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Influence of organic manures on growth and yield of vegetable Clusterbean (*Cyamopsis tetragonoloba* (L.) Taub.)

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Abstract

A field experiment was conducted at Tamil Nadu Agricultural University, Coimbatore during *Kharif* season of 2018-19. The experiment was carried out in a randomized complete block design with twelve treatments replicated thrice viz., Organic farmer's practice, FYM @ 25 t/ha + *Panchagavya* @ 3% as foliar spray (FS), FYM @ 12.5 t/ha + *Panchagavya* @ 3% as FS, FYM @ 12.5 t/ha + banana pseudostem sap @ 2% as FS, Vermicompost @ 5 t/ha + *Panchagavya* @ 3% as FS, Vermicompost @ 5 t/ha + banana pseudostem sap @ 2% as FS, *Ganajeevamruth* @ 500 kg/ha + *Panchagavya* @ 3% as FS, *Ganajeevamruth* @ 500 kg/ha + banana pseudostem sap @ 2% as FS, Humic acid @ 6 l/ha + *Panchagavya* @ 3% as FS, Humic acid @ 6 l/ha + banana pseudostem sap @ 2% as FS, recommended dose of NPK fertilizers (RDF)(50:50:25) + TNAU pulse wonder @ 1% as FS and absolute control. The study revealed that germination and plant population were not statistically different. Significantly higher plant height (32.43 cm, 30.91 cm and 28.52 cm), more number of leaves (15.17, 18.85, 10.57, and 8.50) at 30, 45, 60 DAS and harvest stages, respectively, higher number of pods per plant (93.07) and vegetable clusterbean yield (11084 kg/ha) at harvest stage were recorded under RDF in addition to foliar spray of TNAU pulse wonder. It was statistically on par with treatments such as organic farmer's practice and 25 t/ha of FYM along with foliar spray of 3 per cent *Panchagavya*.

Keywords: Clusterbean, organic farming, growth, yield

Introduction

Vegetable cultivation plays an important role in achieving food security by relieving full stress on cereals, millets and pulse crops. Clusterbean (*Cyamopsis tetragonoloba* (L.) Taub.) is a multipurpose arid crop belongs to Fabaceae family. India ranks first in cluster bean production (2.7 m tons) contributing 80 per cent of world production in an area of 4.25 m ha, and productivity of 567 kg/ha (Singh, 2014) [1]. Clusterbean is mainly grown in Rajasthan, Haryana, Gujarat and Punjab states for guar gum production. But in south India, it is mainly grown for vegetable purpose (Patel *et al.*, 2018) [2].

Agriculture is cycling back towards organic agriculture, because of the indiscriminate use of chemical fertilizers and pesticides, which created many undesirable consequences (Saritha *et al.*, 2013) [3]. Organic agriculture practices are in holistic approach with very less damage to earth ecosystem. It will reduce the chance of crop failure to larger extent and improves the quality, productivity of the crop and reduce the cost of cultivation (Chandrasekhar, 2010) [4]. Besides this, demand for organically grown products at national and international market is very high. Organic manure application shown better growth in clusterbean crop (Elnesairy *et al.*, 2016 [5] and Rawat *et al.*, 2016 [6]). Hence a study was made to evaluate the organic source of nutrients and organic foliar nutrition for enhancing the growth and production of vegetable clusterbean.

Materials and Methods

An experiment was conducted in irrigated wetland farm of Tamil Nadu Agricultural University, Coimbatore during *Kharif* season (2018-19) to evaluate the influence of organic manures on growth parameters of vegetable clusterbean. The soil is clay loam with alkaline pH (8.6), low EC (0.28 dS/m), medium in organic carbon (0.62%), low in nitrogen (252 kg/ha), medium in phosphorous (18.2kg/ha) and high in potassium (402 kg/ha). The experiment was carried out in randomized complete block design with twelve treatments and three replications. Treatment details are as follows ; T₁: Organic farmer's practice (farm yard manure (FYM) @ 10 t/ha + *Jeevamruth* @ 500 l/ha along with irrigation on 3rd days after sowing (DAS), 30 DAS and 60 DAS + *Panchagavya* @ 3% as foliar spray (FS) on 30, 45 and 60 days after sowing (DAS), T₂: FYM @ 25 t/ha + *Panchagavya* @ 3% as FS on 30, 45 and 60 DAS, T₃:

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FYM @ 12.5 t/ha + *Panchagavya* @ 3% as FS on 30, 45 and 60 DAS, T₄: FYM @ 12.5 t/ha + banana pseudostem sap @ 2% as FS on 30, 45 and 60 DAS, T₅: Vermicompost @ 5 t/ha + *Panchagavya* @ 3% as FS on 30, 45 and 60 DAS, T₆: Vermicompost @ 5t/ha + banana pseudostem sap @ 2% as FS on 30, 45 and 60 DAS, T₇: *Ganajeevamruth* @ 500 kg/ha + *Panchagavya* @ 3% as FS on 30, 45 and 60 DAS, T₈: *Ganajeevamruth* @ 500 kg/ha + banana pseudostem sap @ 2% as FS on 30, 45 and 60 DAS, T₉: Humic acid @ 6 l/ha + *Panchagavya* @ 3% as FS on 30, 45 and 60 DAS, T₁₀: Humic acid @ 6 l/ha + banana pseudostem sap @ 2% as FS on 30, 45 and 60 DAS, T₁₁: RDF of NPK fertilizers (50:50:25) + TNAU pulse wonder @ 1% as FS, T₁₂: Absolute control.

The FYM, vermicompost, *Ganajeevamruth* and humic acid were applied as basal whereas *Panchagavya*, banana pseudostem sap were applied as foliar spray on 30, 45, and 60 DAS and *Jeevamruth* was given along with irrigation water on 3rd day after sowing (DAS), 30 DAS and 60 DAS. Field was ploughed two times with cultivator and one plough with rotovator to get fine tilth. Ridges were made at a distance of 45cm using bullock drawn ridge former. Plots were with a net size of 4.95 x 2.55 m. Basal organic manures were applied before sowing and field was irrigated. Variety used in this experiment was clusterbean MDU 1 of TNAU. Seeds were treated with *Rhizobium* @ 80 g/kg and shade dried for 12 hours. Seeds were sown on one side of the ridge at 15 cm spacing. Irrigation was given on the day of sowing and 3rd DAS and later based on moisture content of the soil. Organic liquid manures were applied as foliar spray on 30, 45 and 60 DAS as per treatments. All other cultural practices were followed as per recommendations of TNAU agri portal except, the application of synthetic chemicals. (http://agritech.tnau.ac.in/horticulture/horti_vegetables_clusterbeans.html)

Germination percentage on 8th DAS and plant population on 20th DAS was recorded in five random places in each net plot area. Days to 50 per cent flowering was noted to each treatment when 50 per cent of plant population were flowered and days to pod formation was noted on the tender pod appearance. The following growth parameters were taken from five randomly selected and tagged plants in net plot area on 30, 45, 60 DAS and at harvest stages. Plant height was measured from base of the plant tip of the top leaves. Number of leaves were counted for each plant. Number of pods per plant and yield were recorded at each picking and pooled.

The experimental data was statistically analysed by analysis of variance using Agres software. The level of significance was kept at 5% (P=0.05).

Results and Discussion

Significantly no difference on percentage of germination and plant population per m² was observed among the source of nutrients on clusterbean due to treatments. Similar findings were observed by Naga (2013) [7] and Saritha *et al.* (2013) [3].

On perusal of the data presented in Table 1, days to 50 per cent flowering and pod formation had shown significant difference. Absolute control treatment had taken lesser number for days to 50 percent flowering (29.49) and pod formation (41.43) compared to others. As absolute control was not supplied with any external source of nutrients, which forces the plant for early flowering (Palankar, 2014) [8]. Whereas, in all other treatments the flowering and pod formation was delayed due to supply of nutrients to soil and plant. Nutrient uptake especially N was low in absolute control (1.13) which had influenced early flowering and pod formation. Similar findings were noticed by Saritha *et al.*

(2013) [3]. Application of *Ghanajeevamruth* (31.9) had taken 4 days lesser time than normal flowering (35.8), as it favours to fit vegetable clusterbean in any cropping system as component crop.

The plant height has showed increasing trend up to 60 DAS later it got decreased. The data presented in Table 1 shown that plant height was not significant on 30 DAS, whereas on 45, 60 DAS and at harvest stages significant difference was noticed. Significantly higher plant height (32.43, 30.91 and 28.52 on 45, 60 DAS and at harvest respectively) was found with RDF in addition to TNAU pulse wonder, which remained on par with organic farmer's practice and 25 tonnes of FYM along with foliar spray of *Panchagavya* than others. Minimum plant height (20.78, 19.81 and 18.27 cm on 45, 60 DAS and at harvest respectively) was noticed in absolute control. Higher plant height might be due to readily available nutrients might have enhanced the uptake of nutrients especially nitrogen which promoted plant height. Same results were observed by Manohar (2019) [9].

Number of leaves per plant denotes photosynthetic area, with higher the photosynthetic area good amount of photosynthates can be synthesized and results into better growth and yield of a plant. The data furnished in Table 2 shown that the number of leaves per plant had been increased up to 60 DAS later it was slightly decreased. The application of RDF with TNAU pulse wonder had produced significantly higher number of leaves per plant on 30 DAS (15.17), 45 DAS (18.85), 60 DAS (10.57) and harvest (8.50). Organic farmer's practice and FYM along with *Panchagavya* was statistically on par with RDF in addition to TNAU pulse wonder at all stages of crop. Whereas minimum number of leaves per plant was noticed with Absolute control. These results are in corroboration with Dilipsinh (2011) [10]. Better availability of macro nutrients from RDF and micro nutrients from TNAU pulse wonder might enhanced the number of leaves per plant with complex physiological process. In organic farmer's practice and FYM along with *Panchagavya*, organic manures and Chemolithotrops and autotropic nitrifiers present in *Panchagavya* might have colonized in the leaves and increased the ammonia uptake (Devkumar *et al.*, 2014)[11] which results into higher vegetative growth and more number of leaves.

Number of pods per plant was significantly influenced by application of organic manures. On perusal of data from the Table 2, more number of pods per plant (93.07) was recorded with RDF in addition to TNAU pulse wonder, Organic farmer's practice (85.78) and 25t/ha of FYM along with *Panchagavya* than others. Lesser number of pods were recorded with absolute control (59.63). Similar findings were recorded Vijayavardhan (1999) [12]. The maximum nutrient uptake along with good vegetative growth and translocation of photosynthates might be the reason higher number of pods per plant. In organic treatments T₁ and T₂, application of FYM and *Panchagavya* might have provided micro and macro nutrients along with growth promoting substances to the crop, which in turn could have increased the number of pods per plant

Application of manures and fertilizers had shown significant difference in pod yield. Higher vegetable clusterbean yield (11084 kg/ha) was obtained with RDF in addition to TNAU pulse wonder, organic farmer's practice and 25 t/ha FYM with *Panchagavya* as compared to others. Higher yield was due to good growth and translocation of photosynthates in plant with good availability of nutrients. Same results were observed with Reddy *et al.* (2014) [13]. Absolute control

recorded lower yield (7102 kg/ha). In organic treatments T₁ and T₂, had increased the yield, which might be due to the presence of higher amount of organic matter and micronutrients, such as Fe and Zn and smaller amounts of IAA and GA present in the *Panchagavya* which might have enhanced the growth and yield. Similar results were reported by Somasundaram *et al.* (2003) [14].

Conclusion

From the study, it is inferred that growth and yield parameters of vegetable clusterbean were higher under RDF along with

pulse wonder, organic farmer's practice and FYM @ 25 t/ha along with foliar spray of *Panchagavya* @ 3%, thus clearly showing that all these practices are equally effective. In order to promote organic agriculture for safer environment and human health, farmer's practice of applying FYM @ 10 t/ha in addition along with *Jeevamruth* @ 500l/ha and foliar spray of *Panchagavya* @ 3 per cent or FYM @ 25 t/ha in addition to 3 per cent foliar spray of *Panchagavya* is found to increase the growth and yield of vegetable clusterbean.

Table 1: Effect of Organic manures on growth parameters of clusterbean

Treatment details	Germination percentage	Plant population per m ²	Days to 50% flowering	Days to pod formation
T ₁	90.20	11.72	36.49	48.43
T ₂	89.90	11.68	37.49	49.43
T ₃	88.40	11.49	35.14	47.08
T ₄	89.30	11.60	35.38	47.32
T ₅	88.00	11.43	34.97	46.91
T ₆	88.90	11.55	35.31	47.25
T ₇	87.90	11.42	31.49	43.43
T ₈	87.60	11.38	31.49	43.43
T ₉	87.50	11.37	34.49	46.43
T ₁₀	87.70	11.40	33.49	45.43
T ₁₁	91.20	11.85	39.49	51.43
T ₁₂	87.20	11.33	29.49	41.43
SEd	4.36	0.59	1.54	2.10
CD (0.05)	NS	NS	3.18	4.36

Table 2: Effect of Organic manures on growth and yield of vegetable cluster bean

Treatments	Plant height (cm)				No of leaves per plant				Number of Pods Plant	Yield (kg/ha)
	30 DAS	45 DAS	60 DAS	Harvest	30 DAS	45 DAS	60 DAS	Harvest		
T ₁	26.93	29.89	28.49	26.28	13.98	17.37	9.74	7.84	85.78	10215
T ₂	26.84	29.68	28.29	26.10	13.89	17.25	9.68	7.78	85.18	10145
T ₃	26.39	26.89	25.63	23.64	12.58	15.63	8.76	7.05	77.16	9190
T ₄	26.66	27.16	25.89	23.88	12.71	15.78	8.85	7.12	77.95	9283
T ₅	26.27	26.69	25.45	23.48	12.49	15.51	8.70	7.00	76.62	9125
T ₆	26.54	27.08	25.81	23.81	12.67	15.74	8.83	7.10	77.72	9256
T ₇	26.24	23.53	22.43	20.69	11.01	13.67	7.67	6.17	67.53	8042
T ₈	26.16	23.74	22.63	20.88	11.11	13.80	7.74	6.23	68.14	8115
T ₉	26.13	23.88	22.77	21.00	11.18	13.88	7.79	6.26	68.55	8164
T ₁₀	26.18	26.49	25.25	23.30	12.40	15.40	8.64	6.95	76.04	9055
T ₁₁	27.23	32.43	30.91	28.52	15.17	18.85	10.57	8.50	93.07	11084
T ₁₂	26.04	20.78	19.81	18.27	9.72	12.08	6.77	5.45	59.63	7102
SEd	0.97	1.23	1.33	1.32	0.64	0.86	0.49	0.35	4.40	461
CD (0.05)	NS	2.56	2.77	2.73	1.32	1.78	1.02	0.73	9.13	957

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