EFFECT OF FOLIAR APPLICATION OF GROWTH RETARDANTS ON REPRODUCTIVE EFFICIENCY OF GROUNDNUT (*Arachis hypogaea* L.) GENOTYPES

ABSTRACT

A field experiment entitled "Study on foliar application of Plant growth regulators for improving reproductive efficiency and yield of Groundnut (*Arachis hypogaea* L.) genotypes" was carried out during *Rabi*, 2023-24 at wetland farm of S. V. Agricultural College, Tirupati campus of Acharya N. G. Ranga Agricultural University, Andhra Pradesh. This experiment was laid out in randomized block design with factorial concept and replicated thrice, with four genotypes as factor-1 (G_1-Nithyaharitha, G_2-Dharani, G_3-K-6, G_4-Vishista) and four plant growth regulators applied on as Factor-2 (T_1- Control + RDF of NPK, T_2-Prohexadione calcium@105g a.i/ha,T_3- Putrescine@100 ppm, T_4- Paclobutrazol@ 100 ppm applied before and at peak flowering stage of crop). The reproductive efficiency attributes *viz.,* number of flowers, pegs and pods per plant, flower to peg ratio, flower to pod ratio and length of peg were recorded and analysed to understand the influence of plant growth regulators on groundnut. G_1 recorded highest number for pegs per plant (54.6), total pods per plant (36.8), mature pods per plant (28.5) and lowest flower to peg ratio (2.8), lowest length of peg (5.0cm). whereas G_2 showed lowest flower to pod ratio (4.3). Treatment of T_2 resulted in highest number of pegs per plant (51.8), total pods per plant (36.9), mature pods per plant (29.7), lowest flower to peg ratio (2.6), minimum length of peg (5.2 cm) lowest flower to pod ratio (3.6) and lowest number of flowers per plant (134.9) compared to the other treatments. Nityaharita and Prohexadione calcium@105g a.i/ha resulted in better reproductive efficiency in groundnut.

KEYWORDS: Groundnut,plant growth regulators, growth retardants, Paclobutrazol, reproductive efficiency.

INTRODUCTION

Groundnut belongs to the family fabaceae and order fabales. It is a widely cultivated annual crop that exhibits dicotyledonous behaviour and self-pollination. Groundnut is grown in tropical, sub-tropical, and warm climate zones between the latitudes of 40° N and 40° S. Groundnut is a rich source of edible oil (47-54%), high-quality protein (22-30%), starch (6-24%), cellulose (1-2%), minerals (2-3%) and calories (5-6%). Globally, Groundnut is cultivated under 327 lakh hectares, producing 539 lakh tonnes with the productivity of 1648 kg per hectare (FAOSTAT, 2021). India has 54.2 Lakh hectares area under Groundnut cultivation with a productivity of 1863 kg per hectare. In Andhra Pradesh, groundnut is cultivated in 8.23 lakh hectares with a production of 5.19 lakh tones. Groundnut seed contains 44 to 56% oil and 22 to 30% protein. Kernels are rich sources of riboflavin,

thiamine, nicotinic acid and vitamin Eand is rich in minerals like P, Ca, Mg and K and vitamins.

Reproductive efficiency of groundnut depends primarily on light absorption, assimilates production, production of viable flowers, pegs, flower topeg ratio, conversion of and pegs to filled pods (Swethasree*et al.*,2021). Putrescine is involved in various physiological processes, including growth, development and stress responses and results in increased crop yields (Deotale*et.al.*,2018). Paclobutrazoleis widely proven to inhibit the biosynthesis of gibberellins, which promote stem elongation, resulting in compact plants with shorter internodes with stouter stem, increasing root growth and causing better fruit set (Berova and Zlatev, 2000).Prohexadione Calcium controls excessive vegetative growth, resulting in shorter internodes and a more compact plant structure. It suppresses apical dominance, leading to increased branching and lateral bud development.

The farmers in arid regions of Andhra Pradesh struggle for finding sufficient water supply for the crop during critical stages of crop growth and suitable chemicals for enhancing the flowering window and reproductive productivity. To address the problem, the current study is taken up with an objective to understand the effect of growth retardants on reproductive efficiency of Groundnut.

MATERIALS AND METHODS

A field experiment entitled “Study on foliar application of plant growth regulators for improving reproductive efficiency and yield of Groundnut (*Arachis hypogaea* L.) genotypes” was conducted on sandy clay loam soils of wetland farm of S.V. Agricultural College, Tirupati, Acharya N.G. Ranga Agricultural University. The experiment was laid out in a randomized block design with factorial concept and replicated thrice. The experiment consisted of 16 combinations with four groundnut genotypes *viz.*,Nithyaharitha, Dharani, K-6 and Vishista and four growth regulator treatments *viz.*, control, Prohexadione Calcium @105 g a.i/ha, Putrescine @ 100ppm and Paclobutrazol @100ppm.

The weekly mean temperature during the crop growth period is 33.72°C and mean relative humidity is 60.75 %. A total rainfall of 16.0 mm received during the crop growth period in 1 rainy day as against the decennial average of 92.9 mm of rainfall received in 4.5 rainy days. The decennial mean sunshine hours for the corresponding period is 7.2 hours. The experimental plots were of 3x2 meter size and spacing of 22.5 cm x 10 cm is maintained.

Pre harvest chemical treatment sprays were prepared and applied before and during flowering. In order to prepare 105 g a.i./ha Prohexadione calcium, 105 g of chemical active ingredient is dissolved in 500 litres of water and applied per hectare. In order to prepare 100 ppm of Putrescine, 100 mg of chemical was dissolved in 1 litre of water. In order to prepare 100ppm of Paclobutrazole, 100 mg of chemical is dissolved in 1 litre of water.

Number of flowers was computed by summing up the number of flowers produced per plant during entire flowering period. The number of pegs from the five plants tagged were counted and the average was expressed as number of pegs per plant. The number of pods from the five different plants tagged were counted and the average was expressed as total number of pods per plant. The number of mature pods from the tagged plants were counted and the average was expressed as number of mature pods per plant. It is the ratio of total number of flowers produced per plant to the number of pegs from the plants tagged were counted and the average was expressed as flowers to peg ratio.

It is the ratio of total number of flowers produced per plant during entire flowering period to the number of pods from the five plants tagged which is calculated as flowers to pod ratio. Length of peg(cm) of the five randomly selected and tagged plants in each plot was measured from the base of the flower to the growing point of the peg using a scale which contains numerical values in centimeters(cm). The statistical analysis of experimental data was analyzed in factorial randamised block design and OPSTAT was the statictical package used for data analysis.

RESULTS AND DISCUSSION

The number of flowers per plant of groundnut was significantly influenced by the genotypes. Among the genotypes of the study, the highest (158.8) and lowest (142.3) number of flowers per plant of groundnut were recorded from G_3 and G_4 respectively. There was significant difference found among genotypes and treatments. The maximum and minimum number of flowers per plant was observed with T_1 (173.7) and T_2 (134.9) respectively. And among all of the interactions of genotypes with treated plant growth regulator treatments, the highest number flowers per plant (181.7) found in G_2, treated with T_1. This treatment could result in reduced vegetative growth and translocate those resources to flowers and thereby enhancing the maximum number of flowers and seed filling percentage. The application of PBZ to peanut plants at the stage of pod formation, seed yield was increased (Senoo and Isoda, 2003).

The maximum number of pegs per plant of groundnut was recorded with the G_1 (54.6) which indicates efficiency of the genotype to transform flowers into pegs which could led to better pegs production and yield. Whereas the lowest number recorded with G_3 (42.3). Among the PGRs studied, the maximum number of pegs per plant was observed with T_2 (51.8), and minimum number of pegs per plant recorded with T_1 (44.1). The maximum (57.1) and minimum (36.2) number of pegs per plant were recorded with interaction of G_1 when sprayed with T_2 and G_3 (36.2) with T_1 among all interactions. These results are in similarity with Hua *et al*.(2014) and Barman *et al*.(2017).

The maximum number of pods per plant recorded with the G_1 (36.8) followed by G_2 (36.6) and T_2 (36.9) and lowest number of total pods per plant recorded with G_4 (25.6) and T_1 (21.0). G_1 applied with T_2 recorded highest (40.9) and G_4 when treated with T_1 recorded minimum number of total pods (21.0).The number of mature pods per plant of groundnut was

recorded maximum with the G_1 (28.5), T_2 (29.7) and G_1 treated with T_2 (32.5). This could be attributed to increased pegs production and better assimilate translocation efficiency of G_1 which ultimately leads to greater mature pods production potential. The minimum mature pods per plant recorded with G_4 (22.6) and T_1 (20.3). These results were in accordance with Gaudin, 2022.

The minimum of flower to peg ratio of groundnut was recorded with the G_1 (2.8), T_2 (2.6). And highest flower to peg ratio recorded in genotype G_3 (3.8), T_1 (4.0) and G_3 treated with T_1 (5.0) because of inherent genetic characteristics of genotypes.

The highest of flower to pod ratio was recorded with the G_4 (5.6), T_1 (6.3) and G_4 treated with T_1 (7.5). And lowest flower to peg ratio recorded in genotype G_2 (4.3) and T_2 (3.6).

Minimum length of peg of groundnut was recorded with the G_1 (5.0 cm) and T_2 (5.2 cm**).** Maximum length of peg recorded in genotype G_3 (6.0 cm), T_3 (6.2 cm) which increases plant height by cell division, cell elongation and cell differentiation due to induction of auxins and cytokinin. By treatment with TIBA, peg length inhibited by 25.08% than the control due to reduced plant height results in pegs travel less distance to reach earth surface (Peng *et al.*, 2013).

CONCLUSION

The foliar application of Prohexadione Calcium, Paclobutrazol in at specified concentrations applied to groundnut before flowering stage, had been proved better in reducing excessive vegetative growth and increased the flower and pod number of groundnut. K-6 have been reported better number of flowers and flower to pod ratio.The present study concludes that, the reproductive efficiency obtained with Prohexadione Calcium@ 105ga.i/hain Groundnut, on sandy clay loam soils of Southern Agro-climatic Zone of Andhra Pradeshduring*Rabi* season.

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Table 1: Total Number of Flowers, Pegs and Length of Peg of Groundnut genotypes as influenced by PGRs

Treatments	**Total Number of Flowers**					**Total Number of Pegs**					**Length of Peg(cm)**				
	T1	**T2**	**T3**	**T4**	**Mean**	**T1**	**T2**	**T3**	**T4**	**Mean**	**T1**	**T2**	**T3**	**T4**	**Mean**
G1	171.5	137.3	159.3	148.7	154.2	51.2	57.1	54.3	55.7	54.6	5.1	4.6	5.6	4.7	5.0
G2	181.7	138.8	161.8	149.2	157.9	49.3	56.7	52.9	54.9	53.5	5.7	5.2	6.1	5.3	5.6
G3	179.0	139.5	164.4	152.1	158.8	36.2	46.6	42.0	44.2	42.3	6.1	5.6	6.5	5.8	6.0
G4	162.5	124.0	144.3	138.3	142.3	39.5	46.8	43.8	45.3	43.8	5.9	5.4	6.5	5.7	5.9
Mean	173.7	134.9	157.5	147.1		44.1	51.8	48.2	50.0		5.7	5.2	6.2	5.4	
	G	T	GXT			G	T	GXT			G	T	GXT		
SEm	3.53	3.53	7.06			0.35	0.35	0.70			0.038	0.038	0.076		
CD(P=0.05)	10.201	10.201	NS			1.01	1.01	NS			0.109	0.109	NS		

Table 2: Total Number of pods per plant and mature pods per plant, Flower to Peg Ratio and Flower to Pod Ratio of Groundnut genotypes as influenced by PGRs

Treatments	Total number of pods per plant					Total number of mature pods per plant					Flower to Peg Ratio					Flower to Pod Ratio				
	T1	**T2**	**T3**	**T4**	Mean	**T1**	**T2**	**T3**	**T4**	Mean	**T1**	**T2**	**T3**	**T4**	Mean	**T1**	**T2**	**T3**	**T4**	Mean
G1	30.7	40.9	37.0	38.7	36.8	22.3	32.5	28.7	30.3	28.5	3.4	2.4	2.9	2.7	2.8	5.7	3.4	4.4	3.9	4.4
G2	30.0	40.0	38.2	38.3	36.6	21.0	31.7	29.5	29.3	27.9	3.7	2.5	3.1	2.7	3.0	6.0	3.4	4.2	3.8	4.3
G3	29.0	38.0	36.3	37.0	35.1	20.0	29.0	27.4	28.3	26.2	5.0	3.0	3.9	3.4	3.8	5.9	3.5	4.3	3.9	4.4
G4	21.0	28.7	25.9	26.7	25.6	18.0	25.7	23.0	23.7	22.6	4.1	2.7	3.3	3.1	3.3	7.5	4.2	5.4	5.1	5.6
Mean	27.7	36.9	34.4	35.2		20.3	29.7	27.2	27.9		4.0	2.6	3.3	3.0		6.3	3.6	4.6	4.2	
	G	**T**	**GXT**			**G**	**T**	**GXT**			**G**	**T**	**GXT**			**G**	**T**	**GXT**		
SEm+	0.45	0.45	0.91			0.47	0.47	0.94			0.084	0.084	0.169			0.117	0.117	0.233		
CD (P=0.05)	1.31	1.31	NS			1.36	1.36	NS			0.243	0.243	NS			0.337	0.337	NS		