The Bioscan 16(2): 149-152, 2021
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
www.thebioscan.com

EFFECT OF DIFFERENT LEVELS OF PLANT GROWTH REGULATORS ON GROWTH AND YIELD OF BLACKGRAM (*Vigna mungo* L.)

BODDU REDDY REVANTH* VIKRAM SINGH AND DHANANJAY TIWARI
Department of Agronomy, Naini Agriculture Institute,
SHUATS, Prayagraj (U.P.)-211007, INDIA.
e-mail: reddyrevanth991994@gmail.com

KEYWORDS
Blackgram
NAA
GA_3
Salicylic acid

Received on :
29.11.2020

Accepted on :
07.05.2021

***Corresponding author**

ABSTRACT
An experiment was conducted during *Kharif*-2019 at crop research farm of SHUATS, Prayagraj to study the effect of plant growth regulators on growth and yield parameters of Blackgram. The study was carried out in randomized block design with 3 replications and 9 treatments of NAA (10, 20, 40 ppm), GA_3 (50, 100, 150 ppm) and salicylic acid (50, 100, 150 ppm) with foliar application at 25, 35 and 45 DAS respectively. Results indicated that application of Salicylic acid 150 ppm at 45 DAS, significantly recorded higher growth, yield, net returns and was found to be promising than other treatments. The recorded results with the same are as plant height (43.73cm), Dry weight (3.46g), number of nodules (19.12), pods per plant (42.13), grains per pod (12.20), grain yield (746 kg/ha), stover yield (2478 kg/ha), gross return(Rs 44460/ha), net returns (Rs 22679.10/ha) and benefit cost ratio 2.04. The study concluded that application of Salicylic acid 150 ppm at 45 DAS was productive as well as economic.

INTRODUCTION

Blackgram (*Vigna mungo* L.) also known as urd bean, udad dal, urad dal or urad is a widely grown grain legume of the family Fabaceae, which is mostly cultivated in southern Asia as sole, intercrop or fallow crop. A well-balanced nutritional profile with protein (25-26 %), carbohydrates (45 %), fat (1.2 %), several minerals, amino acids and vitamins made it as an alternative to meet the food needs of the large growing population (Battu *et al*., 2012). Globally, it contributes to more than 40% of total legume seeds traded and is widely cultivated as sole, mix or as an intercrop with Maize, Sorghum, Cotton, Pigeonpea, Bajra and Groundnut in both Kharif and Rabi seasons. It is grown in India, Pakistan, Srilanka, Burma and some countries of East Asia. In India,it is cultivated in Andhra Pradesh, Bihar, Madhya Pradesh, Maharashtra, Uttar Pradesh, West Bengal, Punjab, Haryana, Tamilnadu and Karnataka. It is mainly consumed in the form of dal and papad, apart from this, the dried stalks and leaves are used as fodder for cattle, green pods as vegetables. Fertilizer management is the major agronomic practice in pulses for increased yields and for soil fertility maintenance. Growth and development of legumes depends mainly on the type, time and dosage of fertilizer applied.

Growth regulators mainly improves the physiological efficiency such as photosynthetic ability and can enhance the effective partitioning of accumulates from source and sink in the field crops. Its application promotes the growth parameters in terms of shoot height, fresh and dry biomass, number of branches and number of pods per plant. (Rahman *et al*., 2018) found that application of growth regulators at seedling stages increases the growth of the plant by enhancing the nutrient uptake capacity and application of same at flowering stages minimizes physiological shedding of flowers, immature pods and was effective in controlling the shedding of flowers and floral buds.

Growth regulators like as salicylic acid (SA) and gibberellic acid (GA_3) are recognized endogenous regulator of plant metabolism, which mainly involved in biotic and abiotic stress. The gibberellins are a large family of tetra cyclic diterpenoid plant growth substances. The function of GA_3 as a hormone is to regulate the plant growth by breaking the dormancy and helps in cytokinesis by cell elongation and cell division. GA_3 and salicylic acid applied to blackgram had significantly increased the plant height (cm), total number of branches, leaf area, dry weight per plant, leaf chlorophyll content, stomatal conductance and photosynthesis rate than to the control (Tiwari *et al*., 2018). Application of salicylic acid shows positive effect on growth and yield attributes under salt stress conditions in Blackgram (Salingpa *et al*., 2018). Salicyic acid function as an indirect signal stimulating many physiological, biochemical and molecular process there by affecting the plant growth and development. NAA is a synthetic plant hormone in the auxin family and is an ingredient of commercial plants used for the vegetative propagation. Its application increases the morphological, physiological and biochemical characteristics in the plants (Aslam *et al*., 2010). With the above citated information, the study was carried to asses the

effect of different levels growth regulators on plant growth and yield attributes on blackgram var. SHEKAR-II.

MATERIALS AND METHODS

An experiment was carried during the *Kharif*-2019 at Crop Research Farm, Department of Agronomy, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj (U.P.) which is geographically located at 25º24' 42" N latitude, 81º 50' 56" E longitude and 98 m altitude above the mean sea level. The soil of the experimental study was sandy loamy in texture, slightly basic with the pH (7.2) and available nitrogen and phosphorous are (219 Kg/ha) and (18.3 Kg/ha) respectively. The experiment was laid out in randomized block design with 3 replications and 9 treatments indicated as T_1- NAA 10 ppm foliar spray at 25 DAS, T_2- NAA 20 ppm foliar spray at 35 DAS, T_3- NAA 40 ppm foliar spray at 45 DAS, T_4- GA_3 50 ppm foliar spray at 25 DAS, T_5- GA_3 100 ppm foliar spray at 35 DAS, T_6- GA_3 150 ppm foliar spray at 45 DAS, T_7- Salicylic acid 50 ppm at 25 DAS, T_8- Salicylic acid 100 ppm at 35 DAS, T_9- Salicylic acid 150 ppm at 45 DAS. Urea, SSP and MOP were provided to the plants at the time off sowing as of recommended and seed rate was maintained as per the treatments used.

Statistical analysis

The data noted during the study was subjected for statistical analysis for analyzing the variance among the parameters through Fisher's methods for ANOVA. Critical differences were calculated and the F test was found to be significant at level of 5%.

RESULTS AND DISCUSSION

Growth attributes

Plant height (cm)

Plant height (cm) increased significantly due to the application of growth regulators. Among these, salicylic acid 150 ppm recorded maximum plant height (43.73 cm) at 60 DAS are described in Table No.1. However, the treatment T_8- Salicylic acid 100 ppm at 35 DAS, was found to at par with plant height of 42.60 cm. The increased plant height with the application of salicylic acid at different growth stages might be due to its effect on certain enzymes that increased the photosynthetic efficiency and developed an extensive root system that enabled to extract more water and nutrients from the soil. The above mentioned findings are in complete agreement to that of (Islam *et al.*, 2010) and (Fawzy *et al.*, 2011) in black gram and in Snap bean respectively

Number of branches per plant.

The Table No.1. indicates that among the treatments, the maximum number of branches of 6.46 was observed in T_4- GA_3 50 ppm foliar spray at 25 DAS, it was at par to the treatment T_6- GA_3 150 ppm foliar spray at 45 DAS with 6.34. These results might be due to application of gibberlic acid, which promoted cell division, cell wall extensibility and cell wall elongation that resulted in increased growth (Jadhav *et al.*, 2019) reported the same related to plant growth on application of gibberlic acid.

Number of nodules per plant

Among the treatments, the maximum number of nodules of 19.12 was observed in T_4-GA_3 50 ppm foliar spray at 25 DAS, it was at par with T_8-Salicylic acid 100 ppm foliar spray at 35 DAS with 15.56 and T_3- NAA 40 ppm foliar spray at 45 DAS are described in Table No.1. The efficient nutrient application enhanced the root growth there by colonizing the more rhizo-bacteria that helped for better root development and nodulation (Kumar *et al.*, 2018).

Dry weight (g)

The maximum dry weight (g) of 3.46 g was observed in treatment combination of T_9-Salicylic acid 150 ppm foliar spray at 45 DAS, which was at par to the T_6- GA_3 150 ppm foliar spray at 45 DAS, T_7- Salicylic acid 50 ppm at 25 DAS and T_8- Salicylic acid 100 ppm at 35 DAS with 3.39, 3.38 and 3.34 g respectively. Growth and metabolic efficiency indirectly effected by dry weight accumulation which ultimately effected the yield of crop. This might due to the application of Salicylic acid plays a significant role in translocation of assimilates and suppress the activity of internodes. These findings are in acceptance to the recordings of (Kunjammal *et al.*, 2019) and (Patel *et al.*, 2012).

Yield attributes

The Table No.2 indicates the maximum number of pods per plant were observed in the treatment T_9- Salicylic acid 150 ppm foliar spray at 45 DAS was 42.13, it was at par with T_1- NAA 10 ppm foliar spray at 25 DAS (41.60), T_5- GA_3 100 ppm

Table 1: Effect of Levels of plant growth regulators on growth attributes of Blackgram.

Code	Treatments	Plant height (cm) 60 DAS	No. of branches Per Plant 60 DAS	No.of Nodules per plant 60 DAS	Dry weight (g) 60DAS
T_1	NAA 10ppm Foliar spray at 25DAS	39.87	5.8	12.89	2.94
T_2	NAA 20ppm Foliar spray at 35 DAS	39.01	6.11	13.89	3.01
T_3	NAA 40ppm Foliar spray at 45 DAS	41.1	6.06	15.23	3.04
T_4	GA_3 50ppm Foliar spray at 25 DAS	40.73	6.46	19.12	3.25
T_5	GA_3 100ppm Foliar spray at 35 DAS	41.57	5.74	11.32	3.21
T_6	GA_3 150ppm Foliar spray at 45 DAS	40.43	6.34	10.67	3.39
T_7	Salicylic acid 50ppm Foliar spray at 25 DAS	42.17	5.74	13.89	3.34
T_8	Salicylic acid 100ppm Foliar spray at 35 DAS	42.6	6.01	15.56	3.38
T_9	Salicylic acid 150ppm Foliar spray at 45 DAS	43.73	5.34	13.12	3.46
	Sem(±)	0.5	0.24	1.45	0.04
	CD (P = 0.05)	1.54	-	4.35	0.13

Table 2: Effect of levels of plant growth regulators on yield attributes of Blackgram.

Code	Treatments	PodsPerPlant	Seeds perpod	Seed yield(kg/ha)	Stover Yield(kg/ha)
T_1	NAA 10ppm Foliar spray at 25 DAS	38.20	11.40	506	1893
T_2	NAA 20ppm Foliar spray at 35 DAS	35.60	10.43	486	2015
T_3	NAA 40ppm Foliar spray at 45 DAS	35.33	10.23	521	2145
T_4	GA_3 50ppm Foliar spray at 25 DAS	41.47	10.20	553	2184
T_5	GA_3 100ppm Foliar spray at 35 DAS	41.60	10.17	596	2366
T_6	GA_3 150ppm Foliar spray at 45 DAS	37.47	11.33	634	2247
T_7	Salicylic acid 50ppm Foliar spray at 25 DAS	36.43	10.18	678	2340
T_8	Salicylic acid 100ppm Foliar spray at 35 DAS	37.67	11.23	716	2321
T_9	Salicylic acid 150ppm Foliar spray at 45 DAS	42.13	12.20	746	2478
	SEm(±)	1.56	1.35	31.19	0.10
	CD (P = 0.05)	4.64	-	95.66	0.30

Table3: Economics of different treatments in Blackgram

Code	Treatments	Gross returns (kg/ha)	Net returns (kg/ha)	B:C Ratio
T_1	NAA 10ppm Foliar spray at 25 DAS	28880	8476.1	1.42
T_2	NAA 20ppm Foliar spray at 35 DAS	27740	7315.4	1.36
T_3	NAA 40ppm Foliar spray at 45 DAS	29640	9168.6	1.45
T_4	GA_3 50ppm Foliar spray at 25 DAS	31540	10743.1	1.52
T_5	GA_3 100ppm Foliar spray at 35 DAS	34010	12797.6	1.6
T_6	GA_3 150ppm Foliar spray at 45 DAS	35910	14282.1	1.66
T_7	Salicylic acid 50ppm Foliar spray at 25 DAS	38190	17342.1	1.83
T_8	Salicylic acid 100ppm Foliar spray at 35 DAS	40850	19535.6	1.92
T_9	Salicylic acid 150ppm Foliar spray at 45 DAS	44460	22679.1	2.04

foliar spray at 35 DAS (41.47), T_4- GA_3 50 ppm foliar spray at 25 DAS (38.20). Maximum number of seeds per pods was observed in the treatment T_9-Salicylic acid 150 ppm foliar spray at 45 DAS was 12.20 followed by T_1- NAA 10 ppm foliar spray at 25 DAS and T_8- Salicylic acid 100 ppm at 35 DAS with 11.40 and 11.23 seeds per pod respectively. Highest grain yield was recorded in the treatment combination of T_9- Salicylic acid 150 ppm foliar spray at 45 DAS was 746 kg/ha which was at par with T_8- Salicylic acid 100 ppm at 35 DAS, 716 Kg/ha and T_7- Salicylic acid 50 ppm at 25 DAS, 678 Kg/ha. Highest stower yield was recorded with the T_9- Salicylic acid 150 ppm foliar spray at 45 DAS with 2478 Kg/ha followed by the treatment T_5- GA_3 100 ppm foliar spray at 35 DAS with 2366 Kg/ha.

Application of Salicylic acid enhances flowering and increases production of flowers. It plays an important role in increasing number of pods per plant because it balances and maintains a continuous metabolism of plant to subsequent phases of growth. Salicylic acid plays a key role in transportation of efficient sugars from photosynthetically activated parts and utilizes to develop seeds, furtherly pods per plant and seeds per pod are the main reasons for higher yield. Besides, application of salicylic acid promotes efficient protein synthesis and energy production furtherly resulting in best vigor indices and influences yield. These findings are in complete agreement to the earlier findings of (S. Marimuthu *et al.*, 2015) and (Ghulam *et al.*, 2007).

Economics

The data mentioned in the Table No.3 shows the highest gross (44460/ha), net returns (22679.10/ha) and B:C ratio of (2.04) were obtained with the treatment T_9- Salicylic acid 150 ppm foliar spray at 45 DAS.

ACKNOWLEDGEMENTS

I express my gratitude to my advisor (Dr.) Vikramsingh for constant support guidance and his valuable suggestion for improving the quality of this work. I am indebted to Prof. (Dr.) Thomas Abraham and Prof. (Dr.) Joy Dawson has been a constant source of inspiration and all the faculty members of shuats, Prayagraj, Uttar Pradesh for providing necessary facilities, for their cooperation, encouragement and support

REFERENCES

Arulbalachandran,D., Shankar Ganesh,K. and Subramani.A. *American Eurasian J. Agronomy*. 2009. **2(2):** 109-116.

Aslam M., Ahmad E., Sagu A. G., Hussain K., Ayaz M., Ullah I., Hussain A. and Himayatullah. 2010. Effect of plant growth regulator (NAA) and available soil moisture depletions on yield and yield components of chickpea. *Sarhad J. Agric*.**26(4):** 325-335.

Fawzy, Z.F., El-Bassinoy, A.M., El-Nemr, M.A. and El-Desuki, M. 2011. Improvement of growth, yield and quality of two snap bean (*Phaseolus vulgaris* L.) varieties using some growth regulators. *J.Applied Sciences Research*. **7(12):** 2047-2055

Ghulam, M., Rehana, A., Shahbaz, A. and Syed, M.A. 2007. The yield and yield components of pea (*Pisum sativum* L.) as influenced by salicylic acid. *Pak.J. Bot*. **39(2):**551-559.

Islam, M.R., Prodhan, A.K.M.A., Islam, M.O. and Uddin, M.K. (2010). Effect of plant growth regulators (GABA) on Morphological Characters and yield of Blackgram (*Vigna mungo* L.). *J.Agric.Res* .**48(1):**97-101.

Jadhav. S., Chand,S., Patted, P. and Viswanath,K.2019. Influence of Plant growth regulators on seed quality of black gram (Vigna mungo L.) cv.LBG-625 (Rashmi).*International J. Pure and Applied Biosciences*.**7(3):**115-121.

Kumar, D.,Beg. MZ., Ahmad Sohrab, Shrivastava. 2013. Foliar

application of Potassium on urdbean. *Indian J. Sci*. **2(2):**67-70.

Kunjammai.P. andSukumar .J2019. Effect of foliar application of nutrients and growth regulator on growth and yield of greengram (*Vigna radiata* L.). *Madras Agricultural J.* PP.600-603.

Marimuthu,S. and Surendran,U.2015.Effect of nutrients and Plant groeth regulators on growth and yield of Blackgram in Sandy loam Soils. *Cogent food and Agriculture*.**1:**1010415.

Patel, P.K. and Hemantaranjan, A. 2012. Salicylic Acid Induced Alteration in Dry Matter Partitioning, Antioxidant Defence System and Yield in Chickpea (*Cicer arietinum* L.) under Drought Stress. *Asian J. Crop Science*.**4:** 86-102.

Rahman N., Samaiya D. and Chandra P. 2018. Effect of application of GAƒ and IAA on growth and yield of green gram. *J. Agronomy*.**9:** 151-158.

Salingpa T. W., Lal E. P. and Shukla P. K. 2018. Effect of foliar application of salicylic acid on growth, yield, physiological and biochemical characteristics of mung bean (*Vigna radiata* L.) under salt stress *.J. pharmacognosy and phytochemistry*. **7(6):** 1857-1860

Tiwari V. and P. L. Eugenia. 2018. Effect of foliar application of gibberellic acid on growth, yield, physiological and biochemical characteristics of mungbean (*Vigna radiata* L.) Under salt stress. IJCS; **6(5):**713-717.