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RESEARCH ARTICLE

EFFECT OF FOLIAR APPLICATION OF MACRONUTRIENTS AND GROWTH REGULATORS ON GROWTH AND YIELD OF ON RICEFALLOW BLACK GRAM (VIGNA MUNGO L.)

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ABSTRACT

A field experiment was conducted at Experimental farm, Department of Agronomy, Annamalai University, Annamalai Nagar, to study the effect of foliar application of macronutrients and growth regulators on growth and yield of on rice fallow black gramduring January to April 2011.The experiment was laid out in randomized black design with three replications. The treatment comprised of T_1- Control (Water Spray) T_2- 2% DAP foliar spray at pre flowering and pod filling stage,T_3 - 2% Urea foliar spray at pre flowering and pod filling stage, T_4 -Panchakavya foliar spray at pre flowering and pod filling stage,T_5 - 2% DAP + NAA 40 ppm at pre flowering and pod filling stage,T_6 - 2% Urea + NAA 40 ppm at pre flowering and pod filling stage,T_7-Panchakavya+ NAA 40ppm at pre flowering and pod filling stage. Among treatments, foliar application of 2% DAP + NAA 40 ppm twice at pre flowering and pod filling stage, favourably increased the growth, yield attributes and yield of black gram as compared to the other treatments. Based on the above results, it could be concluded that cultivation of rice fallow blackgram with foliar application of 2% DAP + NAA 40 ppm twice at pre flowering and pod filling stage was promising combination registered higher growth attributes, yield attributes, grain and haulm yields

INTRODUCTION

Pulses constitute an important ingredient in vegetarian Indian diet, which are the main source of vegetable protein. On an average pulses contain 20 to 25 per cent protein, which is almost 2.5 to 3.0 times of the value normally found in cereals. Dietary protein provides amino acids for the synthesis of body protein and other biologically important compounds in the body. Pulses are cheaper than meat, they are often referred to as 'poor mans food' in developing countries like India. The pulse crop residues are nutritious feed for livestock. They are also important for sustainable agriculture as they improve physical, chemical and biological properties of soil and function as mini nitrogen factory. The per capita availability of pulses in India is decreasing from 60.7 g in 1951 to 35.9 g in 2009 as against 60 g recommended by the Indian Council of Medical Research (ICMR). In recent years, there has been understandable concern about gradual decline in per capita availability of pulses. An important reason for this miserable situation in the country seems to replace pulse crop with high yielding cereals. A possible break through in the production of pulses in India could be achieved by the ways of increasing area under pulses and raising the productivity of pulses per unit area of land (Jagadish Kumar, 2000). Pulses occupy 68.32 million hectares area and contribute 57.51 million tonnes to world's food basket. India shares 35.2 per cent area and 27.65 per cent of the global production. In India pulses are grown over an area of 22 to 24 million hectares with a production of 13 to 15 million tonnes. In India black gram is cultivated over an area of 28.8 lakh hectares with a production of 9.2 lakh tonnes. In Tamil nadu the crop is cultivated over an area of 2.1 lakh hectares with a production of only 0.7 lakh tonnes and the productivity is 0.52 tonnes per ha. However, yield is still lower when compared to the national productivity. The reasons for low yield of black gram are the slow rate of dry matter accumulation during the pre-flowering phase, poor pod setting, onset of leaf senescence during the period of pod development and low partitioning efficiency of assimilates to grain. Moreover, black gram being cultivated under rainfed/summer season with low soil moisture, even application of fertilizer at right time and right quantity may not be efficient due to less soil moisture. When availability of moisture becomes scarce, application of fertilizers through foliar spray resulted in efficient absorption.Foliar nutrition is recognized as an important method of fertilization since it usually penetrates the leaf cuticle or stomata and reaches the cells, allowing for simple and quick nutrient uptake. Its benefits include quick and effective nutrient usage, prevention of leaching losses, fixing, and increasing the yield and plant nutrient uptake of irrigated greengram (Manonmani and Srimathi, 2009). Keeping this in view, field investigation was carried out to study the effect of foliar application of macronutrients and growth regulators on growth and yield of rice fallow black gram.

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MATERIAL AND METHODS

A field experiment was conducted at the Experimental farm, Department of Agronomy, Annamalai University, Annamalai Nagar, Tamil Nadu to study the effect of foliar application of macronutrients and growth regulators on growth and yield of rice fallow black gram during January to April 2011. The soil of the experimental field was having a pH of 8.0 and EC of 0.47 dSm^{-1}. Taxonomically the soil is classified as Udic chromustert, low in available nitrogen (218.5 kg ha^{-1}), medium in available phosphorus (21.20 kg ha^{-1}) and high in available potassium (345.4 kg ha^{-1}). The experiment was laid out in randomized black design with three replications. The experiment comprised of seven treatments including T_1 - Control (Water Spray) T_2 - 2% DAP foliar spray at pre flowering and pod filling stage, T_3 - 2% Urea foliar spray at pre flowering and pod filling stage, T_4 - Panchakavya foliar spray at pre flowering and pod filling stage, T_5 - 2% DAP + NAA 40 ppm at pre flowering and pod filling stage, T_6 - 2% Urea + NAA 40 ppm at pre flowering and pod filling stage. T_7 - Panchakavya + NAA 40 ppm at pre flowering and pod filling stage. Black gram variety ADT-3 was chosen for this study. The experimental field was prepared after harvesting the main crop paddy and the stubbles were removed by using sickles. The field was marked into experimental plots as per the lay out. Standard cultivation practices were adopted. Black gram growth and yield attributing characters such as plant height, LAI, DMP, number of pods $plant^{-1}$, number of seeds $pods^{-1}$ and test weight were recorded from 5 randomly selected plants. Grain and haulm yields were also recorded from each plot. The data on various studies recorded during the investigation were subjected to statistical scrutiny suggested by Panse and Sukhatme(1985).

RESULTS

Growth attributes

Among the treatments, foliar application of 2% DAP + NAA 40 ppm twice at pre flowering and pod filling stage recorded significantly higher plant height of 65.0cm, LAI of 2.30 and dry matter production of 2685 kg ha^{-1}. These could be attributed to the foliar application of nutrients and growth regulators increasing the photosynthetic activity of plants helps to develop a more extensive root system and enabling the plants to extract more water and nutrients from deeper depths resulting in better development of plant growth components. Besides, foliar application twice met out N and P at the critical time of flowering and pod filling stage. Further, nutrients applied to foliage would be easily available and translocated in the plants without any loss resulting in higher growth growth attributes.

The results are in conformation with the findings of Ganapathy*et al.*(2008).The least plant height of 45cm, LAI of 2.0 and dry matter production of 1620 kg ha^{-1}were recorded in the water spray treatment (T_1).

Yield attributes and yield

The yield potential of blackgram is determined by its yield attributes, which correspond to the values of growth parameters. Among the treatments, foliar application of 2 % DAP + NAA 40 ppm twice (at pre flowering and pod filling stage) significantly recorded highest number of pods of 33.0 per plant, number of seeds of 6.8per pod and seed weight of 3.6 gm. This might be due twice application of DAP and NAA, which helped in acceleration of various metabolic process *viz.,* photosynthesis, energy transfer reaction and symbiotic biological N- fixation process resulting in higher yield attributes. Furthermore, application of nutrients and growth regulator improved the nutritional conditions offered to the crops, leading to accelerated growth rates, enhanced proliferation, and increased nutrient absorption. Consequently, there is improved transportation of nutrients to the plant's storage organs, resulting in a greater quantity of pods per plant and more seeds per pod. Similar results were obtained by Dixit and Elamathi (2008); Jeyakumar *et al.* (2008).

The least values of number of pods of 25.0 per plant, number of seeds of 5.0 per pod and seed weight of 3.3 gm were observed in the treatment T_1 (control). Regarding grain and haulm yield, foliar application of 2 % DAP + NAA 40 ppm twice at per flowering and pod filling stage significantly recorded the higher grain yield of 1000 kg per hectare and haulm yield of 1800 kg per hectare. Phosphorus, a major element in legume nutrition favours healthy growth by helping in translocation of carbohydrates and promoting seed setting and yield.. Phosphorus nutrition is also necessary for the reduction of nitrates and protein formation. The results clearly showed that foliar application of 2% DAP + NAA 40 ppm twice at pre flowering and pod filling stage favourably influenced the yield attributes *viz*., number of seeds per pod, number of pods per plant and hundred seed weight. These might be due to favourable effect of foliar application of nutrients and growth regulators on growth parameters, particularly LAI, resulting in increased photosynthesis and consequent translocation of photosynthates to the sink resulting in maximum yield attributes which directly reflected on increased the grain yield. The present results are in accordance with the findings of Manivannan *et al.* (2000); Sirinivasaperumal. and Sundari (2004). The lowest grain yield of 700 kg per hectare and haulm yield of 1000 kg per hectare were recorded in the control treatment (T_1).

Table 1. Effect of foliar nutrition on growth, yield attributes, grain and haulm yields of rice fallow black gram

Treatments	Plant height (cm)	Leaf area index	DMP (kg ha^{-1})	Number of pods $plant^{-1}$	Number of seeds pod^{-1}	Seed weight (g)	Grain yield (Kg ha^{-1})	Haulm yield (Kg ha^{-1})
T_1	45.0	2.00	1620	25.0	5.00	3.30	700	1000
T_2	51.0	2.10	2103	29.0	5.90	3.45	840	1450
T_3	47.0	2.03	1843	28.0	5.20	3.33	750	1200
T_4	49.0	2.09	2098	28.0	5.80	3.40	800	1400
T_5	65.0	2.30	2685	33.0	6.80	3.60	1000	1800
T_6	52.0	2.15	2311	29.0	6.00	3.48	900	1500
T_7	56.0	2.20	2374	30.0	6.10	3.50	933	1550
SEd	01.6	0.03	086	0.09	0.24	0.32	23	085
CD (P=0.05)	03.0	0.07	179	02.0	0.53	0.77	55	191

T_1 - Control (Water Spray) T_2 - 2% DAP foliar spray (at pre flowering and pod filling stage). T_3 - 2% Urea foliar spray at pre flowering and pod filling stage. T_4 - Panchakavya foliar spray at pre flowering and pod filling stage, T_5 - 2% DAP + NAA 40 ppm at pre flowering and pod filling stage, T_6 - 2% Urea + NAA 40 ppm at pre flowering and pod filling stage, T_7 - Panchakavya + NAA 40 ppm at pre flowering and pod filling stage.

CONCLUSION

From the results of the field experiment, it could be concluded that foliar application of 2% DAP foliar spray + NAA 40 ppm twice at pre flowering and pod filling stage was registered higher growth attributes, yield attributes, grain and haulm yields of rice fallow black gram.

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