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Influence of Fertilizer Management Practices on Growth, Yield and Quality of Export Oriented Groundnut [*Arachis hypogaea* (L.)].

Key words : Export oriented Groundnut, Growth parameters,Micro nutrients,Quality, Yield.

Groundnut is the most important oilseed crop of India. To a very limited extent, groundnut is also used for table purpose and confectionary, for which bold kernel types are mostly preferred. Because of the bold size of pods and kernels, the nutritional requirement is reportedly higher than traditional cultivars. Groundnut, inspite of its high nutrient requirement, is cultivated mostly on soils deficient in macro and micronutrients. Due to micronutrient deficiencies, particularly Zn, B and Mo yield reduction of groundnut is substantial (Tripathy *et al.*, 1999). One of the factors responsible for low yields of groundnut is the inadequate and imbalanced use of nutrients. Hence, the present experiment was conducted to study the response of 'Asha', an export oriented groundnut variety to different levels of major nutrients along with different micro nutrients. The test cultivar was Asha (ICGV-86564), which matures in 120-130 days with yield potential of 3 t ha^{-1} and the protein content ranged from 30-35 percent.

A field experiment was conducted during *rabi*, 2005 in dry land farm of S.V.Agrilcultural College, Tirupati. The soil of the experimental site was sandy clay loam in texture and the initial nutrient status was 230, 21.4 and 205 N-P_2O_5-K_2O kg ha^{-1} respectively. The experiment was laid out in split plot design and replicated thrice. The treatments comprised of three levels of major nutrients *viz.,* 30-40-50 N-P_2O_5-K_2O Kg ha^{-1} (M_1), 45-60-75 N-P_2O_5-K_2O Kg ha^{-1} (M_2) and 60-80-100 N-P_2O_5-K_2O Kg ha^{-1} (M_3) assigned to main plots and six micronutrient management practices *viz.,* no micronutrient application (S_1), $ZnSO_4$ @ 10 kg ha^{-1} (S_2), Borax @ 5kg ha^{-1} (S_3), $FeSO_4$ @ 2.5 kg ha^{-1} (S_4), $CuSO_4$ @ 5 kg ha^{-1} (S_5) and combined application of all the four micronutrients (S_6) allotted to sub plots. Entire dose of all the fertilizers except nitrogen was applied basally. Nitrogen was applied in two equal splits *viz.,* first half at the time of sowing as basal and remaining half as top dressing at 30 DAS. Growth parameters *viz.,* plant height, leaf area index, drymatter production were recorded at 30, 60, 90 DAS and at harvest. Yield attributes and yields were recorded at harvest. Kernels collected from different treatments were analyzed for oil and protein content by using standard techniques and expressed as percentage.

The plant height of groundnut increased progressively with advance in the age of the crop up to harvest. The highest plant height was recorded with the higher level of major nutrients *i.e.* 60-80-100 N-P_2O_5-K_2O Kg ha^{-1} and with combined application of micro nutrients. Irrespective of the interval, significantly highest leaf area index and drymatter production was recorded with highest level of major nutrients *i.e.* 60-80-100 N-P_2O_5-K_2O Kg ha^{-1}(M_3) which was comparable with 45-60-75 N-P_2O_5-K_2O Kg ha^{-1} (M_2) but higher than with lower level of application 30-40-50 N-P_2O_5-K_2O Kg ha^{-1}(M_1) . Among micro nutrient management practices, combined application all four micro nutrients (B, Zn, Cu and Fe) recorded the highest leaf area index and drymatter production than no micro nutrient application (Table 1) due to improved nodulation, increased nutrient uptake and better growth of the crop. These results are in line with the findings of Bunsa *et al.* (2004).

The yield attributes like number of filled pods $plant^{-1}$, pod weight, shelling percent and test weight of Asha variety recorded highest values with the highest level of major nutrients (M_3) which was comparable with (M_2) but significantly higher with (M_1) Similar results have been reported by Gundalia *et al.* (2004). All the above yield parameters were recorded highest values with combined application of all the four micro nutrients (S_6), which was followed by individual application of Zn and B. Lowest values were recorded with no micro nutrient application. Subramaniyan *et al.* (2001) also reported that application of $ZnSO_4$, borax and ferrous sulphate either alone or in combination significantly increased the pod yield, shelling percentage and 100 kernel weight. The highest pod and haulm yields were produced with the highest level of major nutrients tried (M_3) which was comparable with (M_2) but significantly higher with (M_1) which has produced the lowest yields. Among the micronutrient management practices, significantly the highest pod and haulm yields

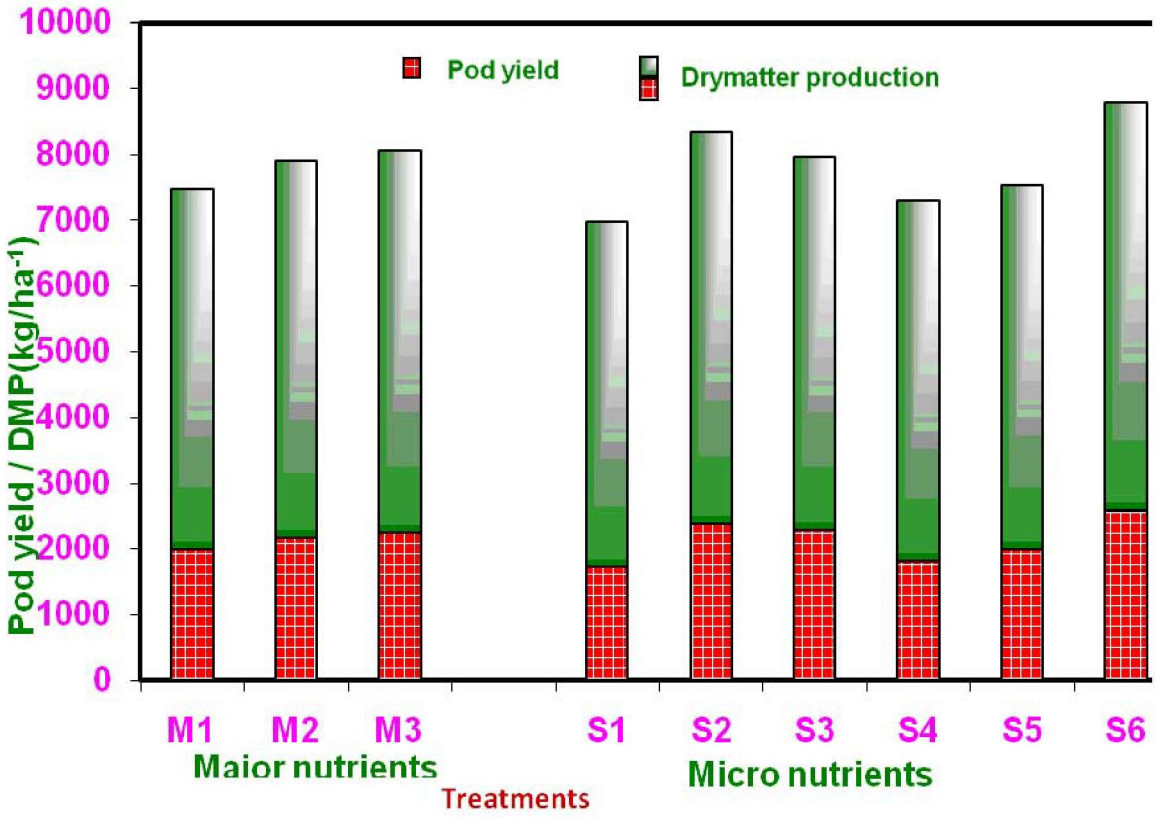
Table 1. Effect of different nutrient management practices on growth parameters of groundnut

Treatment	Plant height (cm)				Leaf Area Index				Drymatter production (kg ha^{-1})			
	30 DAS	60 DAS	90 DAS	At harvest	30 DAS	60 DAS	90 DAS	At harvest	30 DAS	60 DAS	90 DAS	At harvest
Major nutrients (N-P_2O_5-K_2O kg ha^{-1})												
M_1: 60-80-100	7.8	17.9	26.9	33.08	0.193	2.38	3.51	2.95	389	2536	4501	5943
M_2: 45-60-75	8.9	19.3	32.5	35.08	0.204	2.50	3.69	3.15	486	2828	4716	6136
M_3: 30-40-50	9.2	19.8	33.1	35.46	0.209	2.51	3.78	3.20	508	2880	4752	6299
SEm±	0.07	0.31	0.42	0.441	0.002	0.01	0.02	0.01	6.3	3572	18.81	44.86
CD (P=0.05)	0.30	1.22	1.65	NS	0.008	0.05	0.09	0.04	25	140	74	176
Micro nutrients												
S_1: No micronutrient application	8.4	17.5	28.62	32.06	0.188	2.07	3.04	2.26	436	2243	4142	5462
S_2: $ZnSO_4$ @ 10 kg ha^{-1}	8.80	19.5	31.9	34.99	0.206	2.49	3.78	3.34	469	2878	4816	6998
S_3: Borax @ 5 kg ha^{-1}	8.53	18.6	31.35	34.72	0.203	2.48	3.73	3.16	462	2784	4760	6815
S_4: $FeSO_4$ @ 2.5 kg ha^{-1}	8.66	19.0	30.84	33.68	0.193	2.35	3.62	3.11	455	2740	4562	5728
S_5: $CuSO_4$ @ 5 kg ha^{-1}	8.71	19.2	29.93	34.36	0.191	2.40	3.63	3.14	452	2728	4569	5983
S_6: combined application of all the four micronutrients	8.90	20.3	32.58	37.41	0.213	3.03	4.15	3.59	494	3112	5090	7251
Sem±	0.132	0.271	0.417	0.310	0.002	0.01	0.02	0.01	4.5	26.58	37.02	65.9
CD (P=0.05)	NS	0.79	1.23	0.92	0.006	0.04	0.06	0.05	13	77	107	190
M x S interaction												
CD (P=0.05) NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	

Table 2. Yield attributes, yield and quality parameters of groundnut as influenced by different nutrient management practices.

Treatment	Filled pods (no)/ plant	100 pod weight (g)	Shelling (%)	Test Weight (g)/100 kernels	Pod yield (kg ha^{-1})	Haulm Yield (kg ha^{-1})	Harvest index (%)	Protein content (%)	Oil content (%)	B:C ratio
Major nutrients (N-P_2O_5-K_2O kg ha^{-1})										
M_1: 60-80-100	25.5	121.8	64.91	58.0	1984	3834	36.17	32.00	50.42	4.24
M_2: 45-60-75	29.0	129.0	68.84	61.1	2175	4022	37.96	34.32	47.32	4.34
M_3: 30-40-50	29.8	130.4	69.73	62.2	2244	4094	38.52	36.46	43.17	4.48
SEm±	0.262	0.70	0.233	0.670	18.33	46.19	0.11	0.04	0.672	0.06
CD (P=0.05)	1.0	2.8	0.92	2.6	72	182	0.42	0.19	2.62	NS
Micro nutrients										
S_1: No micronutrient application	23.8	107.7	63.2	54.8	1742	3594	33.24	31.66	45.37	3.72
S_2: $ZnSO_4$ @ 10 kg ha^{-1}	31.1	129.5	69.3	62.4	2383	4235	40.04	34.89	48.36	4.84
S_3: Borax @ 5 kg ha^{-1}	29.3	128.8	67.8	59.3	2279	4131	40.09	34.84	48.43	4.73
S_4: $FeSO_4$ @ 2.5 kg ha^{-1}	25.8	125.1	67.4	59.0	1808	3660	33.01	34.04	47.84	3.82
S_5: $CuSO_4$ @ 5 kg ha^{-1}	25.1	125.3	66.9	58.3	2002	3854	36.17	33.56	48.21	4.08
S_6: Combined application of all the four micronutrients	33.4	136.3	71.9	68.7	2592	4426	41.87	36.57	43.61	4.91
SEm±	0.652	0.880	0.635	0.868	61.96	71.53	0.24	0.06	0.53	0.41
CD (P=0.05)	1.9	2.5	1.8	2.5	118	206	0.68	0.18	1.58	0.12
M x S interaction										
SEm±	1.103	-	-	1.504	107.3	-	-	0.10	-	-
CD (P=0.05)	3.3	-	-	4.3	207	-	-	0.31	-	-

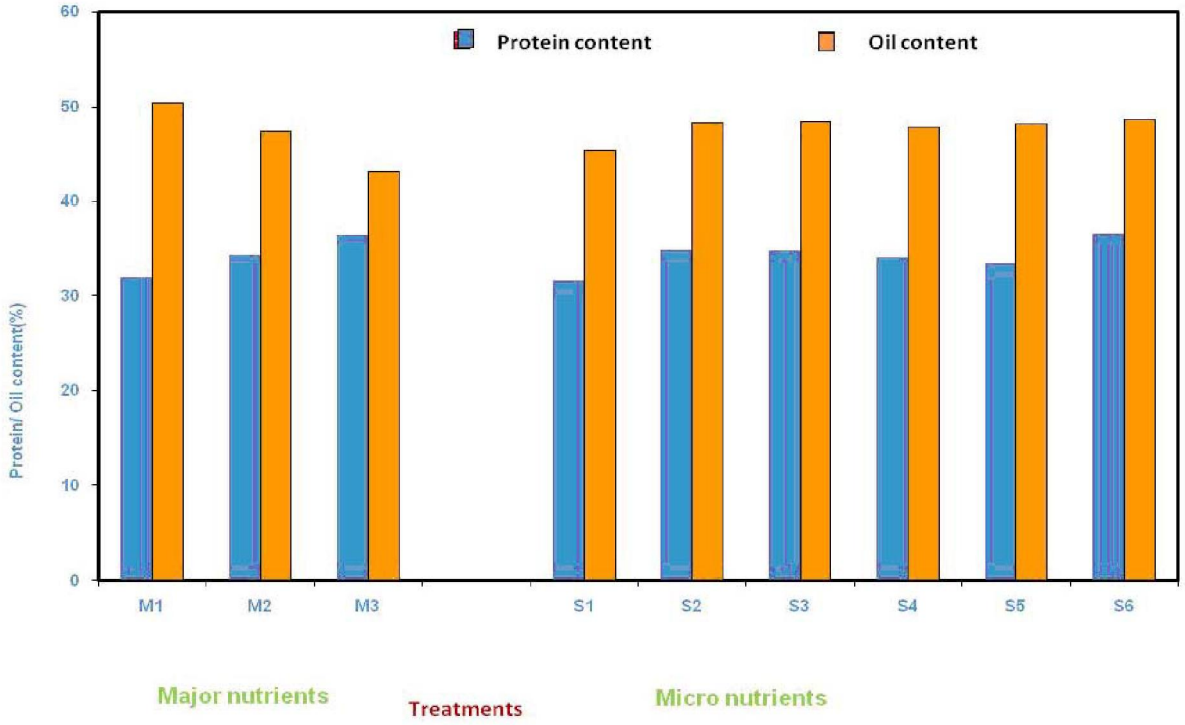
Fig 1. Total drymatter production Vs Pod Yield of groundnut (kg ha-1) as influenced by different nutrient management practices



were recorded with application all the four micronutrients, due to efficient translocation of assimilates, particularly for development of pods i.e., involvement of micronutrients in regulatory functions, auxin production, which resulted in increased stature of all the yield attributes led to higher yields (Table 2). The yield increase was to the tune of 48% due to combined application of micro nutrients over control. Janakiraman *et al.* (2004) reported that pod yield of groundnut was significantly higher when Fe, Zn and B were applied along with recommended dose of NPK fertilizers. These findings are in agreement with those of Chaube *et al.* (2002).

Protein content of kernel was at most important for bold kernel type, which is intended for export purpose. The highest protein content was recorded with the highest level of major nutrients tried (M_3) which was significantly superior to (M_2) and (M_1) with significant disparity between any two successive levels. Among the micronutrient management practices, the highest protein content was recorded with application all the four micronutrients, followed by S_2 and S_3 and lowest with S_1. The increase in protein content was 13.9 % with application of 60-80-100 N-P_2O_5-K_2O Kg ha^{-1} over 30-40-50 N-P_2O_5-K_2O Kg ha^{-1} and 15.5 % with combined application of all the four micro nutrients (B, Zn, Cu and Fe) over no micro nutrient application, as the micro nutrients are involved in the synthesis of amino acids, leading to the formation of the protein molecules (Table 2). Findings of the present investigation are in agreement with those of Krishnappa et al. (1994). Highest oil content was recorded with lowest level of major nutrients (M_1) and with combined application of micro nutrients (S_6). Balasubramaniyan (1997) also reported that inorganic fertilizer application at 150 per cent of recommended dose increased the protein yield, while oil percentage in the kernel remained unaltered. The highest harvest index of 38.52 % and 41.87 % was recorded with M_3 and S_6 respectively. Benefit cost ratio did not differ significantly difference due to different levels of major nutrient tried, while combined application of all four micronutrients resulted in significantly highest B: C ratio.

Fig 2. Protein content and oil content in groundnut kernel (%) as influenced by different nutrient managmnent practices.



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