

MOISTURE STRESS AND HORMONAL INFLUENCE ON THE FLOWERING BEHAVIOUR AND YIELD OF GROUNDNUT (*ARACHIS HYPOGAEA* L.)

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Field experiment conducted at Hebbal, Bangalore, on TMV-2 groundnut during 1976 and 1977 summer seasons, to study the effect of moisture stress and hormonal influence indicated that the total flowers produced in plants stressed between 30 to 45 days from sowing did not differ significantly from the regularly irrigated plots. The pod yield in stressed plots reduced by 4.7 per cent compared to normally irrigated crop with a yield of 3533.5 kg/ha. The flower primordial initiation and the first flower opening were noticed 14 and 24 days after sowing respectively. The first flush of flowers produced before 45th day from sowing dried up and did not form gynophores in stressed plants. However, a higher percentage of fruit set from the second flush compensated for yield differences in both seasons. NAA spray of 25 ppm at any stage of growth did not influence the total flower production as well as yield significantly in stressed and regularly irrigated plots.

Groundnut occupies more than 6.52 lakh hectares in Karnataka and most of it is grown under rainfed conditions. Due to erratic distribution of rainfall, the crop may suffer due to moisture stress at one or more time during its growth period resulting in lower yield. When the moisture stress occurs in the early period during the first flush of flowering, the second flush of flowers make good of losses due to low fruit set from the first flush (Mehrotra *et al.* 1968). But a moisture stress at pod development is observed to cause irreparable damage (Hiller and Clark, 1970). Low number of fruit set can partially be compensated if the weight of the individual pods can be increased by hormonal treatment. Earlier work with normally irrigated crop, has indicated the possi-

bility of increasing the number of flowers, fruit set and kernel weight (Gopalakrishnan and Srinivasan, 1975). To study the effect of moisture stress at the first flush of flowering and also remedial influence of NAA on the stressed plants, the present investigation was taken up

MATERIALS AND METHODS

A field experiment was conducted during 1976 and 1977 summer seasons, at Agronomy Field Unit, University of Agricultural Sciences, Bangalore, on a sandy loam soil. Bunch type (Cv. TMV-2) groundnut was grown with irrigation at weekly intervals and was subjected to moisture stress between 30-45 days after sowing (to synchronise with first flush

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of flowering). Normal irrigation was given during rest of the crop growth. The available moisture content was estimated on 30th and 45th day from sowing. The moisture content in the surface 30 cm depth at 30 days 13.5% which was very near to the field capacity (14.0%) in this soil. The moisture depletion continued over the period and the moisture percentage was 7.3 % in 30cm depth of soil at the end of stress period. In normally irrigated treatments irrigation was given at 60 to 65 percent of available moisture upto 30 cm depth. In stressed plots 25 ppm NAA was sprayed twice as planofix after recovery from the stress condition, whereas in normally irrigated plots the spray was given on 30th and 45th day after sowing (250 litres/ha).

These five treatments were replicated four times in a randomised block design. The crop was sown during January in both seasons with 30 cm x 15 cm spacing. The crop was fertilized with basal dose of 25 kg N, 75 kg P₂O₅ and 37.5 kg K₂O/ha and other cultivation practices were followed as per the package of practices. The flower primordium initiation studies were carried out by taking serial microtome sections (Johansen, 1940). For this purpose the flower buds from the axils of the second node were fixed from 10th to 25th day after sowing.

RESULTS AND DISCUSSION

The days taken for 50 per cent flowering was 40 to 43 days in all treatments which did not appear to be affected by moisture stress (Table 1). However, the number of flowers by this time were only 40 in the stressed plants and 50 in the irrigated plants. Further, the flowers dried up completely in stressed plants before the stress was released on 46th day by giving irrigation. The pattern and rate of flower production showed that the flower production in TMV-2 started on 34th day after sowing but not on 25th day as reported by earlier workers (Venkatanarayana, 1952). In case of moisture stress at early flowering period, most of the early flowers withered away but within two days of irrigation a large number of



Table 1 Growth and other ancillary growth components of TMV-2 groundnut as influenced by hormones and hoisture stress

Treatments	Number of flowers/plant		Number of gyno phores per plant		Days to 50% flowering		Number of branches per plant		Number of nodes upto 10 cm height		Plant height (cm)							
	1976	1977	Mean	1976	1977	Mean	1976	1977	Mean	1976	1977	Mean						
	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean						
1. Normal irrigation (IP ₀)	130	139	134.5	66.3	92.50	79.4	43	40	41.5	7.5	6.2	6.85	5.5	5.5	35.6	32.8	34.2	
2. IP ₀ +25 ppm spray on 30th day (IP ₁)	131	134	132.5	58.5	79.80	69.1	42	99	40.5	8.0	6.4	7.20	5.1	5.4	5.25	39.0	34.5	7.23
3. IP ₀ +25 ppm NAA spray on 30th and 45th day (IP ₂)	120	150	135.0	55.1	72.80	63.9	43	39	41.0	6.9	6.2	6.53	5.1	5.6	5.35	39.8	34.7	37.2
4. Strées (SP ₀)	126	113	119.5	57.0	75.10	66.1	43	40	41.5	7.1	6.8	6.95	5.1	5.9	5.50	42.1	33.7	37.9
5. SP ₀ +25 ppm NAA spray on 45th day (SP ₁)	129	114	121.5	5.50	60.10	57.1	43	40	41.5	7.6	6.2	7.00	5.5	5.7	5.65	39.0	34.3	36.9
F-test	NS	NS		NS	NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
S. Em.±	6.59	9.64		3.60	9.19		2.6	0.50		0.99	1.33		0.38	0.24		2.87	1.83	

flowers appeared on the plant indicating that the flower buds remained dormant during the stress period. The studies by microtechnique also showed that the initiation of flower primordia had already taken by 15th day which was not affected by moisture stress imposed after 30 days of sowing (Plate 1). It is very difficult to predict that would have happened to these flower buds, if the stress was continued for a longer time or repeated in a second cycle.

The differences in pod yield/ ha were significant in 1977 and Haulm yield/ ha in 1976 (Table 2). The pod yield was 3533.5 kg/ha with normal irrigation (I^{PO}) compared to 3370.0 kg with moisture stress between 30-45 days. These observations clearly bring out that in bunch variety of groundnut moisture stress during early period of flowering reduced the vegetative growth but the reproductive phase was not effected.

The other yield components like mean pod weight, matured pods and 100 kernel weight and percent unfilled pods also did not vary significantly. These observations were in conformity with the results of Mehrotra *et al.* (1968). Perhaps the stress imposed was a little early in the growing period and not of very high degree (2 to 7 per cent available moisture at surface 30 cm depth). The most critical time in groundnut crop between 50 to 80 days as re-

ported by earlier workers (Hiller and Clark, 1970). The observations on Table 1 reveal that number of nodes upto 10 cm height from the ground level and the number of branches were more in stressed plants (7.8 and 5.9) than irrigated plants (6.9 and 5.1) respectively. Shorter internodes at the basal region provide a congenial condition for penetration of gynophores into the soil and their development (John *et al.*, 1954).

Influence of NAA spray on flowering, growth and yield:

Days taken to 50% flowering did not appear to be influenced by NAA spray given in the form of planofix and it also did not influence the total number of flowers.

Differences in kernal yield were non-significant (Table 2) during both the years. The yield attributes like number of mature pods, mean pod weight, percentage filled pods and oil content also did not vary significantly due to NAA spray.

Effect of NAA spray on stressed plants:

NAA spray had no effect on flower initiation and days taken to 50 per cent flowering. First spray of NAA was given after 30 days of sowing by which time initiation of flower primordia was already completed. Thus the spray given later on could not bring about any change in the flowers that were already formed.

Table 2: Effect of moisture stress and hormonal influence on yield and its components of TMV - 2 groundnut (Mean of 1976 & 1977)

Treatments	Pod yield kg/ha	Kernel yield kg/ha	Mean pod weight g/pod	Matured pod Number/plant	Per cent unfilled pod	100 Kernel weight (g)	Oil content percent 1976	Haul yield kg/ha
Normal irrigation (I P ₁)	3533.5	2553.0	0.617	39.4	28.6	30.1	46.8	4330
Normal irrigation + 25 ppm NAA spray on 30th day (I P ₂)	3844.5	2861.0	0.644	41.0	26.7	29.1	47.8	4267
Normal irrigation + 25 ppm NAA spray on 30th and 45th day (I P ₃)	3695.5	2817.0	0.637	36.3	23.5	30.9	47.8	4425
Stress (SPo)	3370.0	2414.0	0.616	36.8	29.1	28.4	47.2	4230
Stress + 22 ppm NAA spray on 45th day (Sp ₂)	3572.5	2599.5	0.658	34.3	25.7	32.1	46.6	3999

NS=Not significant

The present investigation revealed that in bunch variety of groundnut (TMV-2) moisture stress between 30-45 days after sowing was not critical. This situation can be exploited to skip one irrigation at flowering period, if there is a scarcity of irrigation water.

The studies also indicated that the chances of increasing the number of flowers by spraying hormones are negligible as the primordial initiation takes place much earlier than foliar development.

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