Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(2): 500-502
Received: 09-01-2019
Accepted: 13-02-2019

G Baradhan
Assistant Professors, Faculty of Agriculture, Annamalai University, Tamil Nadu, India

SM Suresh Kumar
Assistant Professors, Faculty of Agriculture, Annamalai University, Tamil Nadu, India

S Elankavi
Assistant Professors, Faculty of Agriculture, Annamalai University, Tamil Nadu, India

S Ramesh
Assistant Professors, Faculty of Agriculture, Annamalai University, Tamil Nadu, India

GB Sudhagar Rao
Assistant Professors, Faculty of Agriculture, Annamalai University, Tamil Nadu, India

Correspondence
SM Suresh Kumar
Assistant Professors, Faculty of Agriculture, Annamalai University, Tamil Nadu, India

Effect of biostimulant foliar nutrition on the growth attributes of black gram (*Vigna mungo* L.)

G Baradhan, SM Suresh Kumar, S Elankavi, S Ramesh and GB Sudhagar Rao

Abstract
A plant biostimulant is any substance applied to plants with the aim to enhance nutritional efficiency, abiotic stress tolerance and crop quality traits, regardless of its nutrients content. A field experiment was conducted to study the effect of foliar application of PEPTO a plant based bio stimulant which comprises of plant extracts with low molecular weight peptides and natural polysaccharides on the growth and yield of black gram. Among the treatments, foliar application of PEPTO exhibited significant influence on the growth of black gram *viz.*, plant height, LAI and DMP. The treatment recommended package of practice (RPP) with foliar spray of PEPTO @ 5.0 l ha^{-1} on 20-25 and 40 - 45 DAS significantly registered the highest growth attributes of black gram. The treatment *viz.*, RPP with foliar spray of PEPTO @ 2.5 l ha^{-1} on 20-25 and 40 - 45 DAS stood next in order of ranking. The control - RPP with 2% urea spray at 50% flowering (40-45 DAS) recorded the least values in all these growth attributes of black gram.

Keywords: black gram, biostimulants, foliar application and growth

Introduction
Black gram (*Vigna mungo* L.) is one of the major rainy season pulse crops also known as urd grown throughout India. In India, black gram is grown on 3.10 million hectare area with a production of 1.40 million tonnes. In Tamil Nadu, it is grown on an area of 3.41 lakh hectares with a production of 1.21 lakh tonnes with only a productivity of 354 kg ha^{-1} (Shashikumar *et al.*, 2013) [11]. Among these grain legumes, black gram is an ancient and well known leguminous crop of Asia, is a favourable one since it thrives better in all the seasons and it can be grown as a sole or inter crop or fallow crop. It is popular because of its nutritional quality having rich protein (26.2%), carbohydrates (56.6%), fat (1.2%), minerals, amino acids, phosphoric acid, and vitamins.

There is need for enhancement of the productivity of black gram by proper agronomic practices. Several strategies have been initiated to boost the productivity of black gram. One among them is foliar application of organic and inorganic sources of nutrients for exploiting genetic potential of the crop. This is considered to be an efficient and economic method of supplementing part of the nutrient requirements at critical stages. Foliar application is credited with the advantage of quick and efficient utilization of nutrients, elimination of losses through leaching and fixation and regulating the uptake of nutrient by plants (Manonmani and Srimathi, 2009) [6]. The plant biostimulants have been considered as software for plant development and improvement in crop productivity (Malik, 1995) [5].

Growth regulating substances/growth regulators are known to influence a wide array of physio- logical parameters like alteration of plant architecture, assimilate partitioning, promotion of photo- synthesis, uptake of nutrients (mineral ions), enhancing nitrogen metabolism, promotion of flowering, uniform pod formation, increased mobilization of assimilates to defined sinks, improved seed quality, induction of synchrony in flowering, and delayed senescence of leaves (Sharma *et al.*, 2013) [10]. Since, the source is highly limited in pulses with lowering translocation of assimilates to the growing reproductive sinks. Hence, leaf area is important parameters to obtain higher sources in terms of higher assimilation production. Apart from this, major physiological constraints in flower drop and fruit drop (Krishna Surendar *et al.*, 2013) [4]. The biostimulants when applied as foliar spray at proper crop growth stage in optimum concentration could play a significant role in increasing crop yield and quality of produce in different field crops (Nagasubramaniam *et al.*, 2007) [7]. Foliar application of nutrients using is one of the possible ways to enhance the productivity of pulses like black gram.

PEPTO a foliar bio-stimulant for plants is a proprietary product of T. Stanes and Company Ltd., with organic mineral activators, and presented in a soluble, easily absorbable and

available. This plant based product is a low molecular weight peptides comprise of plant extracts with natural polysaccharides. The biggest advantage of is nontoxic and environmentally safe.

Materials and Methods

Field investigation was conducted at Therkumangudi, Cuddalore during February to April, 2017. The field is situated at 11° 33' North latitude and 79° 69' East longitude at an altitude of + 9.00 m above mean sea level. The field is characterized by tropical climate with a mean annual rainfall of 1400 mm distributed over 60 rainy days. The soil of the experimental field was clayey loam. The soil was low in available nitrogen, medium in available phosphorus and high in available potassium.

The treatments comprised of T_1 -Control – Recommended package of practice (RPP) with 2% urea spray at 50% flowering (40-45 DAS), T_2- RPP with Foliar spray of *PEPTO* @ 2.5 l ha^{-1} on 20-25 DAS, T_3 - RPP with Foliar spray of *PEPTO* @ 5.0 l ha^{-1} on 20-25 DAS, T_4- RPP with Foliar spray of *PEPTO* @ 2.5 l ha^{-1} on 20-25 and 40 - 45 DAS and T_5- RPP with Foliar spray of *PEPTO* @ 5.0 l ha^{-1} on 20-25 and 40 - 45 DAS. The experiment was conducted in Randomized block design with three replications. It was carried out with a plot size of 5×4 m2. The black gram variety ADT 5 was selected for the study. The crop was raised with the spacing of 30 × 15 cm and recommended package of practices for black gram were followed. Proper irrigation was done at critical stages of flowering and pod formation. As per the treatment schedule foliar application of *PEPTO* at specified doses of 2.5 l and 5.0 l ha^{-1} were taken up at different stages *viz.*, 20-25 and 40-45 DAS and 2 percent foliar spray of urea at 50% flowering was taken up for treatment (T_1) Control – Recommended package of practice (RPP).

The observations on growth parameters were recorded. Plant height was recorded by measuring the height of plant from ground level to the tip of main branch using a meter scale and the mean value was expressed in centimetre. The DMP was recorded from ten plants selected at random, uprooted with root system intact and were washed to remove the soil particles, placed in a paper cover, shade dried for 24 hrs and then in the hot air oven maintained at 100 ºC for 24 hrs. The dried plants were cooled and the mean weight was recorded in grams. For calculating LAI, the length and width of the terminal leaves were measured from sample plants in each plot at flowering and harvest. LAI was worked out at flowering and harvest using the formula given by Pattuswamy *et al*. (1976) [9]. The data on the various parameters studied during the course of investigation were analysed statistically as per the procedure suggested by Panse and Sukhatme (1978) [8]. Wherever, the results found significant ('F' test), the critical differences (CD) were arrived at five percent probability level.

Results and Discussion

In this present study, the field trial revealed that the RPP with foliar application of *PEPTO* exhibited significant influence on the all the growth attributes of black gram. The treatment RPP with foliar spray of *Pepto* @ 5.0 l ha^{-1} on 20-25 and 40 - 45 DAS (T_5) significantly registered the highest plant height of 28.57 and 40.62 cm at 45 DAS and at harvest, respectively. The treatment *viz.,* RPP with foliar spray of *PEPTO* @ 2.5 l ha^{-1} on 20-25 and 40 - 45 DAS (T_4) which was on par stood next in order of ranking. The other treatments *viz.,* RPP with foliar spray of *PEPTO* @ 5.0 l ha^{-1} on 20-25 DAS (T_3), RPP with foliar spray of *PEPTO* @ 2.5 l ha^{-1} on 20-25 DAS (T_2) was next in descending order. The control - RPP with 2% urea spray at 50% flowering (40-45 DAS) (T_1) recorded the lowest plant height of 21.29 and 30.33 cm at 45 DAS and at harvest, respectively. The treatment with foliar spray of *PEPTO* @ 5.0 l ha^{-1} on 20-25 and 40 - 45 DAS (T_5) significantly registered the highest LAI of 1.79 at flowering stage. The control - RPP with 2% urea spray at 50% flowering (40-45 DAS) (T_1) recorded the least LAI of 1.25. In DMP also the treatment RPP with foliar spray of *PEPTO* @ 5.0 l ha^{-1} on 20-25 and 40 - 45 DAS (T_5) significantly registered the highest DMP of 20.51 g $plant^{-1}$. The control - RPP with 2% urea spray at 50% flowering (40-45 DAS) (T_1) recorded the least DMP of 14.20 g $plant^{-1}$ (Table 1.).

Growth attributes *viz.,* plant height and LAI are very important parameters for a crop in providing more place for flower production leading to more fruit production. This increase in growth attributes may be due to the fact that foliar application of *PEPTO* in promoting the cell elongation and shoot development. Foliar spraying with biostimulants encouraged the vegetative growth and increased the plant capacity for building metabolites. Similar results were also recorded by Venkata Reddy *et al.,* (2009) [13] in Soybean and Verma *et al.,* (2009) [14] in chick pea. The foliar application of *PEPTO* at critical stages of the crop enhanced plant vigour and strengthens the stalk and better photosynthetic activity. Subramani *et al.* (2002) [12], Chandrasekhar and Bangarusamy (2003) [1] and Ganapathy *et al.* (2008) [3] have reported the importance of foliar nutrition with nutrients for the black gram at critical stages. Leaf area is an important factor determining the dry matter production of a crop and subsequently the yield. It is stated that the poor production potential of black gram attributed to poor photosynthetic efficiency, lack of partitioning of photosynthates to pods and seed setting (Dixit and Elamathi, 2007) [2].

Foliar application of *PEPTO* promotes the shoot development, induces uniform flowering and increased the number of flowers and fruit setting. Foliar application of biostimulant enhances the synthesis of carbohydrates and protein and their transport to the site of seed formation. The foliar application of biostimulants at critical stages of the crop growth increase the photosynthetic activity, reduce the senescence and flower drop percentage and increase the pod set by resulting in increased the growth and yield of black gram

Leaf area is considered to be one of the photosynthetic determinants in crop plants and in the present study, application of *PEPTO* resulted in higher LAI. It might have certain metabolites in appreciable amount that help in maintaining the opening of stomata for longer period both in optimum and adverse conditions during the crop growth which led to increased LAI providing stronger source for sink. Improved nutrition may enable greater leaf area production that results in greater interception of light thereby increasing dry matter production (Yadav *et al.,* 2008) [15]. The significant improvement in the accumulation of dry matter in plant and its distribution in different plant parts and number of flowers $plant^{-1}$ in the study was attributed to increased supply of plant nutrients through foliar application of *PEPTO*.

Table 1: Effect of foliar application of *PEPTO* on growth attributes of black gram

Treatments	Plant height at 45 DAS (cm)	Plant height at harvest (cm)	LAI at flowering	DMP (g plant $^{-1}$)
T_{1} - Control - RPP with 2% urea spray at 50 percent flowering (40-45 DAS)	21.29	30.33	1.25	14.2
T_2- RPP with Foliar spray of Pepto @ 2.5 l ha^{-1} on 20-25 DAS	24.64	35.05	1.50	17.18
T_3 RPP with Foliar spray of Pepto @ 5.0 l ha^{-1} on 20-25 DAS	26.11	37.13	1.61	18.46
T_4- RPP with Foliar spray of Pepto @ 2.5 l ha^{-1} on 20-25 and 40 - 45 DAS	28.00	39.81	1.75	20.10
T_5- RPP with Foliar spray of Pepto @ 5.0 l ha^{-1} on 20-25 and 40 - 45 DAS	28.57	40.62	1.79	20.51
$S.E_{D.}$	0.20	0.18	0.06	0.21
CD (p=0.05)	0.40	0.35	0.11	0.43

Conclusion

Pulses are the most important component of the balanced diet in vegetarian country like India. Black gram play an important role in Indian Agriculture as they restore soil fertility by fixing atmospheric nitrogen through their nodules. The productivity of black gram is not sufficient enough to meet the domestic demand of the population. Hence, there is an ample scope for enhancement of the productivity of black gram by proper agronomic practices. Foliar application of biostimulants is one of the possible ways to enhance the productivity of pulses like black gram. The field trial revealed that the treatment RPP with foliar spray of PEPTO @ 5.0 l ha^{-1} on 20-25 and 40 - 45 DAS significantly registered the highest growth parameters and yield of black gram. The control - RPP with 2% urea spray at 50% flowering (40-45 DAS) recorded the least values in all these growth attributes and yield of black gram.

References

1. Chandrasekhar CN, Bangarusamy U. Maximizing the yield of mung bean by foliar application of growth regulating chemicals and nutrients. Madras Agric. J. 2003; 90(1-3):142-145.
2. Dixit PM, Elamathi S. Effect of foliar application of DAP, micronutrients and NAA on growth and yield of green gram (*Vigna radiata* L.). Leg. Res. 2007; 30(4):305-307.
3. Ganapathy M, Baradhan G, Ramesh N. Effect of foliar nutrition on reproductive efficiency and grain yield of rice fallow pulses. Leg. Res. 2008; 31(2):142-144.
4. Krishna Surendar K, Vincent S, Malliga Vanagamudi, Vijyaragavan H. Physiological effects of nitrogen and growth regulators on the crop growth attributes and yield of black gram. Bull. Env. Pharmacol. Life Sci. 2013; 2(4):70-76.
5. Malik CP. Plant growth regulators; software for plant development and crop productivity. Presidential address (Botany section) Indian Science Congress Association, 1995, 1-5.
6. Manonmani V, Srimathi P. Influence of Mother Crop Nutrition on Seed and Quality of black gram. Madras Agric. J. 2009; 96(16):125-128.
7. Nagasubramaniam A, Pathmanabhan G, Mallika V. Studies on improving production potential of baby corn with foliar spray of plant growth regulators. Annual Review of Plant Physiology. 2007; 21:154-157.
8. Panse VG, Sukhatme PV. Statistical method for agricultural workers. ICAR, New Delhi. 33rd Edn, 1978, 145.
9. Pattuswamy S, Thimmegowda S, Krishnamurthy K Determination of leaf area in pulse. Curr. Res. 1976; 5:47.
10. Sharma P, Sardana V, Sukhvinder Singh K. Dry matter partitioning and source–sink relationship as influenced by foliar sprays in groundnut. The Bioscan. 2013; 8:1171-1176.
11. Shashikumar R, Basavarajappa SR, Salkinkop, Manjunatha Hebbar, Basavarajappa MP, Patil HY. Effect of growth regulator, organic and inorganic foliar nutrition on the growth and yield of blackgram. (*Vigna mungo* L.) under rainfed condition. Karnataka J Agric. Sci. 2013; 26(2):311-313.
12. Subramani M, Solaimalai A, Velayutham. Effect of plant population and methods of fertilizer application on yield attributes and yield of irrigated black gram. Madras Agric. J. 2002; 89(4-6):305-306.
13. Venkata Reddy T, Reddy GLN, Swamy NR, Ratna Prasad P, Jayrami Reddy P. Influence of growth regulators and nutrients on yield and yield components in soybean (*Glycine max* L.). The Andhra Agric. J. 2009; 56(1):79-81.
14. Verma CB, Yadav RS, Singh IJ, Singh AK. Physiological traits and productivity of rainfed chickpea in relation to urea spray and genotypes. Leg. Res. 2009; 32(1):103-107
15. Yadav RK, Raj Bahadur, Nirbhay Singh, Chaturvedi GS. Effect of bioregulators on growth and grain yield in field pea. J Food Leg. 2008; 21(3):206-207.