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Effect of foliar nutrition on growth and yield of irrigated greengram (*Vigna radiata* L.)

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Abstract

A field experiment was conducted at Poompuhar Village, Sirkazhi Taluk of Mayiladuthurai District during February to April 2020 to study the effect of foliar nutrition on growth and yield of irrigated greengram. The experiment was laid out in Randomized Block Design (RBD) with eight treatments and three replications. Among the different treatments, the foliar application of 2 % vermiwash spray on 30 and 45 DAS (T_8) recorded significantly the higher growth attributes such as plant height (54.23 cm), leaf area index (3.78), dry matter production (3992 kg ha^{-1}), number of branches plant^{-1} (6.38), crop growth rate (7.80 g m^{-2} day^{-1}) and seed yield (931 kg ha^{-1}), haulm yield (3008 kg ha^{-1}), harvest index (23.6 %). This was followed by foliar application of 3 % panchakavya on 30 and 45 DAS (T_5). The lower growth attributes and seed yield (508 kg ha^{-1}) was obtained in control (T_1).

Keywords: greengram, foliar application, vermiwash

Introduction

Greengram (*Vigna radiata* L.) belongs to the family Leguminosae and sub family Papilionaceae, is being grown as one of the principal crops since ages in our state as well as in the country. It is commonly known as 'Moong or Mung bean; is an excellent source of high quality protein. Being a leguminous crop, it can play a major role in nitrogen fixation from 20-80 kg ha^{-1} (Hayat *et al.*, 2008) [1], thus improving system sustainability. Greengram grains contain 22-28% protein, 60-65% carbohydrates, 1.0-1.5% fat, 3.5-4.5% fibre and 4.5-5.5% ash (USDA, 2019) [2]. The area under greengram in India is 30.48 lakh hectares with a production of 13.45 lakh tonnes and productivity of 441 kg ha^{-1} (GOI, 2019) [3]. The total area under greengram in Tamil Nadu is 1.95 lakh hectares with the production of 0.89 lakh tonnes and productivity of 444 kg ha^{-1}. The productivity of greengram crop in our country is not sufficient enough to meet the domestic demand of the population. The yield potential of greengram is very low because of lack of proper crop management. Greengram is generally grown in rainfed conditions with poor management practices. Hence there is need for enhancement of the productivity of greengram by proper agronomic practices. Soil applied nutrients are insufficient for crop to meet out their nutrient requirement and it may be due to non-availability of nutrients due to abrupt soil conditions, exhausted soil condition or nutrient losses through leaching and many more things which can hinder the availability of nutrients to plants and cease the plant growth, which ultimately affect the yield and quality of the crop produce. To maximise the efficiency of greengram, multiple strategies have been introduced. Among them foliar feeding is often the most effective and economical way to correct plant nutrient deficiencies. Foliar application of nutrients at critical stages of crop growth is most appropriate and accurate method of correcting the nutrient deficiencies and helps to attain maximum potential yield of the crop and ultimately sufficient plant nutrition is absolutely essential for improving their productivity (Thakur *et al.*, 2017) [4]. With this background, the present investigation was undertaken to study the effect of foliar nutrition on growth and yield of irrigated greengram.

Materials and Methods

The field experiment was conducted at Poompuhar Village, Sirkazhi Taluk of Mayiladuthurai District, Tamil Nadu during February-April 2020 to study the effect of foliar nutrition on growth and yield of irrigated greengram. The experimental field was geographically situated at 11º8′ North Latitude and 79º50′ East Longitude at an altitude of +1 m above mean sea level. The farm is characterized by tropical climate with warm and hot summer months. The soil of the experimental field was sandy clay loam in texture. The soil was low in available nitrogen, high in available phosphorus and medium in available potassium. The promising greengram variety CO-8 was chosen for the study. The experiment was laid out in randomized block design (RBD) with three replications. The treatments comprised of T_1 - Control, T_2 - Foliar application of 2 % DAP on 30 and 45 DAS, T_3 - Foliar application of 3 % fish amino acid on 30 and 45 DAS, T_4 - Foliar application of 40 ppm humic acid on 30 and 45 DAS, T_5 - Foliar application of 3 % panchakavya on 30 and 45 DAS, T_6 - Foliar application of 2 % EM on 30 and 45 DAS, T_7 - Foliar application of 10 % seaweed extract on 30 and 45 DAS, T_8 - Foliar application of 2% vermiwash on 30 and 45 DAS. The

salient findings of field experiment are presented below. Observations on growth attributes were taken on five randomly selected peg marked plants in periodical intervals.

Results and Discussion

Growth attributes

All the growth attributes were significantly influenced by different foliar application of nutrients. The growth attributes *viz.,* plant height, leaf area index, dry matter production, number of branches plant^{-1} and crop growth rate (CGR) were significantly influenced by different foliar application of nutrients on greengram. Among the different treatments, T_8 - Foliar application of 2% vermiwash on 30 and 45 DAS has recorded the maximum values of plant height (54.23 cm), leaf area index (3.78), dry matter production (3992 kg ha^{-1}), number of branches plant^{-1} (6.38), and crop growth rate (7.80g m^{-2} day^{-1}) on greengram. Nutrients and growth-promoting substances like gibberellin, cytokinin and auxins, vitamins, antibiotics, etc., present in the vermiwash. These nutrients are easily absorbed and then transported to the leaves, shoots, and other parts of a plant. This might be due to the harmony with the plant growth with a better environment. The results were in concordance with earlier findings of Jijo George *et al*. (2019) [5] and Sonali Rajasooriya and Brintha Karunarathna (2020) [6].

Foliar application of vermiwash has an emphatic effect on plant growth and productivity. The foliar spray drastically improves the growth and production of crops. Its coelomic fluid extraction contains several enzymes, plant growth hormones like cytokinin, gabardine and vitamins along with micro and macro nutrient. It also improves the disease resistant power of the crop. These findings were found to be consistent with the studies of Esakkiammal *et al*. (2015) [7] and Maheswari *et al*. (2017) [8].

This liquid fertilizer contains enzymes such as protease, amylase and phosphatase which are useful for growth and development of plants. Through vermiwash, it can cause rapid absorption of nutrients through the shoot part of the plant and increases the growth factors of the plants. Therefore, it may conclude that significant increase in growth of the plant similarly with the increase in leaf area index, chlorophyll content and dry mater production. It may be due to high levels of macronutrients and micronutrients present in it. Similar findings were documented in Sundararasu and Jeyasankar (2014) [9].

Table 1: Effect of foliar nutrition on growth attributes of irrigated greengram (*Vigna radiata* L.)

Treatments		Plant height (cm)		Leaf area index		Dry matter production (kg ha^{-1})		Number of branches plant^{-1}	crop growth rate (g m^{-2} day^{-1})
		45 DAS	At harvest	45 DAS	At harvest	45 DAS	At harvest		45 DAS –harvest
T_1	Control	24.76	33.31	2.07	2.01	1992	2746	3.97	5.02
T_2	Foliar application of 2 % DAP on 30 and 45 DAS	38.39	48.73	3.40	3.29	2599	3654	5.84	7.03
T_3	Foliar application of 3 % fish amino acid on 30 and 45 DAS	26.57	35.51	2.34	2.27	2119	2943	4.39	5.49
T_4	Foliar application of 40 ppm humic acid on 30 and 45 DAS	35.64	45.92	3.13	3.04	2483	3481	5.53	6.65
T_5	Foliar application of 3 % panchakavya on 30 and 45 DAS	41.54	51.52	3.67	3.54	2712	3825	6.12	7.42
T_6	Foliar application of 2 % EM on 30 and 45 DAS	33.62	43.19	2.87	2.78	2365	3304	5.19	6.26
T_7	Foliar application of 10 % seaweed extract on 30 and 45 DAS	31.02	39.77	2.61	2.52	2243	3126	4.79	5.88
T_8	Foliar application of 2 % vermiwash on 30 and 45 DAS	44.20	54.23	3.93	3.78	2822	3992	6.38	7.80
SEm±		0.56	0.69	0.08	0.07	35.56	52.79	0.07	0.11
CD (P=0.05)		1.72	2.13	0.25	0.23	108.83	161.54	0.23	0.36

Yield

The seed yield, haulm yield and harvest index of irrigated greengram was remarkably influenced by the different treatments of foliar application of nutrients. Among the various treatments evaluated in the study, foliar application of 2% vermiwash on 30 and 45 DAS (T_8), significantly increased the seed yield (931 kg ha^{-1}), haulm yield (3008 kg ha^{-1}) and harvest index (23.6 %) of greengram. The seed yield was increased due to increase in number of pods plant^{-1} and seeds pod^{-1} and high nutrient uptake by the foliar application which contains plant growth hormones.

The grain yield gets increased due to foliar application by which it could be attributed to reduction in flower droppings and increased in pod setting. The above findings are in line with the observations of Esakkiammal *et al*. (2015) [7] and Verma *et al*. (2017) [10]. The foliar application might increase the growth parameters which resulted in higher haulm yield. These findings were similarly consisted with studies of Sharma *et al*. (2010) [11] and Khairnar and Gunjal (2012) [12].

The presence of certain micro-nutrients as calcium, magnesium, manganese, copper, boron, iron, amino acids in vermiwash leads to an increase in the yield of the crop. This was supported by findings of Sudhanshu Verma (2018) [13], Jijo George *et al*. (2019) [5] and Sonali Rajasooriya and Brintha Karunarathna (2020) [6].

Table 2: Effect of foliar nutrition on growth attributes of irrigated greengram (*Vigna radiata* L.)

Treatments		Seed Yield	Haulm yield	Harvest Index (HI)
T_1	Control	508	2133	19.2
T_2	Foliar application of 2 % DAP on 30 and 45 DAS	815	2790	22.6
T_3	Foliar application of 3 % fish amino acid on 30 and 45 DAS	562	2252	19.9
T_4	Foliar application of 40 ppm humic acid on 30 and 45 DAS	753	2688	21.8
T_5	Foliar application of 3 % panchakavya on 30 and 45 DAS	878	2901	23.2
T_6	Foliar application of 2 % EM on 30 and 45 DAS	695	2542	21.4
T_7	Foliar application of 10 % seaweed extract on 30 and 45 DAS	626	2405	20.6
T_8	Foliar application of 2 % vermiwash on 30 and 45 DAS	931	3008	23.6
SEm±		17.00	31.85	0.12
CD (P=0.05)		52.02	97.48	0.37

Conclusion

Application of the different treatments of foliar nutrition (DAP, fish amino acid, humic acid, panchakavya, EM, seaweed extract and vermiwash) registered the maximum values for the growth parameters, seed yield, haulm yield and harvest index of irrigated greengram.

In the light of the above experimental results, it may be concluded that T_8 - Foliar application of 2% vermiwash on 30 and 45 DAS is an effective practice for yield maximization in irrigated greengram. Also this practice holds promise as an agronomically good, ecologically safe and suitable cost-effective approach to farmers.

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