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Research Article

SCREENING GROUNDNUT GENOTYPES FOR MOISTURE STRESS

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ABSTRACT
Groundnut (*Arachis hypogaea L.*) is one of the important oil seed cash crops grown in India which accounts for 45 per cent of the total area under oil seeds and 55 per cent of the total oil seed production. In India rainfall accounts for over 50 per cent of Variance in yield (Challinor et al., 2003) and the average yield of groundnut is very low because of moisture stress at various growth stages irrespective of production environments, Soil conditions, irrigation methods, varieties and other cultivation practices. Keeping this view a field trial was conducted at Regional Research Station, Vriddhachalam with eleven groundnut Genotypes viz., Co1, Co2, JL.24, VG.75, JLM.4, JLM.6, VG.76, VG.15, ICG. 1697 and CGC 4018. The two treatments viz., moisture stress and stress free conditions were adopted for the study. Moisture stress was imposed by withholding irrigation after 25 DAS. The stressed plants were irrigated when they do not recover turger a night. Sampling was done at 25,55 DAS and at harvest. The results have shown that the groundnut Genotypes viz., VG.77, JL.24, Co2 and ICG. 1697 recorded higher pod yield under moisture stress condition. It is also observed that the functional leaves at the time of harvest have contributed for higher pod yield. The study thus indicated that the characters viz., higher root-shoot ratio, lesser shoots and more number of functional leaves are the adaptive characters for drought tolerance mechanism in groundnut genotypes.

***Key Words**: Groundnut, Moisture Stress, Screening*

INTRODUCTION
Groundnut cultivation occupies an area of 0.49 Mha hectares in Tamil Nadu and more than 60 per cent of total are is under rainfed condition. The rains during South West monsoon are erratic and unevenly distributed. With the available soil moisture at the time of sowing the peanut seedlings grow up to 15 to 25 days. Thereafter the crop experiences drought under varying spells. It is observed that the moisture stress nfluences crop growth rate and dry matter production differently based on the magnitude of the stress, its duration and type of genotype (Boyer, 1976; Dalgas and Sheoran, 1984). The mobilization of reserved assimilates from leaves to pods is crucial for pod development and yield. Since water stress brings about changes in growth and dry matter Partitioning in groundnut, a thorough knowledge on leaf water characteristics becomes imperative. The present study was undertaken to find out the effect of effect of moisture stress on dry matter production and pod yield in groundnut.

MATERIALS AND METHODS
A field trial was conducted during summer, at Regional Research Station, Vriddhachalam with eleven groundnut Genotypes. Two treatments one comprising with moisture stress and the other under normal conditions were chosen. The crop was raised under normal irrigated conditions upto 25 days and afterwards moisture stress was imposed by withholding irrigation. The plots under moisture stress were irrigated when the plants did not recover turgor at night. Five plants were carefully removed without much loss of roots in each plot at 25, 55 and 105 (at harvest) days after sowing. Observations on plant height, root length, root – shoot ratio (by length and by weight), dry matter production and pod yield were recorded. At, harvest number of mature and immature pods, pod yield, shelling percentage and 100 kernel weights were recorded.

RESULTS AND DISCUSSION

Dry matter production

The data on dry matter production and root - shoot ratio of eleven groundnut Genotypes under moisture stress and normal conditions are presented in Table 1. The DMP ranged from 4.36 g to 7.47 g/plant under normal conditions affecting a marked decrease in the dry matter production under moisture stress. The culture VG 77 recorded the highest DMP of 15.01 g/plant followed by JL, 24 (14.31 g) under normal conditions. Under moisture stress conditions a different trend was observed. The culture JLM.6 recorded the highest DMP of 7.49 g followed by VG. 75, VG.76 and then VG. 77. In general the per cent reduction of tops is more as compared to the roots. The reduction of tops was higher in JL.24 and VG.77 which recorded a per cent reduction of 67.51 and 66.04, respectively. Excepting JLM.4 all the Genotypes recorded less reduction of root weight under moisture stress conditions.

The ratio by length was higher in CGC 4018 (1.63) followed by ICG 1697 (1.18) VG.76 (1.12) and VG. 77 (1.11). Considering the root – shoot ratio by weight, it was observed that the ratio was better under moisture stress conditions, the culture VG.77 had recorded the higher ratio of 104.28 followed by JLM.6 (84.18) and Co2 (83.87). The larger and deeper root system in the cultures can be considered as one of the adaptive features for drought tolerance mechanism. It was also presumed that the photosynthetic energy was mobilized towards the roots thus enabling the plants to withstand the water stress condition. In addition to the resistance against moisture stress, the root system also facilitated in the greater absorption of nutrients and water from deeper soil horizon. Considerable degree of tops in the cultures VG.77 and JL.24 may also be attribute to less loss of water though transpiration mechanism. Studies conducted at IRRI (Anon, 1975; 1976) on drought tolerance in rice lend support for the present study.

Table 1. Effect of moisture stress on Dry matter production (g / plant) and Root – shoot Ratio (by length and weight) in groundnut (55 DAS). SE: 0.39

Variety	Dry matter production (g plant)						Per cent of control (=100)		Root – shoot ratio by length		Root: shoot Ratio by weight	
	Moisture stress			Normal (control)								
	Tops	Root	Total	Tops	Root	Total	Tops	Roots	Stress	Normal	Stress	Normal
Co.1	4.97	0.33	5.30	6.90	0.30	7.20	72.03	110.00	0.91	0.74	66.39	43.48
Co.2	4.65	0.39	5.04	9.70	0.47	10.15	47.94	82.98	1.05	0.73	83.87	48.45
JL.24	4.50	0.37	4.87	13.85	0.46	14.31	32.49	80.43	1.09	0.62	82.22	33.21
VG.75	5.63	0.46	6.09	11.54	0.48	12.02	48.79	95.83	0.97	0.57	81.71	41.59
JLM.4	5.65	0.28	5.93	9.95	0.49	10.44	56.78	57.14	1.07	0.75	49.56	49.25
JLM.6	6.89	0.58	4.47	11.86	0.65	12.51	58.09	89.23	1.09	0.54	84.18	54.81
VG.76	5.70	0.46	6.16	12.27	0.52	12.79	46.45	88.46	1.12	0.57	80.70	42.38
VG.77	4.89	0.51	5.40	14.40	0.61	15.01	33.96	83.61	1.11	0.59	104.29	42.36
VG.15	5.45	0.39	5.84	8.80	0.36	9.16	61.93	108.30	0.90	0.50	71.56	40.91
ICG.1697	5.10	0.35	5.45	10.88	0.45	11.33	46.88	77.78	1.18	0.55	68.63	41.36
CGC.4018	4.06	0.30	4.36	9.05	0.41	9.46	44.86	73.17	1.63	0.57	73.89	45.30

Cultivar *CD* : *1.16*
SE : *0.17*
Treatments *CD* : *0.49*
SE : *0.56*
C xT *CD* : *1.64*

Pod yield and yield attributes. The data on pod yield and yield attributes are presented in Table 2.

Mature pods

Under normal conditions, the number of mature pods is more in VG.77 (12.90) followed by CGC 4018 (12.50). Under moisture stress conditions, the number was 4.85, 4.15 and 3.55 in VG.77, VG.76 and JL.24, respectively. Thus moisture stress had affected the pod development to a greater extent. The highest yield of pods was obtained in ICG 1697 (85.40 g) closely followed by VG.77 ((84.65 g).

Shelling per cent and 100 – kernel weight

Eventhough the pod yields are higher in IGC 1697 and CGC 4018, the shelling percentage was very poor and hence not considered from the economic pint of view. The culture VG.77 recorded the highest 100 – kernel weights of 39.25 g and 28.50 g under normal and moisture stress conditions, respectively.

The variations displayed in the pod yield and yield attributes under moisture stress conditions are essentially a varietal character and this is presumably an adaptive feature for the drought tolerance in VG. 77, JL.24 and Co. 2.ChandrasekaraRao and Ramamoorthy (1981) observed that varietal differences exhibited in wheat and in rice (SuraprakashRao and Venkateswaralu, 1983).

Functional leaves at Harvest

The data on functional leaves at harvest are presented in Table 2. The number of functional leaves ranged from 10.8 to 93.3 under normal conditions. It ranged from 81.8 to 132.7 numbers per plant under moisture stress conditions. The cultures ICG 1697 and VG. 77 recorded 132.7 and 120.9 number of leaves, respectively. Leaf senescence was considered as on indication for the maturity of pods in groudnut. But under moisture stress conditions, the functional leaves at the time of harvest can be of greater importance. In the cultures ICG. 1697, VG. 77, CGC 4018 and JL. 24, the photosynthetic apparatus viz., the leaf has contributed the photo synthates to the developing pod upto harvest for greater productivity.

Table 2. Effect of moisture stress on mature pods (Numbers), Pod yield (g / m^2), shelling percentage, 100 – kernel weight (g) and functional leaves (Numbers) in groundnut (105 DAS)

Variety	Mature pods		Pod yield		Shelling per cent		100 kernel weight		Functional leaves	
	Stress	Normal	Stress	Normal	Stress	Normal	Stress	Normal	Stress	Normal
Co.1	2.85	12.0	34.00	114.20	75.01	78.56	20.25	26.00	87.0	10.8
Co.2	3.50	10.9	60.70	135.0	70.87	74.38	25.75	37.38	95.6	27.2
JL.24	3.55	10.7	64.10	132.50	73.86	76.14	23.90	33.50	110.0	23.6
VG.75	2.05	9.2	32.10	109.30	75.59	75.81	24.50	32.25	100.5	28.6
JLM.4	1.40	11.75	38.35	131.65	69.94	75.00	22.50	33.00	98.8	24.0
JLM.6	2.86	8.95	50.45	123.75	70.67	74.48	23.50	31.75	98.2	13.4
VG.76	4.15	11.35	60.45	140.00	71.01	73.66	24.50	32.88	98.4	23.2
VG.77	4.85	12.90	84.65	177.80	73.56	75.79	28.50	39.25	120.95	51.6
VG.15	2.85	8.30	40.10	95.40	77.29	77.53	22.00	33.63	81.8	30.0
ICG.1697	1.25	9.75	85.40	259.15	60.59	73.78	22.75	33.75	132.7	60.6
CGC.4018	0.85	12.50	67.20	212.10	63.21	69.86	23.75	35.38	112.5	93.3
Genotypes	*SE ± 1.28*		*5.70*		*0.68*		*0.72*			
	CD (P=0.05) 3.76		*16.77*		*2.01*		*2.13*			
	SE ± 0.55		*2.43*		*0.29*		*0.31*			
	CD (P=0.05) 1.60		*7.15*		*0.86*		*0.91*			
	SE ± 1.81		*8.06*		*0.97*		*1.02*			
C x T	*CD (P=0.05) 5.52*		*23.72*		*2.85*		*3.0*			

Summing of the results, it was evident that tolerant groundnut Genotypes viz., VG. 77, JL. 24 and Co.2 possess greater drought tolerance characters especially for the production of higher DMP, higher root –

shoot ratio, comparatively lesser tops and more number of functional leaves at the time of harvest. These characters may very well contribute to the higher yield potential in groundnut Genotypes under moisture stress conditions.

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