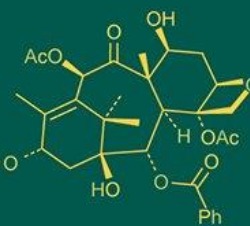
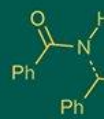


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Response of various methods of jeevamrut application on growth, soil properties and quality of clusterbean (*Cyamopsis tetragonoloba* L. Taub.) cultivars

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Abstract

An experiment was conducted during *kharif*-2023 at College of Agriculture, Swami Keshwanand Rajasthan Agricultural University, Bikaner (Raj.). The treatments comprising of four cultivars [RGC-1066 (V₁), RGC-1033 (V₂), HG-2-20 (V₃) and RGr-12-1(V₄)] in main plots and five treatments of Jeevamrut application [control (Bn₀), soil application 500 lit ha⁻¹ at 30 DAS (Bn₁), foliar spray (10%) at 30 DAS (Bn₂), soil application 500 lit ha⁻¹ + foliar spray (10%) at 30 DAS (Bn₃) and soil application 500 lit ha⁻¹ + foliar spray (10%) at 30 and 60 DAS (Bn₄)] in sub-plots, thus 20 treatment combinations were laid out in split blot design with three replication. The results revealed that among clusterbean cultivars, RGC-1066 recorded significantly higher chlorophyll content (2.74 mg g⁻¹), root depth (81.99 cm) and dry weight of root (0.394 g) whereas HG-2-20 cultivar was proved significantly superior in total number of nodules (35.82), dry weight of nodules (328.53 mg plant⁻¹), protein yield (368.66 kg ha⁻¹), gum content (28.09%), gum yield (618.32 kg ha⁻¹) and soil chemical and biological properties over rest of the cultivars. The trail data further revealed that Bn₄ treatment of Jeevamrut application significantly increased the growth parameters chlorophyll content (2.66 mg g⁻¹), nodules number (31.83) and its dry weight (292.72 mg plant⁻¹), root depth (78.83 cm) and its dry weight (0.363 g), nutrient content in seed and stover, protein content (21.20%), protein yield (489.14 kg ha⁻¹), gum content (29.32%), gum yield (677.68 kg ha⁻¹) and soil chemical and biological properties. Interaction effect of HG-2-20 cultivar with Jeevamrut treatment of soil application 500 lit ha⁻¹ + Foliar spray (10%) at 30 and 60 DAS proved significant superior in respect of number of nodules (42.22).

Keywords: Jeevamrut, cultivars, nodule, microbial count, gum content

Introduction

Clusterbean (*Cyamopsis tetragonoloba* L. Taub.), popularly known by its vernacular name guar is an important leguminous crop of rainfed condition. Clusterbean seed contains 28-33% gum. Clusterbean has natural polysaccharide water-soluble polymer which found in the endosperm, as galactomannan gum, is the chief product used in many industries (Amin *et al.*, 2007) [2]. Clusterbean adds in the fertility of soil by fixing considerable amount of atmospheric nitrogen. It can fix around 37-196 kg atmospheric nitrogen ha⁻¹ year⁻¹ in soil. In present era quality and safety are the two important factors that have gained ever-increasing attention in general consumers. Conventionally grown foods have immense adverse health effect due to presence of higher pesticides residues, high nitrate content, heavy metals, antibiotic residues and genetically modified organisms. The overuse of chemical inputs in agriculture has led to soil and environment pollution. Thus, Jeevamrut in organic farming is a cheaper eco-friendly organic preparation made by cow products namely dung, urine, flour of gram and jaggery. Jeevamrut is liquid organic manure which is an excellent source of organic carbon, nitrogen, phosphorous, potassium and lot of other micro nutrients required by crops. Jeevamrut promotes immense biological activity in soil and makes nutrient available to the crop. It is described as one of the four wheels of Zero Budget Natural Farming (Palekar, 2005) [9]. There was three times increase in available phosphate and two times increase in potash content of soil and the improvement in soil pH and E.C were reported to be close to neutral after organic cultivation (Ali *et al.*, 2011) [1].

Material and methods

A field experiment was conducted during *kharif*-2023 at Agronomy farm, College of Agriculture, Swami Keshwanand Rajasthan Agricultural University, Bikaner. The treatments comprising of four cultivars [RGC-1066 (V₁), RGC-1033 (V₂), HG-2-20 (V₃) and RGr-12-1(V₄)] in main plots and five treatments of Jeevamrut application [control (Bn₀), soil application 500 lit ha⁻¹ at 30 DAS (Bn₁), foliar spray (10%) at 30 DAS (Bn₂), soil application 500 lit ha⁻¹ + foliar spray (10%) at 30 DAS (Bn₃) and soil application 500 lit ha⁻¹ + foliar spray (10%) at 30 and 60 DAS (Bn₄)] in sub-plots, thus 20 treatment combinations were laid out in split blot design with three replication.

Result and Discussion

Growth parameters

Effect of cultivars

A critical examination of data from table 1 showed that RGC-1066 cultivar recorded significant higher chlorophyll content at 60 (4.11 mg g⁻¹) and 90 DAS (2.74 mg g⁻¹). It was significantly superior over V₂ and V₄ cultivars by 20.53 and

20.88 percent respectively at 60 DAS and by 17.60 and 20.53 percent at 90 DAS respectively. It was found at par with HG-2-20 at both stages *i.e.* 60 and 90 DAS. This is definitely due to cultivar's genetic trait to contain higher chlorophyll "a" and "b" content in leaves. Further data (Table 1) indicated that none of the cultivar significantly influenced the number of nodules plant⁻¹ and dry weight of nodules at 30 DAS. However, at 60 DAS maximum number of nodules plant⁻¹ (35.82) and dry weight of nodules (328.53 mg plant⁻¹) were recorded by HG-2-20 cultivar and this might be due to profuse and low root system of the cultivar and just like soil microorganisms nature, more number of roots are found in upper soil which results in higher number of nodules than other cultivars (Sharma *et al.*, 2019). Growth characters like root depth (81.99 cm) and dry weight of root (0.394 g) in table 2 was observed higher in RGC-1066 cultivar at harvest. The reason is, this cultivar is known as drought resistant or low water requirement cultivar, that's why it has deep root system and higher dry weight of root. (Ammaladinne *et al.*, 2022)^[3]

Table 1: Effect of different methods of Jeevamrut application on chlorophyll content, number of nodules and dry weight of nodules of clusterbean cultivars

Treatment	Chlorophyll content (mg g ⁻¹)		Number of nodules plant ⁻¹		Dry weight of nodules (mg plant ⁻¹)	
	60 DAS	90 DAS	30 DAS	60 DAS	30 DAS	60 DAS
Clusterbean cultivars						
RGC-1066	4.11	2.74	4.11	29.02	30.27	262.47
RGC-1033	3.41	2.33	3.75	20.86	29.13	198.91
HG-2-20	3.92	2.62	4.04	35.82	30.19	328.53
RGr-12-1	3.40	2.32	3.80	18.76	28.68	174.04
S.Em.±	0.11	0.06	0.08	0.47	0.63	4.82
CD at 5%	0.38	0.22	NS	1.61	NS	16.69
Methods of Jeevamrut application						
Control	3.40	2.32	3.92	22.06	29.79	205.80
Soil application @ 500 liter ha ⁻¹	3.54	2.40	3.98	26.51	29.41	240.30
Foliar spray (10%) at 30 DAS	3.76	2.53	3.78	22.94	29.34	218.70
Soil application @ 500 liter ha ⁻¹ + Foliar spray (10%) at 30 DAS	3.88	2.60	3.96	27.23	29.38	247.41
Soil application @ 500 liter ha ⁻¹ + Foliar spray (10%) at 30 and 60 DAS	3.99	2.66	3.98	31.83	29.93	292.72
S.Em.±	0.03	0.02	0.08	0.45	0.60	4.35
CD at 5%	0.08	0.05	NS	1.31	NS	12.53

Table 2: Effect of different methods of Jeevamrut application on root depth, dry weight of root, protein content, protein yield, gum content and gum yield of clusterbean cultivars

Treatment	Root depth (cm)	Dry weight of root (g)	Protein content (%)	Protein yield (kg ha ⁻¹)	Gum content (%)	Gum yield (kg ha ⁻¹)
Clusterbean cultivars						
RGC-1066	81.99	0.394	18.13	274.33	27.72	416.06
RGC-1033	75.48	0.364	17.19	346.26	25.83	514.10
HG-2-20	61.00	0.284	16.69	368.66	28.09	618.32
RGr-12-1	72.68	0.335	17.00	335.34	24.83	485.66
S.Em.±	2.42	0.009	0.40	15.88	0.48	17.74
CD at 5%	8.38	0.030	NS	54.94	1.64	61.38
Methods of Jeevamrut application						
Control	65.53	0.328	14.46	186.38	22.76	293.05
Soil application @ 500 liter ha ⁻¹	74.33	0.342	17.45	331.47	25.95	493.07
Foliar spray (10%) at 30 DAS	70.31	0.340	15.13	273.19	26.80	484.91
Soil application @ 500 liter ha ⁻¹ + Foliar spray (10%) at 30 DAS	74.95	0.348	18.00	375.55	28.25	593.97
Soil application @ 500 liter ha ⁻¹ + Foliar spray (10%) at 30 and 60 DAS	78.83	0.363	21.20	489.14	29.32	677.68
S.Em.±	0.66	0.005	0.25	6.66	0.45	12.30
CD at 5%	1.90	0.014	0.71	19.17	1.29	35.43

Effect of Jeevamrut

Experiment findings from table 1 showed that Bn₄ treatment of Jeevamrut application recorded highest chlorophyll content at both growth stages *i.e.* 60 (3.99 mg g⁻¹) and 90

DAS (2.66 mg g⁻¹) which was significantly superior over Bn₀, Bn₁, Bn₂ and Bn₃ by 17.35, 12.71, 6.12 and 2.84 percent respectively at 60 DAS and 14.66, 10.83, 5.14 and 2.3 percent respectively at 90 DAS. This might be due to

availability of essential plant nutrient like nitrogen from both ways *i.e.* soil and foliar. As Mg is the centre element of the chlorophyll followed by nitrogen and these both elements combine makes porphyrin ring. Further data from table 1 indicated that none of the treatment significantly affect number of nodules plant⁻¹ and dry weight of nodules at 30 DAS whereas application of treatment Bn₄ increased the number of nodules plant⁻¹ (31.83) and dry weight of nodules (292.72 mg plant⁻¹) at 60 DAS, because Jeevamrut is reported to be a catalytic agent to promote activity of micro-organisms resulting in healthy and nutrient rich soil (Dahal *et al.*, 2019) [5]. A perusal of data from table 2 highlighted that Bn₄ treatment got maximum root depth (78.83 cm) and dry weight of root (0.363 g) and this increase in root depth might be due to optimum moisture condition available for roots through soil application of Jeevamrut in addition with availability of essential nutrients and growth promoting substance which helps development of root system in both horizontal and vertical direction and turns into higher dry root weight.

Interaction effect of cultivars and jeevamrut

An appraisal of data (Table 3) showed that combined effect of cultivar and Jeevamrut significantly increased the number of nodules plant⁻¹ at 60 DAS. Result of the study exhibited that lowest number of nodules plant⁻¹ was recorded in V₄Bn₂

treatment which was significant inferior to V₄Bn₃ and V₁Bn₄ treatment combination by 183.86 and 85.26 percent respectively. The reason behind as nodules is directly depends on the correlation between root nature of plant and bacterial activity near rhizosphere and HG-2-20 cultivar has profuse and low root system which is supported by Jeevamrut Bn₄ for continuous availability of nutrients and other favorable factors for thus root contains maximum number of nodules (42.22).

Quality parameters

Effect of cultivars

An analysis of data (Table 2) indicated that variation in clusterbean cultivars for protein content was found non-significant, however in terms of protein yield, HG-2-20 cultivar recorded highest protein yield (368.66 kg ha⁻¹). This is due to fact that protein yield is product of protein content and yield of the crop and in yield HG-2-20 found significantly superior. Further data presented in table 2 pointed that HG-2-20 cultivar had highest gum content (28.09%) and gum yield (618.32 kg ha⁻¹). However, it was at par with V₁ cultivar and was statistically superior over V₂ and V₄ by 8.75 and 13.13 percent respectively in respect of gum content, and this is due to genetic superiority of the cultivar over others. Similar findings were given by Sharma *et al.*, 2019 [10].

Table 3: Interaction effect of Clusterbean cultivars and Jeevamrut on nodules plant⁻¹ (60 DAS)

Methods of Jeevamrut application	Clusterbean cultivars			
	RGC-1066	RGC-1033	HG-2-20	RGr-12-1
Control	22.91	15.87	32.63	16.85
Soil application @ 500 liter ha ⁻¹	29.32	20.95	37.00	18.77
Foliar spray (10%) at 30 DAS	26.07	19.11	31.14	15.45
Soil application @ 500 liter ha ⁻¹ + Foliar spray (10%) at 30 DAS	31.86	22.10	36.10	18.86
Soil application @ 500 liter ha ⁻¹ + Foliar spray (10%) at 30 and 60 DAS	34.94	26.28	42.22	23.88
	S.Em.±	0.91	S.Em.±	0.84
	*CD at 5%	2.61	**CD at 5%	2.43

A close examination of data in table 4 exposed that cultivars had no statistical difference in nitrogen, phosphorus and potassium content in seed and stover. An appraisal of data (Table 5 and 6) showed that nitrogen and potassium uptake by seed and stover and total nitrogen and potassium uptake were found significant by HG-2-20 cultivar. Further data from table 5 and 6) indicated that HG-2-20 cultivar found significant superior in phosphorus uptake by seed and in total uptake but found non-significant in stover. This is due to fact that uptake is function of nutrient content multiply to yield and in yield cultivar HG-2-20 found significantly superior.

Effect of jeevamrut

It is apparent from table 2 that Jeevamrut treatments made difference in quality characters. Bn₄ treatment recorded highest protein content (21.20%) and protein yield (489.14 kg ha⁻¹) and it was significantly superior over Bn₀, Bn₁, Bn₂ and Bn₃ in both aspects. The improvement in protein content is might be due to optimum dose of Jeevamrut as foliar

application (10%) which provided more macro nutrients especially nitrogen which helps seed to synthesize more nucleic acid which converts in protein content. Further gum content (29.32%) and gum yield (677.68 kg ha⁻¹) were also recorded highest with Bn₄ treatment application. It was significantly superior by 28.8, 12.9 and 17.8 percent over Bn₀, Bn₁ and Bn₂, respectively in gum content. It is proven in earlier studies that gum content in seed is directly correlated with phosphorus content or its uptake by plant. Jeevamrut doses have direct difference in phosphorus content and with application of Bn₄ treatment at soil and foliage, the phosphorus requirement is fulfilled. Soil application of nutrients do not provide phosphorus gradually and continuously and when its requirement by the crop but Bn₄ treatment 2-times foliar application of Jeevamrut at 30 and 60 DAS meets the phosphorus lacking in plant which increased phosphorus content in seed which in turns synthesis of essential amino acids and phospholipids to produce gum in seed. (Meena K.R *et al.*, 2006) [8].

Table 4: Effect of different methods of Jeevamrut application on nitrogen, phosphorus and potassium content in seed and stover of clusterbean cultivars

Treatment	Nitrogen (%)		Phosphorus (%)		Potassium (%)	
	Seed	Stover	Seed	Stover	Seed	Stover
Clusterbean cultivars						
RGC-1066	2.90	1.10	0.32	0.15	0.80	1.40
RGC-1033	2.75	1.12	0.32	0.15	0.80	1.41
HG-2-20	2.67	1.11	0.33	0.15	0.80	1.42
RGr-12-1	2.72	1.12	0.33	0.15	0.80	1.41
S.Em.±	0.06	0.01	0.02	0.00	0.01	0.02
CD at 5%	NS	NS	NS	NS	NS	NS
Methods of Jeevamrut application						
Control	2.31	1.04	0.30	0.14	0.75	1.30
Soil application @ 500 liter ha ⁻¹	2.79	1.11	0.31	0.15	0.79	1.39
Foliar spray (10%) at 30 DAS	2.42	1.12	0.32	0.15	0.81	1.43
Soil application @ 500 liter ha ⁻¹ + Foliar spray (10%) at 30 DAS	2.88	1.14	0.34	0.15	0.82	1.46
Soil application @ 500 liter ha ⁻¹ + Foliar spray (10%) at 30 and 60 DAS	3.39	1.15	0.35	0.16	0.83	1.47
S.Em.±	0.04	0.01	0.01	0.001	0.01	0.02
CD at 5%	0.11	0.03	0.02	0.003	0.03	0.06

Table 5: Effect of different methods of Jeevamrut application on nitrogen, phosphorus and potassium uptake by seed and stover of clusterbean cultivars

Treatment	Nitrogen uptake (kg ha ⁻¹)		Phosphorus uptake (kg ha ⁻¹)		Potassium uptake (kg ha ⁻¹)	
	Seed	Stover	Seed	Stover	Seed	Stover
Clusterbean cultivars						
RGC-1066	43.89	46.38	4.79	6.41	11.80	59.04
RGC-1033	55.40	51.73	6.35	6.92	15.79	65.58
HG-2-20	58.98	60.78	7.19	8.02	17.60	77.56
RGr-12-1	53.65	50.89	6.33	6.75	15.53	64.30
S.Em.±	2.54	2.10	0.18	0.47	0.36	2.57
CD at 5%	8.79	7.26	0.61	NS	1.26	8.89
Methods of Jeevamrut application						
Control	29.82	40.88	3.87	5.56	9.64	51.13
Soil application @ 500 liter ha ⁻¹	53.03	52.69	5.89	7.00	15.08	65.80
Foliar spray (10%) at 30 DAS	43.71	50.18	5.83	6.53	14.71	64.17
Soil application @ 500 liter ha ⁻¹ + Foliar spray (10%) at 30 DAS	60.09	56.72	7.04	7.54	17.30	72.84
Soil application @ 500 liter ha ⁻¹ + Foliar spray (10%) at 30 and 60 DAS	78.26	61.75	8.19	8.51	19.17	79.15
S.Em.±	1.07	0.99	0.12	0.15	0.27	1.62
CD at 5%	3.07	2.85	0.33	0.43	0.77	4.67

A perusal of data from table 4 depicted that Jeevamrut treatments had ability to produce statistical difference in nutrient content in plant. Bn₄ treatment recorded with highest nitrogen (3.39% and 1.15%), phosphorus (0.35% and 0.16%) and potassium (0.83% and 1.47%) content in seed and stover, respectively. It seems to be positive due to effective utilization of nutrients by both way i.e., photosynthesis and plant root system. Soil and foliar application of organic formulation created a better supply of nutrients gradually as per requirement of crop root by desorption reaction. Further data from table 5 and 6 showed that nitrogen, phosphorus and potassium uptake by seed, stover and total uptake were found significant higher in HG-2-20 cultivar. The reason is nutrient uptake is simply multiplication of nutrient content in plant and yield of seed and stover. An analysis of present experiment shows that nutrient content and yield simultaneously influenced by various methods of Jeevamrut application therefore huge increase was recorded in nutrient uptake by application of Bn₄ treatment. Our present findings are also supported by the work of Sharma *et al.* (2019) [10].

3. Soil properties

3.1 Effect of cultivars

Data illustrated in table 7 indicated that cultivars were found ineffective to produce variation in organic carbon, nitrogen, phosphorus and potassium content in soil after harvest. Further analysis of data shown in table 8 and fig.1 revealed that none of the cultivar significantly affected the

dehydrogenase activity, actinomycetes and fungal population in soil at harvest, however, HG-2-20 cultivar recorded highest bacterial population (4.41 c.f.u 10⁶ g⁻¹ soil) in soil at harvest which was statistically superior over RGC-1033 and RGr-12-1 cultivars by 12.8 and 8.9 percent, respectively. This is definitely due to maximum number of nodules were found in HG-2-20 cultivar (Table 1) and bacterial activity has direct correlation with nodules. (Manivannan *et al.*, 2009) [7]

3.2 Effect of jeevamrut

A critical inspection of experimental data (Table 7) unveiled that Bn₄ treatment of Jeevamrut achieved highest organic carbon (0.127%), nitrogen (130.66 kg ha⁻¹), phosphorus (21.20 kg ha⁻¹) and potassium (197.85 kg ha⁻¹) content in soil after harvest. It is the reason of 2-times soil application of Jeevamrut at 30 and 60 DAS as Bn₄ treatment which significantly boosted the microbial population in soil and cause rapid mineralization of organic matter resulted fast solubilisation and mobilization of macro nutrients (N, P and K) in soil (Atal *et al.*, 2017) [4]. It is obvious from data (table 8 and fig.1) that Jeevamrut treatment had significant impact on biological property of soil. Bn₄ treatment recorded maximum dehydrogenase activity (61.33 µg TPF g⁻¹ soil) and higher bacterial (5.55 c.f.u 10⁶ g⁻¹ soil), actinomycetes (3.88 c.f.u 10⁵ g⁻¹ soil) and fungal (3.88 c.f.u 10⁴ g⁻¹ soil) population in soil at harvest and it was significantly superior over Bn₀, Bn₁, Bn₂ and Bn₃. This might be due to healthy

microbial load in Jeevamrut formulation, which when interact with intra and extra-cellular enzymes cause excellent proliferation of microbes. Soil microbial

respiration is strongly linked to soil enzyme activity, indicating the intensity of soil metabolic process. Similar results were recorded by Gorde *et al.*, 2022. ^[6]

Table 6: Effect of different methods of Jeevamrut application on total nitrogen, phosphorus and potassium uptake by clusterbean cultivars

Treatment	Nitrogen uptake (kg ha ⁻¹)	Phosphorus uptake (kg ha ⁻¹)	Potassium uptake (kg ha ⁻¹)
Clusterbean cultivars			
RGC-1066	90.28	11.20	70.83
RGC-1033	107.13	13.28	81.37
HG-2-20	119.76	15.21	95.16
RGr-12-1	104.54	13.08	79.83
S.Em.±	4.53	0.38	2.91
CD at 5%	15.69	1.32	10.07
Methods of Jeevamrut application			
Control	70.70	9.43	60.76
Soil application @ 500 liter ha ⁻¹	105.72	12.88	80.88
Foliar spray (10%) at 30 DAS	93.89	12.36	78.88
Soil application @ 500 liter ha ⁻¹ + Foliar spray (10%) at 30 DAS	116.80	14.58	90.14
Soil application @ 500 liter ha ⁻¹ + Foliar spray (10%) at 30 and 60 DAS	140.02	16.71	98.32
S.Em.±	1.62	0.18	1.84
CD at 5%	4.68	0.52	5.31

Table 7:-Effect of different methods of Jeevamrut application on organic carbon, nitrogen, phosphorus and potassium content in soil after harvest of clusterbean cultivars

Treatment	O.C (%)	N-soil (kg ha ⁻¹)	P-soil (kg ha ⁻¹)	K-soil (kg ha ⁻¹)
Clusterbean cultivars				
RGC-1066	0.120	121.35	19.47	192.64
RGC-1033	0.119	114.40	18.30	180.56
HG-2-20	0.119	125.75	20.22	196.56
RGr-12-1	0.117	110.71	17.68	177.94
S.Em.±	0.001	3.26	0.55	5.76
CD at 5%	NS	NS	NS	NS
Methods of Jeevamrut application				
Control	0.111	103.64	16.27	172.89
Soil application @ 500 liter ha ⁻¹	0.119	117.66	18.91	188.17
Foliar spray (10%) at 30 DAS	0.115	112.68	17.78	182.85
Soil application @ 500 liter ha ⁻¹ + Foliar spray (10%) at 30 DAS	0.122	125.63	20.42	192.86
Soil application @ 500 liter ha ⁻¹ + Foliar spray (10%) at 30 and 60 DAS	0.127	130.66	21.20	197.85
S.Em.±	0.001	0.99	0.17	1.70
CD at 5%	0.003	2.84	0.48	4.90

Table 8: Effect of different methods of Jeevamrut application on dehydrogenase activity, bacterial, actinomycetes and fungal population in soil after harvest of clusterbean cultivars

Treatment	Dehydrogenase activity (µg TPFg ⁻¹ soil)	Bacterial population (c.f.u 10 ⁶ g ⁻¹ soil)	Actinomycetes population (c.f.u 10 ⁵ g ⁻¹ soil)	Fungal population (c.f.u 10 ⁴ g ⁻¹ soil)
Clusterbean cultivars				
RGC-1066	58.80	4.26	3.26	3.46
RGC-1033	57.26	3.91	3.16	3.28
HG-2-20	59.34	4.41	3.43	3.56
RGr-12-1	57.55	4.05	3.32	3.41
S.Em.±	0.03	0.09	0.04	0.00
CD at 5%	NS	0.31	NS	NS
Methods of Jeevamrut application				
Control	54.97	2.66	2.59	2.82
Soil application @ 500 liter ha ⁻¹	58.22	4.36	3.51	3.68
Foliar spray (10%) at 30 DAS	56.79	3.67	2.85	3.01
Soil application @ 500 liter ha ⁻¹ + Foliar spray (10%) at 30 DAS	59.87	4.56	3.62	3.77
Soil application @ 500 liter ha ⁻¹ + Foliar spray (10%) at 30 and 60 DAS	61.33	5.55	3.88	3.88
S.Em.±	0.38	0.10	0.07	0.13
CD at 5%	1.08	0.29	0.19	0.39

Conclusion

Thus, on the basis of one year experimentation, it can be concluded that cultivation of HG-2-20 cultivar along with the soil application 500 liter ha⁻¹ + Foliar spray (10%) at 30

and 60 DAS of Jeevamrut is a remunerative approach in maximizing the crop productivity under organic cultivation system.

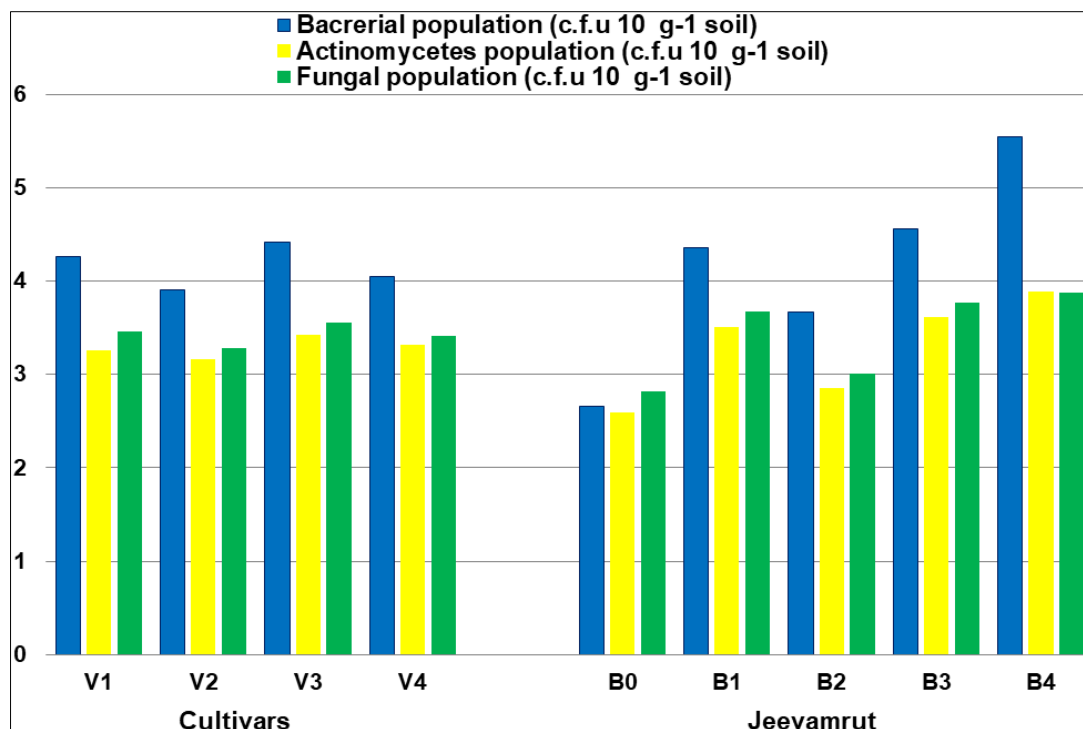


Fig 1: Effect of different methods of Jeevamrut application on biological properties of soil after harvest of clusterbean cultivars

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