The Pharma Innovation Journal 2022; 11(3): 91-93

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(3): 91-93

www.thepharmajournal.com
Received: 07-12-2021
Accepted: 29-01-2022

Guggulla Bhargavi
M.Sc. Scholar, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj, Uttar Pradesh, India

Shikha Singh
Assistant Professor, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj, Uttar Pradesh, India

Corresponding Author:
Guggulla Bhargavi
M.Sc. Scholar, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj, Uttar Pradesh, India

Effect of phosphorus and plant growth regulator on growth and yield of cowpea [*Vigna unguiculata* L.]

Guggulla Bhargavi and Shikha Singh

Abstract
The field experiment was conducted during *Zaid*, 2021 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P.) on sandy loam soil. The experiment laid out in Randomized Block Design consisting of 10 treatments which are replicated thrice i.e., comprising of plant growth regulator spraying twice at 20DAS and 40DAS T_1: 40kg P_2O_5/ha + 0.10ppm Brassinolide, T_2: 40 kg P_2O_5 /ha + 0.25ppm Brassinolide, T_3: 40kg P_2O_5/ha + 0.50ppm Brassinolide, T_4: 50 kg P_2O_5/ha + 0.10 ppm Brassinolide, T_5: 50kg P_2O_5/ha + 0.25ppm Brassinolide, T_6: 50kg P_2O_5/ha + 0.50 ppm Brassinolide, T_7: 60 kgP_2O_5/ha + 0.10ppm Brassinolide, T_8: 60kg P_2O_5/ha + 0.25ppm Brassinolide, T_9: 60kg P_2O_5/ha + 0.50ppm Brassinolide, T_{10}: Control plot N:P:K = 20:60:40 kg/ha and The results obtained on growth and yield attributing characters *viz*., plant height (121.40cm), Nodules (21.14) dry weight (19.5g), branches/plant (4.3), pods/plant (7.2), Seed/pod (12.2), Test weight (121g) seed yield (1915 kg/ha), stover yield (3833 kg/ha) Harvesting index (49.29%) were recorded significantly higher with application of 60kg P_2O_5/ha + 0.50ppm Brassinolide. and highest Cost of Cultivation (30918.00 INR/ha), Gross return (1,02830.00 INR/ha), Net return (71912.00 INR/ha), B:C ratio (2.32) had also recorded at the same treatment with 60kg P_2O_5/ha + 0.50 ppm Brassinolide.

Keywords: Plant growth regulators, growth, yield, economics and INR

Introduction
Cowpea [*Vigna unguiculata* L.] commonly known as Lobia, Black eye pea, Southern pea and Crowder pea is one of the important pulse crop grown for grain, forage and green manuring. This crop is drought hardy nature, its wide and droopy leaves keep soils and soil moisture conserved due to shading effect at favorable conditions.

Next to nitrogen, phosphorus is regarded as the pioneer plant nutrient, since it is needed by the leguminous crop for rapid and healthy root development. Role of phosphorus in nodulation and other enzymatic activity and also acts as yield limiting nutrient next to Nitrogen. It is important role in photosynthesis, respiration and other physiological processes of plant. The vital role played by the phosphorus in reaction involving energy transfer and move specifically ATP in nitrogenase, activity suggests that plants dependence on symbiotic nitrogen for growth. A number of plant growth regulators have been known to maximize the yield in many crops. Brassinolide, a novel plant growth promoting steroidal lactone, was first isolated from rape (*Brassica napus* L.) pollen and was found to exhibit unique plant growth responses in several test systems. Recently, many analogues of brassinolide have been known and they collectively known as brassinosteroids (BRs) or brassin. Brassinosteroids is now considered as an important group of phytohormones.

Brassinosteroids occur ubiquitously in plants and present in extremely low concentrations. The pollen and immature seeds contain about 1-100 mg per gm fresh weight, while shoots and leaves possess still lower amounts in the range of 0.01-0.l gm per g fresh weight, which is a testimony to consider brassinosteroids as Phyto-hormones. Brassinolide induced plant growth was reported to be associated with increased metabolic processes like photosynthesis, nucleic acid and protein synthesis. In an early study, brassinosteroids induced growth promotion was found to be associated with enhanced levels of nucleic acids, soluble proteins and carbohydrates. Therefore, improvement in yield and quality parameters in food legumes may be achieved through suitable application of growth regulators as well as appropriate agronomical practices.

Materials and Methods
The experiment was conducted during the *zaid* season of 2021 at the Crop Research Farm, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and

Sciences, Prayagraj (U.P.). the soil of experimental plot was sandy loamy in texture, nearly neutral in soil reaction PH (7.2), low in organic carbon (0.222%), available N (171.48Kg/ha), available P (12.3Kg/ha), and available K (235.7Kg/ha). The treatment consists of three levels of Phosphorus and three levels of Brassinolide, Plant Growth Regulator Foliar spray. The experiment was laid out in Randomized Block Design with ten treatments each replicated thrice.

Result

Growth attributes

Data in the Table no 1 tabulated that the significantly highest plant height was observed in 60 kg P_2O_5/ha + 0.50 ppm Brassinolide (121.40 cm) which was statistically at par with application of 50 kg P_2O_5/ha + 0.50 ppm Brassinolide (117.16 cm) similarly there was an significant increase in the plant height in 40kg P_2O_5/ha when compared to 20kg P_2O_5/ha and control this was reported by (Jat *et al*. 2013) [3]. Highest dry weight was recorded significantly in 60 kg P_2O_5/ha + 0.50 ppm Brassinolide (19.5g) which was in par with application of 50 kg P_2O_5/ha + 0.50 ppm Brassinolide (18.2g) Growth parameters like plant height and dry matter accumulation were significantly higher in higher treatments of Brassinolide this was reported by (Senguptha *et al*. 2011). The significantly highest number of nodules was observed in 60 kg P_2O_5/ha + 0.50 ppm Brassinolide (21.14) which was statistically at par with application of 50 kg P_2O_5/ha + 0.50 ppm Brassinolide (20.23) with the increase in phosphorus there was an significant increase in number of nodules up to 75kg/ha Chaudhary *et al*. (2016) [1] with the increase in the concentration of phosphorus reported that PSB may increase the P availability and uptake resulted in the profuse nodulation and rhizobium may increase the symbiotic nitrogen fixation. Highest Branches was recorded significantly in 60 kg P_2O_5/ha + 0.50 ppm Brassinolide (4.3) which was in par with application of 50 kg P_2O_5/ha + 0.50 ppm Brassinolide (4.1) and 40 kg P_2O_5/ha + 0.50 ppm Brassinolide (4.1) Similarly with application of phosphorus increased the availability of nitrogen and potassium which resulted in better plant growth and more number of branches per plant this was reported (Saeed *et al*. 2004) [7].

Table 1: Effect of phosphorus and plant growth regulator on growth attributes of cowpea.

Treatments	Plant height	Dry weight	Nodules	Branches
1. 40 kg P_2O_5/ha + 0.10 ppm Brassinolide	95.23	12.12`	11.53	3.2
2. 40 kg P_2O_5/ha + 0.25 ppm Brassinolide	98.58	13.8	15.33	3.9
3. 40 kg P_2O_5/ha + 0.50 ppm Brassinolide	111.57	17.3	19.53	4.1
4. 50 kg P_2O_5/ha + 0.10 ppm Brassinolide	96.55	12.9	12.73	3.5
5. 50 kg P_2O_5/ha + 0.25 ppm Brassinolide	103.04	14.3	16.13	4
6. 50 kg P_2O_5/ha + 0.50 ppm Brassinolide	117.16	18.2	20.23	4.1
7. 60 kg P_2O_5/ha + 0.10 ppm Brassinolide	98.58	13.8	10.66	3.6
8. 60 kg P_2O_5/ha + 0.25 ppm Brassinolide	105.97	15.06	18.86	4
9. 60 kg P_2O_5/ha + 0.50 ppm Brassinolide	121.40	19.5	21.14	4.3
10. Control plot N:P:K = 20:60:40 Kg/ha (without PGR)	86.3	11.2	13.53	3.1
F test	S	S	S	S
S.Em (+)	2.8	0.4	0.47	0.09
CD (5%)	8.36	1.3	1.4	0.2

Yield attributes

Data in the Table no 2 tabulated that the significantly highest number of Pods was observed in 60 kg P_2O_5/ha + 0.50 ppm Brassinolide (7.2) which was statistically at par with application of 50 kg P_2O_5/ha + 0.50 ppm Brassinolide (6.9), with the increase in P_2O_5 up to 60kg/ha there was increase in a significant increase in number of pods/ha this was reported by (Gajera *et al.* 2014) [2]. Highest seed per pod was recorded significantly in 60 kg P_2O_5/ha + 0.50 ppm Brassinolide (12.2) similar result was reported by (Nagar and Meena *et al*. 2004) [5]. The significantly highest test weight was observed in 60 kg P_2O_5/ha + 0.50ppm Brassinolide (121g) which was statistically at par with application of 50 kg P_2O_5/ha + 0.50 ppm Brassinolide (120g), (Dilip Matwa *et al*. 2016), Highest seed yield was recorded significantly in 60 kgP_2O_5/ha + 0.50 ppm Brassinolide (1915kg/ha) similar findings are found when the crop sprayed with 0.50ppm of brassinolide yielded better than other concentration of brassinolide and highest seed yield was obtained with the treatment where it was sprayed twice this was reported by (Senguptha *et al.* 2015) [9]. Highest stover yield had found non-significant with 60 kg P_2O_5/ha + 0.50 ppm Brassinolide (3883kg/ha) and Highest harvesting index had found non-significant with 60 kg P_2O_5/ha + 0.50 ppm (49.29%).

Table 2: Effect of phosphorus and plant growth regulator on yield attributes of cowpea.

Treatments	Pods/plant (No.)	Seeds/pod (No)	Test weight (g)	Seed yield (kg/ha)	Stover yield (kg/ha) (%)	Harvest index
1. 40 kg P_2O_5/ha + 0.10 ppm Brassinolide	4.5	6.2	110.7	1151.6	3333.3	34.33
2. 40 kg P_2O_5/ha + 0.25 ppm Brassinolide	4.9	7.7	114	1158	3433.3	33.88
3. 40 kg P_2O_5/ha + 0.50 ppm Brassinolide	5.6	10	120	1428	3600	39.66
4. 50 kg P_2O_5/ha + 0.10 ppm Brassinolide	4.6	7.0	112	1081	3550	30.43
5. 50 kg P_2O_5/ha + 0.25 ppm Brassinolide	5.1	8.5	116	1176	3616	32.48
6. 50 kg P_2O_5/ha + 0.50 ppm Brassinolide	6.9	10.6	120	1453	3366	43.74
7. 60 kg P_2O_5/ha + 0.10 ppm Brassinolide	4.8	7.4	113	1262	3783	33.37
8. 60 kg P_2O_5/ha + 0.25 ppm Brassinolide	5.2	9.06	119	1220	3483	34.98
9. 60 kg P_2O_5/ha + 0.50 ppm Brassinolide	7.2	12.2	121	1915	3883	49.29
10. Control plot N:P:K = 20:60:40 Kg/ha (without PGR)	4	5.4	110.4	1097	3233	33.96

F test	S	S	S	S	NS	NS
S.Em (+)	0.2	0.4	1.5	126.5	110.52	3.6
CD (5%)	0.8	1.19	4.7	375.9	328.3	10.76

Economics

Data in the table 3 tabulated experimental results reveled that Maximum Gross returns (INR 1,02830.00/ha), Net return (INR 71,912.00/ha), B:C ratio (2.32) was obtained with application of 60 kg P_2O_5/ha + 0.50 ppm Brassinolide. Respectively. (Netwal *et al.* 2018) [6] Had found nearly similar net returns and benefit cost ratio for 1.0 ppm of Brassinolide.

Table 3: Effect of phosphorus and plant growth regulator on economics of cowpea.

Treatments	Cost of cultivation (₹/ha)	Gross return (₹/ha)	Net return (₹/ha)	B:C ratio
1. 40 kg P_2O_5/ha + 0.10 ppm Brassinolide	30,178.00	74,858.5	44680.55	1.48
2. 40 kg P_2O_5/ha + 0.25 ppm Brassinolide	30,428.00	75,270.00	44842.00	1.47
3. 40 kg P_2O_5/ha + 0.50 ppm Brassinolide	30,678.00	92,820.00	62142.00	2.02
4. 50 kg P_2O_5/ha + 0.10 ppm Brassinolide	30,298.00	70,265.00	39967.00	1.31
5. 50 kg P_2O_5/ha + 0.25 ppm Brassinolide	30,548.00	76,440.00	45892.00	1.50
6. 50 kg P_2O_5/ha + 0.50 ppm Brassinolide	30,798.00	94,466.4	63668.4	2.06
7. 60 kg P_2O_5/ha + 0.10 ppm Brassinolide	30,418.00	82,030.00	51612.00	1.69
8. 60 kg P_2O_5/ha + 0.25 ppm Brassinolide	30,668.00	79,343.55	48675.55	1.58
9. 60 kg P_2O_5/ha + 0.50 ppm Brassinolide	30,918.00	1,02830.00	71,912.00	2.32
10. Control plot N:P:K = 20:60:40 Kg/ha (without PGR)	30,218.00	71305.00	41087.00	1.35

Fig 1: Spraying of Brassinolide at 20DAS

Fig 2: Harvesting of crop in Crop Research Farm

Conclusion

It is concluded that application of 60 P_2O_5 kg/ha + 0.50 ppm of Brassinolide has maximum seed yield (2.09t/ha), gross return (INR 1,02830. ₹/ha), net return (INR 71,912 ₹/ha) and B:C ratio (2.32) was recorded. These findings are based on one season therefore; further trail may be required for further confirmation.

Acknowledgment

I express my gratitude to my advisor Dr. Shikha Singh and all the faculty members of department of Agronomy, Naini Agricultural institute, Sam Higginbottom University of Agricultural Technology and Sciences, Prayagraj, (U.P) India for constant support and guidance to carry out the whole experiment research study.

References

1. Chaudhary SN, Thanki JD, Chaudhari VD, Varma. Yield and quality of green gram as influenced by the Organic manures, biofertilizers and phosphorus fertilization. The Bioscan. 2016;11(1):431-433.
2. Gajera RJ, Khafi HR, Raj AD, Yadav V, Lad AD. Effect of phosphorus and biofertilizer on growth and yield of green gram. Agriculture Update. 2014;9:98-102.
3. Jat SR, Patel BJ, Shivran AC, Kuri BR, Jat G. Effect of Phosphorus and Sulphur levels on growth and yield of cowpea (*Vigna unguiculata* (L.) Walp) Under Rainfed conditions Annals of plant and soil research. 2013;15(2):114 -117.
4. Matwa Dilip, Rao KP, Dhewa JS, Rajveer. Effect of Plant Growth Regulator (PGRs) and Micronutrients on flowering and yield parameters of Green gram original research article, 2017.
5. Nagar KC, Meena NL. Effect of phosphorus solubilizing bacteria on yield components, yield and quality of cluster bean. Legume res. 2004;27:27-31.
6. Netwal M, Dr. Choudhary MR, Jakhar R, Devi S, Choudary S. Journal of Pharmacognosy and Phytochemistry. 2018;**7**(6):2093-2096.
7. Saeed M, Akram HM, Iqbal MS, Yar A, Ali A. Impact of fertilizer on the seed yield of chickpea. International Journal of Agriculture and Biology. 2004; 6(1):108-109.
8. Sengupta K, Banik NC, Bhui S, Mitra S. Effect of Brassinolide on growth and yield of summer green gram crop. (*Vigna radiata* L.). Journal of crop and weed. 2011;7(2):152-154.
9. Senguptha K, Tamang D. Response of green gram to foliar application of nutrients and Brassinolide. Journal of crop and weed. 2015;11(1):43-35.