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INFLUENCE OF GROWTH REGULATOR AND NUTRIENTS ON THE QUALITY OF GROUNDNUT (*Arachis, hypogaea* L.)

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"The individual and cumulative effect of Gypsum, NAA and Boron on the quality and productivity of groundnut was studied. Gypsum when applied @ 1000 kg/ha and a beneficial influence in increasing the pod yield and Kernel quality of groundnut. NAA (in the form of planofix) @ 20 ppm and 40 ppm improved the pod yield as well as the quality of Kernel. No beneficial effect of Boron was found. The cumulative effect of gypsum, NAA and Boron was found to be baneficial in improving the pod yield and Kernel quality.

Groundnut is an important oil-seed crop containing about 50 Percent edible oil and 25-35 per cent protein. The average area under groundnut in India is 7.19 milion hectares and India leads the world in the area under groundnut with its contribution of 38% to the total global mean. The per hectare yields are very low in India. Hence, there is every need to improve both production and quality of groundnut.

Legumes and oil-seed crops are especially classified as sulfur-loving crops. Its deficiency retards the formation of proteins. Nitrogen uptake by kernel was markedly increased by calcium application. An increase in the nitrogen content of groundnut kernal by sulfur was reported by Pathak and Pathak (1972) The oil content in kernal was imporved by sulfer (Pathak & Pathak 1972 and Bhuiya and Chaudary, 1976) and gypsum (Milton et al. 1976). The yield of groundnut was also enhanced by gypsum application (Milton et al. 1976 and Subba Rao, 1975). As gypsum contains both calcium and sulfur and is also cheaper, it was tried on groundnut. As Boron was also reported to improve the yield and quality of groundnut, (Sankaran et al. 1977 and Harris & Gilman, 1957) it was also included in the trial. Some growth substances are supposed to improve the quality and quantity of groundnut (Sanjeevaiah 1967 and Gopalakrishnan and Srinivasan 1975). So, NAA was also tried. As such, in addition to cultural practices, exegenous supply of growth regulaters and nutrients can improve the quality of groundnut. The individual effect of some of these chemicals was tried earlier. However, the cumulative influence of these chemicals viz., gypsum, NAA and Boron was not tried so far.

Hence, with the objective to evaluate the individual as well as cumulative influence of gypsum, Naphthalene Acetic Acid and Boron on the

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quality of groundnut, the present investigation was conducted.

MATERIAL AND METHODS

A field experiment was carried out in the Agricultural College Farm, Bapatla during Rabi 1976-77, in split-plot Design replicated four times with the following treatments.

Main plots

G_0 = Control (No gypsum)

G_{500} = Gypsum @ 500kg/ha

G_{1000} = Gypsum @ 1000 kg/ha

Plot size = 10 m²

Sub-Plots

The combination of Boron and NAA at the concentrations mentioned below.

NAA

NAA_0 = NAA @ 0 ppm

NAA_{20} = NAA @ 20 ppm

NAA_{40} = NAA @ 40 ppm

NAA_{60} = NAA @ 60 ppm

Boron

B_0 = No Boron

B_1 = Boron @ 0.1%

B_2 = Boron @ 0.2%

Gypsum was applied before sowing and incorporated into the soil. Fertilizer schedule included 35 kg N, 30 kg P_2O_5 and 45 kg K_2O per hectare; with nitrogen applied in two equal split doses, one at sowing, the other at 20 days after sowing (20 DAS). Seeds of groundnut CV. TMV-2, were sown with the spacing of 30 x 15cm. NAA was sprayed twice to the foliage at 35 DAS and 65 DAS. Boron (Borax) was sprayed once only at 36 DAS Plant protection measures were taken up as and when required. The crop was irrigated at 10 days interval. The data on the following physiological parameters were recorded as per the standard methods and the mean data were tabulated (Table I to III D).

1. Oil content in Kernel
2. Nitrogen content in Kernel
3. Protein content In Kernel
4. Pod yield/sq. m. and per hectare

RESULTS AND DISCUSSION

A perusal of the data (Table 1) clearly indicated that the oil content of the kernels was increased by 1% and 3% over control with gypsum @ 500 and 1000 kg per hectare respectively indicating its influence on groundnut kernel quality.

NAA either alone or in combination with gypsum had no beneficial effect on the oil content at all concentrations tried. Boron had also no beneficial effect on groundnut.

Among different combinations of gypsum, NAA and Boron, the treatment viz., G_{1000} NAA_0 B_2 had recorded highest oil content in Kernel (51.8%) followed by G_{1000} NAA_{40} B_0, G_{1000} NAA_{40} B_2 and G_{1000} NAA_0 B_0. These results clearly indicate that oil content was mainly influenced by gypsum only which either alone or in

combination with other chemicals under trial could improve the oil content.

Maximum nitrogen content in Kernel (5.33%) was recorded with gypsum @ 1000 kg/ha and it was 3 7% more than that of control. Negligible improvement in Kernel nitrogen was recorded due to Boron application.

NAA in general increased the nitrogen content of Kernels, with decrease in increasing concentration. Maximum nitrogen (5.35%) was recorded with NAA @ 20 ppm. Next comes in order the treatment NAA_{40} (5.34%) followed by NAA_{60} (5.33%).

The data on the nitrogen content revealed that the treatments viz., G_0 NAA_{60} B_2, G_{1000} NAA_{20} B_2, G_{500} NAA_{40} B_1 and G_{500} NAA_{20} B_0 recorded more nitrogen content in Kernel than the control and other treatmental combinations.

Protein content in kernel was obtained by multiplying the figures of nitrogen content with a factor 6 25 and the mean data was furnished in Table 2. In respect of protein content also, Gypsum @ 1000 kg/ha topped the list. The trend observed in respect of nitrogen content was also noticed in protein content.

The data on pod yield/sq. m was reeorded at harvest and were present Table 2, 3. Application of gypsum @ 1000 kg/ha improved the pod yield over untreated check.

NAA when sprayed @ 40 ppm recorded significantly higher yield than the other concentrations tried Next comes in order NAA_{20} ppm which in turn was significantly superior to NAA_{60}ppm and control; the latter two were on par with each other. (Table 3)

There was a significant interastion of gypsum and NAA on pod yield (Table 3). The combination of gypsum @ 1000 kg/ha and NAA @ 40 pm gave maximum yield and it was significantly superior to the rest of the treatments.

Though Boron had little influence in increasing the pod yield, the combined effect of Boron @ 0.1% and NAA @ 40 ppm was significantly superior to others. (Table 3) The interaction between gypsum and Boron was not significant (Table 3).

The combined effect of gypsum, NAA and Boron was significant (Table 3). Maximum pod yield of 40.3 q/ha was obtained with the treatmental combination of gypsum @ 1000 kg/ha, NAA @ 40 ppm and Boron @ 0.2% and it was 34% higher than the untreated check.

The cumulative effect of gypsum NAA and Boron on groundnut has not been studied earlier. Generally, these chemicals can improve the quality and pod yield in groundnut. (Milton et al., 1967).

Oil content in Kernels was improved by gypsum application. These observations are in conformity with the findings of Pathak and Pathak (1972) and Bhuiya & Chaudary who obtained a

favourable effects of sulfur on the oil content of groundnut Oil content in groundnut was also reported to be improved by gypsum[4].

NAA had no beneficial affect on oil content. These observations are in contrary to the findings of Sanjeevaiah *et al.* (1967) Boron also had no beneficial influence on oil content.

Among the different combinations of gypsum, NAA and Boron, maximum oil content was obtained in the treatment viz., G_{1000} NAA_0B_2. These results clearly indicated that oil content was mainly influenced by gypsum.

An increase in nitrogen content was observed with gypsum. It was reported that nitrogen content can be improved by sulfur (Pathak and Pathak 1972) and gypsum. (Sankaran et al., 1977)These observations together with the findings of the present investigation shown that gypsum i. e., sulfur and calcium can improve the nitrogen content in Kernel. Negligible improvement in Kernel nitrogen was noticed due to Boron fertilization.

In general, the nitrogen in Kernel was improved by NAA. The nitrogen content in Kernal was inversely proportional to the concentration of the chemical-NAA. The same trend was observed in respect of protein content in kernel.

Pod yield was increased with gypsum application. It was reported that legumes and oil-seed crops were especially classified as sulfur-loving crops and the yields can be increased by sulfur applications. (Milton et al. 1976). These observations are in accordance with the findings of the present study NAA when sprayed @ 40 ppm recorded significantly higher yields than the other concentrations tried. Next comes in order NAA @ 20 ppm. Gupta and Singh (1977) also obtained increased Pod yield with NAA. Hence, the results of the present investigation were in agreement with the observations of these workers.

There was significant interaction of gypsum and NAA on pod yield. The combination of gypsum @ 1000 kg/ha and NAA @ 20 ppm gave maximum yields which was significantly superior to the rest.

Although boron had little influence on pod yield, the combined effect of Boron @ 0.1% and NAA @ 40 ppm was significantly superior to the rest in improving pod yield.

The interaction of gypsum and Boron was insignificant.

The combined effect of gypsum-NAA and Boron was significant. Maximum pod yield was recorded with the treatment G_{1000} NAA_{40} B_2. These results are indicating that gypsum in combination with NAA and Boron can improve the pod yield significantly.

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REFERENCES

ANONYMOUS. 1970. A.O.A C Official and tentative Methods of Analysis. Association of Official Agricultural Chemists, Washington, D. C.

BHOIYA, Z. H. and S.V. CHOUDHARY, 1976 Effect of S. N. P. protain and oil content of groundnut in Brahmaputra flood-Plain soil. Ind. J. Agric. Sci Vol. 46 (12).

GOPALAKRISHNAN, S and P. S. SRINIVASAN 1975. Effect of planofix an NAA formulation, on groundnut. Pesticides Vol. 9 (5). 23-25.

GUPTA R and S. S. SINGH, 1977. Effect of planofix (L — NAA) and 2, 4—C on the growth and yield of groundnut var. T. 64 in the presence and absence of lime. The Allahabad Farmer Vol. XLVIII (4) : 443-44.

HARRIS. H. C. and R. L. GLLUAN, 1957. Effect of Boron on peanuts. Soil Sci. 84 (3) 233—242.

MILTON, E. WALKER; C. TERRY, KEISLING and J. SAWLEY DREXIER, 1976. Responce of three peanut cultivars to gypsum. Agron. J. Vol 68 (3) : 527.

PATHAK, A. N. and R. K. PATHAK 1972. Effect of sulfur component of some fertilizers on groundnut (Arachis hypogaea 28) Ind. J. Agroc. Res. 6 (1) : 23—26.

SANJEEVAIAH, B S.; G. P. HANIHAYI, and B. G. RAJASEKHARA. 1967 Responce of groundnut (Arachis hypogaea, L.) to plant growth regulators Mysore J. Agric Vol. I (2) : 81-87.

SANKARAN, N; P. SENNAIAN and Y. B. MORACHAN 1977. Effect of forms and levels of Calcium and levels of Boron on the uptake of nutrients and quality of groundnut. Mad Agric. J. 64 (6) : 384-388.

SUBBARAO, I. V. 1975 Nutritional disorders of crops in A. P. Technical Bulletin No. 1: 39.

Table 1 Effect of gypsum, NAA and Boron on oil content of Kernels (%n)

Treatments	G_0			G_{500}			G_{1000}			Mean for
	B_0	B_1	B_2	B_0	B_1	B_2	B_0	B_1	B_2	NAA
NAA_0 ...	46.5	47.9	46.8	50.4	46.1	46.3	49.0	48.3	51.8	48.2
NAA_{50} ...	46.7	46.4	47.9	47.2	46.3	46.2	48.8	47.9	48.5	47.3
NAA_{10} ...	46.4	43.2	47.9	43.4	48.3	48.0	51.6	49.3	45.1	47.9
NAA_{00} ...	47.60	43.1	48.4	46.8	49.0	48.7	47.5	49.1	48.1	41.1
Mean or G (Gypsum)		47.2			47.7			48.7		

Table 2. Effect of gypsum, NAA and Boron on Nitrogen and Protein content of Kernels (%).

Treatments	G_0			G_{500}			G_{1000}			Mean for NAA
	B_0	B_1	B_2	B_0	B_1	B_2	B_0	B_1	B_2	
NAA_0	4.59 (28.69)	3.50 (21.88)	5.30 (33.13)	5.53 (34.56)	5.41 (33.81)	3.51 (21.54)	5.16 (32.25)	5.03 (32.44)	4.98 (31.13)	4.78 (29.87)
NAA_{30}	6.18 (46.56)	5.82 (36.38)	4.10 (25.63)	3.33 (20.81)	5.40 (33.75)	6.16 (38.50)	6.26 (39.13)	5.24 (32.75)	5.67 (35.44)	5.35 (34.33)
NAA_{40}	5.55 (34.69)	5.44 (34.00)	4.77 (29.81)	4.98 (31.13)	6.23 (38.94)	5.12 (32.00)	5.21 (32.56)	5.59 (34.94)	5.23 (32.69)	5.34 (33.03)
NAA_{50}	4.55 (28.44)	4.78 (29.88)	6.35 (39.69)	5.09 (31.81)	5.09 (31.81)	5.47 (34.19)	5.30 (33.13)	5.44 (34.00)	4.88 (30.50)	5.33 (32.80)
Mean for G. (Gypsum)		5.08 (32.40)			5.11 (31.94)			5.33 (33.33)		

The figures in parenthesis indicate the Protein content of kernel (%).

Table 3 Effect of gypsum, NAA and Boron on Pod yield (q/ha)

Treatments	G_0			G_{500}			G_{1000}			Mean for NAA
	B_0	B_1	B_2	B_0	B_1	B_2	B_0	B_1	B_2	
NAA_0	30.0	28.5	32.0	31.5	32.0	32.5	33.4	31.0	38.4	31.74
NAA_{30}	34.0	32.5	32.5	32.8	36.5	32.8	34.0	33.0	37.5	33.96
NAA_{40}	35.3	36.0	33.5	33.8	37.3	31.8	35.5	37.0	40.3	35.61
NAA_{50}	34.0	35.3	33.5	33.5	35.4	31.3	34.0	31.8	27.3	32.84
Mean for Gypsum		33.09			33.39			34.13		

Parameter	Significance of 'F' test	C. D at 5%
Gypsum (G)	—	N.S.
NAA	*	10.9
BORON (B)	—	N.S.
GXNAAXB	*	37.71
NAA X B	*	18.58
G X B	—	N.S
GXNAA	*	10.88