Biological Forum – An International Journal **14(4a): 518-520(2022)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Effect of Seed Treatment and Foliar Nutrition on Plant Height, Leaf Area Index and Dry Matter Partitioning of Blackgram

Niharika Das*[1], M. Ratnam[2], S. Prathibhasree[3] and P. Mohana Rao[4]

[1]*M.Sc. Scholar, Department of Agronomy, Agricultural College Bapatla (Andhra Pradesh), India.*
[2]*Principal Scientist, Department of Agronomy, NARP, RARS, Lam, Guntur (Andhra Pradesh), India.*
[3]*Principal Scientist & Head, Department of Agronomy, Agricultural College Farm, Bapatla (Andhra Pradesh), India.*
[4]*Assistant Professor, Department of Soil Science & Agricultural Chemistry, Agricultural College, Bapatla (Andhra Pradesh), India.*

(Corresponding author: Niharika Das)*
(Received 19 September 2022, Accepted 17 November, 2022)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: A field experiment was conducted at Agricultural College Farm, Bapatla during *rabi* 2021-22 to evaluate the effect of foliar nutrition and seed treatment on plant height, leaf area index and dry matter partitioning of blackgram under rainfed conditions of Andhra Pradesh. The soil subjected to the rainfed conditions are devoid of adequate amount of moisture. So, even though the fertilizers are applied through soil in adequate time and quantity, the fertilizer use efficiency decreases due to insufficient soil moisture availability. The soils of the experimental field was low in available nitrogen, medium in P_2O_5, high in K_2O, low in organic matter and neutral to slightly alkaline in reaction. The experiment was laid out in randomized block design with nine treatment combination with foliar nutrition and seed treatment. The experimental data indicated that foliar nutrition and seed treatment significantly influenced the plant height, leaf area index (LAI) and dry matter partitioning of blackgram under rainfed conditions. The seed treatment with PPFMs @10 ml kg^{-1} seed *fb* foliar spray of 10:8:34:2 (N: P: K: S) @10 g l^{-1} at 45 and 60 DAS in addition to the RDF significantly recorded more plant height, LAI and dry matter at 60 DAS and harvest which was on a par with seed treatment with PPFMs @10 ml kg^{-1} seed *fb* foliar spray of 24:24:0:11(N: P: K: Zn) @10 g litre^{-1} at 30 40 DAS in addition to RDF (T_8) and foliar spray of 10:8:34:2 (N: P: K: S) @10 g litre^{-1} at 45 and 60 DAS in addition to RDF (T_6).

Keywords: Blackgram**,** PPFMs, Foliar nutrition, Rainfed, LAI.

INTRODUCTION

Blackgram (*Vigna mungo* L.) is a protein rich leguminous food legume belonging to *fabaceae* family and it contains about 25% protein content with 347 kcal energy. Blackgram is being cultivating in an area of 3.06 millionhectares with a production of 1.70 million tones and productivity of 555 kg ha^{-1} (Indiastat, 2021-22). It accounts for about 10% of India's total pulse production (Balaji *et al.* (2019). In Andhra Pradesh it is grown in an area of 3.93 lakh ha with an average production of 3.65 lakh tonnes and productivity was 929 kg ha^{-1} (Directorate of Economics & Statistics, 2021-2022). Blackgram crop being important from the point of food and nutritional security has been facing a reduction in productivity over several years due to various reasons (Ramesh *et al.,* 2020). Amongst them the fertility management is imperative to ensure better crop production on exhausted soils. As it is majorly cultivated under rainfed condition with poor management practices (Raushan *et al.,* 2020) even soil application of fertilizers at right time and at right quantity may not be efficient due to lack of soil moisture. Availability of moisture becomes scarce, under these circumstances application of nutrients through foliar spray may result in efficient absorption of assimilates from source to sink (Milan *et al.,* 2021). Foliar feeding of nutrients is a one of the technique of feeding the plants by applying liquid fertilizer directly to the foliage and are able to absorb essential elements like N, P, K micronutrients like Zn and secondary nutrients like S by their leaves through stomata and epidermis (Swaminathan *et al.,* 2021) as micronutrients have played a vital role in the improving overall growth and quality of blackgram (Mondal *et al.,* 2011) and is credited with the advantage of quick and efficient utilization of nutrients, elimination of losses through leaching, nutrient fixation and regulation in uptake of nutrient by plants. Pink Pigmented Facultative Methylotrophs convert the methanol produced from the plant metabolism into auxin and cytokinins thereby inducing the plant growth and fastens the seed germination and seedling growth, increases the leaf area index and chlorophyll content and results in earliness in flowering, fruit set, and maturation thereby alleviating the adverse effects of

drought stress (Kumar *et al.,* 2022). Under these circumstances the present investigation was initiated.

METHODOLOGY

A field experiment was conducted during *rabi* 2021-22 at Agricultural College Farm, Bapatla, Acharya N.G. Ranga Agricultural University. The farm is situated between 15.55°N latitude and 80°30′E longitude with an altitude of 5.49 meters above the mean sea level. It is about 8 km away from Bay of Bengal in Krishna Agro-Climatic Zone of Andhra Pradesh, India. The sowing was done during 43rd standard meteorological week *i.e*., on 28th October 2021 and crop was harvested during 4th standard meteorological week *i.e*., on 22nd January, 2022. The variety was taken for study Ghantashala Minumu-1, released in 2019 as "GBG-1" from Agricultural Research Station, Ghantashala. It is resistant to Mungbean Yellow Mosaic Virus and photo-insensitive. It matures within 75-80 days and has yield potential of 1300-1400 kg ha^{-1} during *rabi*. The experiment was laid out in Randomized Block Design with three replications having nine treatments namely T_1: RDF, T_2: Seed treatment with PPFMs @10 ml kg^{-1} seeds *fb* T_1, T_3: T_2 *fb* foliar spray of PPFMs @ 1% at 30 DAS, T_4: T_1 *fb* foliar spray of 28:28:0 (N: P: K) @10 g $litre^{-1}$ at 20 DAS, T_5: T_1*fb* foliar spray of 24:24:0:11(N: P: K: Zn) @10 g $litre^{-1}$ at 30 and 40 DAS, T_6: T_1 *fb* foliar spray of 10:8:34:2 (N: P: K: S) @10 g $litre^{-1}$ at 45 and 60 DAS, T_7: T_2*fb* foliar spray of 28:28:0 (N: P: K) @10 g $litre^{-1}$ at 20 DAS, T_8: T_2 *fb* foliar spray of 24:24:0:11(N: P: K: Zn) @10 g $litre^{-1}$ at 30 and 40 DAS, T_9: T_2*fb* foliar spray of 10:8:34:2 (N: P: K: S) @10 g $litre^{-1}$ at 45 and 60 DAS. The soil of the experimental field was clay, non-saline, neutral in reaction, medium in organic carbon content (0.57 %), low in available nitrogen (205 kg ha^{-1}), medium in phosphorous (28.9 kg ha^{-1}), high in potassium content (249 kg ha^{-1}) and low in zinc content (0.42 mg kg^{-1}). The basal dose of 20 kg N and 50 kg P_2O_5 was applied at the time of sowing.

The seeds were first treated with PPFMs @ 10 ml $litre^{-1}$ of water in which the seeds were soaked for 1 hour and then was used for sowing at the spacing of 30 cm × 10 cm. As per the schedule the foliar treatments and the seed treatments were imposed. Recommended plant protection measures and other management practices were followed as per the Crop Production Guide. The biometric observations were taken and analysed the data statistically. The data on plant height, leaf area index and total dry matter production were recorded at 30 DAS, 60 DAS and at harvest and tabulated.

RESULTS AND DISCUSSION

A. Growth parameters

The observations pertaining to the plant height (cm), Leaf Area Index and total dry matter production (kg ha^{-1}) were recorded before and after the scheduled treatment imposition at different stages of the crop growth. The growth parameters increased from the vegetative to reproductive stage. At 60 DAS and harvest the foliar nutrition through 10:8:34:2 (N:P:K:S) at 45 and 60 DAS and PPFMs as seed treatment in addition to RDF significantly reported maximum plant height (48.10 cm and 52.13 cm respectively), LAI (1.96, 1.89 respectively) and total drymatter production (2758 kg ha^{-1} 4291 kg ha^{-1} respectively). However the results were on a par with the foliar nutrition of 24:24:0:11 (N: P: K: Zn) @ 10 g $litre^{-1}$ applied at 30 and 40 DAS.

The increase in plant height (Table 1) due to the application of different foliar nutrients at different stages (30, 60 DAS and Harvest) of the blackgram might be due to application at critical crop growth stage helped in regulating the cell division, cell multiplication, cell elongation and development and finally enhance the photosynthetic activity and build up of carbohydrates and protein in plants. These findings are in harmony with the findings of (Karthikeyan *et al.,* 2020) and (Milan *et al.,* 2021) with respect to plant height. Also the LAI was positively and significantly influenced by the foliar nutrition and seed treatment with PPFMs when applied along with RDF over the RDF alone. The enhanced leaf area index (Table 1) under the influence of foliar nutritions at different stages (30, 60 DAS and Harvest) of the blackgram could be due to the reason that potassium is essential to obtain maximum leaf extension, elongation and regulates the osmotic turgor of cells and water balance, which is the driving force for cell division and elongation.

Also the foliar application of micronutrients along with the major nutrients might have enhanced higher uptake and utilization of essential plant nutrients for increased photosynthates production and further crop canopy establishment leading to enhanced values of leaf area index. The results are in agreement with (Balaji *et al.* 2019) in blackgram.

The total dry matter production as influenced by the different foliar nutrition and seed treatment with PPFMs (Table 1) indicated that there was an increase in total dry matter with increase in time up to harvest. The increased drymatter production under the influence of the foliar nutrition might be due to the cumulative effect of an increased availability of nutrients with application of foliar nutrients spray at critical crop growth stage coupled to soil based RDF application helping in improved crop growth in terms of plant height, higher leaf area duration ultimately resulted in higher dry matter production. These results are corroborating with the findings of Balaji *et al.* (2019); (Karthikeyan *et al.,* 2020) and (Milan *et al.,* 2021).

The significant effect of PPFMs when combined with foliar nutrition along with RDF might be due to the increased activity of meristematic cells, increased cell division and cell elongation and increased availability of nitrogen with the presence of nitrogen fixing facultative methylotrophs. Addition to that the biosynthesis of the plant growth promoting substances like cytokinins, indole acetic acid (IAA), gibberellic acid (GA), vitamins and antibiotic substances by the PPFM microbial inoculants acted in synergy to it. The results are in concordance with the observations of (Vedavani *et al.,* 2021) and (Kumar *et al.,* 2022).

Table 1: Plant height, LAI, and Dry matter production of blackgram at different growth stages as influenced by the different foliar nutritions and seed treatments.

Treatments	Plant height (cm)			LAI			Dry matter production (kg ha^{-1})		
	30DAS	60DAS	Harvest	30DAS	60DAS	Harvest	30DAS	60DAS	Harvest
T_1: RDF	25.38	37.17	39.70	0.86	1.55	1.49	608	2144	3481
T_2: Seed treatment with PPFMs @10 ml kg^{-1} seeds *fb* T_1	27.00	38.60	40.97	0.88	1.62	1.54	618	2216	3590
T_3: T_2*fb* foliar spray of PPFMs @ 1% at 30 DAS	27.59	39.97	42.42	0.89	1.65	1.58	620	2288	3697
T_4: T_1*fb* foliar spray of 28:28:0 (N: P: K) @10 g l^{-1} at 20 DAS	31.37	41.03	45.00	1.08	1.70	1.59	764	2327	3760
T_5: T_1*fb* foliar spray of 24:24:0:11(N: P: K: Zn) @10 gl^{-1} at 30 and 40 DAS	26.28	44.10	46.93	0.86	1.75	1.68	610	2555	4105
T_6: T_1 *fb* foliar spray of 10:8:34:2 (N: P: K: S) @10 g l^{-1} at 45 and 60 DAS	26.00	46.63	49.70	0.87	1.89	1.79	609	2676	4198
T_7: T_2*fb* foliar spray of 28:28:0 (N: P: K) @10 g l^{-1} at 20 DAS	32.44	42.40	45.00	1.13	1.72	1.64	792	2399	3770
T_8: T_2*fb* foliar spray of 24:24:0:11(N: P: K: Zn) @10g l^{-1} at 30 and 40 DAS	28.19	44.73	47.57	0.89	1.82	1.74	623	2614	4146
T_9: T_2*fb* foliar spray of 10:8:34:2 (N: P: K: S) @10 g l^{-1} at 45 and 60 DAS	28.81	48.10	52.13	0.89	1.96	1.89	625	2758	4291
SEm±	1.22	1.67	2.05	0.03	0.08	0.08	22.6	113.6	170.9
CD (p=0.05)	3.65	5.01	6.14	0.08	0.23	0.23	67.8	340.5	512.4

***RDF:** 20:50:0 NPK kg ha^{-1}

***PPFMs:** Pink Pigmented Facultative Methyloytrophs which was developed at Bio fertilizer unit, ARS, Amaravati, and ANGRAU

CONCLUSION

From the experimental results it can be concluded that the Foliar application of 10:8:34:2 (N:P:K:S) @ 10 g litre^{-1} applied at 45 and 60 DAS when combined with seed treatment with PPFMs @ 10g kg^{-1} seeds in addition to RDF recorded significantly highest growth parameters in terms of plant height (cm), Leaf Area Index, and Total drymatter production (kg ha^{-1}). However the results were on a par with the foliar nutrition of 24:24:0:11 (N: P: K: Zn) @ 10 g litre^{-1} applied at 30 and 40 DAS.

FUTURE SCOPE

Foliar nutrition being a supplement to the conventional soil applied fertilizers should be encouraged in the crops grown under rainfed condition . Application of biofertilizers like Pink Pigmented Facultative Methylotrophs in the form of seed treatment and foliar application along with the recommended dose of fertilizer will be promising to sustain the crop yield in the moisture stress conditions.

Acknowledgement. The authors are thankful to Department of Agronomy, Agricultural college, Bapatla, Acharya N.G. Ranga Agricultural University, Guntur, India for providing us necessary facilities to undertake the study.

Conflict of Interest. None.

REFERENCES

Balaji, P., Vinod Kumar, S. R., Srinivasan, G. and Mrunalini, K. (2019). Effect of foliar nutrition on yield maximization strategies for irrigated black gram cv. ADT 3. *Journal of Pharmacology and Phytochemistry*, *8*, 2884-2886.

Directorate of Economics and Statistics, AP 2021-2022: 09-12.

Karthikeyan, A., Vanathi, J., Babu, S. and Ravikumar, C. (2020). Studies on the effect of foliar application of organic and inorganic nutrients on the phenotypic enhancement of black gram cv. Vamban-6. *Plant Archives*, *20*(2), 1161-1164.

Kumar, R.A., Selvakumar, S., Harishankar, K. and Sivasabari, K. (2022). Effect of pink-pigmented facultative methylotrophs, PGRs and Nutrients on Growth, Yield and Economics of Irrigated Blackgram [*Vigna mungo* (L.) Hepper]. *Legume Research-An International Journal*, *1*, 6.

Mondal, M.M.A., Rahman, M. A., Akter, M. B. and Fakir, M.S.A. (2011). Effect of foliar application of nitrogen and micronutrients on growth and yield in mungbean (*Vigna radiate* L.). *Legume Research-An International Journal*, *34*(3), 166-171.

Mori Milan, B., Deshmukh Swapnil, P., Thakor Bharvi, K. and Patel Upasana, J. (2021). Growth of summer greengram (*Vigna radiata* L.) As influenced by foliar nutrition under south Gujarat condition. *Journal of Pharmacognosy and Phytochemistry*, *9*(6), 2160-2162.

Ramesh, T., Rathika, S., Sangeetha, S., Satheesh, S., Ponpradeepa, M., and. Pavithra, A. M. (2020). Enhancement of Black Gram Productivity through Foliar Spray of Nutrients and Growth Hormones-A Review. *Journal homepage: http://www. ijcmas. com*, *9*(12).

Raushan, R. K., Singh, H., Upadhaya, B., and. Kumar, R. (2020). Effect of foliar application of nutrients on yield and yield attributes of black gram (*Vigna mungo* L.) under rainfed condition. *Journal of Pharmacognosy and Phytochemistry*, *9*(1), 627-630.

Swaminathan, C., Surya, R., Subramanian, E., and. Arunachalam, P. (2021). Challenges in Pulses Productivity and Agronomic Opportunities for Enhancing Growth and Yield in Blackgram [*Vigna mungo* (L.) Hepper]: A Review. *Legume Research-An International Journal*, *1*, 9.

Vedavani, R., Kumar, D. M., Nandish, M.S., Veeranna, H.K. and Salimath, S. B. (2021). Growth and Yield Components of Maize (*Zea mays* L.) as influenced by Pink Pigmented Methylotrophic Bacteria in Integrated Nutrient Management. *Biological Forum – An International Journal*, *13*(3a), 807-811.

www.indiastat.com, 2021-22

How to cite this article: Niharika Das, M. Ratnam, S. Prathibhasree and P. Mohana Rao (2022). Effect of Seed Treatment and Foliar Nutrition on Plant Height, Leaf Area Index and Dry Matter Partitioning of Blackgram. *Biological Forum – An International Journal*, *14*(4a): 518-520.