Biological Forum – An International Journal **14(3): 204-207(2022)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Influence of Plant Growth regulators on flowering and Seed Yield in Groundnut (*Arachis hypogaea* L.)

Sowjanya Pasala[1*], D. Shashibhushan[2], M. Pallavi[3] and P. Sujatha[4]

[1]Department of Seed Science and Technology,
College of Agriculture, PJTSAU, Hyderabad (Telangana), India.
[2]Associate Professor, Department of Genetics and Plant Breeding,
Agricultural College, Palem (Telangana), India.
[3]Assistant Professor (Seed Science & Technology),
Department of Seed Science and Technology, PJTSAU, Hyderabad (Telangana), India.
[4]Associate Professor (Seed Science & Technology),
Department of Seed Science and Technology, SRTC, Rajendranagar, Hyderabad (Telangana), India.

(Corresponding author: Sowjanya Pasala)*
(Received 05 May 2022, Accepted 30 June, 2022)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: A study to evaluate the effect of foliar application of plant growth regulators on flowering subsequently on pod and seed characteristics in groundnut (*Arachis hypogaea* L.) var. Kadiri Lepakshi conducted at Seed Research and Technology Centre Farm, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad during *Rabi* 2021-2022. The foliar application of different plant growth regulators *i.e.,* Ethrel, Chloro Choline Chloride (CCC), Maleic Hydrazide (MH), Naphthalic Acetic Acid (NAA), and Mepiquat Chloride was taken up at 60 days after sowing in various dosages. The treatments applied reduced the flower production irrespective of the concentration which in turn led to fewer immature pods and more double-seeded pods, ultimately leading to increase yield than the untreated (control) plants. A statistically significant difference was observed in weight of pod and seed output. When compared to the control which had the lowest yield among the treatments Mepiquat Chloride @ 500 ppm had the greatest yield/plot (6.84 kg/plot). These treatments can be used to control the indeterminate nature of groundnut, thereby resulting in perfect dissemination of reserves to the early formed pods leading to increase in number of filled pods and decrease in number of unfilled and immature pods.

Keywords: Groundnut, growth regulators, indeterminate flowering, pod filling, seed yield.

INTRODUCTION

Peanut (*Arachis hypogaea*), also called groundnut, earthnut, or goober, a legume of the pea family (Fabaceae), has multifaceted uses as grain, oilseed, and serves as raw material for more than 300 industrial products like flour, soaps, and plastics. Groundnut seed is rich in oil and protein content varying from 44 % to 56% and 22% to 30% respectively on dry seed basis. (Savage and Keenan 1994). The world production of groundnut was 49 million tonnes (2019), a 7% increase over the production in 2018. China ranks first with 36% of global production, followed by India (14%). Currently it occupies an area 4,825 thousand hectares with a production of 9,952 thousand tonnes and a productivity of 2063 kg/ha (Indiastat, 2021).

The major problem encountered in groundnut production is the formation of immature and ill filled pods due to its indeterminate nature leading to uneven maturity. This in turn leads to reduced pod filling efficiency with ultimate reduction in yield. Thus, there is a need to identify proper measures to arrest the flowering at later stages of crop growth so that the food from source is diverted to early formed pods only leading to perfect filling with decrease in number of unfilled, immature pods. To overcome this uneven maturity, there is a need to arrest flower formation at later stages of crop growth (Vinothini *et al*., 2018).

This study was thus taken up to identify the appropriate plant growth regulator to arrest flowering at later stages of crop growth and which ultimately increase the yield (Krishnamurthy 1981).

MATERIAL AND METHODS

A field experiment was conducted at the Research farm of Seed Research and Technology Centre, Rajendranagar, Hyderabad, in a Randomized Block

Design replicated thrice to evaluate the influence of plant growth regulators on flowering and yield in groundnut var. Kadiri Lepakshi (K-1812) during *Rabi*, 2021-22. The seed of the groundnut variety Kadiri Lepakshi (K 1812) was procured from Agricultural Research Station, Kadiri and used as a source seed material for the investigation. The plot size for each treatment is 4 × 3 m^2 and the crop was sown following a row-to-row spacing of 22.5 cm and plant to plant spacing of 10 cm. Crop was sown on 25th November 2021 and the various treatments *i.e*., foliar application of plant growth regulators such asT_1-Mepiquat chloride @ 500 ppm, T_2-Mepiquat Chloride @ 1000 ppm, T_3-Ethrel @ 200 ppm, T_4-Ethrel @ 400 ppm, T_5- CCC @ 500 ppm, T_6- CCC @ 1000 ppm, T_7-MH @ 100 ppm, T_8- MH @ 200 ppm, T_9- NAA @ 100 ppm, T_{10}- NAA @ 200 ppm and T_{11}- Control were imposed 60 days after sowing, to prevent flowering in subsequent development stages. The observations were recorded on crop growth and yield parameters from 10 plants in each plot. The test weight of the seeds was taken from a random sample of 100 seeds and the plot yield (kg) was also recorded. The data collected was analysed statistically adopting the procedure described by Panse and Sukhatme (1985).

RESULTS

A field experiment on the influence of plant growth regulators on flowering and seed yield in groundnut (*Arachis hypogaea* L.) was conducted during *Rabi* (2021-2022) with variety K-1812. To achieve higher yield, it is crucial to stop production of new flowers after 60 DAS to prevent the mobilisation of resources to flowers as it may benefit the availability of enough days for finishing the seed filling. Among treatments, T_1-mepiquat chloride @ 500 ppm (42) recorded significantly lowest number of flowers /plant after spraying significantly high test weight (48.55 g) and more yield per plot (6.84 kg/plot) compared to untreated control (136 number of flowers, 40.20 g test weight and 5.32 kg plot yield respectively). Regardless of concentrations, all other PGRs except Ethrel @ 200 ppm showed a significant reduction in the number of flowers/plant over the control (Table 1).

The plants treated with mepiquat chloride @ 500 ppm produced the maximum number of double-seeded mature pods (13), compared to less number of mature double-seeded pods plant^{-1}andmore number of flowers plant^{-1}in control. The number of double-seeded immature pods plant^{-1}, single-seeded immature pods plant^{-1}, and ill-filled pods plant^{-1} were reported as 8, 3, and 8 in the control, respectively (Table 2).

Plants treated with Mepiquat Chloride @ 500 ppm recorded highest weight of double-seeded mature pods plant^{-1} (33.82 g)which was on par with T_9- NAA @ 100 ppm (32.98), T_8 MH @ 200 ppm (31.24), T_6 CCC @ 1000 ppm (29.64) and T_4 Ethrel @ 400 ppm (29.32). Significantly low weight of double-seeded mature pods plant^{-1}(27.54) was observed in the untreated control. When compared to Mepiquat Chloride @ 500 ppm, the negative pod features of the weight of double seeded immature pods plant^{-1}, weight of single-seeded immature pods plant^{-1} and weight of ill-filled pods plant^{-1} were reported as 3.08, 0.43, and 1.11 g respectively in Control (Table 3).

Significantly more number of mature seeds/plant (62) were recorded with Mepiquat Chloride @ 500 ppm which was on par with T_2-Mepiquat Chloride @ 1000 ppm (59), T_3-Ethrel @ 200 ppm & T_6-CCC @ 1000 ppm (58), T_8-MH @ 200 ppm (57) and T_{10}-NAA @ 200 ppm (54). The weight of mature seeds plant^{-1}was maximum in T_1-Mepiquat Chloride @ 500 ppm (27.05 g) followed by T_9-NAA @ 100 ppm (24.63), T_8-MH @ 200 ppm (22.95) and T_6-CCC @ 1000 ppm (22.76) which are on par with the best treatment. When compared to Mepiquat Chloride @ 500 ppm, the negative seed characteristics, such as the number of immature seeds plant^{-1} and their weight, were reported as 14 and 2.92 g in the Control (Table 4).

Table 1: Influence of spraying of plant growth regulators on flowering and yield component in groundnut.

Treatment	Number of flowers/plant before spraying	Number of flowers/plant after spraying	Test weight (g)	Plot yield (Kg)
T_1-Mepiquat Chloride @ 500 ppm	44	42	48.55	6.84
T_2-Mepiquat Chloride @ 1000 ppm	45	92	41.41	6.49
T_3-Ethrel @ 200 ppm	43	118	42.84	5.72
T_4-Ethrel @ 400 ppm	44	111	40.21	5.99
T_5-CCC @ 500 ppm	46	93	41.29	5.34
T_6-CCC @ 1000 ppm	43	112	47.47	5.07
T_7-MH @ 100 ppm	42	93	44.72	6.51
T_8-MH @ 200 ppm	44	80	44.62	5.34
T_9-NAA @ 100 ppm	44	86	39.98	6.28
T_{10}-NAA @ 200 ppm	43	97	42.94	6.00
T_{11}-Control	45	134	40.20	5.32
Grand Mean	**43.93**	**96.33**	**43.11**	**5.90**
S.E (m)	**1.46**	**6.21**	**1.58**	**0.35**
S.E. (d)	**2.09**	**8.79**	**2.24**	**0.50**
C.D. (0.05)	**NS**	**18.33*****	**4.67****	**1.04***
C.V. (%)	**5.75**	**11.17**	**6.35 %**	**10.37%**

*, ** represent significance at 0.05 and 0.01 probability levels respectively.

Table 2: Influence of spraying of plant growth regulators on pod characteristics in groundnut.

Treatment	Number of double-seeded mature pods /plant	Number of double-seeded immature pods /plant	Number of single-seeded mature pods /plant	Number of single-seeded immature pods /plant	Number of ill-filled pods /plant	Total number of pods/plant
T_1-Mepiquat Chloride @ 500 ppm	31	5	9	3	6	53
T_2-Mepiquat Chloride @ 1000 ppm	22	7	6	3	5	43
T_3-Ethrel @ 200 ppm	25	6	8	2	6	46
T_4-Ethrel @ 400 ppm	27	5	7	3	4	47
T_5-CCC @ 500 ppm	20	7	8	2	4	40
T_6-CCC @ 1000 ppm	24	6	7	3	4	44
T_7-MH @ 100 ppm	25	6	6	1	5	43
T_8-MH @ 200 ppm	29	6	8	4	5	51
T_9-NAA @ 100 ppm	29	5	7	3	4	48
T_{10}-NAA @ 200 ppm	26	5	8	2	4	45
T_{11}-Control	25	8	7	3	8	50
Grand Mean	**25.66**	**5.91**	**7.33**	**2.66**	**4.93**	**46.48**
S.E (m)	**1.69**	**0.33**	**0.401**	**0.32**	**0.31**	**1.78**
S.E. (d)	**2.39**	**0.46**	**0.57**	**0.46**	**0.44**	**2.52**
C.D. (0.05)	**5.00***	**0.96*****	**1.18*****	**0.95****	**0.91*****	**5.25****
C.V. (%)	**11.45**	**9.55**	**9.47**	**20.97**	**10.85**	**6.63**

*, ** represent significance at 0.05 and 0.01 probability levels respectively.

Table 3: Influence of spraying of plant growth regulators on pod characteristics in groundnut.

Treatment	Weight of double seeded mature pods /plant	Weight of double seeded immature pods /plant	Weight of single-seeded mature pods /plant	Weight of single-seeded immature pods /plant	Weight of ill-filled pods /plant	Total weight of pods /plant
T_1-Mepiquat Chloride @ 500 ppm	33.82	1.91	5.64	0.64	0.79	42.8
T_2-Mepiquat Chloride @ 1000 ppm	25.23	2.85	3.33	0.71	0.68	32.80
T_3-Ethrel @ 200 ppm	27.76	2.48	4.47	0.55	0.98	36.24
T_4-Ethrel @ 400 ppm	29.32	1.96	3.86	0.58	0.51	36.22
T_5-CCC @ 500 ppm	20.63	1.94	3.36	0.41	0.51	26.86
T_6-CCC @ 1000 ppm	29.64	2.09	4.37	0.51	0.49	37.1
T_7-MH @ 100 ppm	28.55	2.54	3.50	0.37	0.90	35.87
T_8-MH @ 200 ppm	31.24	2.20	4.16	0.85	0.68	39.13
T_9-NAA @ 100 ppm	32.98	3.38	2.19	0.62	0.61	39.78
T_{10}-NAA @ 200 ppm	27.33	1.93	3.87	0.38	0.81	34.31
T_{11}-Control	27.54	3.08	3.97	0.43	1.11	36.13
Grand Mean	**28.55**	**2.39**	**3.88**	**0.55**	**0.73**	**36.11**
S.E (m)	**1.65**	**0.32**	**0.49**	**0.062**	**0.09**	**1.96**
S.E. (d)	**2.34**	**0.45**	**0.69**	**0.087**	**0.12**	**2.77**
C.D. (0.05)	**4.88****	**0.95***	**1.46***	**0.18*****	**0.25*****	**5.78****
C.V. (%)	**10.033**	**23.21**	**22.05**	**19.49**	**20.20**	**9.40**

*, ** represent significance at 0.05 and 0.01 probability levels respectively.

Table 4: Influence of spraying of plant growth regulators on seed characteristics in groundnut.

Treatment	Number of seeds /plant	Number of mature seeds /plant	Number of immature seeds /plant	Weight of seeds /plant	Weight of mature seeds /plant	Weight of immature seeds /plant
T_1-Mepiquat Chloride @ 500 ppm	72	62	10	28.15	27.05	1.10
T_2-Mepiquat Chloride @ 1000 ppm	71	59	12	20.65	19.35	1.30
T_3-Ethrel @ 200 ppm	71	58	13	22.34	20.73	1.61
T_4-Ethrel @ 400 ppm	63	51	12	24.39	21.99	2.40
T_5-CCC @ 500 ppm	52	40	12	16.26	15.08	1.18
T_6-CCC @ 1000 ppm	69	58	12	23.99	22.76	1.23
T_7-MH @ 100 ppm	64	53	11	21.42	20.19	1.23
T_8-MH @ 200 ppm	68	57	11	24.12	22.95	1.17
T_9-NAA @ 100 ppm	62	48	13	26.79	24.63	2.16
T_{10}-NAA @ 200 ppm	68	54	13	20.96	19.68	1.28
T_{11}-Control	66	52	14	23.33	20.41	2.92
Grand Mean	**65.98**	**53.96**	**12.02**	**22.95**	**21.35**	**1.60**
S.E (m)	**3.60**	**3.61**	**0.59**	**1.61**	**1.61**	**0.18**
S.E. (d)	**5.09**	**5.10**	**0.84**	**2.28**	**2.27**	**0.25**
C.D. (0.05)	**10.61***	**10.64***	**1.75****	**4.75****	**4.74****	**0.53*****
C.V. (%)	**9.44**	**11.57%**	**8.54**	**12.16**	**13.03**	**19.35**

*, ** represent significance at 0.05 and 0.01 probability levels respectively.

DISCUSSIONS

The impact of plant growth regulators on the phases of groundnut development has been the subject of several investigations. The current study found that foliar application of mepiquat chloride @ 500 ppm on groundnut at 60 DAS arrests flowering at later stages. Similar observation of reduction in flowers was recorded by Avinasha *et al.* (2019) with the spraying of mepiquat chloride. This reduction of flowers is desirable as it will help in the efficient dissemination of food reserves to early formed pods thereby increasing the number of filled pods/plant leading to higher productivity. These results are also in conformity with the findings of Pushp and Virender (2013) who reported that foliar application of mepiquat chloride in groundnut alters the source-sink relationship which leads to diversion of assimilates to the already formed pods. With the increase in the number of mature pods, there is a proportional increase in the seed weight which is majorly contributed by mature seeds with the application of mepiquat chloride as confirmed by Pushp sharma *et al.,* (2013).

CONCLUSION

Based on the results obtained from the present study, it can be concluded thatfoliar application of mepiquat chloride @ 500 ppm at 60 DAS may help to increase the number of mature pods and mature seeds and thereby increase yield.

FUTURE SCOPE

As a future line of work, the obtained foliar application of MC @ 500 ppm may be tested on large scale for the confirmation of the reproducibility of the result. The treatments on par with MC may also be tested again for validation.

Acknowledgement. This is part of the corresponding author's postgraduate thesis work at Professor Jayashankar Telangana State Agricultural University. I am highly grateful of research facilities provided by the Department of Seed Science and Technology, Seed Research and Technology centre, PJTSAU, Rajendranagar.

Conflict of Interest. None.

REFERENCES

Avinasha, B. L., Srinivasan, S., Sritharan, N. and Selvakumar, T. (2019). Effect of PGRs and nutrients on flowering and productivity of groundnut (*Arachis hypogaea* L.). *Journal of Pharmacognosy and Phytochemistry*. 8 (3): 3767-3769.

Indiastat. Season-wise Area, Production and Productivity of Groundnut in India (1949-1950 to 2020-2021-3rd Advance Estimates).

Krishnamurthy, H. N. (1981). Plant growth substances including applications in agriculture. Tata McGraw Hill.

Panse, V.G. and Sukhatme, PV. Statistical methods for agricultural workers. Statistical methods for agricultural workers.1978. 3.

Pushp, S. and Virender, S. (2012). Effect of growth-regulating substances on the chlorophyll, nitrate reductase, leghaemoglobin content, and yield in groundnut (*Arachis hypogaea*). *An International quarterly journal of life sciences, 7*(1): 13-17.

Pushp, S., Virender, S. and Sukhvinder, S. K. (2013). Dry matter partitioning and source-sink relationship as influenced by foliar sprays in groundnut. *The Bioscan*, *8*(4): 1171-1176.

Savage, G. P. and Keenan, J. I. (1994). The Composition and Nutritive Value Of groundnut Kernels. In: Smartt, J., Ed., The Groundnut Crop, Chapman and Hall, London.

Vinothini, N., Vijayan, R. and Umarani, R. (2018). Impact of foliar application of plant growth regulators on seed filling and seed multiplication rate in groundnut (*Arachis hypogaea* L.). *International Journal of Chemical Studies, 6*(5): 2186-2189.

How to cite this article: Sowjanya Pasala, D. Shashibhushan, M. Pallavi and P. Sujatha (2022). Influence of Plant Growth regulators on flowering and Seed Yield in Groundnut (*Arachis hypogaea* L.). *Biological Forum – An International Journal*, *14*(3): 204-207.