

Effect of Foliar Nutrition on the Growth, Yield and Economics of Blackgram

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Abstract: A field experiment was conducted at Achalvadi village, located at Harur block of Dharmapuri district to study the effect of foliar nutrients on the growth, yield and economics of blackgram. The experiment consisted of ten treatments. The experimental plots were laid out in randomized block design with three replications. The treatments consisted of, T₁ – Control, T₂ – RDF (44:22:0 kg of NPK ha⁻¹) + EFYM @ 750 kg ha⁻¹, T₃ – RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 2% urea twice at 30 and 45 DAS, T₄ - RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 2% DAP twice at 30 and 45 DAS, T₅ - RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 1% KCl twice at 30 and 45 DAS, T₆ - RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 3% Panchagavya twice at 30 and 45 DAS, T₇ - RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 2% urea at 30 DAS+ Foliar application of Silixol plus @ 1 ml/litre @ 45 DAS, T₈ - RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 2% DAP at 30 DAS + Foliar application of Silixol plus @ 1 ml/litre @ 45 DAS, T₉ - RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 1% KCl at 30 DAS + Foliar application of Silixol plus @ 1 ml/litre @ 45 DAS, T₁₀ - RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 3% Panchagavya at 30 DAS + Foliar application of Silixol plus @ 1 ml/litre @ 45 DAS. Among the various treatments tried, application of RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 2% DAP at 30 DAS + Foliar application of Silixol plus @ 1 ml/litre @ 45 DAS (T₈) recorded the maximum growth parameters viz. plant height (35.64 and 40.78 cm at 45 DAS and harvest stages respectively), number of branches plant⁻¹ (7.86), leaf area index (5.72) and dry matter production (14.69 g plant⁻¹), yield attributes viz. number of pods plant⁻¹ (14.38), number of seeds pod⁻¹ (7.27), yield (1247 and 1975 kg ha⁻¹ of seed and haulm yield respectively) and economics (Rs. 86043, Rs. 57195 and 2.98 of gross income, net income and B:C ratio respectively) of the crop. This treatment was followed by RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 2% DAP twice at 30 and 45 DAS (T₄). The lower values of growth parameters, yield attributes, yield and economics were recorded under the control treatment (T₁).

Key words: Pulses, Blackgram, EFYM, foliar nutrients and Silicon

INTRODUCTION

Blackgram (*Vigna mungo* L.) belonging to the family Fabaceae is the most important pulse crop cultivated in India. In India, blackgram is cultivated in the area of 4.47 million hectares with the production of 2.83 million tonnes and productivity of 632 kg ha⁻¹ (Agricultural Statistics at a Glance, 2019). The United Nations declared the year 2016 as “International Year of Pulses” to increase the public awareness regarding the nutritional benefits of pulses aimed to improve food security and nutrition as part of sustainable food production (Mohanty and Satyasai, 2015). The World Health Organization (WHO) recommends 80 g pulse per day per person and the Indian Council of Medical Research (ICMR) recommends 47g pulse per day per person. Blackgram consists 22.3% of protein, 48.0% of carbohydrates, 154 mg of calcium, 300 mg phosphorus, 9.1 mg of iron, 1.4 g of 3.37 g of riboflavin, 0.42 g of thiamin and 2 mg niacin per 100 g of black gram (Asaduzzaman *et al.*, 2010). Though pulses are rich in protein they are still being cultivated 95 per cent under rainfed condition and more than 78 per cent under energy starved condition. The main reasons for low productivity of blackgram is poor nutrient management practices and cultivation under moisture stress condition (Suhathiya and Ravichandran, 2018). Hence there is a need to increase the production potential of pulses. The growth phase of blackgram is often obstructed by the slow translocation of assimilates, poor pod setting due to flower abscission and lack of nutrient during critical stages of crop growth (Mahala *et al.*, 2001). These obstructs can be overcome by the foliar application of the nutrients required for the crop growth. Hence, in this study combined application of various foliar nutrients along with the recommended

dosage of fertilizers and EFYM @750 kg ha⁻¹ to various treatments was imposed to study the effect of the foliar nutrients on the growth, yield and economics of the blackgram.

MATERIALS AND METHODS

A field study entitled “Effect of foliar nutrients on the growth, yield and economics of blackgram” was conducted at Achalvadi village, Harur block of Dharmapuri district. The experimental field is geographically located in the latitude of 11°59’ N and longitude of 78° 29’E with an altitude of 392 meters above mean sea level. The experiment consisted of ten treatments, three replications and the experimental plots were laid out in randomized block design. The treatments include, T₁ – Control, T₂ – RDF (44:22:0 kgs of NPK ha⁻¹) + EFYM @ 750 kg ha⁻¹, T₃ – RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 2% urea twice at 30 and 45 DAS, T₄ - RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 2% DAP twice at 30 and 45 DAS, T₅ - RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 1% KCl twice at 30 and 45 DAS, T₆ - RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 3% Panchagavya twice at 30 and 45 DAS, T₇ - RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 2% urea at 30 DAS + Foliar application of Silixol plus @ 1 ml/litre @ 45 DAS, T₈ - RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 2% DAP at 30 DAS + Foliar application of Silixol plus @ 1 ml/litre @ 45 DAS, T₉ - RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 1% KCl at 30 DAS + Foliar application of Silixol plus @ 1 ml/litre @ 45 DAS, T₁₀ - RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 3% Panchagavya at 30 DAS + Foliar application of Silixol plus @ 1 ml/litre @ 45 DAS. The field experiment was conducted under the rainfed condition. The experimental field soil was sandy loam in texture which was low in available nitrogen (238 kg ha⁻¹), medium in available phosphorus (19.5 kg ha⁻¹) and high in available potassium (292 kg ha⁻¹). The blackgram variety ADT 5 was chosen for the study. The recommended dosage of fertilizers (25:12.5:0 kgs of NPK ha⁻¹) through urea (46% N) and DAP (18%N and 46%P₂O₅) were applied as basal. The foliar application of nutrients were sprayed on 30 and 45 DAS as per treatment schedule.

RESULTS AND DISCUSSION

Growth parameters

The foliar application of various nutrients had a remarkable effect on the growth of blackgram (Table 1). Application of RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 2% DAP at 30 DAS + Foliar application of Silixol plus @ 1 ml/litre @ 45 DAS (T₈) produced the maximum values of growth parameters viz. plant height of 35.64 and 40.78 cm at 45 DAS and harvest stages respectively, no of branches plant⁻¹ of 7.86, leaf area index of 5.78 and dry matter of 14.69 g plant⁻¹ over the rest of other treatments. It was followed by the application of RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 2% DAP twice at 30 and 45 DAS (T₄). The increase in growth of blackgram might be due to the foliar spray of 2% DAP, silixol plus @ 1ml/litre along with the application of RDF and EFYM @ 750 kg ha⁻¹. This combined application of various sources of nutrients favours the crop growth. The growth parameters were significantly influenced due to the foliar spray of 2% DAP + 1% KCl at flowering and pod filling stages of crop growth in pulses (Geetha and Velayutham, 2009). The foliar application of silicon increases the erectness of leaves (Yavarzadesh *et al.*, 2008) increasing the light interception and photosynthetic efficiency of the crop which eventually lead to the more dry matter accumulation (Jinger *et al.*, 2018). The foliar importance of the silicon was earlier reported by Jawahar *et al.* (2019) in rice. The foliar application of DAP supplies nitrogen and phosphorus which are essential for the vegetative growth and nitrogen fixation of the legumes. Rakhi Chhimpa and Sharma (2018) also reported that foliar application of silicon increases the growth of blackgram. Hence all these factors might have favoured the growth of crop and increase in dry matter production. The minimum values of growth parameters were observed under the control treatment (T₁). These findings are in line with Marimuthu and Surendran (2015), Rakhi Chhimpa and Sharma (2018), Suhathiya and Ravichandran (2018).

Yield attributes and yield

The foliar application of various nutrients significantly influenced the yield attributes and yield of blackgram (Table 2). Among the various treatments imposed in the study application of RDF

+ EFYM @ 750 kg ha⁻¹ + Foliar application of 2% DAP at 30 DAS + Foliar application of Silixol plus @ 1 ml/litre @ 45 DAS (T₈) produced the maximum values of yield attributes viz. number of pods plant⁻¹ (14.38) and number of seeds pod⁻¹ (7.27) and yield (1247 and 1975 kg ha⁻¹ of seed and haulm yield respectively). This treatment was followed by the application of RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 2% DAP twice at 30 and 45 DAS (T₄). The foliar application of 2% DAP supplies the major essential element phosphorus which is necessary for the seed formation. The foliar application of the silicon through the silixol plus increase the photosynthetic efficiency of the crop. The significant increase in yield attributes of black gram might be due to combined foliar spray of 2% DAP and silixol plus along with the basal application of RDF and EFYM @ 750 kg ha⁻¹ which play a major role in growth, development and metabolism of black gram. These combination might have favored better translocation of assimilates from the source to sink resulting in the improvement of yield attributes and yield (Marimuthu and Surendran, 2015). Similar findings regarding the foliar application of 2% DAP in pulse crops were reported earlier by Ramesh *et al.* (2016), Bhaskar Ritika *et al.* (2020) and Sruthi *et al.* (2020). Rakhi Chhimpia and Sharma (2018) reported that foliar application of 2% silicon produced the maximum yield attributes and yield in blackgram.

Economics

The field investigation on the effect of foliar nutrition on the economics of blackgram reveals that application of RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 2% DAP at 30 DAS + Foliar application of Silixol plus @ 1 ml/litre at 45 DAS (T₈) recorded the maximum values of gross income (Rs. 86043 ha⁻¹), net income (Rs. 57195 ha⁻¹) and B:C ratio (2.98) over the other treatments. This treatment was followed by the application of RDF + EFYM @ 750 kg ha⁻¹ + Foliar application of 2% DAP twice at 30 and 45 DAS (T₄). The lower values of economics were recorded under the control treatment (T₁).

CONCLUSION

Blackgram is the most important pulse crop cultivated in India. It is cultivated majorly under rainfed condition in energy starved situation. Hence there is a need to increase the production potential of blackgram under rainfed condition. From the present investigation application of RDF (25:12.5: 0 kg of NPK ha⁻¹) + EFYM @ 750 kg ha⁻¹ + Foliar application of 2% DAP twice at 30 DAS + Foliar application of Silixol plus @ 1 ml/litre @ 45 DAS can be recommended to produce the economically sound yield under rainfed condition.

Table 1. Effect of foliar nutrients on the growth of blackgram

Treatment	Plant height (cm)		No. of branches plant ⁻¹	LAI at Flowering stage	DMP at harvest stage (g plant ⁻¹)
	45 DAS	At harvest stage			
T ₁	25.68	28.24	6.18	3.30	9.28
T ₂	27.29	30.28	6.45	3.56	10.36
T ₃	28.47	31.58	6.59	3.81	10.79
T ₄	34.92	39.63	7.53	5.33	14.02
T ₅	30.72	32.58	6.95	4.28	11.82
T ₆	33.81	38.57	7.21	4.70	12.95
T ₇	29.56	33.46	6.79	4.05	11.23
T ₈	35.64	40.78	7.86	5.72	14.69
T ₉	31.62	36.38	7.02	4.50	12.32
T ₁₀	32.74	37.45	7.38	5.01	13.45
SEd	0.51	0.52	0.12	0.13	0.31
CD (<i>p</i> =0.05)	1.08	1.16	0.27	0.30	0.63

Table 2. Effect of foliar nutrients on the yield attributes and yield of blackgram

Treatment	No. of pods plant ⁻¹	No. of seeds pod ⁻¹	Test weight (g)	Seed yield (kg ha ⁻¹)	Haulm yield (kg ha ⁻¹)
T ₁	9.08	5.84	3.72	767	1462
T ₂	10.18	6.08	3.73	803	1587
T ₃	10.97	6.15	3.75	879	1632

T ₄	13.88	7.02	3.78	1201	1895
T ₅	11.30	6.14	3.76	925	1739
T ₆	12.80	6.79	3.77	1148	1830
T ₇	11.16	6.49	3.77	842	1630
T ₈	14.38	7.27	3.79	1247	1975
T ₉	12.10	6.54	3.79	960	1800
T ₁₀	13.58	6.76	3.76	1004	1845
SEd	0.22	0.11	0.02	21.03	23.89
CD(p=0.05)	0.46	0.24	NS	43.80	74.65

Table 3. Effect foliar nutrients on economics of blackgram

Treatments	Cost of cultivation	Gross income (Rs. ha ⁻¹)	Net income (Rs. ha ⁻¹)	B:C Ratio
T ₁	24437	52923	28486	2.16
T ₂	26908	55407	28499	2.05
T ₃	28478	60651	32173	2.12
T ₄	29224	82869	53645	2.83
T ₅	28588	63825	35237	2.23
T ₆	30808	79212	48404	2.57
T ₇	29039	58098	29059	2.00
T ₈	28848	86043	57195	2.98
T ₉	29094	66240	37146	2.27
T ₁₀	30204	69276	39072	2.29

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