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RESPONSE OF JL-24 GROUNDNUT TO RATES, TIMES AND METHODS OF GYPSUM APPLICATION

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In sandy loam soil top dressing of 500 kg/ha gypsum over a basal dressing of the recommended dose of NP at 30 days after sowing (DAS) coinciding with first flowers appearance increased significantly test weight of pod and kernels, shelling outturn and pod yield of spanish groundnut cultivars JL-24 and TCG 1704 (Pre-release variety). Delayed application at 45 or 60 DAS decreased the pod yield. There was further yield reduction when gypsum was applied to the plant and earthed up. Eventhough top dressing of 750 kg/ha of gypsum alone increased pod yield over on gypsum application, the increase was highest due to top dressing of 500 kg/ha with NP. Higher dose of gypsum at 1000 kg/ha depressed pod yield either with or without NP in both JL-24 and TCG 1704. The response of JL-24 and TCG 1704 per unit of gypsum was 6.95 and 6.53 kg of pods respectively The highest additional net return was with NP and 500 kg/ha of top dressing of gypsum at flower appearance.

Calcium and sulphur requirements of groundnut are quite heavy. Even in neutral and alkaline soils of sandy texture, calcium deficiency may become serious. Deficiency of calcium leads to poor root and pod development. Calcium when applied to rooting zone only, does not meet the demands of developing fruits as calcium is absorbed directly by developing gynophores. Therefore, it is very important that sufficient quantities of calcium are present in the fruiting (0-5 cm depth) as well as rooting zones for proper kernel development. Supply of calcium improves growth and qulity of nuts as evidenced by lighter firmer shells and fewer unfilled pods (Kanwar *et al*, 1983). Sulphur plays an important role besides nitrogen and phosphorus in the formation of proteins and it is involved in metabolic and enzymatic processes of all living cells. Likewise, it plays an important role in chlorophyll formation, increases protein and oil contents, cysteic acid and methionine contents of groundnuts. Chopra and Kanwar (1966) observed that sulphur fertilization not only increased the yield but also improved the quality of groundnut. Sulphur is observed by the pegs penetrating into the soil and also developing pods. Therefore, it must be made avilable in the pod zone (Sankara Reddy, 1982). The data available in the effect of calcium and sulphur nutrition to groundnut in Indian soils is scanty with recent varieties. Earlier studies conducted at Tirupati with TMV-2 groundnut showed that gypsum application at

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first flower appearance gave higher response than basal application (Veera Raghavaiah *et al.*, 1982, 1983). Experiments conducted at ICRISAT, where soils are not deficient in calcium, have shown that some varieties gave positive response to gypsum application under drought stress while some other varieties responded positively when both gypsum and irrigation were applied (ICRISAT, 1982).

An experiment was therefore laid out to study the response of new varieties of groundnut to different doses, times and methods of application of gypsum under irrigated conditions and the results are given below.

MATERIALS AND METHODS

The experiment was conducted in *rabi* 1983-84 on sandy loam soil which had a pH of 8.5, EC 0.11 m mhos/cm, low in available N and P. The available calcium and magnesium contents of the test site were 3 5 and 0.9 me/100 g of soil raspectively while the sulphur content was low with 6 ppm / 100g of the soil. The experimental design was split plot and the treatmental set was replicated thrice. The treatments consisted of different doses, times and methods of gypsum application with no fertilizer, N alone and NP as checks alloted to main plots. The test groundnut varieties JL-24 and TCG 1704 (pre-release variety evolved at NARP Tripati) were alloted to sub-plots. The details of the treatments are given in Table 1. The crop was sown on 28-15-1983. The spacing adopted was 22.5 x 10 cm to give 4.44 lakh population/ha. Wherever nitrogen was applied, 20 kg/ha was given as basal

TABLE 1 Yield and yield attributes as influenced by Gypsum treatments

Treatment	No. of filled pods/plant	100-pod weight (g)	100-kernel weight (g)	Shelling percentage	pod yield (kg/ha)	Haulm yield (kg/ha)
1	2	3	4	5	6	7
Main Plots (Gypsum & Fertilizer levels)						
T1 No fertilizer and no gypsum	6.5	87.4	38.5	70.6	1599	1900
T2 30 kg N/ha	7.2	90.3	39 6	71.5	1691	2012
T3 30 N + 20 P kg/ha as DAP	8.2	95.5	39.8	72.8	2032	2416
T4 Gypsum only @ 250 kg/ha basal (mixing with soil)	9.0	98 9	41.7	73.0	2608	3096
T5 Gypsum only @ 500 kg/ha as basal (mixing with soil)	9.0	100.2	41 5	73.8	2642	3149
T6 Gypsum only @ 750 kg/ha basal (mixing with soil)	10.2	101.8	41.5	73.8	2898	3444

T7 Gypsum only @ 1000 kg/ha basal (mixing with soil)	9.4	95.7	41.2	74.2	2769	3331
T8 Gypsum only@250 kg/ha top dressing (mixing with soil)	9.9	97.8	41.3	71.3	2515	2990
T9 Gypsum only@500 kg/ha top dressing (mixing with soil)	11.5	98.5	41.7	72.9	2615	3100
T10 Gypsum only@750 kg/ha top dressing (mixing with soil)	9.2	100.2	42.5	76.1	2777	3285
T11 Gypsum only@1000 kg/ha top dressing (mixing with soil)	8.9	99.4	41.7	73.7	2553	3033
T12 T_3+Gypsum @ 250 kg/ha basal (mixing with soil)	10.6	104.0	42.1	74.7	2980	3556
T13 T_4+Gypsum@250 kg/ha top dressing (mixing with soil)	10.8	105.4	43.3	75.1	3030	3585
T14 T_5+Gypsum@500 kg/ha basal (mixing with soil)	10.7	103.8	43.3	76.2	3041	3613
T15 T_3+Gypsum@500 kg/ha top dressing (mixing with soil)	10.6	107.5	44.9	77.7	3370	3948
T16 T_3+Gypsum@500 kg/ha top dressing + earthing up	8.6	102.2	42.0	73.7	3025	3588
T17 T_3+Gypsum@500 kg/ha at 45 DAS (mixing with soil)	9.3	100.6	41.1	75.5	3047	3609
T18 T_3+Gypsum@500 kg/ha at 45 DAS+ earthing up	8.2	94.7	40.2	72.8	2459	2993
T19 T_3+Gypsum 500 kg/ha at 60 DAS applied to the base of plant	9.6	95.8	41.4	74.2	2530	3012
T20 T_3+Gypsum @ 500 kg/ha at 60 DAS+ mixing	8.5	97.2	41.7	75.1	2652	3158
S. Em (±)	0.6	2.6	0.6	1.1	112	13_1
C. D. (5%)	1.8	7.2	1.6	3.1	311	363
Sub-plots (Varieties)						
V_1 - JL-24	8.2	123.4	50.8	73.1	2728	3236
V_2 - TCG 1704	10.3	74.3	32.3	74.7	2555	3046
S. Em (±)	0.17	0.68	0.17	0.3	26	3_1
C. D. (5%)	0.50	1.90	0.50	0.9	73	86
Interaction C. D. (5%) a.	1.25	5.06	1.12	2.17	220	257
b.	2.12	8.39	2.10	4.14	328	388
General Mean	9.3	98.8	41.5	73.9	2641	3141
C. V. (%)	14.2	5.3	3.2	3.5	7.8	7.7

and 10 kg/ha as top dressing at 30 DAS. Entire quantity of phosphorus was applied basally in the form of Diammonium phosphate. Gypsum was applied at 250, 500, 750 and 1000 kg/ha with and without fertilizers (NP) either basal or as top dressing. Gypsum was either applied to the base of the plant on both the sides and mixed into the soil by hoeing or applied to the base of the plant on both sides and earthed up. The times of application of gypsum was basal, top dressing at 30, 45 and 60 days after sowing.

RESULTS AND DISCUSSION

The data obtained on yield attributes and pod and haulm yield are given in Table 1.

Effect of gypsum application :

Gypsum treatments had significant influence on yield attributes and yield of both the groundnut varieties. The lowest yield (1599 kg/ha) was obtained where no fertilizer and no gypsum was applied and so was the case with pod number, test weight of pod and kernels and shelling outturn. Nitrogen in combination with phosphorus increased significantly test weight of pod over the treatment of without any fertilizer. Among the gypsum treatments without NP, basal application of gypsum alone at 750 kg/ha gave maximum pod yield but it was on par with basal application of other doses tried. But in combination with NP, top dressing of either 250 or 500 kg/ha of gypsum at flower appearance was superior to respective basal applications. However, highest pod yield (3370 kg/ha) was obtained due to basal application of NP followed by top dressing of 500 kg/ha at first flower appearance. Delayed application of gypsum at 45, or 60 DAS decreased the pod and haulm yields of groundnut whereas earthing up to cover gypsum, further depressed the yield obviously due to disturbance of developing pegs and pods

Response of varieties :

Between the two test varieties JL-24 was significantly superior to TCG 1704 with regard to 100-pod and kernel weight which was responsible for a higher pod yield (2728 kg/ha) compared to the yield of (2555 kg/ha) TCG 1704. The haulm yield obtained from JL-24 variety was also significantly superior to that of TCG 1704. However, the number of filled pods and shelling outturn were significantly higher in TCG 1704 compared to JL-24.

Interaction :

Interaction was significant for all the yield attributes and yield. In JL-24 highest number of filled pods were with top dressing of 500 kg/ha gypsum (with NP) while top dressing of 500 kg/ha gypsum alone at flower appearance gave maximum number of pods in TCG 1704. On an average, TCG 1704 gave higher number of filled pods compared to

JL-24. Similarly, TCG 1704, was superior to JL-24 with reference to shelling outturn. However, 100-pod weight, 100-kernel weight and pod yield of JL-24 were superior to TCG -1704 at any given dose of gypsum. The higher values of these characters were recorded with both the varieties when top dressing of 500 kg/ha of gypsum was done over a basal NP application. The percentage increase of pod yield of JL-24 and TCG 1704 over no fertilizer was 126 and 96.8 respectively when NP was applied basally and top dressed with gypsum @ 500 kg / ha at flower appearance. The percentage increase in pod yield due to this treatment over NP was 58.6 74.4 for JL-24 and TCG 1704 respectively while the response per kilogram of gypsum applied was 6.95 and 6.53 respectively. The favourable effect of gypsum application on pod number, pod and kernel weight,

TABLE 2 Effect of gypsum treatments x Varieties on pod yield of Groundnut

Treatment	JL - 24	TCG 1704	Total	Mean
T1	1538	1659	3198	1599
T2	1666	1715	3381	1690
T3	2192	1872	4063	2032
T4	2865	2351	5216	2608
T5	2890	2394	5284	2642
T6	3052	2743	5795	2898
T7	2739	2799	5538	2769
T8	2579	2451	5030	2515
T9	2835	2394	5229	2615
T10	2890	2663	5553	2777
T11	2543	2562	5105	2553
T12	3130	2829	5959	2980
T13	3240	2820	6060	3030
T14	3158	2924	6082	3041
T15	3476	3264	6740	3370
T16	3198	2852	6050	3025
T17	2996	3098	6094	3047
T18	2571	2347	4118	2459
T19	2423	2637	5060	2530
T20	2569	2734	5303	2652
Mea	2728	2555		
	C. D. (5%)	a = 220		
		b = 328		
	C. V. (%)	7.8		

shelling outturn and yield has been earlier reported by Dalal *et al.* (1963), Chopra and Kanwar (1966), Veera Raghavaiah *et al.*, (982, 1983) and Kanwar *et al.* (1983). Highest additional net return of Rs 6743/ha was obtained due to basal application of NP followed by top dressing of gypsum @ 500 kg/ha at flower appearance over no fertilizer and gypsum.

TABLE 3 Economics of gypsum application

Treatment	Additional yield over no fertilizer and gypsum (kg/ha)		Value of additional yield (Rs./ha)*	Additional expenditure (Rs /ha)*	Addl. net return over no fertilizer & gypsum (Rs./ha)*
	Pod	Haulm			
T1	—		—	—	—
T2	91	112	375	154	221
T3	433	516	1784	422	1362
T4	1009	1196	4156	58	4098
T5	1043	1249	4297	116	4181
T6	1299	1544	5350	174	5176
T7	1170	1431	4823	232	4591
T8	916	1090	3773	66	3707
T9	1016	1200	4184	124	4060
T10	1178	1385	4851	182	4669
T11	954	1135	3929	240	3689
T12	1381	1656	5690	480	5210
13	1431	1685	5893	488	5405
14	1442	1713	5939	538	5401
15	1771	2048	7289	546	6743
16	1426	1688	5873	586	5287
17	1448	1609	5963	546	5417
18	860	1093	3549	586	2963
19	931	1112	3835	546	3289
20	1053	1258	4338	586	3752

* Figures rounded off to the nearest rupee.

Cost of 1 kg of groundnut pods Rs. 4-00
Cost of 1 kg of groundnut haulms Rs. 0-10
Cost of 1 kg of DAP Rs. 3-48
Cost of 1 kg of Urea Rs. 2-24
Cost of 1 kg of gypsum Rs. 0-20
Cost of 1 unit of N Rs. 4-86

This study has confirmed earlier results and added information to the effect that for new variety JL-24 also gypsum application contributed to increased pod yield. There was no advantage due to a dose beyond 500 kg/ha and earthing up after gypsum application.

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SEED SIZE IN RELATION TO IMBIBITION, EMERGENCE AND SPEED OF EMERGENCE IN PEANUT (*Arachis hypogae* L.) cv POL 1 AND TMV 2

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A study was carried out to assess the influence of seed size relative to imbibition, radicle emergence and speed of emergence, in groundnut cv POL 1 and TMV 2. The study revealed that the imbibition rate increased with increase in duration of soaking irrespective of seed size. However, imbibition rate and speed of radicle emergence showed a negative correlation with seed size in laboratory study alone. In field emergence test, the graded seeds gave significantly higher percentage of germination than the ungraded seeds and were on par. The speed of field emergence decreased with increase in seed size in both the varieties.

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