

Enhancing Growth and Yield of Blackgram through Foliar Application of Organic and Inorganic Nutrients

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Abstract

Field experiments were conducted at ICAR Krishi Vigyan Kendra, Perambalur district (TN) to study the effect of foliar application of nutrients on the phenotypic enhancement of Blackgram variety CO8, during the summer seasons of 2024-25. The experiments were laid out in Randomized Block Design (RBD) with three replications. The growth and yield components of Blackgram viz., plant height, leaf area index, dry matter production, number of pods plant⁻¹, pod length, number of seeds pod⁻¹ and grain yield were favourably influenced by foliar application of 1 % pulse wonder spray on 30 DAS and 45 DAS (T2). The control (T1) recorded the lowest values with the above growth attributes. Among the treatments, foliar application of 1% pulse wonder spray on 30 DAS and 45 DAS (T2) recorded the highest growth attributes viz., plant height, LAI, Nodule number and nodule biomass DMP, Absolute Growth Rate (AGR), Crop Growth Rate (CGR) and Leaf Area Duration (LAD) in Summer the season.

Keywords: Blackgram, Foliar spray, DAP, Panchakavya and Pulse wonder.

Introduction

Blackgram ranked third on regarding economic significance among the pulses and contributes to 10 per cent in the country. Blackgram is an indeterminate in habit of flowering and fruiting and there is a continuous competition for available assimilates between vegetative and reproductive sinks throughout the growth period. Since, the source is highly limited in pulses with lowered translocation of assimilates to the growing reproductive sinks. Apart from the genetic make-up, the physiological factors viz., insufficient partitioning of assimilates, poor pod setting due to flower abscission and lack of nutrients during critical stages of crop growth play a vital role on pulse production (Kalita *et al.*, 1994). The total area under pulses in Tamilnadu is around 3.65 lakh hectares with the production of 3.10 lakh tonnes and the average productivity of 851 kg per hectare (Tnstat, 2014). The per capita consumption of pulses in India is around 30-35 gm as against the recommendation of Indian Council of Medical Research (ICMR) at 45 gm and World Health Organisation (WHO) at 80 gm per day. But the level of productivity of these crops in India is far below the average productivity of the other countries. Farmers generally take up sowing with the basal

application of nutrients as recommended and there is no regional recommendation of foliar nutrition during the crop growth period. Further, soil application of nutrients is often not enough to meet the growing crop demand particularly in short duration crop like Blackgram, as it is basically indeterminate in habit of flowering and fruiting, there is a continuous competition for available assimilates between vegetative and reproductive sinks throughout the growth period. In many cases, the aerial spray of nutrients is preferred and gives quicker and better results than the soil application (Jamal *et al.*, 2006). Foliar nutrients usually penetrate the leaf cuticle or stomata and enter the cells facilitating the easy entry of nutrients. Foliar application is credited with remarkably rapid absorption and nearly complete utilization of nutrients, elimination of leaching losses and fixation and helps in regulating the uptake of nutrient by plants (Manonmani and Srimathi, 2009). As fertilizers application is complicated to apply through top dressing or placement, foliar fertilization is best suited for rabi pulses (Rahman *et al.*, 2015). Apparently, in rice fallow situation, there is no possibility of basal application of fertilizer for pulses, since the pulses are sown before the harvest of the rice crop and fertilizer incorporation becomes impossible. Under these circumstances, foliar application of nutrients would be more appropriate, efficient and economical than the soil application (Balusamy and Meyyazhagan, 2000). Hence, there is ample scope for enhancement of the production and productivity of Blackgram by proper agronomic practices. Several strategies like the use of good quality seeds, high yielding varieties, proper nutrient and irrigation management along with the adoption of innovative agro-technologies have to be initiated to boost its productivity level. One among them is the foliar application of organic and inorganic sources of nutrients for exploiting the genetic potential of the crop. Hence the present investigation was carried out to study the effect of foliar application through organic and inorganic nutrients on the phenotypic enhancement of Blackgram.

Materials and Methods

The field experiment was conducted at ICAR Krishi Vigyan Kendra, Perambalur district to study the effect of foliar application through organic and inorganic nutrients on the phenotypic enhancement of Blackgram variety VBN 8, during summer season of 2023-24. The soil of the experimental field was clay loam. The experiments were laid out in Randomized Block Design (RBD) with three replications. The promising Blackgram variety VBN 8 was chosen for the study. The field experiment consisted of eleven treatments *viz.*, T1- Without foliar application (control), T2- Foliar application of 1% pulse wonder spray on 30 and 45 DAS, T3- Foliar application of 2 % DAP on 30 and 45 DAS, T4- Foliar application of 3 % panchakavya on 30 and 45 DAS, T5- Foliar application of 0.5 % 19:19:19 on 30 and 45 DAS, T6- KCl @ 2% on 30 and 45 DAS, T7- Vermiwash @ 5 % on 30 and 45 DAS, T8- Cow urine @ 5% on 30 and 45 DAS, T9- NAA 50 ppm on 30 and 45 DAS, T10- Urea 1% on 30 and 45 DAS, T11- ZnSO₄ @ 0.2% on 30 and 45 DAS.

Crop management practices

The plots were prepared with the dimension of 5 m × 4 m and seeds of variety CO8 were sown with a spacing of 30×10 cm. Irrigation was given uniformly and regularly to all plots as per the requirement to prevent the crop from water stress at any stage. The crop biometric observations such as plant height, LAI, Nodule number and nodule biomass were recorded at appropriate growth stages of the crop. DMP was worked out after keeping the sample in the oven at 80o C for 48 hours. Absolute Growth Rate (AGR), Crop Growth Rate (CGR) and Leaf Area Duration

(LAD) were calculated by adopting the procedure described by Radford (1967), Watson (1952) and Power (1967), respectively. The experimental data were statistically analysed as suggested by Gomez and Gomez (1976). For significant results, the critical difference was worked out at 5 per cent level.

Results and Discussion

Growth attributes

The result of the field experiment was conducted during summer season on 2023-24 (Table 1 and 2) indicated that foliar application of pulse wonder 25 and 45 DAS had significantly influenced growth attributes of Blackgram. Foliar application of micronutrients and growth promoters applied at the proper time and stage resulted in better growth, development and metabolism of Blackgram. It also helped in increasing translocation of nutrients into the plant without any loss that contributes to better photosynthetic activity and ultimately reflected in a significant increase in plant height. Furthermore, the stimulating action of auxin as zinc is the promoter of auxin which softens the cell wall by increasing in its plasticity followed by hydrolysis of starch to sugars which lower the water potential of cell, resulting in the entry of water into the cell causing elongation (Meena *et al.*, 2012). Similar results were also observed by Ganapathy *et al.* (2008), Ravishankar *et al.* (2013), Mannan (2014) and Babu (2017). Higher LAI might be due to the positive influence of foliar spray of nutrients on cell division and cell elongation which facilitates better crop growth and development. Similar findings were reported by Mohmoud *et al.* (2006) and Cheghakhor *et al.* (2009). Higher dry matter production is due to the application of nutrients significantly play a role in cell division, cell differentiation and development, translocation of photosynthates and growth regulators from source to sink. Besides, it's overall efficiency and utilization of nutrients and other resources and better interception of light paves more production of photosynthates during the crop period. The pronounced effect of foliar application of water-soluble fertilizers on DMP has also been reported by Pradeep and Elamathi (2007), Sathyamoorthi *et al.* (2008). Supplementation of adequate macro and micronutrients enhance the crop growth and development in source capacity *viz.*, plant height, number of branches plant⁻¹ and number of leaves plant⁻¹. These findings were confirmed with Singh *et al.* (2009), Pathak *et al.* (2012) and Ganga *et al.* (2014). The foliar nutrition has significantly influenced on growth indices *viz.*, AGR, CGR and LAD at all growth stages (Table 2). Among the treatments, foliar spray of pulse wonder @ 1% (T2) registered a maximum value of AGR, CGR and LAD (0.85, 0.27 and 27.53) at 55 DAS followed by foliar application of 3 % panchakavya (T4) (0.77, 0.24 and 25.93) at 55 DAS-Harvest. A similar trend also noticed in other growth rate indices of Blackgram. Crop production is determined by CGR as a function of light interception by the leaf area of a crop and is influenced by leaf area index, photosynthetic rate and leaf angle. Interaction of phytohormones and nutrients on growth and development of crop plants cause positive responses on plant growth rate (Mir *et al.*, 2010). The higher leaf area duration had a positive influence on dry matter production by way of keeping the leaves remains green for a longer time which in turn participating in the photosynthetic activity for longer period. These results are corroborating the findings of Shashikumar *et al.* (2013) and Sritharan *et al.* (2015) in Blackgram. In addition to that, the foliar application influenced the root nodule number per plants (27.38) and also nodule biomass (271.51 mg plant⁻¹) respectively during summer season. This might be due to prominent supply of growth hormones and other nutrients to the

growing tip of root establishment activity throughout the growth period. Similar results are quote out by Pineda *et al.* (1994).

Table 1: Effect of Foliar application of organic and inorganic nutrients on growth characters of Blackgram

Treatments	Summer season 2023-24					
	Plant height (cm)	LAI @Flower	DMP (kg ha ⁻¹)	No.of branches plant ⁻¹	No.of Nodule plant ⁻¹	Nodule biomass mg/plant
T ₁ . Without foliar application (control)	33.80	0.92	1838.58	4.46	9.07	38.78
T ₂ - Foliar application of 1% pulse wonder spray on 30 and 45 DAS	49.79	2.45	3255.17	7.26	27.38	271.51
T ₃ - Foliar application of 2 % DAP on 30 and 45 DAS	35.96	1.23	2474.79	5.15	11.60	70.63
T ₄ - Foliar application of 3 % panchakavya on 30 and 45 DAS	46.95	2.21	3132.42	6.76	24.80	227.41
T ₅ - Foliar application of 0.5 % 19:19:19 on 30 and 45 DAS	38.16	1.43	2597.20	5.52	12.31	95.76
T ₆ - KCl @ 2% on 30 and 45 DAS	40.54	1.52	2652.27	5.74	13.39	107.75
T ₇ - Vermiwash @ 5 % on 30 and 45 DAS	46.24	2.13	3095.87	6.64	21.07	192.18
T ₈ - Cow urine @ 5% on 30 and 45 DAS	44.29	1.89	2966.22	6.27	20.42	170.18
T ₉ - NAA 50 ppm on 30 and 45 DAS	1.06	0.09	56.81	0.18	1.06	13.08
T ₁₀ - Urea 1% on 30 and 45 DAS	2.19	0.18	118.31	0.37	2.20	27.20
T ₁₁ - ZnSO ₄ @ 0.2% on 30 and 45 DAS	33.80	0.92	1838.58	4.46	9.07	38.78
S.Em	49.79	2.45	3255.17	7.26	27.38	271.51
CD(P=0.05)	35.96	1.23	2474.79	5.15	11.60	70.63

Table 2: Effect of Foliar application of organic and inorganic nutrients on AGR, CGR and LAD of Blackgram

Treatments	Summer season 2023-24					
	AGR@ 35-55	AGR@ 55-Har	CGR@ 35-55	CGR@ 55-Har	LAD@ 35-55	LAD@

	DAS	DAS	DAS	DAS	DAS	55-Har
T ₁ - Without foliar application (control)	0.13	0.21	0.02	0.04	18.99	13.55
T ₂ - Foliar application of 1% pulse wonder spray on 30 and 45 DAS	0.31	0.85	0.11	0.27	31.26	27.53
T ₃ - Foliar application of 2 % DAP on 30 and 45 DAS	0.17	0.42	0.06	0.11	24.65	19.63
T ₄ - Foliar application of 3 % panchakavya on 30 and 45 DAS	0.29	0.77	0.10	0.24	30.09	25.93
T ₅ - Foliar application of 0.5 % 19:19:19 on 30 and 45 DAS	0.16	0.34	0.06	0.07	23.47	16.11
T ₆ - KCl @ 2% on 30 and 45 DAS	0.15	0.33	0.05	0.06	22.09	15.26
T ₇ - Vermiwash @ 5 % on 30 and 45 DAS	0.27	0.70	0.09	0.21	29.34	25.07
T ₈ - Cow urine @ 5% on 30 and 45 DAS	0.16	0.34	0.05	0.06	22.43	18.14
T ₉ - NAA 50 ppm on 30 and 45 DAS	0.24	0.62	0.08	0.18	28.17	23.58
T ₁₀ - Urea 1% on 30 and 45 DAS	0.22	0.58	0.08	0.16	27.32	22.62
T ₁₁ - ZnSO ₄ @ 0.2% on 30 and 45 DAS	0.20	0.50	0.07	0.14	25.82	21.13
S.Em	0.01	0.04	0.00	0.02	0.45	0.56
CD(P=0.05)	0.02	0.08	0.01	0.03	0.93	1.28

Conclusion

To boost the productivity of Blackgram, it can be concluded and recommended that the foliar application of 1% pulse wonder spray on 30 DAS and 45 DAS (T₂) is found to be sustainable and most efficiently suitable nutrient management technology for maximizing the Blackgram productivity in a cost-effective approach and sustain the soil fertility.

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BIOGRAPHIES (Optional notmandatory)



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