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Response of green gram to different bio-stimulants under organic farming

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Abstract
A field investigation entitled "Response of green gram to different bio-stimulants under organic farming" was conducted in *kharif* season of 2024 at the Organic Farming Research and Training Centre, MPKV, Rahuri. The experiment consists of eleven treatments *viz.*, T_1: Absolute control, T_2: Water spray, T_3: Foliar spray of Cow urine @ 10%, T_4: Foliar spray of Vermiwash @ 10%, T_5: Foliar spray of Panchagavya @ 3%, T_6: Foliar spray of Chitosan @ 5%, T_7: Foliar spray of Amrutpani @ 5%, T_8: Foliar spray of Jeevamrut @ 10%, T_9: Foliar spray of Sea weed extract @ 2%, T_{10}: Foliar spray of Waste decomposer @ 25%, T_{11}: Foliar spray of Kunapajala 5%.
The experiment was laid out in Randomized Block Design (RBD) with three replications. The Phule Chetak variety seeds were line sown at spacing of 30 cm ×10 cm. At the time of sowing an application of the recommended dose of fertilizers (RDF) at 20:40:00 N:P_2O_5:K_2O kg ha^{-1}, integrated with vermicompost 700 kg ha^{-1} and phosphate rich organic manure (PROM) 400 kg ha^{-1} as a basal dose and foliar sprays of different bio-stimulants were applied at 30 and 45 DAS.
The results showed that growth attributing characters *viz*., plant height (62.81 cm), plant spread (36.71 cm), number of branches plant^{-1} (10.07) and dry matter (27.57 g) accumulation were recorded by application of T_8 Foliar spray of Jeevamrut @ 10% at 30 and 45 DAS. The treatment T_6 Foliar spray of Chitosan @ 5% at 30 and 45 DAS and T_5 Foliar spray of Panchagavya @ 3% spray at 30 and 45 DAS were found at par with treatment T_8 Foliar spray of Jeevamrut @ 10% at 30 and 45 DAS in respect of growth parameters.
As regards yield attributing characters *viz*., number of clusters plant^{-1} (8.77), number of pods plant^{-1} (28.57), weight of pods plant^{-1} (15.01 g), number of seeds pod^{-1} (10.17), number of seeds plant^{-1} (221), weight of seeds plant^{-1} (12.76 g), seed yield (1238 kg ha^{-1}) and straw yield (1891 kg ha^{-1}) of green gram were recorded significantly the highest under treatment T_8 Foliar spray of Jeevamrut @ 10% at 30 and 45 DAS. It was followed by and at par with other treatments T_6 Foliar spray of Chitosan @ 5% at 30 and 45 DAS and T_5 Foliar spray of Panchagavya @ 3% at 30 and 45 DAS.
A one-season experimental study can be concluded that an application of the recommended dose of fertilizers (RDF) at 20:40:00 N:P_2O_5:K_2O kg ha^{-1}, integrated with vermicompost 700 kg ha^{-1} and phosphate rich organic manure (PROM) 400 kg ha^{-1} as a basal dose, along with foliar application of Jeevamrut @10% at 30 and 45 days after sowing (DAS), significantly enhanced yield-attributing parameters, seed yield, nutrient uptake, and economic returns of *kharif* green gram cultivated on medium black soil.

Keywords: Bio-stimulant, Jeevamrut, chitosan, panchagavya, foliar sprays, green gram

1. Introduction
Green gram (*Vigna radiata* L.) is a member of the Leguminosae or Fabaceae family and has a chromosome number of 2n = 22. Although pollination in green gram occurs naturally, there is only a very small amount of cross-pollination. Green gram plays a special role in diversifying Indian agriculture and helps to reduce malnutrition among the country's vegetarian population. After chickpea and pigeon pea, green gram is the third most important pulse crop in India. The major green gram producing states are Rajasthan, Maharashtra, Andhra Pradesh, Odisha, Tamil Nadu, Madhya Pradesh, and Uttar Pradesh. Rajasthan is the largest producer of green gram in terms of both area and production (Patela and Gangwar, 2023) [14].
Green gram is a popular and important pulse crop in India, offering a rich protein source (24.5%) along with high quality tryptophan (60 mg g^{-1}) and lysine (460 mg g^{-1}). When combined with cereals, pulses like green gram provide a balanced diet for many vegetarian Indians. This short duration crop also contains riboflavin (0.21 mg 100g^{-1}) and good amounts of minerals.

When sprouted, it has a significant quantity of ascorbic acid, thiamine, and riboflavin. Green gram thrives in multiple and intercropping systems, and its plants can be used as green manure or fodder after pod collection. Its seeds can be split into dal, similar to lentils or black gram, or processed into starch noodles (bean thread noodles, vermicelli) or soup (Chaudhari *et al.*, 2024) [4].

During *Kharif* 2023-24, the green gram crop in India occupied 31.28 lakh hectares (77.29 lakh acres), which is lower than the 34.86 lakh hectares (86.14 lakh acres) recorded during the same period in 2022-23. The major green gram cultivating states in the country are Rajasthan with 23.97 lakh hectares (59.23 lakh acres), Karnataka with 2.00 lakh hectares (4.94 lakh acres), Maharashtra with 1.81 lakh hectares (4.47 lakh acres), Odisha with 0.95 lakh hectares (2.35 lakh acres), and Gujarat with 0.65 lakh hectares (1.61 lakh acres). According to the second advance estimates released by the Central Government, green gram production in 2023 - 24 is estimated at 15.06 lakh tonnes. The key producing states include Rajasthan, which is expected to contribute 10.56 lakh tonnes, followed by Maharashtra with 0.71 lakh tonnes, Karnataka and Andhra Pradesh each with 0.67 lakh tonnes, Gujarat with 0.42 lakh tonnes, and Odisha with 0.28 lakh tonnes (Annonymous, 2024).

To achieve excellent status in agriculture, technological advancements and agri- infrastructure upgrading remain concerning matters. Over time, the heavy reliance on chemical fertilizers and pesticides for high production has led to declining soil fertility and challenging food safety conditions. In the present scenario, however, organic farming is the backbone of the great Indian civilization. It's the safest way to maintain both soil fertility and public health.

Consequently, organic farming can deliver quality food without negatively impacting soil health, the environment, or human well-being (Mukherjee *et al*., 2022) [11].

With growing awareness about the negative impacts of chemical farming, promoting organic agriculture has become essential for sustainable crop production and soil health. Organic practices, such as using fermented manures like panchgavya, jeevamrut, vermiwash, amritpani, kunapajala, waste decomposer, seaweed extract, and chitosan are gaining popularity among the farmers. Plants can absorb nutrients up to 20 times more efficiently through their leaves than through the soil, making liquid organic manures effective in addressing temporary nutrient deficiencies. Green gram (*Vigna radiata* L.), a vital pulse crop valued for its high protein content, benefits significantly from organic cultivation methods. Utilizing fermented organic manures in its production supports sustainable agriculture and ensures high quality, chemical free produce.

2. Materials and Methods

The experiment was carried out at the Organic Farming Research and Training Centre, located at Mahatma Phule Krishi Vidyapeeth, Rahuri. Rahuri is geographically located at a latitude of 19°57' North and between 74°32' and 74°10' East longitude, at an altitude of 511 meters above sea level. The region lies on the eastern side of the Western Ghats and is considered a rain shadow area. Climatically, it falls in a semi-arid zone, receiving an average annual rainfall of 407-619 mm over 15 to 45 rainy days.

The experiment consists of eleven treatments *viz.*, T_1: Absolute control, T_2: Water spray, T_3: Foliar spray of Cow urine @ 10%, T_4: Foliar spray of Vermiwash @ 10%, T_5: Foliar spray of Panchagavya @ 3%, T_6: Foliar spray of Chitosan @ 5%, T_7: Foliar spray of Amrutpani @ 5%, T_8: Foliar spray of Jeevamrut @ 10%, T_9: Foliar spray of Sea weed extract @ 2%, T_{10}: Foliar spray of Waste decomposer @ 25%, T_{11}: Foliar spray of Kunapajala @ 5%. These bio- stimulants were sprayed at the flowering and pod initiation stages of green gram. The experiment was laid out in randomized block design (RBD) with three replications. The Phule Chetak variety seeds were line sown at spacing of 30 cm x 10 cm.

The soil in the experimental area belongs to the Inceptisol order and has a clay loam texture. The topography of the experimental field is uniform and level. Representative initial soil samples were collected to evaluate the baseline soil fertility. These samples were thoroughly mixed to create a composite sample, which was then analyzed for both physical and chemical properties. The experimental soil had a clay loam texture, slightly alkaline in reaction (pH 8.20), medium organic carbon content (0.53%), and an electrical conductivity of 0.35 ds m^{-1}. It was low in available nitrogen (173.87 kg ha^{-1}), low in available phosphorus (15.54 kg ha^{-1}), and very high in available potassium (378.76 kg ha^{-1}).

Five selected plants were used for observation of the plant height. The plant height was recorded in cm from the ground level up to the tip of the stem with the help of a metric scale. Observations were started from 30, 45 and 60 DAS of five selected plants and were subsequently recorded at an interval of 14 days up to harvest. Plant spread (cm) was measured on five observation-tagged plants by measuring the maximum horizontal space occupied by the plant between the tips of two extreme leaves on either side of the plant at 30, 45, 60 DAS and at harvest. The mean plant spread was reported by averaging the plant spread of five observation plants. The number of branches was recorded periodically at 30, 45, 60 DAS and at harvest of five selected plants and an average number of branches was worked out and recorded. One representative plant from each plot was randomly selected and uprooted at the growth stage (30, 45, 60 DAS and at harvest) of one selected plant observation for dry matter studies. Roots were discarded for dry matter studies. First, plants were air-dried and kept in a hot air oven at 55±5°C until constant weight was obtained. On cooling the dry weight $plant^{-1}$ was recorded.

At harvest from five sampled plants were selected and tagged number of clusters $plant^{-1}$, number of pods $plant^{-1}$, number of seeds pod^{-1} and number of seeds $plant^{-1}$ calculated separately. The weight of Pods $Plant^{-1}$ and weight of seeds $Plant^{-1}$ weighed on weighing balance separately at harvest.

The total seeds obtained from each observation plant were weighed separately on analytical weighing balance and the mean value was calculated for obtaining the weight of seeds $plant^{-1}$. The produce was dried in the sun for a week. After threshing, the seeds were cleaned of dried leaves, soil and other foreign material. The seed yield from net plot was recorded and then converted on a hectare basis by multiplying with the hectare factor. After removing the grain from the pods, the stalks along with the empty pods were dried in the sun. Upon drying, the weight of the bundle of stalk $plot^{-1}$ was recorded. The weight $plot^{-1}$ was transferred into a hectare basis by utilizing the hectare factor. Biological yield of crop is the total biomass put by a crop, and is calculated by summing up the seed yield straw yield. The Harvest index was calculated by using a formula.

$$\text{Harvesting index} = \frac{\text{Economic yield}}{\text{Biological yield}} \times 100$$

The standard method of "Analysis of variance" was used for analyzing the data (Panse and Sukhatme, 1985) [12].

3. Results and Discussion

3.1 Plant Height (cm)

The highest plant height was recorded in treatment T_8 (Jeevamrut @ 10%), with plant heights of 45.32 cm, 57.94 cm, and 60.28 cm observed at 30, 45, and 60 days after sowing (DAS), respectively. T_6 (Chitosan @ 5%) also showed considerable plant height, with values of 44.43 cm, 56.68 cm, and 60.28 cm at 30, 45, and 60 DAS, respectively. Similarly, T_5 (Panchagavya @ 3%) recorded plant heights of 43.38 cm, 54.61 cm, and 58.46 cm at the same intervals, and these results were statistically comparable to the higher performing treatment. In contrast, the shortest plants were observed in the absolute control plot (no spray), with heights of 41.34 cm, 46.73 cm, and 49.18 cm at 30, 45, and 60 DAS, respectively. Among all the foliar applications of organic treatments, Jeevamrut sprays significantly enhanced plant height. This improvement is likely due to the presence of abundant growth-promoting substances that increases cell division and cell elongation. These similar findings were reported by Mondal *et al*. (2011) [10] and Patil *et al.* (2012) [17] and Yogananda *et al.* (2015) [21].

3.2 Plant Spread (cm)

The plant spread of green gram was notably greater in T_8 (Jeevamrut @ 10%), measuring 36.77, 40.55, and 36.71 cm at 45 and 60 DAS and at harvest, respectively. Meanwhile, the plant spread in T_6 (Chitosan @ 5%) recorded 35.20, 38.36 and 34.29 cm at 45, 60 DAS, and at harvest, respectively, and T_5 (Panchagavya @ 3%) showed 35.16 cm, 37.86 cm, and 33.84 cm at the same intervals, both of which were comparable to the other treatments. The smallest plant spread of green gram, measuring 27.59 cm, 30.18 cm, and 27.89 cm at 45, 60 DAS, and harvest, respectively, was noted in the absolute control plot (no spray). The foliar application of Jeevamrut is effectively absorbed and transported throughout the plant via the phloem. It indirectly increases auxin availability in the rhizosphere which enhances the microbial activity in the soil. It gives a better root development, cell division and elongation that's why it facilitates better nutrient and water uptake from the soil, facilitating overall plant growth and plant spread of green gram crop. Similar findings were reported by El-Tanahy *et al*. (2012) [6], Spehia *et al.* (2018) [20], and Kumar (2020) [7].

3.3 Number of branches plant^{-1}

The highest number of branches per plant in green gram was observed in T_8 (Jeevamrut @ 10%), with counts of 6.57, 8.64, and 10.07 at 30, 45, and 60 DAS, respectively. Meanwhile, T_6 (Chitosan @ 5%) and T_5 (Panchagavya @ 3%) recorded branch numbers of 6.40, 7.83 and 9.70 and 6.15, 7.77 and 9.64 at 30, 45, and 60 DAS, respectively, which were statistically comparable to the superior treatment. The lowest branch count per plant was noted in the control plot (no spray), with values of 4.54, 4.78, and 6.51 at 30, 45, and 60 DAS, respectively. Jeevamrut, a bio-stimulant applied as a foliar spray, is rich in natural growth-stimulating compounds, including hormones like auxins and gibberellins. These promote the emergence of active buds and result in a higher leaf area index, which increases photosynthesis and fuels further plant growth. Similar results were reported by Makwana *et al.* (2020) [8], Patil *et al*. (2023) [16] and Patil *et al.* (2024) [15].

3.4 Dry matter accumulation plant^{-1} (g)

The highest dry matter production per plant of green gram was recorded in T_8 (Jeevamrut @ 10%) with values of 16.57, 27.23, and 27.57 g at 45, 60 DAS, and at harvest, respectively. Meanwhile, T_6 (Chitosan @ 5%) showed dry matter accumulation of 15.53, 25.30, and 25.53 g, and T_5 (Panchagavya @ 3%) recorded 15.27, 25.21, and 25.47 g at the same stages, both of which were comparable to the superior treatment. The lowest dry matter accumulation per plant was observed in the control plot (no spray), measuring 11.45, 21.78, and 22.05 g at 45, 60 DAS, and at harvest, respectively. Such bio-stimulants have macronutrients such as Nitrogen, Phosphorous and Pottasium as well as beneficial microorganisms which enhance microbial activity that boosts nutrient uptake from soil and improves overall biomass accumulation. Similar findings were reported by Mohammad and Latif (2012) [9], Chongre *et al*. (2020) [5] and Patel *et al.* (2021) [13].

3.5 Yield attributes

As regards yield attributing characters *viz*., number of clusters plant^{-1} (8.77), number of pods plant^{-1} (28.57), weight of pods plant^{-1} (15.01 g), number of seeds pod^{-1} (10.17), number of seeds plant^{-1} (221), weight of seeds plant^{-1} (12.76 g), seed yield (1238 kg ha^{-1}) and straw yield (1891 kg ha^{-1}) of green gram were recorded significantly the highest under treatment T_8 Foliar spray of Jeevamrut @ 10% at 30 and 45 DAS. It was followed by and at par with other treatments T_6 Foliar spray of Chitosan @ 5% at 30 and 45 DAS and T_5 Foliar spray of Panchagavya @ 3% at 30 and 45 DAS. Rabani and Cheatsazan (2021) [18], Singh *et al*. (2023) [19] and Patil *et al*. (2024) [15].

3.6 Seed Yield (kg ha^{-1})

The highest seed yield of green gram was recorded in T_8 (Jeevamrut @10%) with 1238 kg ha^{-1} at harvest. T_6 (Chitosan @5%) produced a seed yield of 1153 kg ha^{-1}, while T_5 (Panchagavya @3%) yielded 1134 kg ha^{-1}, both of which were statistically comparable to the top treatment. The lowest seed yield was observed in the control plot, with 827 kg ha^{-1}. Foliar application of bio-stimulants that better nutrient absorption leads to more robust vegetative growth and improved flowering and seed development Similar findings were presented by Bhargavi (2023) [3], Singh *et al*. (2023) [19] and Patil *et al*. (2023) [16].

3.7 Straw Yield (kg ha^{-1})

The highest straw yield of green gram was recorded in T_8 (Jeevamrut @10%) with 1891 kg ha^{-1} at harvest. T_6 (Chitosan @5%) and T_5 (Panchagavya @3%) produced straw yields of 1786 kg ha^{-1} and 1760 kg ha^{-1} respectively, both statistically comparable to the top-performing treatment. The lowest straw yield (1477 kg ha^{-1}) was observed in the control plot. The use of bio-stimulants in this study increased leaf area, which enhanced the plant's ability to capture sunlight, thereby improving photosynthesis. This led to better growth attributes such as increased plant height, greater number of branches per plant, and higher dry matter accumulation, all contributing to an improved straw yield. Similar results were obtained by Abu-Muriefah (2013) [1], Chongre *et al*. (2020) [5] and Patel *et al.* (2021) [13].

3.8 Biological Yield (kg ha^{-1})

The highest biological yield of green gram was recorded in T_8 (Jeevamrut @10%) with 3129 kg ha^{-1} at harvest. T_6 (Chitosan @ 5%) and T_5 (Panchagavya @ 3%) produced biological yields of 2939 kg ha^{-1} and 2894 kg ha^{-1}, respectively, both statistically comparable to the top treatment. The lowest biological yield was observed in the control plot, with 2304 kg ha^{-1}. Similar results were obtained by Abu-Muriefah (2013) [1], Chongre *et al.* (2020) [5] and Patel *et al*. (2021) [13].

3.9 Harvest Index (%)

The harvest index of green gram was only minimally affected by the foliar application of various bio-stimulants during the *Kharif* season of 2024. The average harvest index recorded during the study was 38.50%. Different bio-stimulant foliar sprays showed little to no significant impact on the harvest index percentage of green gram, with values ranging from 35.67 to 39.56% for the *Kharif* crop. Similar findings were presented by Makwana *et al*. (2020) [8] and Patil *et al*. (2023) [16].

Table 1: Periodical growth attributes of green gram as influenced by foliar application of different bio-stimulants:

Tr. No.	Treatment	Plant height (cm)			Plant spread (cm)				No. of branches plant^{-1}			Dry matter (g) plant^{-1}			
		30 DAS	45 DAS	60 DAS	30 DAS	45 DAS	60 DAS	At harvest	30 DAS	45 DAS	60 DAS	30 DAS	45 DAS	60 DAS	At harvest
T_1	Absolute control	41.34	46.73	49.18	17.93	27.59	30.18	27.89	4.54	4.78	6.51	5.12	11.45	21.78	22.05
T_2	Water spray	41.47	47.01	51.41	19.72	29.18	32.08	30.53	3.58	6.21	7.01	5.20	13.54	22.97	23.60
T_3	Foliar spray of Cow urine @ 10%	42.70	50.92	56.33	20.94	31.23	35.56	32.43	5.53	6.70	7.87	5.40	14.27	24.14	24.77
T_4	Foliar spray of Vermiwash @ 20%	43.04	52.03	57.30	21.25	33.46	37.56	33.17	5.84	6.97	8.24	5.58	14.95	24.61	24.85
T_5	Foliar spray of Panchagavya @ 3%	43.38	54.61	58.46	22.58	35.16	37.86	33.84	6.15	7.77	9.64	5.71	15.27	25.21	25.47
T_6	Foliar spray of Chitosan @ 5%	44.43	56.68	60.28	23.94	35.20	38.36	34.29	6.40	7.83	9.70	5.84	15.53	25.30	25.53
T_7	Foliar spray of Amrut pani @ 5%	42.55	50.17	54.45	20.41	30.97	35.24	32.26	5.11	6.44	7.64	5.33	14.10	23.43	24.10
T_8	Foliar spray of Jeevamrut @ 10%	45.32	57.94	62.81	21.14	36.77	40.55	36.71	6.57	8.64	10.07	6.57	16.57	27.23	27.57
T_9	Foliar spray of Sea weed extract @ 2%	42.81	51.45	57.12	21.18	32.78	36.94	32.99	5.64	6.81	8.11	5.52	14.62	24.58	24.82
T_{10}	Foliar spray of Waste decomposer @ 25%	42.25	49.85	53.99	20.02	29.85	35.26	32.10	5.12	6.33	7.50	5.24	13.47	23.24	24.04
T_{11}	Foliar spray of Kunapajala @ 5%	42.19	48.66	52.18	19.84	29.43	34.56	31.83	4.96	6.26	7.03	5.23	13.34	23.14	23.61
	S.E m ±	1.82	1.62	1.68	1.86	1.10	1.36	1.06	1.14	0.31	0.50	0.98	0.52	0.71	0.77
	C.D. at 5%	NS	4.78	4.95	NS	3.25	4.03	3.15	NS	0.91	1.48	NS	1.53	2.10	2.27
	General Mean	42.80	51.39	55.77	20.81	31.96	35.83	32.55	5.40	6.73	8.06	5.52	14.28	24.15	24.58

Note: 1. Soil application - at the time of sowing as basal dose
2. Two foliar sprays given at flowering and pod filling stage

Table 2: Yield attributing characters, seed yield, straw yield, biological yield and harvest index as influenced by foliar application of different bio-stimulant

Tr. No	Treatment	No. of clusters plant^{-1}	No. of pods plant^{-1}	Weight of pods plant^{-1} (g)	No. of seeds pods^{-1}	No. of seeds plant^{-1}	Weight of seed plant^{-1} (g)	1000 seed weight (g)	Yield (kg ha^{-1})			Harvest index (%)
									Seed	Straw	Biological yield	
T_1	Absolute control	5.64	22.17	10.84	6.47	174	9.22	38.39	827	1477	2304	35.91
T_2	Water spray	6.23	23.54	11.66	6.64	187	10.02	40.01	841	1517	2358	35.67
T_3	Foliar spray of Cow urine @ 10%	7.04	25.04	12.60	7.37	207	10.72	40.92	1047	1644	2691	38.91
T_1	Foliar spray of Vermiwash @ 20%	7.24	25.58	13.20	7.57	212	11.23	41.13	1081	1684	2765	39.08
T_5	Foliar spray of Panchagavya @ 3%	7.97	27.07	13.94	8.84	214	11.85	42.94	1134	1760	2894	39.18
T_6	Foliar spray of Chitosan @ 5%	8.53	27.37	14.23	8.96	217	12.10	43.02	1153	1786	2939	39.23
T_7	Foliar spray of Amrut pani @ 5%	6.94	24.87	12.57	7.28	203	10.69	40.51	1036	1641	2677	38.71
T_8	Foliar spray of Jeevamrut @ 10%	8.77	28.57	15.01	10.17	221	12.76	45.94	1238	1891	3129	39.56
T_9	Foliar spray of Sea weed extract @ 2%	7.15	25.35	12.85	7.45	214	10.93	40.78	1065	1638	2703	39.39
T_{10}	Foliar spray of Waste decomposer @ 25%	6.53	24.54	12.10	7.20	198	10.29	40.48	1027	1623	2650	38.74
T_{11}	Foliar spray of Kunapajala @ 5%	6.33	23.94	11.86	6.90	189	10.09	40.32	1017	1579	2596	39.17
	S.E m ±	0.47	0.93	0.60	0.47	7.11	0.40	1.67	38.74	60.51	80.07	-
	C.D. at 5%	1.40	2.76	1.77	1.38	20.97	1.19	NS	114.31	178.52	236.20	-
	General Mean	7.06	25.27	12.74	7.65	203	10.84	41.25	1042	1658	2700	38.50

4. Conclusion

The field experiment conducted during the *Kharif* season 2024 at the Organic Farming Research and Training Centre, MPKV, Rahuri, demonstrated that foliar application of bio-stimulants significantly improved the growth, yield, quality, soil health, microbial activity, and economic returns of green gram under organic farming conditions.

Application of recommended dose of fertilizer N:P2O5:K2O 20:40:00 kg ha^{-1} through vermicompost 700 kg ha^{-1} and phosphate rich organic manure (PROM) 400 kg ha^{-1} at the time of sowing and Treatment T_8, involving the foliar application of Jeevamrut @10% at flowering and pod initiation stage, proved to be superior and effective in enhancing growth parameters, yield traits, nutrient uptake, protein and microbial populations of soil, while treatment T_6 (Chitosan @5%) and T_5 (Panchagavya @3%) also performed well and were statistically at par with the treatment T_8 (Jeevamrut @10%).

The foliar application of Jeevamrut @10% resulted in the highest gross monetary returns of ₹1,25,658 ha^{-1}, net monetary returns of ₹83,108 ha^{-1}, and a benefit-cost ratio (B:C) of 2.95.

However, the foliar application of Vermiwash @ 10% and foliar application of Panchagavya @3% also recorded higher monetary returns, which were statistically at par with those obtained from Jeevamrut @ 10%.

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References

1. Abu-Muriefah SS. Effect of chitosan on common bean (*Phaseolus vulgaris* L.) plants grown under water stress conditions. Int Res J Agric Sci Soil Sci. 2013;3(6):192-199.
2. Anonymous. Green gram Outlook - September to October 2024 report from PJTSAU. 2024.
3. Bhargavi K, Sumathi V, Krishna Reddy G, Umamahesh V. Influence of organic manures and organic sprays on productivity and economics of summer greengram (*Vigna radiata* L.). Int J Environ Clim Change. 2023;13(10):3111-3116.
4. Chaudhari SN, Sharma R, Patel A, Verma K. Green gram: Nutritional profile, cropping value and utilization. Indian J Agron. 2024;69(2):115-120.
5. Chongre S, Mondal R, Biswas S, Munshi A, Mondal R, Pramanick M. Effect of liquid manure on growth and yield of summer green gram (*Vigna radiata* L. Wilczek). Curr J Appl Sci Technol. 2020;38(6):1-7.
6. El-Tanahy AMM, Mahmoud AR, Abde-Mouty MM, Ali AH. Effect of chitosan doses and nitrogen sources on the growth, yield and seed quality of cowpea. Aust J Basic Appl Sci. 2012;6(4):115-121.
7. Kumar YP, Singh S, Shukla PK, Shekar BS. Influence of spacing and organic nutrients spray on growth and yield of chickpea (*Cicer arietinum* L.). Pharma Innov. 2020;5(2):26-37.
8. Makwana SN, Patel KB, Patel RD. Effect of bio-fertilizers and nitrogen on growth and yield attributes of bitter gourd (*Momordica charantia* L.). Int J Curr Microbiol Appl Sci. 2020;9(5):2503-2510.
9. Mohammad AR, Latif A. Effects of chitosan seed-priming on germination and early growth of lentil (*Lens culinaris*) under salinity stress. Res Crops. 2012;14(2):489-491.
10. Mondal MMA, Puteh AB. Effect of foliar application of chitosan on growth and yield of Indian spinach (*Basella alba* L.). Res Crops. 2011;14(1):253-256.
11. Mukherjee K, Sharma A, Das S. Organic farming: A sustainable approach to soil health, food safety and environmental protection. Indian J Agron. 2022;67(4):305-310.
12. Panse VG, Sukhatme PV. Statistical Methods for Agricultural Workers. New Delhi: ICAR Publication; 1985. p. 87-89.
13. Patel SP, Malve SH, Chavda MH, Vala YB. Effect of Panchagavya and Jeevamrut on growth, yield attributes and yield of summer pearl millet. Pharma Innov J. 2021;SP-10(12):105-109.
14. Patela M, Gangwar B. Green gram (*Vigna radiata* L.): Importance, production, and role in Indian agriculture. J Indian Agron. 2023;58(3):245-250.
15. Patil AH, Pawar RM, Sawant DM. Influence of manurial liquids and micronutrients on yield, nutrient uptake and nutrient use efficiency in chickpea. Tanz Res J. 2024;10(2):1869-7720.
16. Patil B, Rajemahadik V, Bodake P, Kasture M, More V, Kale V, *et al*. Effect of irradiated chitosan on growth and yield of green gram (*Vigna radiata* L. Wilczek) in Konkan region of Maharashtra. Pharma Innov J. 2023;12(12):3148-3152.
17. Patil SV, Halikatti SI, Hiremath SM, Babalad HB, Sreenivasa MN, Hebsur NS, *et al*. Effect of organics on growth and yield of chickpea (*Cicer arietinum* L.) in vertisols. Karnataka J Agric Sci. 2012;25(3):326-331.
18. Rabani V, Cheatsazan H. Chitosan seed priming improves germination traits and enhances yield and root development of faba bean (*Vicia faba* L.). J Agric Sci Technol B. 2021;11:53-60.
19. Singh A, Kumar P, Sharma R. Effect of natural farming components on growth and yield attributes of black gram (*Vigna mungo* L.). J Sustain Agric. 2023;45(2):150-159.
20. Spehia RS, Devi M, Singh J, Sharma S, Negi A, Singh S. Lettuce growth and yield in Hoagland solution with an organic concoction. Int J Veg Sci. 2018;24(6):557-566.
21. Yogananda M, Jaybhay SS, Patil RB. Performance of cowpea (*Vigna unguiculata*) under organic production system in southern dry zone of Karnataka. Legume Res. 2015;38(5):710-715.