Original Research Article

Influence of Phosphorus and salicylic acid on the growth and yield of green gram (*Phaseolus radiata* L.)

Abstract

A field experiment was conducted during *Zaid* (summer) season of 2023 at Crop Research Farm Department of Agronomy. The experiment was laid out in a Randomized Block Design with 10 treatments and replication thrice. The treatments consisted of 3 levels of phosphorus (30, 40 and 50 kg/ha) and 3 levels of Salicylic acid (500,750 and 1000 ppm) along with recommended doses of nitrogen and potash and a control (25-40-25 kg N-P-K/ha). Phosphorus at 50 kg/ha and Salicylic acid at 1000 ppm recorded maximum plant dry weight (17.07g), pods per plant (13.49), seeds per pod (25.69), test weight (40.24), seed yield (13.75q/ha).

Key words: green gram, phosphorus, salicylic acid, Yield

INTRODUCTION

Pulses are an excellent gift of nature for human life and play a crucial role in providing a nutritional diet. India is a global leader in terms of production, consumption. Pulses are seen as the most significant food source afterward cereals in India as well as the world, for they are the best protein and Energy sources for humans **(Salih 2013).** Pulse crops contribute significantly to dietary protein as well as providing and fixing of atmospheric nitrogen. It is a natural mini-nitrogen producing industry within the field. The farmers also perform a significant function in enhancing the nitrogen availability in the soil through growing pulse crops. Legumes have a certain extent phytochemical such as flavonoids, phytosterols, and polyphenols which have benefits for health **(Sreerama*et al*., 2010).** They are not only efficient sources of nutrients but also help to decrease many non-transmissible diseases like cardiovascular diseases and colon cancer **(Jukanti*et al*., 2012).**Mungbean is the ultimate source of high-quality protein. The seeds are highly nutritious with protein, Vit-A, thiamine, riboflavin, nicotinic acid (25%, 83 IU, 0.72 mg/100g, 0.15 mg /100g, 2.4 mg/100g

respectively) (ICMR). It provides energy 334 Kcal /100g, it is a rich source of carbohydrate (56.7g/100g) and is a very good source of Magnesium 127mg/100g, Calcium 124mg/100g, phosphorus 326mg/100g and Iron 4.4mg/100g **(Kavya N 2014).**

Foliar application of salicylic acid at pre-flowering and flowering stage of the crop significantly increased in chlorophyll content of greengram. Salicylic acid also increased reducing and non-reducing sugar, starch and soluble protein content in the leaves over control and water spray **(Maity and Bera, 2009).**Phosphorus enhances water use efficiency by promoting root growth which allows the crop to utilize water stored in deeper soil layers.One of the unique characteristics of phosphorus is its low availability due to slow diffusion and high fixation in soils. Moreover, the availability of soil phosphorus is greatly altered by soil type as well as the physico-chemical characteristic of the soil. Therefore, maintaining a proper P-supplying level at the root zone can maximize the efficiency of plant roots to mobilize and acquire P from the rhizosphere. Groundnut being a leguminous crop and rich in oil requires higher amount of phosphorus. **(Kadam *et al*. 2014).**

MATERIALS AND METHODS

This experiment was laid out during the *Zaid* season of 2023 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.). The crop research farm is situated at 25^0 39" 42" N latitude, 81^0 67" 56" E longitude and at an altitude of 98 m above mean sea level.The treatments consisted of 3 levels of phosphorus (30, 40 and 50 kg/ha) and 3 levels of Salicylic acid (500,750 and 1000 ppm) along with recommended doses of nitrogen and potash and a control (25-40-25 kg N-P-K/ha). The experiment was laid out in a Randomized Block Design with 10 treatments and replication thrice. Data recorded on different aspects of crop, *viz.,* growth, yield attributes were subjected to statistically analysis by analysis of variance method. (**Gomez and Gomez, 1976)** and economic data analysis mathematical method.

RESULT AND DISCUSSION:

Growth parameters

Plant dry weight (g)

At 45 DAS, significant and maximum plant dry weight (9.34 g) was recorded in treatment 9. However, treatment 8 (9.17 g) and treatment 7 (8.91 g), were found to be statistically at par with treatment 9 (9.34 g).

The significant and higher plant dry weight was with the application of phosphorus (50 kg/ha) being an energy bond compound and its major role is transformation of energy essential for almost all metabolic processes photosynthesis, respiration, cell elongation and cell division, activation of amino acids for synthesis of protein and carbohydrate metabolism which ultimately increase all the growth attributes and dry weight of plants **Pandey and Pandey (2019)**.Further Significant and higher plant dry weight was observed with application of Salicylic acid before flowering with proper combination and due to increase in chlorophyll content in leaves, thereby increasing photosynthetic efficiency through foliar spray of salicylic acid**Manjri*et al*. (2018)**

Yield parameters

Number of pods/plant:

At harvest, Treatment 9 was recorded significant and maximum number of pods/plant (25.69) which was superior over all other treatments. However, the treatment 8 (23.30) and treatment 7 (23.13) was found to be statistically at par with the treatment 9 (25.69).

The Significant and higher number of pods/plants was with the application of phosphorus which it might be the reason of moderate plant nutrients availability due to which the plant produces more pods/plant as compare to other treatments and also phosphorus strongly increases the reproduction of the plants *i.e*., flowering and fruiting. These results were similar with that of **Kumari (2017).**

Number of seeds/pod:

At harvest, Treatment 9 was recorded significant and maximum number of seeds/pod (13.49) which was superior over all other treatments. However, the treatment 8 (12.29) was found to be statistically at par with the treatment 9 (13.49).

The significant and higher number of seed/plants was with the application of phosphorus (50 kg/ha) which may be the reason of moderate plant nutrients availability due to which the plant produces more number of seed/pod is a genetically controlled character and the difference among genotypes was due to their different genetic ability for this parameter **Rahman *et al*. (2013)**.Further Significant and higher number of seed per plant observed with application of Salicylic acid before flowering with proper combination and due to increase in chlorophyll content in leaves, thereby increasing photosynthetic efficiency through foliar spray of salicylic acid**Matwa*et al*. (2017).**

Test weight (g):

At harvest, highest test weight (40.24g) was recorded in treatment 9, However, the treatment 8 (38.36 g) and treatment 7 (37.27 g) was found to be statistically at par with the treatment 9.

The significant and higher test was with the application of phosphorus (50 kg/ha) which may be the reason of moderate plant nutrients availability due to which the plant produces more number of seed/pod is a genetically controlled character and the difference among genotypes was due to their different genetic ability for this parameter **Patel *et al*. (2018)**

Seed yield (q/ha)

At harvest, Treatment 9 was recorded significantly maximum Seed yield (13.75 q/ha) which was superior over all other treatments. However, the treatment 8 (12.94 q/ha) and treatment 7 (11.81 q/ha) was found to be statistically at par with the treatment 9.

The Significant and higher seed yield was with application of phosphatic fertilizer therefore provided balance nutrition to the crop which resulted in higher seed yield of green gram. Phosphorus also increased the photosynthesis and translocation of assimilates to different plant parts for enhanced growth and yield attributing characters of the crop as observed in number of pods per plant and number of seeds per pod. In the later stage, the excess assimilates stored in the leaves was translocated towards sink development which ultimately contributed to higher seed yield. These findings were supported by **Muthal*et al*., (2016)**

CONCLUSION:

Based on the above findings it can be concluded that greengram with the application of phosphorus at 50 kg/ha in combination with Salicylic acid 1000 ppm recorded highest plant dry weight, number of pods/plant number of seed/pod, test weight and heightseed yield.

Table 1. Response of different Levels of Phosphorus and Salicylic acid on growth, yield attributes and yield of Greengram.

S.No.	Treatment Combinations	Plant dry weight (g) (45 DAS)	No. of pods /plant	Seeds/pod (No.)	Test weight (g)	Seed yield (q/ha)
1.	Phosphorus 30kg/ha + Salicylic acid 500 ppm	6.69	17.67	7.57	32.55	7.96

2.	Phosphorus 30kg/ha + Salicylic acid 750 ppm	6.97	18.17	7.97	33,53	8.43
3.	Phosphorus 30kg/ha + Salicylic acid 1000 ppm	7.17	19.12	8.69	34.16	9.14
4.	Phosphorus 40kg/ha + Salicylic acid 500 ppm	7.68	19.61	9.10	35.21	8.42
5.	Phosphorus 40kg/ha + Salicylic acid 750 ppm	8.15	20.78	9.94	35.72	10.28
6.	Phosphorus 40kg/ha + Salicylic acid 1000 ppm	8.58	21.45	10.16	36.01	10.63
7.	Phosphorus 50kg/ha + Salicylic acid 500 ppm	8.91	23.30	11.54	37.27	11.81
8.	Phosphorus 50kg/ha + Salicylic acid 750 ppm	9.17	23.13	12.29	38.36	12.94
9.	Phosphorus 50kg/ha + Salicylic acid 1000 ppm	9.34	25.69	13.49	40.24	13.75
10.	CONTROL (N-P-K) 25:40:25 kg/ha	6.07	15.89	14.18	31.36	7.17
	SEm(±)	1.54	0.96	0.68	1.52	0.61
	CD (p=0.05)	2.58	2.87	2.03	4.53	1.83

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