International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2019): 7.583

Effect of Foliar Application of Chelated Nutrient on the Growth and Yield Characters of Irrigated Greengram

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Abstract: ***Pulses are important food crop in India. The legumes are more useful because, it is the main source of amino acid as well as protein. They are important for sustainable agriculture as they improve physical, chemical and biological properties of soil and function as mini nitrogen factory. The current study was aimed to evaluate the growth and yield characters of greengram (vigna radiata). Field experiment was conducted at the Experimental Farm, Department of Agronomy, Faculty of Agriculture, Annamalai University, Annamalai Nagar to study the effect of foliar application of chelated nutrient on the growth and yield characters of irrigated greengram during June to August 2016. Fourteen treatments combinations were studied in RBD with three replication. The growth and yield characters of greengram viz., plant height, leaf area index, dry matter production, nodulation count, yield attributes and yield were favourably influenced by foliar application of 0.2% chelated nutrient + 2% DAP at flowering and pod formation stages (T_{11}). The control (T_1) recorded the lowest values of growth and yield components. Based on the results of field experiment, it may be concluded that the foliar application of 0.2% chelated nutrient +2% DAP at flowering and pod formation stages is efficient nutrient management practice for maximizing the growth and yield of irrigated greengram.***

Keywords: chelated nutrient, DAP, greengram, growth and yield

1. Introduction

Pulses are drought resistant and prevent soil erosion due to their deep root system and good ground coverage, because of these good characters; pulses are called as "Marvel of nature". Many exporting countries are dependent on India for marketing their pulses. Even though India is the world's largest producer, importer and consumer of pulses, still there is a gap of 2.4 million tonnes between the production and consumption of pulses in the country which is met through imports. The current level of production is well below the requirement, and future projected demand for 2017 and 2022 also mounting high to 14.3 and 16.1 million tonnes, respectively to meet the specified per capita requirement (Praduman *et al*., 2009). In Tamil Nadu, the area under greengram is around 6.6 lakh hectares with a production of 3.69 lakh tonnes and average productivity of 588.47 kg ha^{-1}(GOTN, 2012). The low yield is attributed to several reasons *viz*., cultivated as rainfed crop, as intercrops in marginal lands, poor management practices and low yield potential of varieties. In addition to that the lack of nutrients during the critical stages of crop growth leads to nutrient stress, and then poor productivity of the crop even in irrigated crop. Proper nutrient management is an important factor to be considered for sustaining pulse productivity (Malik *et al*., 2006).

Foliar application of nutrients using water soluble fertilizer is one of the possible ways to enhance the productivity of greengram. Foliar application of DAP, urea and brassinolide on the foliage of summer greengram crop is a good management practice to obtain a higher crop yield. Spraying of nutrients is effective, more efficient, and requires less amount of fertilizer in comparison with surface application and thus it is certainly beneficial from practical point of view (Sengupta and Tamang, 2015). Keeping these points in view, the present investigation was carried out to develop specific nutrient management practices such as foliar application of chelated nutrients or DAP or combination of both for augmenting the productivity of greengram.

2. Materials and Method

The field experiment was conducted to study the effect of foliar application of chelated nutrient on the growth and yield characters of irrigated greengram at Annamalai University Experimental Farm, Annamalai Nagar, during June to August 2016. Fourteen treatments combinations were studied in RBD with three replication. The greengram variety chosen for the experimental was VBN 3. Seeds were dibbled adapting a spacing of 30×10 cm (30 cm between the rows and 10 cm) between plants in a row. Two seeds were dibbled at a depth of 1 to 2 cm.

Life irrigation was given on third day after sowing (DAS) and subsequent irrigations were given at 10 days interval depending on the weather conditions. Besides, hand weeding was done at 30 DAS. Dried pods were collected in one to two pickings from the plants after that the entire plants were cut with using a sickle and bundled separately from each plot. The grains were cleaned; dried and dry weight was recorded plot-wise.

3. Result and Discussion

The plant height, leaf area index, dry matter production, and number of effective nodules (FS) was significantly influenced by foliar application of 0.2% chelated nutrient +2% DAP at flowering and pod formation stages (T_{11}). This treatment recorded the highest plant height (53.46 cm), leaf area index (FS) (3.25), dry matter production (3127 kg ha^{-1}) and number of effective nodules (FS) (17.71). This was

followed by foliar application of 0.2% chelated nutrient spray at flowering and pod formation stages (T_5). The least plant height of (41.31cm), dry matter production (2030 kg ha^{-1}), least leaf area index of 1.02 and number of effective nodules of 14.23 $plant^{-1}$ respectively were recorded under control (T_1).Were significantly responsed by different treatments (Table1).

Foliar application of chelated nutrient and DAP enhanced the availability of macro and micro nutrients throughout the crop growth period which might have helped in increasing translocation into the plants without any loss that contributed for better photosynthetic activity and ultimately reflected on significant increase in plant height and number of pods $plant^{-1}$. Effective nutrient management in greengram ecosystem by rational application of chelated micro nutrient and macro nutrients might have caused internal root growth, which occurred primarily from the lower hypocotyls and resulted in increased total length of lateral root and ultimately enhanced the rhizobial activity in legumes. Similar finding was reported by Pradeep Mohan Dixit and Elamathi (2007), Suriyalakshmi (2013) and (Muthal *et al*., 2016).

The yield attributes and yield of greengram were significantly influenced by foliar application of 0.2% chelated nutrient +2% DAP at flowering and pod formation stages (T_{11}). This treatment record the highest plants pod^{-1} (17.00), number of grains pod^{-1} (7.00), haulm yield (2554 kg ha^{-1}) and grain yield (1050 kg ha^{-1}) during the experiment at harvest stage respectively. This was followed by foliar application of 0.2% chelated nutrient spray at flowering and pod formation stages (T_5). The treatments T_9 ,T_{10} ,T_3,T_4, T_{14},T_{12},T_{13}, T_8,T_6, and T_7 were on par with each other and ranked next (Table 2). This could be attributed to ideal physiological condition throughout the crop growth as a result of cumulative and synergistic effect on highest growth and yield attributes might have ultimately led to higher grain yield in greengram. Further, supplementing nutrients through foliage with DAP and chelated nutrients at various growth stages of crop enhanced the grain yield by ensuring prompt delivery of mineral nutrients to the site of photosynthesis and translocated assimilates more efficiently to the developing pods and further aided for proper grain filling up resulting in higher grain yield. Mannivanan *et al*. (2002) stated that micronutrients play an important role in increasing grain yield of the crop through their effect on the plant itself and on the nitrogen fixing symbiotic process, enhance the chlorophyll content, increase the photosynthetic rate, translocation of photosynthates and catalyst for various enzymatic system. Similar reports of increase in pulse yield due to foliar spray of micronutrients were also reported by Shashikumar *et al*. (2013), Godase *et al*. (2014) Sengupta and Tamang (2015), Joab Wamar *et al*. (2016).

The least number of pods $plant^{-1}$ (13.60), number of grains pod^{-1} (4.38), haulm yield (2090 kg ha^{-1}) and grain yield (431 kg ha^{-1}) during the experiment at harvest stage was recorded by the control treatment (T_1).

4. Conclusion

Based on the experimental results, it can be concluded that foliar application of 0.2% chelated nutrient+2% DAP at flowering stage and pod formation stage treatment (T_{11}) is found to be the viable and most efficiently suitable nutrient management technology for irrigated greengram.

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Table 1: Effect of foliar nutrients on growth characters of greengram

Treatments	Plant growth characters			
	Plant height at harvest	Leaf area index at (FS)	Dry matter production (kg ha^{-1}) at harvest	Number of effective nodules $plant^{-1}$ at (FS)
T_1 : Water spray only (control)	41.31	1.02	2030	14.23
T_2 : 2% DAP spray twice (Flowering and Pod formation stages)	42.49	1.41	2156	14.63
T_3 : 0.2% chelated nutrient spray (Flowering stage)	48.87	2.47	2657	16.58
T_4 : 0.2% chelated nutrient spray (Pod formation stage)	47.77	2.36	2641	16.44
T_5 : 0.2% chelated nutrient spray twice (Flowering and Pod formation stages)	52.29	3.04	3001	17.35
T_6 : 0.4% chelated nutrient spray (Flowering stage)	44.67	1.80	2312	15.16
T_7 : 0.4% chelated nutrient spray (Pod formation stage)	43.71	1.76	2284	15.06
T_8 : 0.4% chelated nutrient spray twice (Flowering and Pod formation stages)	44.69	1.88	2353	15.35
T_9 : 0.2% chelated nutrient +2% DAP spray (Flowering stage)	51.09	2.81	2877	16.96
T_{10} : 0.2% chelated nutrient +2%DAP spray (Pod formation stage)	50.06	2.78	2782	16.93
T_{11} : 0.2% chelated nutrient +2% DAP spray (Flowering and Pod formation stages)	53.46	3.25	3127	17.71
T_{12} : 0.4% chelated nutrient +2%DAP spray (Flowering stage)	46.48	2.12	2485	15.78
T_{13} : 0.4% chelated nutrient +2%DAP spray (Pod formation stage)	45.93	2.06	2478	15.72
T_{14} : 0.4% chelated nutrient +2%DAP spray (Flowering and Pod formation stages)	46.61	2.13	2515	16.03
$S.E_D$	0.45	0.07	49.10	0.13
CD (p=0.05)	1.14	0.17	123.25	0.34

FS – Flowering stage

Table 2: Effect of foliar nutrients on yield attributes and yield of greengram

Treatments	Number of pods $plant^{-1}$	Number of grains pod^{-1}	Grain yield (kg ha^{-1})	Haulm yield (kg ha^{-1})
T_1 : Water spray only (control)	13.60	4.38	431	2090
T_2 : 2% DAP spray twice (Flowering and Pod formation stages)	14.02	4.69	504	2141
T_3 : 0.2% chelated nutrient spray (Flowering stage)	15.88	6.13	844	2377
T_4 : 0.2% chelated nutrient spray (Pod formation stage)	15.73	6.02	817	2370
T_5 : 0.2% chelated nutrient spray twice (Flowering and Pod formation stages)	16.66	6.72	989	2501
T_6 : 0.4% chelated nutrient spray (Flowering stage)	14.52	5.07	583	2194
T_7 : 0.4% chelated nutrient spray (Pod formation stage)	14.41	5.01	579	2192
T_8 : 0.4% chelated nutrient spray twice (Flowering and Pod formation stages)	14.72	5.24	635	2227
T_9 : 0.2% chelated nutrient +2% DAP spray (Flowering stage)	16.30	6.43	918	2447
T_{10} : 0.2% chelated nutrient +2%DAP spray (Pod formation stage)	17.23	6.40	907	2431
T_{11} : 0.2% chelated nutrient +2% DAP spray (Flowering and Pod formation stages)	17.00	7.00	1050	2554
T_{12} : 0.4% chelated nutrient +2%DAP spray (Flowering stage)	15.12	5.56	710	2293
T_{13} : 0.4% chelated nutrient +2%DAP spray (Pod formation stage)	15.09	5.54	701	2283
T_{14} : 0.4% chelated nutrient +2%DAP spray (Flowering and Pod formation stages)	15.35	5.76	757	2317
$S.E_D$	0.12	0.10	23.05	16.88
CD (p=0.05)	0.32	0.27	57.86	42.38