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THE RESPONSE OF GROUNDNUT TO PHOSPHORUS AND POTASSIUM UNDER DIFFERENT WATER MANAGEMENT PRACTICES *

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Summer rice fallows offer great scope for increasing groundnut *(Arachis hypogea* L.*)* production in Kerala while scarcity of water is the major yield constraint in attaining potential productivity in groundnut during summer season. To overcome this no precise water management technique has been developed in Kerala. The productivity of irrigated groundnut can further be enhanced by satisfying its nutritional requirement. Phosphorus and potassium are reported to be the most important nutrients influencing groundnut yield. With this background, an investigation was undertaken to study the response of groundnut to phosphorus and potassium application under different soil moisture regimes, in the sandy loam soils during summer season.

Materials and Methods

The experiment was carried out in the sandy loam soil of the Agronomic Research Station, Chalakudy, Kerala during January to April 1980. The treatments consisted of combinations of three irrigation schedules (IW/CPE ratios of 0.3, 0.6 and 0.9), three levels of phosphorus (25, 50, 75 kg P_2O_5/ha) and three levels of potassium (25, 50, 75 kg K_2O/ha). It was laid out in a partially confounded factorial experiment in randomised block design and with two replications. The variety tested was TMV 2 and the spacing adopted was 25 cm x 15 cm. The plot size was 6mx 2.75 m.

Cattle manure (2 t/ha), nitrogen (10 kg/ha), and phosphorus and potassium (as per treatments) were applied fully as basal. Lime (1000 kg/ha) was applied at the time of flowering. Other cultural and management practices were given to the treatments uniformly as per the Package of Practices Recommendations of Kerala Agricultural University (Anon., 1978).

One irrigation was given uniformly to all plots one day before sowing. The evaporation readings were recorded daily using USWB class A pan evaporimeter and whenever cumulative pan evaporation minus rainfall reached 166.67mm, 83.33mm or 55.56 mm differential irrigations were administered at a depth of 50 mm to 0.3, 0.6 and 0.9 IW/CPE ratios respectively.

The observations relating to growth attributes were recorded at 30th and 60th day after sowing and at harvest. The data on yield and yield attributes were recorded at harvest.

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Results and Discussion

Growth attributes

The plant height at all stages was significantly increased by irrigations at shorter intervals and the maximum height was recorded when irrigations were scheduled at 0.9 IW/CPE ratio. Irrigation treatments exerted significant influence on the number of branches and leaves per plant only at 60th day after sowing which may be due to the optimum moisture condition at this stage, coinciding with the active vegetative phase of the crop. The effect of frequent irrigations in increasing LA! was found to be significant only in the early two stages.

The effect of graded doses of phosphorus on the growth attributes of groundnut was not pronounced at any of the stages. Except in the early stages, levels of potassium exerted significant influence in increasing the plant height and the maximum height was recorded at 75 kg K_2O/ha. The results further revealed that higher levels of potassium significantly increased the leaf number only at the harvest stage wnereas the LAI was increased only at 60th day after sowing. Increased LA! at higher levels of potassium at 60th day after sowing can be attributed to an increase in leaf size even though the leaf number remained uniform.

Yield attributes

From the data presented in Table 1, it can be seen that all the yield attributes viz., number of pods per plant, weight of mature pods per plant, 100 pod weight, 100 kernal weight and shelling percentage were significantly influenced by irrigation schedules and the highest values were recorded by 0.9 IW/CPE ratio.

Higher levels of phosphorus was found to increase the weight of mature pods per plant, 100 pod weight and 100 kernal weight significantly whereas the number of pods per plant has shown an increasing trend.

A significant increase in the weight of mature pods per plant, 100 pod weight, 100 kernal weight and an increasing trend in the number of pods per plant can be observed at higher levels af potassium.

Haulm yield

The direct effects of irrrigation, phosphorus and potassium were found to be significant in influencing the haulm yield (Table 1). Among the treatments 0.9 IW/CPE ratio, 75 kg P_2O_5/ha and 75 kg K_2O/ha recorded maximum haulm yield among irrigation schedules, levels of phosphorus and levels of potassium respectively. Interaction effect between irrigation and potassium was also found significant (Tab!e 2).

Table 1

Yield *and* yield attributes as influenced by irrigation schedules, graded levels of phosphorus and potassium

Treatments	No. of pods per plant	Weight of mature pods per plant(g)	100 pod weight (g)	100 kernel weight (g)	Shelling percentage	Pod yield (kg/ha)	Haulm yield (kg/ha)
IW/CPE ratio							
0.3	13,1	8.14	65.59	28.43	65.9	1848	4032
0.6	13.1	8.85	72.00	30.29	70.2	2054	4590
0.9	15.6	9.65	76.63	31.99	72.7	2533	5261
F Test	Sig	Sig	Sig	Sig	Sig	Sig	Sig
PA (kg/ha)							
25	12.5	7.88	64.95	28.07	63,6	1920	4509
50	12.7	9 32	74.61	31.40	70.0	2125	4548
75	14.6	9.44	74.66	31.24	70.2	2399	4878
F Test	NS	Sig	Sig	Sig	NS	Sig	Sig
K_2O (kg/ha)							
25	13.5	7.84	65.13	28.46	68.8	1940	4412
50	13.3	8.55	74.78	30.62	69.6	2016	4638
75	15.0	10.24	74.31	31.64	70.4	2480	4835
F Test	NS	Sig	Sig	Sig	NS	Sig	Sig
C. D. (0.05)	2.06	1.207	5.276	2.168	2,59	358.7	294.6
Interaction	NS	NS	NS	NS	NS	NS	Sig

Table 2

Combined effect of irrigation and potassium on haulm yield, kg/ha

		IW/CPE ratio			Mean
		0.3	0.6	0.9	
K_2O (kg/ha)	25	4007	4133	5095	4512
	50	4030	4356	5528	4638
	75	4210	5281	5162	4885
Mean		4082	4590	5261	

C. D. (0.05) Marginal means = 294.6
Means of combination = 510.5

Table 3

Details of irrigations given to the treatments

Details	Irrigation schedules		
	0.3 IW/CPE ratio	0.6 IW/CPE ratio	0.9 IW/CPE ratio
*Total number of irrigations	3	5	8
Quantity of irrigation water applied (mm)	150	250	400
Irrigation water plus rainfall during the crop period (mm)	206.6	306.6	456.6
Irrigation interval (days) excluding rainy period	35	17.5	11.7

* Including presowing irrigation

Pod yield

The result reveals that an increase in irrigation frequency enhanced pod yield significantly. The highest yield was recorded by 0.9 IW/CPE ratio. This schedule required eight irrigations at an interval of 12 days (Table 3). This is in line with the results obtained from Bhavanisagar (Anon., 1979) and with that reported by Subramanian *et al*. (1974),

Increasing the application of phosphorus from 25 kg P_2O_5/ha significantly increased pod yield, but the yields at 50 kg and 75 kg P_2O_5 were on par. Higher levels of phosphorus improved the number of pods per plant and significantly increased the weight of pods per plant, 100 pod weight and 100 kernal weight, which might have contributed to the increased yield. The result is in agreement with findings of Tripathi and Moolani (1971) who reported linear increase in pod yield with increase in the rate of applied phosphorus up to 50 kg P_2O_5/ha.

Application of 75 kg K_2O/ha significantly increased the pod yield over 25 and 50 kg K_2O/ha. Increased weight of mature pods per plant, weight of 100 pods and 100 kernels might have contributed to this result. Nair (1978) also reported yield increase by the application of potassium up to 75 kg K_2O/ha.

Summary

A field experiment conducted in the sandy loam soil of the Agronomic Research Station, Chalakudy, to study the effect of different irrigation schedules (0.3, 0.6 and 0.9 IW/CPE ratios) and graded doses of phosphorus and potassium 25,50 and 75 kg P_2O_5 and K_2O per ha respectively) on the growth attributes, yield

and yield characters has shown that growth attributes like plant height, number of branches per plant, number of leaves per plant and LAI were favourably influenced by irrigation and application of potassium. Yield characters like number and weight of mature pods per plant, 100 pod weight and 100 kernel weight were higher at higher levels of irrigation, phosphorus and potassium. Highest yield was recorded when irrigations were scheduled at 0 9 IW/CPE ratio (irrigating once in 12 days) and 50 kg P_2O_5 and 75 kg K_2O per ha was found to be sufficient for better yields.

സംഗ്രഹം

വിവിധ ഇടവേളയിലുള്ള ജലസേചനവും (0·3, 0.6, 0.9 IW/CPE അനുപാതത്തിൽ) വിവിധ അളവിലുള്ള ഭാവഹവും കൗഷാരവും (ഹെക്ടറൊന്നിന് 25, 50, 75 കി. ഗ്രാം) വേനൽക്കാല നിലക്കടലയുടെ വളർച്ച, വിളവ് ഇവയെ എങ്ങിനെ സ്വാധീനിക്കുന്നു എന്നതിനെപ്പറ്റി ചാലക്കുടി അഗ്രോണമിക് റിസർച്ച് സ്റ്റേഷനിൽ ഒരു പഠനം നടത്തുകയുണ്ടായി. നിലക്കടല ചെടിയുടെ ഉയരം, ശിഖരങ്ങളുടെയും ഇലകളുടേയും എണ്ണം, ഇല വിസ തീർണ്ണത്തിന്റെ സൂചിക ഇവയെ ജലസേചനവും, കൗഷാരവും കാര്യമായി സ്വാധീനിക്കുന്നതായി കണ്ടു. ചെടിയൊന്നിനുള്ള നിലക്കടലയുടെ എണ്ണവും തൂക്കവും, 100 നിലക്കടലയുടെ തൂക്കം (തോടോടും അല്ലാതെയും) എന്നീ വിള ഉൽപ്പാദക സ്വഭാവങ്ങൾ,ജലസേചനത്തിന്റേയും ഭാവഹത്തിന്റേയും കൗഷാരത്തിന്റേയും തോത് കൂടുന്നതായി കണ്ടു. IW/CPE അനുപാതം 0.9 ആകുമ്പോൾ (ശരാശരി 12 ദിവസത്തിലൊരിക്കൽ) നനയ്ക്കുന്നതുമൂലവും 50 കി. ഗ്രാം ഭാവഹവും 75 കി. ഗ്രാം കൗഷാരവും നൽകുന്നതുമൂലവും ഏറ്റവും കൂടുതൽ ഉൽപ്പാദനം ലഭിക്കുന്നതായി കണ്ടു.

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