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Response of organic manures on yield and economics of Chickpea (*Cicer arietinum* L.) in Bundelkhand region

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Abstract

A field experiment was conducted at Organic Research Farm Karguwanji, Institute of Agricultural Science, Bundelkhand University Jhansi (Uttar Pradesh) during the *Rabi* season of 2023-24 with the objective to response of organic manures on growth parameters of Chick pea (*Cicer arietinum* L.) in Bundelkhand region. The experiment was laid out in a Randomized Block Design with nine treatment combinations and three replications. The treatment consisted of organic manures treatment viz., T₀-Control (RDF), T₁-FYM (100%), T₂-Vermicompost (100%), T₃-Jeevamrut (100%), T₄-FYM (50%) + Vermicompost (50%), T₅-Vermicompost (50%) + Jeevamrut (50%), T₆-FYM (50%) + Jeevamrut (50%), T₇-FYM (33%) + Vermicompost (33%) + Jeevamrut (34%) and T₈- Trichoderma (50%) + Neem cake (50%). The growth parameters viz., plant population (26.27 plants m⁻²), plant height (42.73cm), number of branches (11.05 plant⁻¹), dry matter accumulation plant⁻¹ (23.23 g), leaf area (458.02 cm² at 60 DAS), leaf area index (1.27 at 60 DAS) and CGR (0.222 g plant⁻¹ day⁻¹) at harvest of chick pea with FYM @ 33% + vermicompost @ 33% + Jeevamrut @ 34% was significant superior found as compared to other organic manure treatments. The yield attributes and yield viz., no. of pods (74.25 plant⁻¹), no. of seeds (1.44 pod⁻¹), 100 seed weight (20.70g) and nutrient content and uptake of chick pea with FYM @ 33% + vermicompost @ 33% + Jeevamrut @ 34% were significantly higher as compared to other organic manure treatments. Result also revealed that the total number of nodules (30.75 plant⁻¹), number of effective nodules plant⁻¹ (27.00 plant⁻¹), fresh weight of nodules (615.00 mg), dry weight of nodules (104.55 mg) significantly higher than the control. The seed, straw and biological yield of chick pea with FYM @ 33% + vermicompost @ 33% + Jeevamrut @ 34% were significantly higher as compared to other organic manure treatments. The gross (₹108742ha⁻¹), net return (₹84556 ha⁻¹) and B:C ratio (3.50) of chickpea with FYM @ 33% + vermicompost @ 33% + Jeevamrut @ 34% were significantly higher as compared to other treatments.

Keywords: Chickpea, organic manures, yields, nutrients contents and economics

Introduction

Chickpea (*Cicer arietinum* L.) is an important *Rabi* grain legume which is known as Bengal gram, chana and horse gram. Chickpea has a very good nutritive food legume having 21% protein, 2.9% to 7.4% of total lipid concentration and 334 to 437 Kcal/100g energy. On an average chickpea has two to three times more protein content than cereal crops. Globally, chickpea ranks third after beans and peas with an annual production of over 18.1 million tonnes from an area of 18.9 million ha (FAO, 2023) [6]. South and South-East Asia dominates in chickpea production with 80% of regional contribution. India is the single largest producer of chickpea in the world, accounting for 75% (13.75 million tonnes) of the total production from an area of 10.91 million ha. The productivity of chickpea is 1260 kg ha⁻¹ as compared to the world average of 957 kg ha⁻¹. Maharashtra, Rajasthan and Madhya Pradesh occupied 3rd highest area with 2.83mha (25.97%), 2.25mha (20.65%) and 2.03mha (18.59%), respectively and 2nd highest production after Maharashtra 3.28 million tonnes (23.82%) with 3.03 million tonnes (22.05%) and 2.65 million tonnes (19.28%), respectively (DAC & FW, 2023) [4]. Madhya Pradesh has highest productivity of chickpea with 1494 kg ha⁻¹ (DAC & FW, 2023) [4].

Organic sources of nutrient are widely recognized as a sustainable system and there is also a growing interest from consumers in organic food because of the perceived advantages to the environment and human health. Every year the area of organic agriculture in the world is increasing. Soil health is the capacity of a soil to function within ecosystem boundaries to

sustain biological productivity, maintain environmental quality, and promote plant and animal health” (Doran and Parkin, 1994) [5]. Several studies have reported that a positive effect of organic farming on soil health including microbial community traits (Lori *et al.*, 2017) [13]. The use of intensive crops, manures and chemical plant protection products causes changes in the soil environment in Agro-ecosystems (Gajda and Przewłoka, 2012) [7]. The excess use of inorganic fertilizer has led to the entry of harmful compounds into food chain and their harmful effect on microorganism so it is believed that application of organic fertilizer can solve many of these problems as this system is believed to maintain soil productivity and enhancing natural processes and cycles in harmony with environment.

Materials and Methods

A field experiment was conducted at Organic Research Farm Karguwanji, Institute of Agricultural Science, Bundelkhand University Jhansi (Uttar Pradesh) during the *Rabi* season 2023-24 and is situated in the semi-arid, at 25°27'31" N latitude and 78°34'47" E longitude at an altitude of 258 meters above mean sea level and comes under semi arid condition. The soil of the field is derived from sandy loam in texture, low in organic carbon (0.45%), available nitrogen (137 kg ha⁻¹) and medium in available phosphorous (13.12 kg ha⁻¹) and medium in available potassium (232 kg ha⁻¹) with neutral in soil reaction (pH 7.4). The average rainfall is about 400 mm, most of which is received from South-West monsoon during July to September. The amount of total rainfall received during the crop period was 575.5 mm. The experiment comprised of 9 treatments viz., T₀-Control (RDF), T₁-FYM (100%), T₂-Vermicompost (100%), T₃-Jeevamrut (100%), T₄-FYM (50%) + Vermicompost (50%), T₅-Vermicompost (50%) + Jeevamrut (50%), T₆-FYM (50%) + Jeevamrut (50%), T₇-FYM (33%) + Vermicompost (33%) + Jeevamrut (34%) and T₈-Trichoderma (50%) + Neem cake (50%). The experimental was laid out in randomized block design with three replications. The Chickpea hybrid 'JG-16' was sown. The recommended dose of fertilizer (20:60:20 N: P: K kg ha⁻¹) was applied in control, fertilizer was drilled and broadcasted at the time of sowing. For calculation of different indices five representative plants from each plot were selected randomly and tagged for observing the effect of different treatments on plant characters. All biometric observations were recorded periodically on these randomly selected and tagged plants.

Results and Discussion

1. Growth parameters

Growth parameters of chickpea viz., plant height, number of branches and dry matter accumulation plant⁻¹ of chickpea were studied periodically at different stages 20, 40, 60, 80 DAS and at harvest in the present research observed that significant increase in plant height (cm), number of branches and dry matter accumulation plant⁻¹ (g) was noticed due to application of organic manures showed in table 1 and 2. Plant height, number of branches plant⁻¹ and dry matter accumulation plant⁻¹ were significantly affected due to organic fertilizers. Data in table 1 indicated that progressive increase in those characters with the T₇ (FYM @ 33% + vermicompost @ 33% + jeevamrut@34%). This increase was due to additional supply of nutrients through application of organic manures which increased the nutrients uptake in plant which in turn helped in increased plant height, number of branches, dry matter production. These results are in confirmation with the findings of Haridha *et al.*, (2020) [8] and Patel *et al.*, (2021) [15].

Among the different treatments FYM @ 33% + vermicompost

@ 33% + jeevamrut@34% was recorded significantly higher value of leaf area, leaf area index CGR and RGR (Table 2). Size and number of leaves is responsible for leaf area and leaf area index. Significant effect on leaf area and leaf area index at 60 DAS with the FYM @ 33% + vermicompost @ 33% + jeevamrut@34%. At 20 and 40 DAS were not show significant effect, but higher leaf area and leaf area index also recorded in T₇. Application of FYM @ 33% + vermicompost @ 33% + jeevamrut@34% increased the leaf area due to positive effect on cell division and cell elongation leading to enhanced leaf growth in present research. CGR and RGR depends on dry matter accumulation plant⁻¹. These results are in accordance with the findings of Kumar *et al.*, (2022) [10], Vaishnavi *et al.*, (2021) [20] and Raja and Singh, (2022) [16].

Application of FYM @ 33% + vermicompost @ 33% + jeevamrut@34% increase the synthesis of photo pigments. Significantly increase in total nodules plant⁻¹, effective nodules plant⁻¹, fresh and dry weight of nodules at flowering were observed under (T₇) FYM @ 33% + vermicompost @ 33% + jeevamrut@34% showed in table 4.9. Due to the application of additional dose of nitrogen and phosphorus through organic manures which influence better root development of the plant and it might lead to profuse nodulation on account of enhance in the rhizobia activity in the rhizosphere under the influence of (T₇) FYM @ 33% + vermicompost @ 33% + jeevamrut@34% which in turn resulted in the formation of more number and effective nodules Singh *et al.*, (2022) [18]. These results are in accordance with the findings of Kumar *et al.*, (2022) [10], Singh *et al.*, (2022) [18] and Sridhara *et al.*, (2023) [19].

Yield attributes and yield

Organic manures are new generation manures which contain macro and micro nutrients in different ratio. These manures are highly nutrient content for organic manures Mishra *et al.*, (2023) [14]. The result present research pods plant⁻¹, seeds pod⁻¹ and seed index (Table 3) showed significant effect due to treatment (T₇) FYM @ 33% + vermicompost @ 33% + jeevamrut@34% chickpea. The increase in yield attributing parameters such as number of pods plant⁻¹, number of seeds pod⁻¹ and seed index. Similar results were obtained Sabourifard *et al.*, (2023) [17]. This was attributed due to higher chlorophyll content with enhanced photosynthetic activity and higher uptake of nutrients and there by increased plant dry matter production in the pod setting stage which might have improved and increased the pod development and number of pods plant⁻¹ and finally contributed for higher productivity. Adequate supply of N, P and K through application of organic manures would have increased its uptake and increased the dry matter. These results are in confirmation with the results of Singh *et al.*, (2022) [18], Sabourifard *et al.*, (2023) [17] and Sridhara *et al.*, (2023) [19].

Seed, straw and biological yield (kg ha⁻¹)

The seed yield, straw yield and biological yield of chickpea was significantly varied by application of organic manures which is presented in table 3. Maximum seed yield, straw yield and biological yield 1759 kg ha⁻¹, 2373 kg ha⁻¹ and 4132 kg ha⁻¹ was recorded with the (T₇) FYM (33%) + Vermicompost (33%) + Jeevamrut (34%) which proved superiority among all treatments. which was at par with treatment T₆, T₈ and T₅, while the minimum seed yield, straw yield and biological yield (1406 kg, 2119 kg and 3525 kg ha⁻¹) of chickpea was observed under T₀ control. The quantum difference in seed yield was 353 kg ha⁻¹ which in terms of percentage was 20.06% over control. while minimum straw yield was in (T₀ %) control. Similar results were

obtained by Singh *et al.*, (2022)^[18], Sabourifard *et al.*, (2023)^[17] and Sridhara *et al.*, (2023)^[19]. The slow releasing of organic manures positively impacts on seed yield, straw yield and biological yield due to optimum of availability all nutrients of crop growth might have caused efficient translocation of photosynthates from source to sink. Similar results are in close confirmation with the findings of Singh *et al.*, (2022)^[18], Sabourifard *et al.*, (2023)^[17] and Sridhara *et al.*, (2023)^[19].

2. Nutrient content and uptake

Significantly higher nutrient content (NPK %) in seed and straw recorded with (T₇) FYM @ 33% + vermicompost @ 33% + jeevamrut@34% in table 3. These result mainly due to easily availability and absorption of nutrients under application of organics without spending much energy for their transport and without any loss in transit. Similar results were also reported by Laharia *et al.*, (2013)^[12] in soybean and Javiya *et al.*, (2022)^[9] on chick pea.

Application of (T₇) FYM @ 33% + vermicompost @ 33% + jeevamrut@34% has shown significant effect on nutrients uptake by crop. Higher nutrient uptake by seed and straw with treatment (T₇) FYM @ 33% + vermicompost @ 33% + jeevamrut@34%. Nutrient uptake (kg ha⁻¹) is multiple of nutrients content and yield (seed and straw yield). Hence, availability and absorption of nutrient is important for higher

nutrient uptake. Similar results of increased uptake of nutrient recorded by Laharia *et al.*, (2013)^[12] in soybean and Javiya *et al.*, (2022)^[9] on chick pea.

Economics

The cost of cultivation increased with the application of organic manures to the crops in compared to control treatment in chick pea crop (Table 1). Maximum cost of cultivation of ₹ 26013 ha⁻¹ was recorded with (T₂) Vermicompost (100%) followed by (T₄) FYM (50%) + Vermicompost (50%) (₹ 25013 ha⁻¹). While, Jeevamrut @ 100% (T₃) resulted in minimum cost of cultivation is ₹ 22513 ha⁻¹. The maximum gross return and net return of ₹ 142935 ha⁻¹ and ₹ 84556 ha⁻¹ was obtained in the treatment of T₇: FYM (33%) + Vermicompost (33%) + Jeevamrut (34%) than rest of other treatments. While, the lowest gross returns and net return were obtained from T₀: Control (RDF) treatment (₹ 64573 ha⁻¹ and ₹ 88139 ha⁻¹). Significantly higher B:C ratio 3.50 recorded with FYM (33%) + Vermicompost (33%) + Jeevamrut (34%) and application of FYM (50%) + Jeevamrut (50%) (3.42). These treatments were significantly superior to rest of the treatments. While T₀: Control (RDF) recorded lowest B:C ratio. Corroborative findings were also reported by the findings of Amareswari and Sujathamma, (2015)^[2], Kumbar and Devakumar (2016)^[11] and Akhila (2017)^[1].

Table 1: Effect of organic manures on plant population (plants m⁻²), plant height (cm), number of branches plant⁻¹ and dry matter accumulation plant⁻¹(g) at different stages

Treatments	Plant population (plants m ⁻²)		Plant height (cm)					Number of branches plant ⁻¹				Dry matter accumulation plant ⁻¹ (g)				
	15DAS	At harvest	20 DAS	40 DAS	60 DAS	80 DAS	At harvest	20 DAS	40 DAS	60 DAS	At harvest	20 DAS	40 DAS	60 DAS	80 DAS	At harvest
T ₀ : Control (RDF)	24.17	22.25	16.97	23.57	28.83	38.60	37.82	2.47	4.21	8.74	8.89	1.13	2.61	6.06	12.63	18.19
T ₁ : FYM (100%)	24.22	22.29	17.02	23.93	29.14	38.87	38.48	2.30	4.31	8.85	9.03	1.15	2.62	6.09	12.69	18.28
T ₂ : Vermicompost (100%)	24.23	22.33	17.15	24.22	32.56	38.93	38.57	2.31	4.34	9.57	9.57	1.16	2.66	6.27	13.32	18.62
T ₃ : Jeevamrut (100%)	24.30	22.36	17.39	24.39	32.88	39.73	39.38	2.47	4.39	9.72	9.88	1.18	2.74	7.73	14.17	19.81
T ₄ : FYM (50%) + Vermicompost (50%)	24.23	22.45	17.48	24.52	33.64	39.92	39.57	2.48	4.45	10.18	10.81	1.18	2.78	7.78	14.54	20.33
T ₅ : Vermicompost (50%) + Jeevamrut (50%)	24.51	22.60	18.44	24.79	34.90	43.27	42.07	2.62	4.87	10.44	10.86	1.19	3.25	8.74	16.51	23.14
T ₆ : FYM (50%) + Jeevamrut (50%)	24.31	22.58	17.76	24.75	34.75	42.79	40.72	2.56	4.66	10.39	10.83	1.19	2.81	8.17	15.74	22.02
T ₇ : FYM (33%) + Vermicompost (33%) + Jeevamrut (34%)	24.22	22.67	18.54	26.27	35.81	44.40	42.73	2.64	5.21	10.47	11.05	1.20	3.26	8.77	16.57	23.23
T ₈ : Trichoderma (50%) + Neem cake (50%)	24.45	22.50	17.69	24.69	34.61	42.62	40.56	2.55	4.62	10.22	10.82	1.18	3.09	8.01	15.61	21.83
S.Em(±)	0.12	0.08	0.57	0.09	0.13	0.16	0.15	0.08	0.22	0.04	0.04	0.04	0.09	0.03	0.06	0.08
CD at 5%	NS	0.25	NS	0.28	0.39	0.48	0.46	NS	NS	0.11	0.12	NS	0.27	0.09	0.17	0.25

Table 2: Effect of organic manures on leaf area(cm²), leaf area index, CGR (g plant⁻¹ day⁻¹) and RGR(g g⁻¹ day⁻¹) at different stages

Treatments	Leaf area (cm ²)			Leaf area index			CGR (g plant ⁻¹ day ⁻¹)				RGR (g g ⁻¹ day ⁻¹)			
	20 DAS	40 DAS	60 DAS	20 DAS	40 DAS	60 DAS	20-40 DAS	40-60 DAS	60-80 DAS	80DAS-At harvest	20-40 DAS	40-60 DAS	60-80 DAS	At harvest
T ₀ : Control (RDF)	94.50	189.60	393.80	0.27	0.53	1.10	0.074	0.173	0.329	0.185	0.042	0.042	0.037	0.012
T ₁ : FYM (100%)	98.06	193.23	422.77	0.28	0.54	1.18	0.074	0.174	0.330	0.186	0.041	0.042	0.037	0.012
T ₂ : Vermicompost (100%)	98.25	196.60	427.75	0.28	0.55	1.20	0.075	0.181	0.353	0.177	0.041	0.043	0.038	0.011
T ₃ : Jeevamrut (100%)	100.88	202.35	442.30	0.29	0.57	1.24	0.078	0.250	0.322	0.188	0.042	0.052	0.030	0.011
T ₄ : FYM (50%) + Vermicompost (50%)	101.08	202.75	442.18	0.29	0.57	1.24	0.080	0.250	0.338	0.193	0.043	0.051	0.031	0.011
T ₅ : Vermicompost (50%) + Jeevamrut (50%)	104.92	208.10	447.91	0.30	0.58	1.25	0.103	0.275	0.389	0.221	0.050	0.050	0.032	0.011
T ₆ : FYM (50%) + Jeevamrut (50%)	102.33	203.25	444.55	0.29	0.57	1.24	0.081	0.268	0.379	0.209	0.043	0.053	0.033	0.011
T ₇ : FYM (33%) + Vermicompost (33%) + Jeevamrut (34%)	109.25	214.77	458.02	0.31	0.60	1.27	0.103	0.276	0.390	0.222	0.050	0.050	0.032	0.011
T ₈ : Trichoderma (50%) + Neem cake (50%)	101.13	202.85	443.68	0.29	0.57	1.24	0.095	0.246	0.380	0.207	0.048	0.048	0.033	0.011
S.Em(±)	3.06	6.21	1.67	0.01	0.02	0.00	0.003	0.004	0.001	0.001	0.001	0.001	0.002	0.001
CD at 5%	NS	NS	5.01	NS	NS	0.01	0.008	0.011	0.004	0.002	0.003	0.004	NS	NS

Table 4.3: Effect of organic manures on yield attributes and yield of chickpea

Treatments	Total number of nodules plant ⁻¹	Number of effective nodules plant ⁻¹	Fresh weight of nodules (mg)	Dry weight of nodules (mg)	No. of pods plant ⁻¹	No. of seedspod ⁻¹	100 Seed weight(g)	Seed yield (kg ha ⁻¹)	Straw yield (kg ha ⁻¹)	Biological yield (kg ha ⁻¹)	Harvest Index (%)
T ₀ : Control (RDF)	24.50	21.50	490.00	79.63	60.13	1.26	19.90	1406	2119	3525	
T ₁ : FYM (100%)	25.50	22.25	510.00	84.15	60.92	1.27	20.10	1520	2133	3653	39.91
T ₂ : Vermicompost (100%)	27.25	23.00	545.00	87.20	62.75	1.31	20.10	1583	2196	3779	41.63
T ₃ : Jeevamrut (100%)	28.13	23.63	562.50	90.00	64.75	1.32	20.20	1598	2211	3809	41.90
T ₄ : FYM (50%) + Vermicompost (50%)	29.21	26.71	564.18	92.27	64.94	1.35	20.30	1602	2215	3817	41.96
T ₅ : Vermicompost (50%) + Jeevamrut (50%)	29.62	23.35	590.83	100.97	73.00	1.42	20.60	1713	2327	4040	41.97
T ₆ : FYM (50%) + Jeevamrut (50%)	29.50	26.75	584.00	97.80	70.57	1.38	20.40	1659	2272	3931	42.43
T ₇ : FYM (33%) + Vermicompost (33%) + Jeevamrut (34%)	30.75	27.00	615.00	104.55	74.25	1.44	20.70	1759	2373	4132	42.21
T ₈ : Trichoderma (50%) + Neem cake (50%)	29.40	26.25	582.50	97.58	70.29	1.36	20.40	1653	2267	3920	42.58
S.Em(±)	0.11	0.10	2.20	0.37	0.26	0.01	0.08	6.29	50.33	54.33	42.18
CD at 5%	0.33	0.29	6.58	1.10	0.79	0.02	0.23	18.87	150.90	162.89	0.50
											NS

Table 4: Effect of organic manures on nutrient content (NPK %) in seed and straw of chickpea

Treatments	Nutrient content in seed (%)			Nutrient content in straw (%)			Total Nutrient content (%)		
	N	P	K	N	P	K	N	P	K
T ₀ : Control (RDF)	2.73	0.37	0.56	0.57	0.23	1.08	3.30	0.60	1.64
T ₁ : FYM (100%)	2.75	0.38	0.57	0.58	0.24	1.10	3.33	0.62	1.67
T ₂ : Vermicompost (100%)	2.77	0.44	0.58	0.63	0.25	1.21	3.40	0.69	1.79
T ₃ : Jeevamrut (100%)	2.91	0.47	0.58	0.64	0.25	1.21	3.55	0.72	1.79
T ₄ : FYM (50%) + Vermicompost (50%)	2.91	0.47	0.59	0.64	0.25	1.25	3.55	0.72	1.84
T ₅ : Vermicompost (50%) + Jeevamrut (50%)	3.17	0.48	0.73	0.97	0.27	1.70	4.14	0.75	2.43
T ₆ : FYM (50%) + Jeevamrut (50%)	3.06	0.48	0.64	0.66	0.27	1.34	3.72	0.75	1.98
T ₇ : FYM (33%) + Vermicompost (33%) + Jeevamrut (34%)	3.43	0.54	0.79	1.10	0.33	1.73	4.53	0.87	2.52
T ₈ : Trichoderma (50%) + Neem cake (50%)	3.05	0.48	0.64	0.66	0.27	1.25	3.71	0.75	1.89
S.Em (±)	0.09	0.01	0.02	0.02	0.01	0.04	0.11	0.02	0.06
CD at 5%	0.27	0.04	0.06	0.07	0.02	0.12	0.34	0.06	0.18

Table 5: Effect of organic manures on nutrient uptake (NPKkg ha⁻¹) by seed and straw of chickpea

Treatments	Nutrient uptake by seed (kg ha ⁻¹)			Nutrient uptake by straw (kg ha ⁻¹)			Total nutrient uptake (kg ha ⁻¹)		
	N	P	K	N	P	K	N	P	K
T ₀ : Control (RDF)	38.39	5.20	7.87	12.09	4.88	22.92	50.48	10.08	30.79
T ₁ : FYM (100%)	41.81	5.78	8.67	12.40	5.13	23.51	54.21	10.91	32.18
T ₂ : Vermicompost (100%)	43.85	6.97	9.18	13.85	5.50	26.60	57.70	12.46	35.78
T ₃ : Jeevamrut (100%)	46.51	7.51	9.27	14.16	5.53	26.77	60.67	13.04	36.04
T ₄ : FYM (50%) + Vermicompost (50%)	46.62	7.53	9.45	14.19	5.54	27.71	60.81	13.07	37.16
T ₅ : Vermicompost (50%) + Jeevamrut (50%)	54.31	8.22	12.51	22.63	6.30	39.66	76.94	14.52	52.16
T ₆ : FYM (50%) + Jeevamrut (50%)	50.75	7.96	10.61	15.01	6.14	30.48	65.76	14.10	41.09
T ₇ : FYM (33%) + Vermicompost (33%) + Jeevamrut (34%)	60.35	9.50	13.90	26.13	7.84	41.10	86.48	17.34	55.00
T ₈ : Trichoderma (50%) + Neem cake (50%)	50.43	7.94	10.58	14.98	6.13	28.36	65.40	14.06	38.94
S.Em(±)	1.59	0.23	0.34	0.88	0.30	1.60	2.46	0.53	1.94
CD at 5%	4.77	0.69	1.01	2.65	0.89	4.81	7.39	1.59	5.81

Table 6: Effect of organic manures on yield (kg ha⁻¹) and economics of chickpea

Treatments	Cost of cultivation (₹ha ⁻¹)	Gross returns (₹ha ⁻¹)	Net returns (₹ha ⁻¹)	B:C ratio
T ₀ : Control (RDF)	23566	88139	64573	2.74
T ₁ : FYM (100%)	24013	94418	70405	2.93
T ₂ : Vermicompost (100%)	26013	98194	72181	2.77
T ₃ : Jeevamrut (100%)	22513	99093	76580	3.40
T ₄ : FYM (50%) + Vermicompost (50%)	25013	99334	74321	2.97
T ₅ : Vermicompost (50%)+ Jeevamrut (50%)	24263	105985	81722	3.37
T ₆ : FYM (50%)+ Jeevamrut (50%)	23263	102724	79461	3.42
T ₇ - FYM (33%)+ Vermicompost (33%) + Jeevamrut (34%)	24186	108742	84556	3.50
T ₈ : Trichoderma (50%)+ Neem cake (50%)	24813	102389	77576	3.13
S.E.m.±	-	552.9	552.9	-
CD at 5%	-	1657.5	1657.5	-

Conclusion

Based on the present findings, it can be concluded that, different organic manure under integrated nutrient management had significantly influenced the yield and economics of chick pea. The organic manure treatment of nutrient of FYM (33%)+ Vermicompost (33%) + Jeevamrut (34%) i.e., treatment T₇ was found significantly superior than other treatments with respect to maximum values for viz., total number of nodules, number of effective nodules plant⁻¹, fresh weight of nodules, dry weight of nodules, no. of pods, no. of seeds, 100 seed weight, seed yield, straw yield, biological yield, gross return, net return and B:C ratio. The nutrient-rich organic manure treatment using a combination of FYM (33%), Vermicompost (33%), and Jeevamrut (34%), known as treatment T₇, showed notable superiority compared to other treatments in terms of nutrient content and uptake in chick pea crop.

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