



Effect of foliar application of DAP and micronutrients on crop growth attributes and yield of rice fallow blackgram (*Vigna mungo* L.)

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Abstract

A field experiment was conducted at Annamalai University experimental farm in clay loam soil during 2010. Black gram variety ADT3 was sown as test crop. To study the effect of foliar application of DAP and Micronutrients on crop growth attributes and yield of blackgram (*Vigna mungo* L.). T1- (control), T2 - DAP 2%, T3 - DAP 2% + 1% KCl, T4 - DAP 2% + 1% KCl + 0.50% ZnSO₄, T5 - DAP 2% + 1% KCl + 0.50% ZnSO₄ + 0.50% FeSO₄, T6 - DAP 2% + 1% KCl + 0.50% ZnSO₄ + 0.10% boric acid, T7 - DAP 2% + 1% KCl + 0.50% ZnSO₄ + 0.05% FeSO₄, T8 - DAP 2% + 1% KCl + 0.50% ZnSO₄ + 0.05% sodium molybdate, T9 - DAP 2% + 1% KCl + 0.50% ZnSO₄ + 0.05% sodium molybdate + 0.05% Cobalt chloride, T10- DAP 2% + 1% KCl + 0.50% ZnSO₄ + 0.10% boric acid + 0.05% sodium molybdate, T11 - DAP 2% + 1% KCl + 0.50% ZnSO₄ + 0.10% boric acid + 0.05% sodium molybdate + 0.05% cobalt chloride, T12 - DAP 2% + 0.50% ZnSO₄ + 0.50% FeSO₄ + 0.10% boric acid + 0.05% sodium molybdate. The results of the study indicated that Foliar application of DAP 2% + 0.50% ZnSO₄ + 0.50% FeSO₄ + 0.10% boric acid + 0.05% sodium molybdate + 0.05% cobalt chloride recorded the highest plant height, dry matter production, number of pods per plant, seeds per pod, test weight, grain yield and haulm yield over the control. This treatment recorded the highest grain yield 870 kg ha⁻¹ and haulm yield of 2090 kg ha⁻¹.

Keywords: DAP, Micronutrients, Black gram, growth attributes, Yield

Introduction

Black gram (*Vigna mungo* L.) is a widely grown grain legume and belongs to the family fabaceae and assumes considerable importance from the point at food and nutritional security. It is a short duration crop suitable for multiple cropping systems and intercropping. The United Nations declared 2016 as International year of pulses (IYP) to heighten public awareness of the nutritional benefits of pulses as a part of sustainable food production aimed at food security and nutrition (Mohanty *et al.*, 2015). India accounts for 33 % of world production of pulses. Due to stagnant production, the net availability of pulses has come down from 60 gm in 1951 to 41.7 g/day/capita

in 2016, as against Indian council of medical research (ICMR) which recommends 65 g/day /capita. The total area under pulses in India is around 25.23 million hectares with a production of 19.27 million tonnes and productivity of 764 kg ha⁻¹ (Instat, 2014). In Tamil Nadu, blackgram is cultivated in 3.65 lakh hectares with the production of 3.10 lakh tonnes and an average productivity of 851 kg ha⁻¹ (Tnstat, 2014). This low yield is attributed to several reasons viz., low yielding varieties, cultivating in marginal lands mostly as rain fed crops and poor management practices. In Tamil Nadu rice fallow pulses contributes 40-50 % of total pulses production in which blackgram occupies a

major share. The productivity of rice fallow blackgram is always far below than its normal cultivation (Sasikala *et al.*, 2014). The main reasons for low productivity are poor plant population, poor nutrient and moisture stress under critical stages. Generally, rice fallow blackgram sowing will be carried out a week before harvest of rice crop and fertilizer incorporation becomes impossible. Under these circumstances, foliar application of nutrients would be more appropriate, efficient and economical than soil application. (Balusamy and Meyyazhagan, 2000). Hence, proper nutrient management is an important factor to be considered for sustaining pulse productivity. Among them foliar application of major nutrients like DAP, KCl and micronutrients are the potent force in improving the growth, flower initiation, pod setting and yield of pulses.

Materials and Methods

Field experiment was carried out to study the effect of foliar application of DAP and micronutrients on crop growth attribute and yield of rice fallow blackgram during (January –April 2010) at Annamalai University, Annamalai nagar. The soil was clay loam in texture with $\text{KMnO}_4\text{-N}$ (188 kg ha⁻¹), Olsen-P (17.7 kg ha⁻¹) and $\text{NH}_4\text{OAC-K}$ (376 kg ha⁻¹). The experiment consist of 13 treatments layout in RBD with three replications. The treatments are T1-(control), T2 - DAP 2%, T3 - DAP 2% + 1% KCl, T4 - DAP 2% + 1% KCl + 0.50% ZnSO_4 , T5 - DAP 2% + 1% KCl + 0.50% ZnSO_4 + 0.50% FeSO_4 , T6 - DAP 2% + 1% KCl + 0.50% ZnSO_4 + 0.10% boric acid, T7 - DAP 2% + 1% KCl + 0.50% ZnSO_4 + 0.05% FeSO_4 , T8 - DAP 2% + 1% KCl + 0.50% ZnSO_4 + 0.05% sodium molybdate, T9 - DAP 2% + 1% KCl + 0.50% ZnSO_4 + 0.05% sodium molybdate + 0.05% Cobalt chloride, T10 - DAP 2% + 1% KCl + 0.50% ZnSO_4 + 0.10% boric acid + 0.05% sodium molybdate, T11 - DAP 2% + 1% KCl + 0.50% ZnSO_4 + 0.10% boric acid + 0.05% sodium molybdate + 0.05% cobalt chloride, T12 - DAP 2% + 0.50% ZnSO_4 + 0.50% FeSO_4 + 0.10% boric acid + 0.05% sodium molybdate, T13 - DAP 2% + 0.50% ZnSO_4 + 0.50% FeSO_4 + 0.10% boric acid + 0.05% sodium molybdate + 0.05% cobalt chloride were sprayed on 30 and 45 DAS. The blackgram variety ADT3 was chosen for the study. Sowing was done at one day after harvest of rice crop. The growth attributing characters viz., plant height @ harvest and DMP at 45 DAS, yield attributing characters viz., number of pods plant-1, and number of seeds pod-1, 100 grain weight and also the grain and haulm yield

of rice fallow blackgram were recorded and the results are given below:

Results and Discussion

Growth parameters:

The results of the study indicated that the foliar application of DAP and micronutrients favourably increased the growth characters of blackgram over control (Table 1.) Among the treatments, application of DAP 2% + 0.05% ZnSO_4 + 0.50% FeSO_4 + 0.10% Boric acid + 0.05% sodium molybdate + 0.05% cobalt chloride (T 13) was significantly superior in increasing the plant height (59.34 cm) and DMP (1458.63 kg ha⁻¹) of blackgram at 45 DAS. This was followed by the T12 - DAP 2% + 0.50% ZnSO_4 + 0.50% FeSO_4 + 0.10% boric acid + 0.05% sodium molybdate which recorded the plant height of 57.86 cm and DMP of 1410.21 kg ha⁻¹. The treatments from T2 to T11 were also found efficient in increasing the plant height and DMP of blackgram as compared to untreated treatment control. Increase in growth characters might be due to supply of nutrients which helped in vigorous growth of the plant. (Sasikala and Ramachandra Bhupathi, 2005). Kalyani *et al.*, (1993) reported that molybdenum, iron, boron increased the hormone synthesis and translocation, carbohydrate metabolism and DNA synthesis and then improved the additional growth and yield in pigeon pea.

Yield character:

In the present study the foliar application of macro and micronutrients applied alone or in combination in significantly increased the yield characters was well evidenced (Table.1). Of the various fertilizers treatments, T13 - DAP 2% + 0.50% ZnSO_4 + 0.50% FeSO_4 + 0.10% boric acid + 0.05% sodium molybdate + 0.05% cobalt chloride was most efficacious in improving the yield characters viz., number of pods plant-1 (14.83), number of seeds pod-1 (6.9), 100 grain weight of (4.52 g). This treatment was followed by T12 - DAP 2% + 0.50% ZnSO_4 + 0.50% FeSO_4 + 0.10% boric acid + 0.05% sodium molybdate which recorded 14.51 pods plant-1, 6.83 seeds pod-1 and 4.46 g of 100 grain weight respectively. The increased yield characters with macronutrients along with micronutrients might be due to increased photosynthetic ability which in turn favoured and increased accumulation of dry matter and also efficient partitioning of photosynthates towards sink (Mondal *et al.*, 2011). Foliar spray met constant requirement of

nitrogen and phosphorus at reproductive stage of the crop and variation in the yield components like number of pods / plant, number of seeds /pod pod length and test weight, which had direct influence on the grain yield. Other factors which directly influenced the grain yield and growth attributes like plant height,

leaf area index and total dry matter production. subramani *et al.* (2002), Chandrasekhar and Bangarusamy (2003), Dixit and Elamathi (2007), Mondal *et al.* (2011) and Ganapathy *et al.* (2008) also endorsed the result obtained in the present study.

Table 1. Effect of foliar application of DAP and Micronutrients on crop growth attributes and yield of blackgram (*Vigna mungo* L.)

Treatment	Plant Height At Harvest (cm)	Dry matter Production on 45 DAS (kg ha ⁻¹)	Number of Pods plant ⁻¹	Number of Seeds Pod ⁻¹	100 Grain Weight (g)
T1- Control (Water spray)	27.95	724	10.22	5.64	3.96
T2-DAP 2%	42.32	868.41	10.69	5.91	4.05
T3-DAP 2% + 1% KCl	44.49	925	11.02	6.02	4.10
T4-DAP 2% + 1% KCl + 0.50 % ZnSO ₄	45.96	981.17	11.35	6.13	4.16
T5-DAP 2% + 1 % KCl + 0.50 % ZnSO ₄ + 0.05% FeSO ₄	47.42	1031	11.68	6.22	4.21
T6-DAP 2% + 1 % KCl + 0.50 % ZnSO ₄ + 0.10% B	48.92	1083	12.04	6.31	4.26
T7- DAP 2% + 1 % KCl + 0.50 % ZnSO ₄ + 0.50% FeSO ₄ + 0.10% B	53.43	1135.31	12.36	6.41	4.31
T8- DAP 2% + 1 % KCl + 0.50 % ZnSO ₄ + NaMoO ₄ 0.05%	50.41	1239.07	13.25	6.49	4.32
T9-DAP 2 % + 1 % KCl + 0.50 % ZnSO ₄ + NaMoO ₄ 0.05 % + CoCl ₂ 0.05%	51.89	1239.07	13.89	6.66	4.38
T10-DAP 2 % + 1% KCl + 0.50 % ZnSO ₄ + 0.10% B + NaMoO ₄ 0.05 %	56.40	1187	13.57	6.57	4.37
T11-DAP 2 % + 1% KCl + 0.50 % ZnSO ₄ + 0.10% + NaMoO ₄ 0.05% + CoCl ₂ 0.05 %	54.91	1344	14.20	6.74	4.40
T12- DAP 2 % + 0.50 % ZnSO ₄ + 0.50% FeSO ₄ +0.10 % B + NaMoO ₄ 0.05%	57.86	1410.21	14.51	6.83	4.46
T13- DAP 2 % + 0.50 % ZnSO ₄ + 0.50 % FeSO ₄ +0.10 % B + NaMoO ₄ 0.05 % + CoCl ₂ 0.05 %	59.34	1459.63	14.83	6.90	4.52
SED	0.69	22.51	0.13	0.03	0.019
CD (P=0.05)	1.42	46.38	0.27	0.06	0.04

Yield:

The profound influence of fertilizers namely DAP and micronutrients fertilizers applied as foliar spray alone or in combinations significantly increasing the yield of blackgram was clearly brought out in the present study (Table.1). The highest blackgram grain yield of 869.58 kg ha⁻¹ and Haulm yield of 2089.56 kg ha⁻¹ was recorded by the treatment T13, which represented 50.30 % and 101.99 % increase over control. This was followed by T12 DAP 2 % + 0.50 % ZnSO₄ + 0.50 %

FeSO₄ + 0.10 % B + 0.05 % sodium molybdate which recorded 837.31 kg ha⁻¹ of grain yield and 2016.84 kg ha⁻¹ of haulm. Control recorded the lowest grain yield (578.56 kg ha⁻¹), haulm yield (1034.48 kg ha⁻¹). Increased yield due to DAP and micronutrients application could be due to supply of plant nutrients which helped in increased nitrogen fixation and its availability to the plants along with other nutrients. (Sasikala and Ramachandra bhupathi, 2005) & Nath *et al.*, (2004)

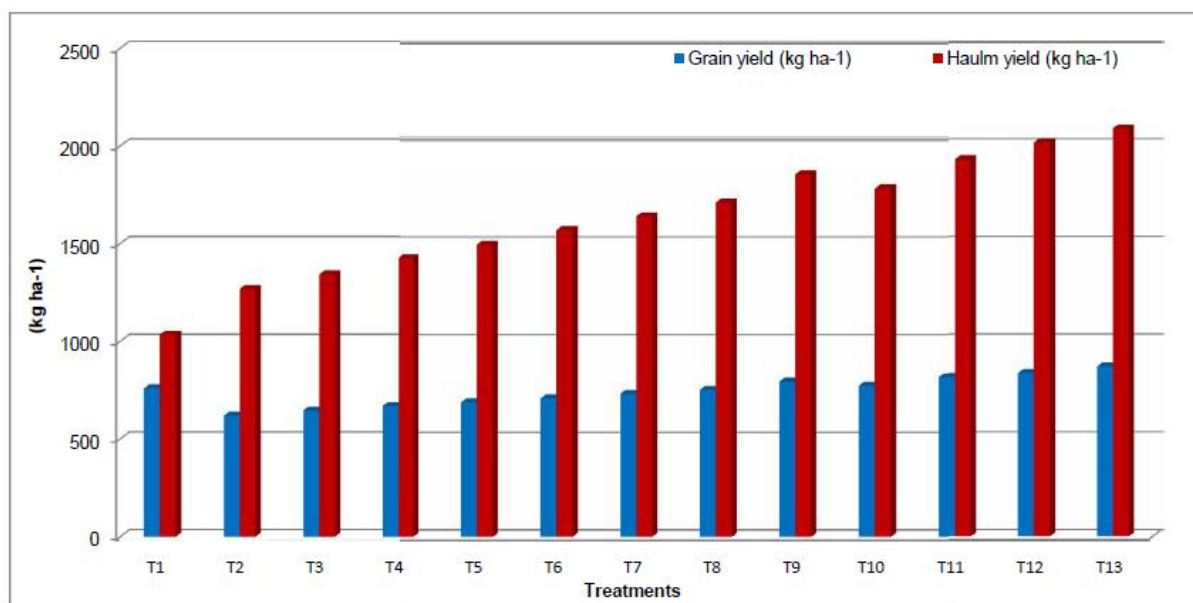


Fig. 1. Effect of foliar application of DAP and Micronutrients on grain yield and haulm yield of blackgram (*Vigna mungo* L.)

Conclusion

The present study clearly indicated the beneficial role of DAP with micronutrients applied as foliar spray was most efficient for increasing the growth and yield of blackgram.

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