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EFFECT OF GROWTH REGULATORS ON YIELD AND YIELD ATTRIBUTES OF TMV 2 GROUNDNUT UNDER IRRIGATED CONDITIONS

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Experiments conducted during *rabi* 1977 and *kharif* 1978 at the Tirupati campus of the Andhra Pradesh Agricultural University indicated that growth regulators significantly increased yield attributes and pod yield of groundnut while haulm yield decreased in both the seasons. Both yield attributes and pod yield were maximum while halum yield was minimum with SADH 1000 ppm closely followed by MH 50 ppm in both the seasons. A plant density of 0.50 million plants/ha (20 x 10 cm) and foliar spray of SADH 1000 ppm or MH 50 ppm at 30 and 50 days after sowing were equally effective for the improvement of pod yield of TMV 2 groundnut on sandy loam soils. There were no interactions between growth regulators and plant densities in both the seasons.

Among the several approaches to improve groundnut productivity, regulation of plant metabolism by using endogenous growth substances is one. Foliar application of growth regulators has been reported to improve groundnut yields by influencing the plant physiological processes favorably (Thimmegowda *et al.*1976). The present field investigation was undertaken to study the influence of growth regulators on groundnut crop of different spatial arrangements.

MATERIALS AND METHODS

A field experiment was conducted at the Tirupati campus of Andhra pradesh Agricultural University in a split plot design during *rabi* 1977 and in a factorial randomised block design during *kharif* 1978 under irrigated conditions.

In the split plot design, three plant populations (S_1 1.00 (10 X 10 cm); S_2 0.50 (20 X 10 cm) and S_3 0.33 (30 X 10 cm) million plants/ha) formed the main plot treatments, whereas four growth regulators sprayed on the crop at two concentrations along with a water spray (control) were the sub -plot treatments (T_1 - water spray; T_2 - and T_3 - MH (Maleic hydrazide 1;2-dihyropyridazine-3) 25 and 5o ppm; T_4 and T_5 - CCC (Cycocel-2Chloroethyl trimethylammonium chloride) 250 and 500 ppm; T_6 and T_7 - SADH (Alar-Succinic acid 2 2dimethyl hydrozide) 500 and 1000 ppm and T_8 and T_9 - NAA (Alpha Naphathalene acetic acid) 25 and 50 ppm). Based on the results of the first year trial the treatments were modified by including the next higher concentration of each growth regulator (MH-100; CCC-1000

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SADH- 2000 and NAA-100 ppm) and adopting a spacing of 20X10 cm which was found to be optimum. Under control, no spray was also introduced in addition to water spray. The treatments were replicated thrice. The soil were sandy loam low in available nitrogen (105 and 90 kg/ha) medium in available P (15.35 and 11.44 kg/ha) and K(139.52 and 145·75 kg/ha). Fertiliser to supply 30,17 and 33 kg/ha of N, P and K respectively was applied basally for all the plots in both the seasons. The growth regulators were dissolved in a small quantity of ethyl-alcohol (not more then 0.01% of the final solution) and diluted to the required concentration with distilled water. A small quantity of Tween-80 (0.01%) a wetting agent was added to the solution before spraying. Spraying was done at 30 and 50 days after sowing. At maturity of the crop, data on various yield attributes and yield were recorded. Relationship between yield attributes and yield also worked out.

RESULTS AND DISCUSSION

Growth regulators

In both the seasons, growth regulators significantly increased almost all the yield attributes compared to control (Table 1 & 2). Number of pods per plant significantly differed in plants treated with growth regulators in *kharif* only, while filled pods per plant differed in both the seasons. Maximum number of pods and filled pods per plant were recorded with SADH 1000 ppm were significantly higher but they were on par with MH 50 ppm, except total pods per plant in *Kharif* but they were significantly more than in the rest of the treatments combinations. In both the seasons, the volume weight of pods alone significanly differed in plants treated with growth regulators, but not the weight of pods per plant. Maximum volume weight of pods was recorded with SADH, but was on par with the volume weight recorded with NAA only in *rabi*, but it was significantly more compared to the rest of the growth regulators. The volume weight of pods significantly increased only with increase in concentration of SADH. Shelling percentage altered significantly due to application of growth regulators in *rabi* only. Maximum shelling percentage was with NAA 50 ppm which was on a par with the shelling percentage recorded with MH 50 ppm and CCC 500 ppm but it was significantly higher in the rest of the treatments. In *kharif*, the shelling percentage trend was similar to that of *rabi*. In both the seasons, growth regulators had similar effect on 100-kernal weight. However the 100-kernal weight was highest with NAA and MH 50 ppm.

In both the seasons, pod yield significantly increased in plants treated with growth regulators compared to control. Among the growth regulators, none of them showed significant difference in pod yield. In both the seasons, maximum pod yield was obtained with SADH 1000 ppm which was on par with MH 50 ppm, CCC 500 ppm and NAA 50 ppm (Except in *kharif*) but it was significantly superior compared to other treatment combinations. Higher pod yield with SADH may be due to efficient diversion photosynthates to pods rather than in production of excessive vegetative growth (Gorbet aud Whitty, 1973]. Moreover, a medium concentration of SADH 1000 ppm, the number of pods and filled pods per plant were more compared tolower (500 ppm) and higher (2000 ppm) concentrations. There was a reduction in pod yeild by almost 50 per cent in *kharif* compared to *rabi* This may be due to less number of sunshine hours per day (2.8 to 10.4) particularly 70 days after sowing in *kharif*, while in *rabi* the number of sunshine hours per day (9.4 to 11.0) were more. This might have led to lower production photosynthates essential for better filling of pods.

plant densities

Yield attributes such as total number of pods,filled pods and weight of pods per plant significantly increased with decrease in plant density (Table 1). Maximum number of total and filled pods per plant and higher weight of pods per plant was with lower density of 0.33 million plants/ha (30 x 10 cm). However, the percent of filled pods per plant to that of total pods per plant was maximum with medium plant density of 0.50 million plants/ha (20x10 cm) closely followed by higher plant density of 1.00 million plants/ha (10 x 10 cm) and lower plant density. Similar was the trend with weight of pods per plant. At higher plant density, the feeding zone per plant is less compared to lower density but the plants at higher density orient themselves to light to grow tall, resulting in lower number of flowers and pegs that reach the soil for developing into pods, Almost all the flowers and pegs may reach the soil for developing into pods with lower plant density. Further, this may be due to less competition among plants, facilitating better expression of yield attributes. Increase in weight of pods per plant with lower plant density may be due to higher number of total and filled pods per plant. Significantly higher volume weight of pods and shelling percentage was with higher plant density, which was on par with medium density, but both were significantly superior to lower plant density. Similar was the trend with kernel weight (Lawrence 1974).

Maximum pod yield (4, 133 kg/ha) was obtained with 0.50 million plants/ha which was on par with 1.00 million plants/ha but both were significantly superior to 0.33 million plants/ha. Though yield attributes per plant at 0.33 million plants/ha were significantly higher, final pod yield did not compensate for the loss in yield due to low plant density compared to the other two plant dansites. Though plant population was more at 1.00 million plants/ha.due to heavy competition for nutrients there was reduction in yield ultimately resulting in yield which was on par with 0.50 million plants/ha. Maximum pod yield at 0.50 million plants/ha may be due to cumulative effect of several yield attributes than at the other two densities. Highest haulm yield was with 1.00 million plants/ha which was significantly more than the rest. This may be due to increase in population which might have resulted in increased haulm yield. Maximum harvest index (55.2%) was in lower plant density closely followed by medium (54.9%) and higher (48.1%) densities (Table 1). There was no interaction between plant densities and growth regulators.

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Table 1. Effect of growth regulators and plant population on yield of groundnut (*Rabi* 1977).

Treatments	Total pods/ plant	Filled pods/ plant	Weight of pods/ plant (g)	Volume wt. of pods (g/l)	Shelling percentage	100- Kernel weight (g)	Yield kg/ha pod	Harvest index (%)
Water spray (WS)	12.6	8.9	8.08	346	68.7	32.26	3632	44.6
Growth regulators								
MH 25 ppm	13.9	9.9	8.61	351	71.9	34.27	3822	49.9
MH 50 ppm	17.9	12.3	10.88	351	74.5	36.60	4195	55.3
CCC 250 ppm	13.8	9.7	8.84	355	71.7	33.89	3838	51.8
CCC 500 ppm	16.9	11.8	10.50	356	73.9	35.99	4136	54.9
SADH 500 ppm	14.3	10.1	9.73	360	71.4	34.18	3867	54.1
SADH 1000 ppm	13.8	12.7	11.75	370	73.6	35.30	4285	57.2
NAA 25 ppm	14.8	10.0	9.45	350	72.8	34.41	3809	51.1
NAA 50 ppm	16.7	11.5	10.12	362	75.3	37.18	4106	54.8
Mean	15.9	11.0	9.99	357	73.2	35.23	4009	53.7
SEm +(GRS)	0.50	0.21	0.47	3	0.54	0.68	62	—
CD 5% "	1.40	0.58	1.33	11	1.52	1.93	173	—
Plant Population								
S_1 1.00 m plants/ha	8.7	6.4	5.62	364	73.8	36.02	4035	48.4
S_2 0.50 m "	13.7	10.2	9.51	359	72.9	35.23	4133	54.9
S_3 0.33 m "	24.1	15.7	14.17	344	71.3	33.33	3731	55.6
SEm + (S)	0.13	0.15	0.53	4	0.35	0.18	51	—
CD 5%	0.44	0.53	1.82	13	1.20	0.62	175	—

Table 2. Effect of growth regulators on yield of groundnut (Kharif 1978)

Treatments	Total pods/ plant	Filled pods/ plant	Weight of pods/ plant (g)	Volume wt. of pods (g/l)	Shelling percentage	100-Kernel weight (g)	Yield kg/ha pod	Harvest index %
No spray	8.4	5.4	5.1	329	65.2	27.07	2071	38.1
Water spray(WS)	8.7	5.2	5 5	335	65.3	27.73	2119	39.9
Growth regulators								
MH 25 ppm	10.1	6.7	5.8	347	68.4	29.67	2402	46.7
MH 50 ppm	11.7	7.8	6 5	350	69 5	31.70	2664	49.7
MH 100 ppm	9.4	5 7	5 6	337	66.3	28.60	2288	41.8
CCC 250 ppm	10.7	6 9	6.1	355	68.0	29.20	2410	47.0
CCC 500 ppm	11.4	7 6	6.4	358	69.3	30.33	2566	48.6
CCC 1000 ppm	9.7	6.1	5.7	338	66 4	28.20	2366	42.8
SADH 300 ppm	9.5	5.8	5.7	363	66.9	28.93	2360	45.2
SADH 1000 ppm	12.3	8.1	6.9	338	68 9	30.87	2797	51.1
SADH 2000 ppm	10.5	7.1	5.9	397	67.6	28 00	2420	47.7
NAA 25 ppm	9.8	6.4	6.0	343	68 1	30.20	2395	46.4
NAA 50 ppm	11.3	7.3	6.2	368	70.8	32.87	2465	47.5
NAA 100 ppm	9.2	5.5	5.6	340	66.7	28.30	2198	41.5
Mean	10.5	6.7	6.0	356	68.1	29.74	2441	46.3
SEm±	0.12	0.11	0.1	3	0.89	0.65	55	
CD 5%	0.35	0.31	0.5	9	2.58	1.89	276	