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Influence of Nutrients on Growth, Morpho-Physiological Traits in Blackgram

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Abstract

A field experiment was conducted during *kharif* 2012 at Main Agricultural Research Station UAS Dharwad. To find out the effect of nutrients on growth, morpho-physiology, yield and yield components in blackgram (DU-1). Results revealed that plant height, number of branches, total dry matter (TDM) are significantly increased the application of $MnSO_4$ (0.3%) followed by $MgSO_4$ (0.5%). The growth parameters *viz.*, LAI, LAD, Significantly increased with the application of $MnSO_4$ (0.3%).

Keywords : blackgram, growth, TDM

Introduction

Pulse crops play vital role in the India. India is the major pulse growing country in the world, with a total area of 239.3 lakh ha and a production of 153.1 lakh tons with an average yield of 605 kg per ha. It is estimated that the pulse requirement by 2020 AD would be minimum of 30.3 million tonnes. The productivity of pulses in India is as low as 650 kg per ha as compared to 4769 kg per ha in France and world average of 900 kg per ha (Anon., 2000).

It ranks third among all pulses grown in India after chickpea and pigeon pea. India is the largest producer as well as consumer of black gram.

Among the grain legumes, blackgram [*Vigna mungo* (L.) Hepper), an ancient and well known leguminous crop of Asia, is popular because of its nutritional quality and suitability for multiple cropping system. It is a fast growing crop and fits best in rotation and mixed cropping system. Blackgram is highly priced pulse, rich in phosphoric acid. Besides, being cooked for consumption with rotis and rice, it is also used in making papads and badian. The plant characteristics associated with yield potential and also possibility of increasing yield potential through the use of nutrients.

Material and Methods

Blackgram is a versatile crop and has become more popular among the farmers of northern Karnataka. A field experiment was conducted at MARS UAS Dharwad during *kharif* 2012 with a view to find out the effect of nutrients on growth morpho-physiological and yield components and quality parameters in blackgram (DU-1). The experiment conducting twelve treatments' with foliar spraying of nutrients *viz.*, KNO_3 (0.5%), $MnSO_4$ (0.3%), $ZnSO_4$ (0.3%), $MgSO_4$ (0.5%), H_3BO_3 (0.2%), $CuSO_4$ (0.2%), $FeSO_4$ (0.3%), $MnSO_4$ (0.3%) + $CuSO_4$ (0.2%), $ZnSO_4$ (0.3%) + $FeSO_4$ (0.3%), H_3BO_3 (0.2%) + $CuSO_4$ (0.2%), KnO_3 (0.5%) + $FeSO_4$ (0.3%) and Control (unsprayed). The experiment was laid out in a complete randomized block design (RCBD) with three replications comparing in between the treatments and control. observations on plant height, number of branches, total dry matter (TDM). Growth parameters *viz.*, leaf area index (LAI) calculated by following formula (Sestak *et al.*, 1972) and leaf area duration (LAD) calculated by following formula a Power *et al.* (1967) and expressed in days.

Results and Discussion

The data on plant height, number of branches and total dry matter (TDM) indicated significant differences due to the application of nutrients and disease incidence (Table 1). Plant height has significantly increased with the application of 0.3% of $MnSO_4$ from 40 to at harvest stage were as it significantly lowest in control as compared to other treatments. Among the different treatments $MnSO_4$ (0.3%) recorded significantly more plant height at harvest. These results are similar to that of Bisht and Tripathi (1987) who also reported that manganese deficiency depressed the plant growth in safflower. And number of branches has significantly highest recorded in the treatment of $MnSO_4$ (0.3%) during at 80 DAS, Similar observations was made by Chandel *et al.* (1989), who opined that application of micronutrients increased the number of branches and leaves in soybean. Significantly the total dry matter was increased from at 40 to 80 DAS in the treatment of $MnSO_4$ (0.3%) is followed by $MgSO_4$ (0.5%) but significantly lowest TDM was recorded in control as compared to the other treatments. after that significantly declined during at harvest stage. Nutrients in general involve in the photosynthesis and protein synthesis directly or indirectly and enhance the synthesis of carbohydrates and proteins which in turn to enhance the growth and development. Nutrients sprayed plants had higher TDM as compared to control suggesting the protective role of these nutrients to overcome the incidence of powdery mildew and leaf spot disease. Similarly, Bhat (1997) also reported increase in TDM, dry weight of leaf, stem and pods in protected treatments as compared to unprotected treatments against late leaf spot in groundnut. Foliar spray of $FeSO_4$ and $ZnSO_4$ individually increased the dry matter production in groundnut (Christopher *et al.*, 1997). Prakasa rao (1998) also reported that with an increase in Fe content, there was a significant increase in total dry matter accumulation in greengram.

Leaf area index (LAI) showed significant differences among the nutrient treatments at all the stages (Table 2). The data revealed that LAI steadily increased from 40 to 60 DAS and declined at 80 DAS. Among the nutrients, $MgSO_4$ (0.50%) had significantly higher LAI followed by $MnSO_4$ (0.3%). Significantly, lower LAI values were noticed in

control over other treatments. However, at 60 and 80 DAS, significantly higher leaf area index was noticed in $MnSO_4$ (0.3%) over control at both the stages. The LAD increased as the growth stage advanced. The data (Table 2) revealed that significant differences for LAD among the nutrients at both 40-60 DAS and 60-80 DAS. Among the nutrient treatments at 40-60 DAS, $MnSO_4$ (0.3%) followed by $ZnSO_4$ (0.3%) + $FeSO_4$ (0.3%) recorded significantly higher LAD over others whereas, at 60-80 DAS the similar trend was observed *i.e.,* $MnSO_4$ (0.3%) recorded higher LAD had noticed is followed by $MnSO_4$ (0.3%) + $CuSO_4$ (0.2%) and lower LAD was recorded in control (unsprayed) at both the stages. Similarly, Bourgeoi *et al.* (1991) and Bhat (1997) reported that the extent of leaf area index (LAI) and leaf area duration (LAD) the reduction was more in unprotected treatment as compared to protected treatments in all genotypes of groundnut.

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Table 1. Effect of nutrients on morphological and total dry matter (TDM) in blackgram

Treatments	Plant height (cm^2)	Number of branches	Total dry matter (gm $plant^{-1}$)			
			40 DAS	60 DAS	80 DAS	at harvest
T_1 - Foliar application of KNO_3 (0.5%)	32.02	5.39	4.30	8.28	10.32	9.42
T_2 - Foliar application of $MnSO_4$ (0.3%)	37.45	6.36	5.96	10.32	13.32	11.85
T_3 - Foliar application of $ZnSO_4$ (0.3%)	34.48	5.11	4.33	7.32	10.81	9.83
T_4 - Foliar application of $MgSO_4$ (0.5%)	36.23	6.02	5.57	10.23	13.04	11.24
T_5 - Foliar application of H_3BO_3 (0.2%)	34.66	5.43	4.49	8.16	11.27	10.04
T_6 - Foliar application of $CuSO_4$ (0.2%)	34.50	5.19	4.33	8.12	10.93	9.89
T_7 - Foliar application of $FeSO_4$ (0.3%)	34.95	5.45	4.44	8.32	11.40	10.14
T_8 - Foliar application of $MnSO_4$ (0.3%) + $CuSO_4$ (0.2%)	35.87	5.96	5.34	9.92	12.33	11.11
T_9 - Foliar application of $ZnSO_4$ (0.3%) + $FeSO_4$ (0.3%)	35.71	5.93	4.53	8.44	11.47	10.72
T_{10} - Foliar application of H_3BO_3 (0.2%) + $CuSO_4$ (0.2%)	35.54	5.61	4.73	10.23	11.90	11.07
T_{11} - Foliar application of KnO_3 (0.5%) + $FeSO_4$ (0.3%)	35.48	5.76	4.66	10.05	11.49	11.03
T_{12} - Control	31.39	4.94	3.45	6.40	8.55	8.65
Mean	34.86	5.60	4.60	8.74	11.40	10.41
S. Em+_	0.51	0.19	0.16	0.25	0.50	0.54
CD at 5%s	1.49	0.55	0.46	0.73	1.46	1.60

Table 2. Effect of nutrients on growth parameters LAI and LAD in blackgram

Treatments	Leaf area index (cm^{-2})			Leaf area duration (days)	
	40 DAS	60 DAS	80 DAS	40-60 DAS	60-80 DAS
T_1 - Foliar application of KNO_3 (0.5%)	1.44	1.93	1.41	33.67	32.97
T_2 - Foliar application of $MnSO_4$ (0.3%)	1.64	2.47	1.77	39.17	41.03
T_3 - Foliar application of $ZnSO_4$ (0.3%)	1.47	1.81	1.33	32.97	31.50
T_4 - Foliar application of $MgSO_4$ (0.5%)	1.65	2.38	1.63	38.67	37.97
T_5 - Foliar application of H_3BO_3 (0.2%)	1.49	2.00	1.44	34.97	35.13
T_6 - Foliar application of $CuSO_4$ (0.2%)	1.48	1.98	1.39	34.53	33.70
T_7 - Foliar application of $FeSO_4$ (0.3%)	1.49	2.04	1.53	35.37	35.14
T_8 - Foliar application of $MnSO_4$ (0.3%) + $CuSO_4$ (0.2%)	1.55	2.36	1.57	39.40	40.43
T_9 - Foliar application of $ZnSO_4$ (0.3%) + $FeSO_4$ (0.3%)	1.61	2.46	1.59	40.77	38.23
T_{10} - Foliar application of H_3BO_3 (0.2%) + $CuSO_4$ (0.2%)	1.58	2.20	1.51	37.47	36.80
T_{11} - Foliar application of KnO_3 (0.5%) + $FeSO_4$ (0.3%)	1.53	2.35	1.55	39.90	38.33
T_{12} - Control	1.34	1.80	1.29	31.47	30.50
Mean	1.52	2.13	1.50	36.53	35.98
S. Em+_	0.04	0.11	0.04	1.19	0.90
CD at 5%	0.12	0.31s	0.11	3.49	2.64