



International Journal of Advanced Chemistry Research

ISSN Print: 2664-6781
ISSN Online: 2664-679X
IJACR 2025; 7(6): 30-34
www.chemistryjournals.net
Received: 22-04-2025
Accepted: 27-05-2025

Sagar
Research scholar, Department
of Soil Science & Agricultural
Chemistry, SKRAU, Bikaner,
Rajasthan, India

Dr. RK Jakhar
Assistant Professor,
Department of Soil Science &
Agricultural Chemistry,
SKRAU, Bikaner, Rajasthan,
India

Corresponding Author:
Sagar
Research scholar, Department
of Soil Science & Agricultural
Chemistry, SKRAU, Bikaner,
Rajasthan, India

Influence of different organic manures, Beejamrit and Jeevamrit on soil properties in Western Rajasthan

Sagar and RK Jakhar

DOI: <https://www.doi.org/10.33545/26646781.2025.v7.i6a.291>

Abstract

An experiment was carried out at Research farm of Agricultural Research Station, SKRAU, Bikaner during *kharif*, 2022 on loamy sand soil. The experiment was laid out in a factorial randomized block design (FRBD) with three replications and 16 treatment combinations comprising of different manures (Control, FYM 7.5 t ha⁻¹, Vermicompost 5.0 t ha⁻¹ and Poultry manure 2.5 t ha⁻¹) and different liquid manures (Control + Seed Treatment with Beejamrit + Spray of Jeevamrit at 30, 45 & 60 DAS + Seed Treatment with Beejamrit and Spray of Jeevamrit at 30, 45 & 60 DAS).

The results indicated that application of poultry manure 2.5 t ha⁻¹ significantly increased available nitrogen, phosphorous, potassium and Zn, Fe, Cu, Mn in soil. EC and organic carbon of soil were improved by the application of Poultry manure 2.5 t ha⁻¹. Moreover, bulk density and pH of soil significantly decreased with Poultry manure 2.5 t ha⁻¹. Particle density did not influence significantly by manures application.

Keywords: FYM, vermicompost, poultry manure, nitrogen, phosphorus, potassium, soil and jeevamrit

Introduction

Cluster bean (*Cyamopsis tetragonoloba*), commonly known as guar, is a coarse, drought tolerant legume, mainly grown in *kharif* season in arid and semi-arid regions of the country. This crop is a rich source of nourishment and is considered as protective supplementary food as it contains large quantities of minerals, vitamins and essential amino acids. The important minerals like calcium, phosphorous and iron, which are generally lacking in cereals while they are available in abundant quantities in this legume. The natural polysaccharide water-soluble polymer found in the endosperm (Reddy *et al.*, 2011) [23], as galactomannan gum, is the chief product used in many industries (Amin *et al.*, 2007) [2]. Cluster bean cultivars with high gum content (>32 per cent) is more preferred for export (Bhatt *et al.* 2015) [7]. Due to diversified uses of cluster bean gum in textile, paper, explosive and mining industries, pharmaceuticals, cosmetic goods and food stuffs, it has ever increased demand in the international market. In India, it is cultivated mainly in Rajasthan, Gujarat, Punjab, Haryana, Uttar Pradesh and Maharashtra and occupies an area of 2.7 million hectares with production of 1.3 million tonnes having productivity of 481 kg ha⁻¹ (Anonymous 2020-21) [3, 4]. In Rajasthan, cluster bean is being grown in 2.48 million hectares area with 1.13 million tonnes production and 458 kg ha⁻¹ average productivity (Anonymous 2020-21) [3, 4]. In Rajasthan, Bikaner region is the leading district both in terms of area and production, however, the average productivity is low.

As soils of arid regions are hungry as well as thirsty, foliar application of nutrients plays an important role in enhancing the production and productivity of the crop. Therefore, it may be a matter of research to investigate suitable source of nutrients for foliar application which can boost the quantity and quality of the crop. Due to environmental concern, there is an urgent need to reduce the use of chemical fertilizers in agriculture and alternative to chemicals are being sought to improve crop productivity and quality. One option is the use of organic nutrients or growth regulators, which may promote plant growth through a variety of mechanisms, including supply of organic nutrients or production of plant hormones.

Jeevamrit are cheaper eco-friendly organic preparations made by cow products namely dung, urine, milk, curd and ghee. Jeevamrit promotes immense biological activity in soil and makes the nutrients available to crop

Materials and Methods

The experiment was conducted at Research farm of Agricultural Research Station, SKRAU and Bikaner during *kharif*, 2022. Geographically, it is situated at 28° 10' N latitude and 73° 18' E longitude at an altitude of 223.88 m above mean sea level. The maximum and minimum temperature ranged between 40.9°C and 14.4°C during crop growing season. The maximum and minimum relative humidity of the locality fluctuates in between 91.3 and 56.1%. The bright sunshine hours in *Kharif* season, 2022 was recorded from 4.7 to 10.4 hours throughout the experiment. The total rainfall was 287.5 mm with 20 rainy days from June 25, 2022 to November 01, 2022.

The experiment was laid out in a factorial randomized block design (FRBD) with three replications and 16 treatment combinations replications comprising of different manures (Control, FYM 7.5 t ha⁻¹, Vermicompost 5.0 t ha⁻¹ and Poultry manure 2.5 t ha⁻¹) and different liquid manures (Control + Seed Treatment with Beejamrit + Spray of Jeevamrit at 30, 45 & 60 Days After Sowing + Seed Treatment with Beejamrit and Spray of Jeevamrit at 30, 45 & 60 Days After Sowing).

Observations were recorded at soil samples from each treatment plot taken with the help of an auger by boring randomly at four places after the harvest of the crop at 0-15 cm soil depths. Collected soil samples were air dried, ground in wooden pestle and mortar, passed through 2 mm sieve and preserved in cloth bags for the subsequent analysis for different chemical and physical properties. For pH determination 20 gram of air dried soil stirred with 40 ml distilled water for half an hour and pH (1:2 soil: water suspension) determined using glass electrode in combination with calomel electrode. Electrical conductivity of (1:2 soil: water) supernatant solution measured by conductivity meter after keeping soil suspension over-night. Organic carbon was determined by following Walkley and Black (1934) [27] wet digestion method. Available nitrogen in soil was determined by Alkaline KMnO₄ method (Subhiah and Asija, 1956) [26]. Available phosphorus in soil was determined by 0.5 M NaHCO₃ (Olsen *et al.*, 1954) [20]. Available potassium in soil was determined by 1 neutral normal ammonium acetate extractable K using flame photometer (Jackson, 1973) [17]. Available micronutrients Zn, Cu, Fe and Mn in soil were determined by DTPA extractable method (Lindsay and Norvell, 1978) [18]. Soil bulk density was determined using RD bottle method (Richards, 1954) [24]. Particle density of soil was determined by measuring mass of oven dried soil solid and their volume by using Pycnometer method (Richards, 1954) [24].

Experimental data recorded in various observations were statistically analyzed with the help of Fisher's analysis of variance technique (Fisher, 1950) [13]. The Critical Difference (CD) for the treatment comparisons were worked out wherever the variance ratio (F-Test) was found significant at 5% level of significance.

Results and Discussion

Effect of organic manures and fertilizer levels on soil physical properties after harvest of groundnut

Organic manures

Data pertaining to the effect of manures on soil bulk density, particle density and total porosity of soil after harvest of cluster bean crop have been presented in (Table 1). Results indicated that different manures significantly improved the bulk density and porosity of soil. The minimum bulk density (1.47 Mg m⁻³) and maximum porosity was observed with FYM @ 7.5 t ha⁻¹. The particle density of soil did not change significantly by adding different manures.

Liquid Organic Manures

A perusal of data (Table 1) showed that bulk density of soil changes significantly by addition of different liquid organic manures. The minimum bulk density (1.47 Mg m⁻³) was observed with seed treatment with beejamrit over rest of the treatments. Particle density and porosity of soil did not change significantly by addition of different liquid organic manures.

Role of different manures in improving physical properties of soil is well known. The result (Table 1) indicated that the total porosity and soil moisture content were significantly increased while bulk density was reduced with different organic manure. However, all kinds of manures had non-significant effect on particle density of the soil. The bulk density of soil significantly decreased with organic manures and the lowest value was recorded with FYM 10.0 t ha⁻¹. It may be due to decomposition of manure improves soil permeability and increases aggregate stability as a result of complex series of polysaccharides synthesized by the bacteria in decomposing organic manure and by their secondary product which acted on soil building materials that cause increase in macro and micro-pores in soil. Thus, the improvement in soil structure brought significant reduction in bulk density. The similar findings were also obtained by Hati *et al.* (2006) [14], Ewulo *et al.* (2008) [11], Islam *et al.* (2011) [16] and Atakora *et al.* (2019) [5] who observed decrease in bulk density due to increase in organic carbon content in soil. Soil moisture content significantly improved with various manure and the highest was observed with FYM 10.0 t ha⁻¹. It is attributed to the mulching effect caused by organic manures and improved moisture retention and water acceptance as a result of improved soil structure and macro-porosity (Ewulo *et al.*, 2008) [11] and it also confined to the colloidal and hydrophobic nature of the manures. Similar types of result have also been reported by Poku *et al.* (2014) [22], Agbede *et al.* (2017) [1] and Atakora *et al.* (2019) [5].

Effect of organic manures and fertilizer levels on soil chemical properties after harvest of groundnut

Organic manures

The effect of different manures on organic carbon is presented in tables 2, 3 and 4, clearly indicated that there is significant increase in organic carbon of soil with application of different manures. The maximum organic carbon (0.127 Per cent) was recorded under treatment FYM @ 7.5 t ha⁻¹ and highest EC, available N, P, K, Zn, Cu, Fe and Mn were reported in poultry manure @ 2.5 t ha⁻¹.

Table 1: Effect of different organic manures, beejamrit and jeevamrit on bulk density, particle density and total porosity of soil at harvest of cluster bean

Treatment	Bulk density (Mg m ⁻³)	Particle density (Mg m ⁻³)	Total porosity (%)
A. Organic manures			
F ₁ : Control	1.55	2.61	40.57
F ₂ : FYM @ 7.5 ton per ha ⁻¹	1.47	2.59	43.28
F ₃ : Vermicompost @ 5.0 ton per ha ⁻¹	1.49	2.60	42.77
F ₄ : Poultry manures @ 2.5 ton per ha ⁻¹	1.51	2.60	41.73
SEm±	0.01	0.01	0.24
CD at 5%	0.02	NS	0.69
B. Liquid Organic Manures			
M ₁ : Control	1.55	2.61	41.87
M ₂ : Seed treatment with beejamrit	1.47	2.59	42.04
M ₃ : Spray of jeevamrit at 30,45 and 60 days after sowing	1.49	2.60	42.24
M ₄ : Seed treatment with beejamrit and Spray of jeevamrit at 30,45 and 60 days after sowing	1.51	2.60	42.20
SEm±	0.01	0.01	0.24
CD at 5%	0.02	NS	NS

Liquid Organic Manures

An appraisal of data (Table 2, 3 and 4) reported that application of different liquid organic manures did not show any significant effect on soil organic carbon content, EC, available N, P, K, Zn, Cu, Fe and Mn in soil after harvesting of cluster bean.

Organic manure significantly reduced the soil pH (Table 2). It is ascribed to the decomposition of organic manures in soil and continuously production of organic acids, associated with surplus increase of CO₂ reduction and

hydrogen ion that may contribute to soil acidification. Our results were in agreement with previous findings of Azeez *et al.* (2012) [6], Liu *et al.* (2010) [19]. Different manures significantly enhanced electrical conductivity (Table 2). This increase in soil electric conductivity was caused by the solubilization of inorganic ions such as chloride, sulphate and sodium from manures and other organic species formed through organic matter mineralization. The results had close confirmatory with Chang *et al.* (2007) [8], Ibeto *et al.* (2020) [15], and Singh *et al.* (2020) [28].

Table 2: Effect of different organic manures, beejamrit and jeevamrit on pH, EC and organic carbon of soil at harvest of cluster bean

Treatment	pH	EC (dSm ⁻¹)	Organic carbon (%)
A. Organic manures			
F ₁ : Control	8.47	0.139	0.117
F ₂ : FYM @ 7.5 ton per ha ⁻¹	8.37	0.174	0.127
F ₃ : Vermicompost @ 5.0 ton per ha ⁻¹	8.30	0.178	0.124
F ₄ : Poultry manures @ 2.5 ton per ha ⁻¹	8.27	0.187	0.121
SEm±	0.02	0.004	0.002
CD at 5%	0.06	0.011	0.006
B. Liquid Organic Manures			
M ₁ : Control	8.39	0.164	0.120
M ₂ : Seed treatment with beejamrit	8.37	0.167	0.121
M ₃ : Spray of jeevamrit at 30,45 and 60 days after sowing	8.34	0.172	0.120
M ₄ : Seed treatment with beejamrit and Spray of jeevamrit at 30,45 and 60 days after sowing	8.32	0.176	0.121
SEm±	0.02	0.004	0.002
CD at 5%	NS	NS	NS

Table 3: Effect of different organic manures, beejamrit and jeevamrit on available nitrogen, phosphorus and potassium in soil after harvest of cluster bean

Treatment	Available nutrients (kg ha ⁻¹)		
	Nitrogen	Phosphorus	Potassium
A. Organic manures			
F ₁ : Control	91.8	15.3	208.3
F ₂ : FYM @ 7.5 ton per ha ⁻¹	116.2	17.5	218.3
F ₃ : Vermicompost @ 5.0 ton per ha ⁻¹	124.4	18.3	235.8
F ₄ : Poultry manures @ 2.5 ton per ha ⁻¹	129.3	19.3	240.8
SEm±	1.82	0.37	2.40
CD at 5%	5.26	1.06	6.94
B. Liquid Organic Manures			
M ₁ : Control	113.2	17.5	214.0
M ₂ : Seed treatment with beejamrit	114.6	17.6	226.1
M ₃ : Spray of jeevamrit at 30,45 and 60 days after sowing	116.8	17.3	229.9
M ₄ : Seed treatment with beejamrit and Spray of jeevamrit at 30,45 and 60 days after sowing	117.2	18.0	233.3
SEm±	1.82	0.37	2.40
CD at 5%	NS	NS	NS

Table 4: Effect of different organic manures, beejamrit and jeevamrit on DTPA extractable micronutrients (Zn, Cu, Fe and Mn) in soil after harvest of cluster bean

Treatment	DTPA extractable micronutrients (ppm)			
	Fe	Mn	Zn	Cu
A. Organic manures				
F ₁ : Control	3.81	1.670	0.376	0.277
F ₂ : FYM @ 7.5 ton per ha ⁻¹	4.03	1.754	0.406	0.296
F ₃ : Vermicompost @ 5.0 ton per ha ⁻¹	4.05	1.756	0.419	0.307
F ₄ : Poultry manures @ 2.5 ton per ha ⁻¹	4.21	1.813	0.428	0.311
SEm±	0.08	0.027	0.006	0.004
CD at 5%	0.22	0.077	0.016	0.010
B. Liquid Organic Manures				
M ₁ : Control	4.03	1.747	0.406	0.295
M ₂ : Seed treatment with beejamrit	4.02	1.747	0.406	0.295
M ₃ : Spray of jeevamrit at 30,45 and 60 days after sowing	4.03	1.748	0.407	0.299
M ₄ : Seed treatment with beejamrit and Spray of jeevamrit at 30,45 and 60 days after sowing	4.03	1.749	0.408	0.301
SEm±	0.08	0.027	0.006	0.004
CD at 5%	NS	NS	NS	NS

The available nitrogen, phosphorus, potassium, sulphur and micronutrients content in soil after harvest of the groundnut crop were significantly improved by various manure application (Table 3 and 4). It is because of the reason that the organic manure is a store house of almost all essential nutrients needed for proper plant growth and it also improves the soil environment by improving physico-chemical properties of soil. The improved availability of plant nutrients owing to decrease in pH as well as increase in cation exchange capacity of soil was also reported by Choudhary (2015). It may also due to the formation of higher stability chelates with organic legends that have lower susceptibility to fixation, adsorption and precipitation in soil (Pareek and Yadav, 2011) ^[21].

Conclusion

On the basis of one season experiment, results of the present investigation showed that investigation showed that yield of *kharif* cluster bean can be maximized by the application of Poultry manure 2.5 t ha⁻¹ along with physico-chemical properties like-bulk density, particle density, porosity, OC, pH, EC, available macro and micro nutrients content of soil after harvesting of cluster bean.

References

- Agbede TM, Adekiya AO, Eifediyi EK. Impact of poultry manure and NPK fertilizer on soil physical properties, growth and yield of carrot. *J Hort Res*. 2017;25(1):81-88.
- Amin AM, Ahmad AS, Yin YY, Yahya N, Ibrahim N, 2007.
- Anonymous. Agricultural statistics at a Glance. Ministry of Agriculture & Farmers' Welfare, Government of India, 2020-21, p. 70.
- Anonymous. Rajasthan Agricultural Statistics at a glance. Commissioner ate of Agriculture, Government of Rajasthan, 2020-21, p. 90.
- Atakora K, Agyarko K, Dapaah HK, Asiedu EK, Baayim AJ, Osei BY, *et al*. The combine effect of Grasscutter (*Thryonomys swinderianus*) manure and NPK fertilizer on soil properties, growth and yield of carrot (*Daucus carota*). *J Exp Agric Int*. 2019;40(1):1-11.
- Azeez JO, Van Averbeke W. Dynamics of soil pH and electrical conductivity with the application of three animal manures. *Commun Soil Sci Plant Anal*. 2012;43(6):865-874.
- Bhatt RK, Jukanti AK, Roy MM. Cluster bean (*Cyamopsis tetragonoloba* L. Taub.), an important industrial arid legume: A review. *Legume Res*. 2015;40(2):207-214.
- Chang EH, Chung RS, Tsai YH. Effect of different application rates of organic fertilizer on soil enzyme activity and microbial population. *J Soil Sci Plant Nutr*. 2007;53(2):132-140.
- Chaudhary JH, Ramdev S, Desai LJ. Growth, yield, yield attributes and economics of summer groundnut (*Arachis hypogaea* L.) as influenced by integrated nutrient management. *J Appl Nat Sci*. 2015;7(1):369-372.
- Chesnin L, Yien CH. Turbidometric determination of available sulphates. In: *Proceedings of Soil Science Society of America*. 1950;15:149-151.
- Ewulo BS, Ojeniyi SO, Akanni DA. Effect of poultry manure on selected soil physical and chemical properties, growth, yield and nutrient status of tomato. *Afr J Agric Res*. 2008;3(9):612-616.
- Food Hydrocolloids. 2004;21(2):273-279.
- Fisher RA. *Statistical Methods for Research Workers*. Edinburgh: Oliver and Boyd, 1950.
- Hati KM, Swarup A, Singh D, Misra AK, Ghosh PK. Long-term continuous cropping, fertilisation and manuring effects on physical properties and organic carbon content of a sandy loam soil. *Aust J Soil Res*. 2006;44(5):487-495.
- Ibeto CN, Lag-Brots AJ, Marshall R, Semple KT. The nutritional effects of digested and undigested organic wastes combined with wood ash amendments on carrot plants. *J Soil Sci Plant Nutr*. 2020;20:460-472.
- Islam M, Karim A, Jahiruddin M, Majid NM, Miah MG, Ahmed MM, *et al*. Effects of organic manure and chemical fertilizers on crops in the radish-stem amaranth-Indian spinach cropping pattern in homestead area. *Aust J Crop Sci*. 2011;5(11):1370-1378.
- Jackson ML. *Soil Chemical Analysis*. 2nd Ed. New Delhi: Prentice Hall, 1973, p. 239-241.
- Lindsay WL, Norvell WA. Development of DTPA soil test for Zn, Fe, Mn and Cu. *Soil Sci Soc Am J*. 1978;42(3):421-428.
- Liu E, Yan C, Mei X, He W, Bing SH, Ding L, *et al*. Long-term effect of chemical fertilizer, straw, and

- manure on soil chemical and biological properties in northwest China. *Geoderma*. 2010;158(4):173-180.
20. Olsen SR, Cole CV, Watnable FS, Dean LA. Estimation of available phosphorus in soil by extraction with sodium bicarbonate. USDA Circular 939. Washington, DC: USDA, 1954, p. 8-60.
21. Pareek N, Yadav BL. Effect of organic manures on soil physicochemical properties, soil microbial biomass and yield of mustard under irrigation of different residual sodium carbonate waters. *J Indian Soc Soil Sci*. 2011;59(4):336-342.
22. Poku PA, Agyarko K, Dapaah HK, Dawuda M. Influence of *Mucuna pruriens* green manure, NPK and chicken manure amendments on soil physic-chemical properties and growth and yield of carrot (*Daucus carota*). *J Agric Sustain*. 2014;5(1):2201-4357.
23. Reddy K, Krishna Mohan G, Satla S, Gaikwad S. Natural polysaccharides: Versatile excipients for controlled drug delivery systems. *Asian J Pharm Sci*. 2011;6(6):275-28.
24. Richards LA. Diagnosis and improvement of saline and alkaline soils. USDA Hand Book No. 60. Oxford: IBH Pub. Co., 1954.
25. Patra K, Parihar R. Enhancing soil fertility and crop nutrition through vermicomposting. *International Journal of Agriculture and Nutrition* 2023;5(2):114-117. DOI: <https://doi.org/10.33545/26646064.2023.v5.i2b.168>
26. Subbiah BV, Asija GL. A rapid procedure for estimation of available N in soils. *Curr Sci*. 1956;25:259-260.
27. Walkley A, Black IA. An examination of the degtjareff method for determining soil organic matter, and a proposed modification of the chromic acid titration method. *Soil Sci*. 1934;77:29-38.
28. Singh DK, Thomas T, Swaroop N. Effect of different level of inorganic fertilizer, FYM and neem cake on soil properties and yield attributes by carrot (*Daucus carota* L.). *Int J Curr Microbiol Appl Sci*. 2020;9(9):2319-7706.