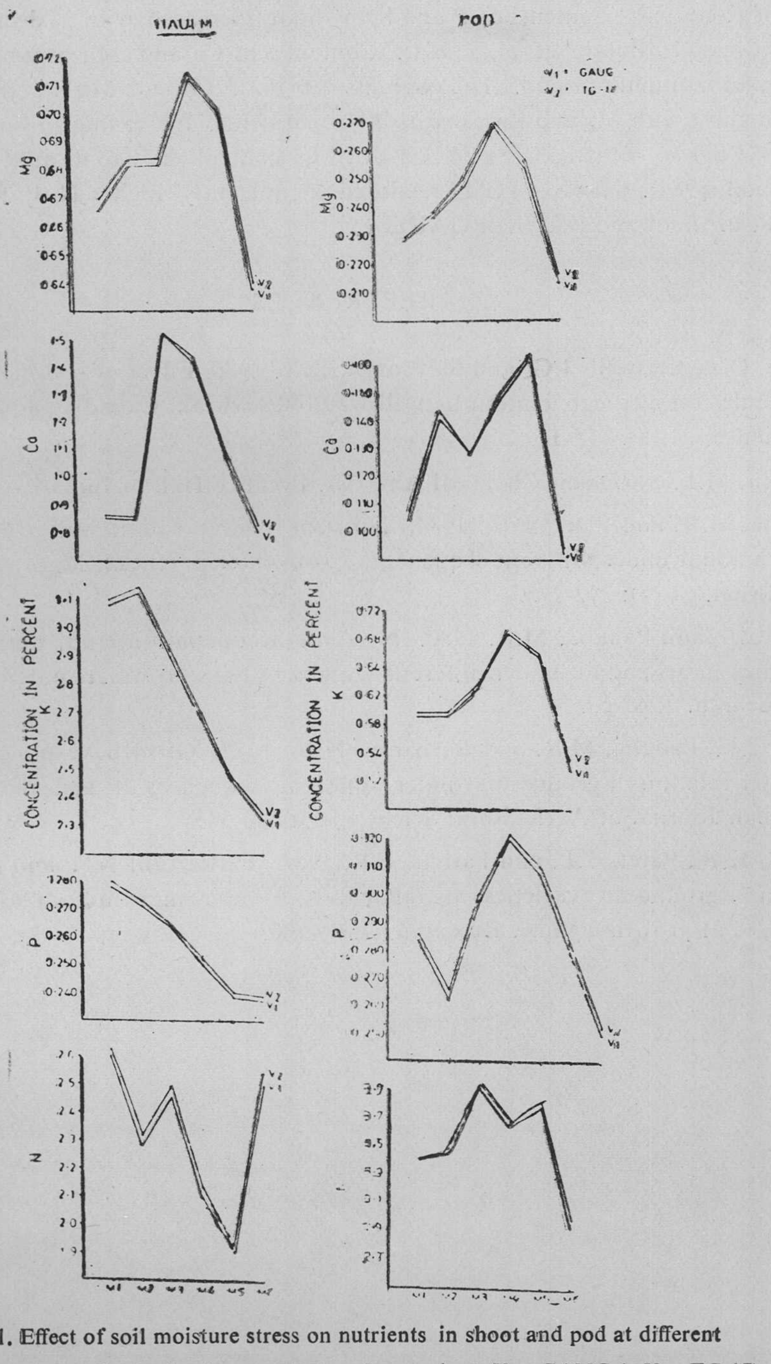

Fig. 1. Effect of soil moisture stress on nutrients in shoot and pod at different stages of growth of two varieties of groundnut (V_1—GAUG 1. V_2—TG 17)

case of K content. Contents of P and K in shoot increased with a decrease in water content in soil (Polara et al., 1984). Contents of Ca and Mg were maximum in shoot and minimum in pod. The contents of both Ca and Mg in shoot and pod were highest with M_4 and lowest with M_6 treatments. Increasing soil-moisture stress from 1/3 bar to -10 bar increased Ca and Mg content in shoot and pod (Padalia and Patel, 1984). Variety, TG 17 recorded significantly higher N, P, K, Ca ano Mg content in shoot and pod than GAUG 1.

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