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EFFECT OF JEEVAMRUT ON GROWTH, QUALITY AND ECONOMICS OF CLUSTER BEAN (*CYAMOPSIS TETRAGONOLOBA* L.) CV. PUSA NAVBAHAR

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ABSTRACT

An experiment was carried out on "Effect of *jeevamrut* on growth, quality and economics of cluster bean (*Cyamopsis tetragonoloba* L.) cv. Pusa Navbahar" at College Farm, College of Horticulture, S. D. Agricultural University, Jagudan, Gujarat, India during *kharif*, 2023. Experiment was laid out in randomized block design with three replications. Total nine treatments were evaluated in the present study viz., control (T₁), *Jeevamrut* spray @ 5% (T₂), *Jeevamrut* spray @ 7.5% (T₃), *Jeevamrut* drenching @ (500 l/ha) (T₄), *Jeevamrut* drenching @ (750 l/ha) (T₅), *Jeevamrut* spray @ 5% + *Jeevamrut* drenching @ (500 l/ha) (T₆), *Jeevamrut* spray @ 5% + *Jeevamrut* drenching @ (750 l/ha) (T₇), *Jeevamrut* spray @ 7.5% + *Jeevamrut* drenching @ (500 l/ha) (T₈), *Jeevamrut* spray @ 7.5% + *Jeevamrut* drenching @ (750 l/ha) (T₉). *Jeevamrut* spraying and drenching was done at 20, 40, 60 and 25, 45, 65 DAS, respectively. Based on the discussion thus far, it is concluded that application of *jeevamrut* spray @ 7.5% at 20, 40 and 60 DAS and *jeevamrut* drenching @ 750 l/ha at 25, 45 and 65 DAS in *kharif* cluster bean is advantageous for getting higher yield and net returns

Keywords: *Jeevamrut*, Drenching and Spraying.

Introduction

A substantial amount of the global human diet is composed of vegetables, which are important for human nutrition, particularly as sources of phytonutrients, which include vitamins, minerals, fiber, and phytochemicals (Craig and Beck, 1999). They are members of roughly twenty-five plant families, some of which are indigenous to India. Growing awareness of the nutritional worth of vegetables has led to a sharp rise in interest in their production in recent years.

Given the importance of vegetable crops as a source of income for growers and as a source of nourishment for human diets, olericulture is receiving increased attention in many places across the world. The highest protein content is seen in leguminous plants. In Indian horticulture, they are crucial. Their capacity to fix nitrogen from the atmosphere

biologically and their relationship with nitrogen-fixing bacteria makes them special.

The leguminosae family includes the cluster bean and guar (*Cyamopsis tetragonoloba* L.). Other names for it include guvar bean, gavar, and gawar. Although its exact origin is unknown, *Cyamopsis tetragonoloba* is thought to have evolved from the African species *Cyamopsis senegalensis*. It has been cultivated for centuries in South Asia, where it was domesticated. The Sanskrit term "gauaahar," which meaning cow feed or other animal feed, is where the name "guar" originates. In Gujarat, 45.56 thousand hectares are used for guar cultivation, yielding 45.25 thousand metric tons of output. Gujarat as a whole is the primary growing region for cluster beans. In the Mehsana district, 3600 hectares of cluster beans are grown, yielding 38,880 metric tons of production (Anonymous, 2023).

An essential vegetable crop during the summer and kharif seasons, cluster beans thrive in arid and semi-arid areas. It is an upright annual plant that can reach a height of two meters. Its stems are angled, and its leaves are trifoliate, oval, and serrated. The tiny, pink or white blooms are carried on axillary racemes. According to Patel *et al.* (2018), the pods are compressed, linear, erect, and clustered. They have two ridges on the dorsal side and one on the ventral side, and they are 4–10 cm long. Each pod contains 5–12 seeds that range in color from white to grey or black.

Cluster beans are extensively farmed, but not on a huge commercial basis. Cluster beans are essentially a summer annual legume with deep roots that can withstand drought. In addition to Uttar Pradesh, Madhya Pradesh, Andhra Pradesh, Tamil Nadu, Karnataka, and Kerala, the crop is mostly farmed in the arid regions of Rajasthan, Haryana, Gujarat, and Punjab (Venkataratnam, 1973). Vegetables are made from the tender green pods. Protein, vitamin A, and vitamin C are all abundant in them. According to Aykroyd (1963), the composition of a cluster bean is as follows: 81 g of moisture, 10.8 g of carbohydrates, 3.2 g of protein, 0.4 g of fat, 1.4 g of minerals, 316 I.U. of vitamin A, 47 I.U. of vitamin C, 0.03 mg of riboflavin, 0.09 mg of thiamine, and 33.3% protein in the dry seed. According to Choudhary (1976), dry green pods are kept and consumed as vegetables. Numerous applications in agricultural systems, various industrial applications, and additional dietary and social applications. A good source of protein is cluster bean seed meal, which is a byproduct of the guar gum industry and is made up of seed coat and germ cell material. Its main application is as animal and poultry feed. Cluster beans are primarily and most difficult to employ in a variety of businesses. The primary product utilized in the production of textiles, paper, stamps, cosmetics, medications, and food items is galactomannan gum, a naturally occurring polysaccharide water soluble polymer that is present in the endosperm. Kumar and Singh, (2002). One well-known traditional plant used in folk medicine is *Cyamopsis tetragonoloba* L. It has antiulcer, antisecretory, cytoprotective, digestive, laxative, dyspepsia, anorexia, appetizer, cooling, hypoglycemic, hypolipidemic, and antihyperglycemic properties. Mukhtar *et al.* (2006).

Jeevamrut supplies the nutrients for the crop stand and encourages a great deal of biological activity in the soil. It is made by combining 1 kg of soil, cow dung, pulse flour, jaggery, and urine, and it is let to ferment for a week. Beneficial microorganisms are thought to microbiologically enrich soil, and the filtered extract is

applied to the soil. According to Bharadwaj *et al.* (2021), *Jeevamrut* is said to have a very high population of nitrogen fixers, phosphate solubilizers, and siderophore processes. Until the soil is enriched, *jeevamrut* is either sprayed or sprinkled on the crop field or put to the irrigation tank at regular intervals of fifteen days.

Additionally, *Jeevamrut* improves N fixation, nitrogen mobilization, and utilization, all of which raise soil fertility. Growth hormones and a trace amount of macro and micronutrients are found in *jeevamrut*, which helps to improve crop quality and growth. The organisms proliferate greatly due to the easy energy supply, especially jaggery, and during the fermentative process, they produce helpful metabolites including organic acids and antibiotics that are efficient against other pathogenic organisms (Patel & Patel, 2017).

Materials and Methods

A field experiment on cluster bean cv. Pusa Navbahar was conducted at College Farm, College of Horticulture, S. D. Agricultural University, Jagudan, Gujarat, India during *kharif* 2023. The experiment was laid out in Randomized Block Design with three replications and total nine treatments. The treatments contain control (T₁), *Jeevamrut* spray @ 5% (T₂), *Jeevamrut* spray @ 7.5% (T₃), *Jeevamrut* drenching @ (500 l/ha) (T₄), *Jeevamrut* drenching @ (750 l/ha) (T₅), *Jeevamrut* spray @ 5% + *Jeevamrut* drenching @ (500 l/ha) (T₆), *Jeevamrut* spray @ 5% + *Jeevamrut* drenching @ (750 l/ha) (T₇), *Jeevamrut* spray @ 7.5% + *Jeevamrut* drenching @ (500 l/ha) (T₈), *Jeevamrut* spray @ 7.5% + *Jeevamrut* drenching @ (750 l/ha) (T₉). *Jeevamrut* spraying and drenching was done at 20, 40, 60 and 25, 45, 65 DAS, respectively. The experimental soil was loamy sand, with good drainage condition. The FYM 5 t/ha and poultry manure 500 kg/ha were applied. Plant height of five tagged plants from the ground level to tip of the plant was measured with the help of meter scale at 60 DAS and at last harvest then averaged out. The number of days taken for opening of first flower were counted from the date of sowing of five tagged plants in each plot and was averaged out. The number of days counted from the date of seed sowing to the first picking (edible maturity) were recorded to work out days taken for first picking. Nitrogen in pod was estimated by the modified micro kjeldhal's method as outlined by Jackson (1973). Protein content of the pods was computed by multiplying per cent N with factor 6.25. Chlorophyll a, b & total chlorophyll content of leaves (mg/g) was measured as per method suggested by Sadasivam and Manickam (1997). The gross

realization (Palanisami *et al.*, 2002) in term of rupees (Rs.) per hectare was worked out by considering the prevailing market price of the cluster bean under each treatment. The cost of cultivation was worked out by considering the expenses incurred for input (seeds, manure, irrigations etc.), cultural operations, manpower, electricity etc. from land preparation to final picking of each treatment. The cost of cultivation was then deducted from gross realization to work out the net profit. The benefit cost ratio (BCR) was calculated on the basis of formula. $BCR = \text{Gross realization (Rs.)} / \text{Total cost of cultivation (Rs.)}$

Results and Discussion

Growth parameters

The mean data on growth parameters such as maximum plant height at 60 DAS and at last harvest, days taken for initiation of flowering and days taken for first picking after sowing are depicted in Table 1 and 2 respectively.

Plant height at 60 DAS and at last harvest (cm)

The mean data presented in table 1. revealed that the effect of *jeevamrut* on plant height at 60 DAS and at last harvest was statistically significant. Maximum plant height at 60 DAS (84.39 cm) and at last harvest (145.33 cm) was observed with treatment T₉ (*Jeevamrut* spray @ 7.5% + *Jeevamrut* drenching @ 750 l/ha) and was statistically at par at 60 DAS and at last harvest with treatments T₈ (82.22 cm), (78.03 cm) and T₇ (138.93 cm), (135.23 cm). The minimum plant height at 60 DAS (67.45 cm) and at last harvest (113.20 cm) was recorded in T₁ (control).

This may be because of the use of *jeevamrutha* organic liquid formulation, which, when applied to soil, creates a congenial environment for microorganisms and helps make vital nutrients such as nitrogen, phosphorus, and potassium available to plants. It also creates a congenial environment for beneficial microbes (Devakumar *et al.*, 2008). According to Gangadhar *et al.* (2020), the application of *jeevamrutha* may have contributed to increased nutrient availability in the rhizosphere soil, which in turn improved the uptake of nitrogen, total phosphorus, and total potassium in chillies. These results are consistent with those of Sutar *et al.* (2018) in cowpea.

Days taken for initiation of flowering

Data presented in Table 2 showed that the effect of *jeevamrut* on days taken for initiation of flowering was non-significant

Days taken for first picking after sowing

The data presented in Table 2 revealed that the effect of *jeevamrut* on days taken for first picking after sowing was statistically non-significant.

Quality parameters

The mean data on quality parameters such as Protein content (%) depicted in Table 3.

Protein content (%)

The quantitative study illustrates the significant impact that various treatments had on this attribute during the cropping period. Maximum protein content (8.65 %) was recorded with treatment T₉ (*Jeevamrut* spray @ 7.5% + *Jeevamrut* drenching @ 750 l/ha) which was at par with treatments T₈ (8.39 %) and T₇ (8.30 %). The treatment T₁ (control) had the minimum protein content (7.72 %).

This could be because the crop is receiving a sufficient and well-balanced supply of nutrients at the appropriate moment. As evidenced by all the yield qualities of the biggest stature, the cowpea crop could accumulate a significant amount of biomass and partition a considerable fraction of assimilates to the sink, leading to a superior yield structure and potentially improved quality metrics. Cowpea, Desai *et al.* (2014).

Chlorophyll content (mg/g) (a, b and total)

Results in Table 4 demonstrated that there was no statistically significant relationship between *jeevamrut* on chlorophyll content (a, b and total) (mg/g).

Economics

The details of economics *i.e.*, cost of cultivation, gross return, net return and BCR on data basis for different treatments have been calculated and presented in Table 5. From the economic point of view, Maximum net return (2,11,709 Rs./ha) and BCR (3.01) was found under (*Jeevamrut* spray @ 7.5% + *Jeevamrut* drenching @ 750 l/ha) (T₉), whereas the minimum net return (1,34,453.4 Rs./ha) was found in T₁ (control) treatment

Table 1: Effect of *jeevamrut* on plant height (cm)

Tr. No.	Treatment details	Plant height at 60 DAS (cm)	Plant height at last harvest (cm)
T1	Control	67.45	113.20
T2	<i>Jeevamrut</i> spray @ 5%	70.87	117.67
T3	<i>Jeevamrut</i> spray @ 7.5%	72.24	119.00
T4	<i>Jeevamrut</i> drenching @ 500 l/ha	73.47	125.80
T5	<i>Jeevamrut</i> drenching @ 750 l/ha	74.87	126.50
T6	<i>Jeevamrut</i> spray @ 5% + <i>Jeevamrut</i> drenching @ 500 l/ha	75.46	127.67
T7	<i>Jeevamrut</i> spray @ 5% + <i>Jeevamrut</i> drenching @ 750 l/ha	78.03	135.23
T8	<i>Jeevamrut</i> spray @ 7.5% + <i>Jeevamrut</i> drenching @ 500 l/ha	82.22	138.93
T9	<i>Jeevamrut</i> spray @ 7.5% + <i>Jeevamrut</i> drenching @ 750 l/ha	84.39	145.33
	S.Em. \pm	2.92	5.59
	C.D. at 5 %	8.75	16.76
	C.V. %	6.70	7.58

Table 2 : Effect of *jeevamrut* on days taken for initiation of flowering and days taken for first picking after sowing

Tr. No.	Treatment details	Days taken for initiation of flowering	Days taken for first picking
T1	Control	44.40	54.20
T2	<i>Jeevamrut</i> spray @ 5%	44.07	53.87
T3	<i>Jeevamrut</i> spray @ 7.5%	43.27	53.40
T4	<i>Jeevamrut</i> drenching @ 500 l/ha	42.60	53.20
T5	<i>Jeevamrut</i> drenching @ 750 l/ha	42.47	52.93
T6	<i>Jeevamrut</i> spray @ 5% + <i>Jeevamrut</i> drenching @ 500 l/ha	41.87	52.67
T7	<i>Jeevamrut</i> spray @ 5% + <i>Jeevamrut</i> drenching @ 750 l/ha	41.80	51.20
T8	<i>Jeevamrut</i> spray @ 7.5% + <i>Jeevamrut</i> drenching @ 500 l/ha	40.53	50.73
T9	<i>Jeevamrut</i> spray @ 7.5% + <i>Jeevamrut</i> drenching @ 750 l/ha	39.93	49.67
	S.Em. \pm	1.05	1.23
	C.D. at 5 %	NS	NS
	C.V. %	4.30	4.05

Table 3: Effect of *jeevamrut* on protein content (%) of cluster bean

Tr. No.	Treatment details	Protein content (%)
T1	Control	7.72
T2	<i>Jeevamrut</i> spray @ 5%	8.00
T3	<i>Jeevamrut</i> spray @ 7.5%	8.02
T4	<i>Jeevamrut</i> drenching @ 500 l/ha	8.05
T5	<i>Jeevamrut</i> drenching @ 750 l/ha	8.14
T6	<i>Jeevamrut</i> spray @ 5% + <i>Jeevamrut</i> drenching @ 500 l/ha	8.20
T7	<i>Jeevamrut</i> spray @ 5% + <i>Jeevamrut</i> drenching @ 750 l/ha	8.30
T8	<i>Jeevamrut</i> spray @ 7.5% + <i>Jeevamrut</i> drenching @ 500 l/ha	8.39
T9	<i>Jeevamrut</i> spray @ 7.5% + <i>Jeevamrut</i> drenching @ 750 l/ha	8.65
	S.Em. \pm	0.14
	C.D. at 5 %	0.41
	C.V. %	2.87

Table 4 : Effect of *jeevamrut* on chlorophyll content (mg/g) (a, b and total)

Tr. No.	Treatment details	Chlorophyll content (mg/g)		
		a	b	Total chlorophyll
T1	Control	2.43	1.36	3.83
T2	<i>Jeevamrut</i> spray @ 5%	2.51	1.39	3.96
T3	<i>Jeevamrut</i> spray @ 7.5%	2.58	1.41	4.05
T4	<i>Jeevamrut</i> drenching @ 500 l/ha	2.59	1.48	4.12
T5	<i>Jeevamrut</i> drenching @ 750 l/ha	2.68	1.46	4.18
T6	<i>Jeevamrut</i> spray @ 5% + <i>Jeevamrut</i> drenching @ 500 l/ha	2.73	1.43	4.24
T7	<i>Jeevamrut</i> spray @ 5% + <i>Jeevamrut</i> drenching @ 750 l/ha	2.81	1.46	4.32
T8	<i>Jeevamrut</i> spray @ 7.5% + <i>Jeevamrut</i> drenching @ 500 l/ha	2.88	1.48	4.44
T9	<i>Jeevamrut</i> spray @ 7.5% + <i>Jeevamrut</i> drenching @ 750 l/ha	3.05	1.55	4.62
	S.Em. \pm	0.14	0.04	0.16
	C.D. at 5 %	NS	NS	NS
	C.V. %	9.29	4.39	6.45

Table 5: Effect of treatments on economics

Tr. No.	Yield/hectare (q)	Gross return (Rs./ha)	Total cost (Rs./ha)	Net returns (Rs./ha)	Benefit: cost ratio
T ₁	77.31	97475	231928.4	134453.4	2.38
T ₂	80.41	99875	241234.6	141359.6	2.42
T ₃	82.63	99950	247901.2	147951.2	2.48
T ₄	85.80	102725	257407.4	154682.4	2.51
T ₅	87.67	104225	263012.3	158787.3	2.52
T ₆	88.68	104000	266049.4	162049.4	2.56
T ₇	98.57	105500	295718.5	190218.5	2.80
T ₈	100.35	104075	301050	196975	2.89
T ₉	105.76	105575	317284	211709	3.01

Conclusions

Based on the discussion thus far, it is concluded that application of *jeevamrut* spray @ 7.5% at 20, 40 and 60 DAS and *jeevamrut* drenching @ 750 l/ha at 25, 45 and 65 DAS in kharif cluster bean is advantageous for getting highest growth and net returns.

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