The Pharma Innovation Journal 2023; 12(12): 1215-1218

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(12): 1215-1218

www.thepharmajournal.com
Received: 15-09-2023
Accepted: 25-10-2023

Jagannath Kulal
M.Sc. Scholar, Department of Soil Science and Agricultural Chemistry, College of Agriculture, VNMKV, Parbhani, Maharashtra, India

SV Chikshe
Assistant Professor, Department of Soil Science and Agricultural Chemistry, College of Agriculture, VNMKV, Parbhani, Maharashtra, India

SR Pillewad
Assistant Professor, Department of Soil Science and Agricultural Chemistry, College of Agriculture, VNMKV, Parbhani, Maharashtra, India

Corresponding Author:
Jagannath Kulal
M.Sc. Scholar, Department of Soil Science and Agricultural Chemistry, College of Agriculture, VNMKV, Parbhani, Maharashtra, India

Preparation of nutrient enriched compost and its effect on growth, nutrient dynamics, yield and yield attributes in chickpea

Jagannath Kulal, SV Chikshe and SR Pillewad

Abstract
The present investigation in relation to **"**Preparation of nutrient enriched compost and its effect on growth, nutrient dynamics, yield and yield attributes in chickpea.**"** The field experiment was conducted during *Rabi* season 2022-2023 at Research Farm, Department of Soil Science and Agricultural chemistry, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. The results indicated that growth parameters like plant height, number of branches, number of pods, seed and straw yield &The nitrogen, phosphorus, potassium, Sulphur and DTPA extractable micronutrient (Fe, Mn, Zn, Cu) availability found to be maximum at harvesting stage of chickpea with the application of 75% RDF (N: P_2O_5: K_2O) + @ 50% Nutrient Enriched Compost followed by 75% RDF (N: P_2O_5: K_2O) + @ 25% Nutrient Enriched Compost. Whereas lowest value was recorded in absolute control.

Keywords: Nutrient enriched compost, nutrient availability, yield

Introduction
Chickpea (*Cicer arietinum* L.) is the crop belonging to legume family and third most important pulse crop in the world after dry bean and dry peels. Among the leguminous crops, chickpea occupies an important position due to its nutritious value (17-23% protein) in large vegetarian population of the country (Kumar *et al.* 2014) [6]. Nutrient enriched composting is basically a microbiological process accomplished by the combined activity of bacteria, actinomycetes, fungi and protozoa which are either present in the composting material or are introduced externally to speed up composting and enrich the compost. Under proper moisture and aeration conditions, the diverse micro-flora attacks the organic matter to derive their energy, carbon and other nutrients. The result of substrate is broken down to form an amorphous brown to dark brown mixture known as compost. The waste material with adequate water content undergoes intensive decomposition from low to high temperature in heaps or pits for around 4 to 8 months. Nutrient enriched compost is considered a valuable organic fertilizer, supplying nutrients for the crop and hence saving substantial amount if mineral fertilizes (Erhart *et al.* 2005) [3].

Materials and Methods
The present investigation was carried out during *Rabi* season 2022-23 at Research Farm, Department of Soil Science and Agricultural Chemistry, College of Agriculture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani on the "Preparation of nutrient enriched compost and its effect on growth, nutrient dynamics, yield and yield attributes in chickpea.". Total twenty-seven soil samples were collected after harvest of chickpea crop. The experiment was conducted in Randomized Block Design with Nine treatments each were replicated three times. The treatment consists of T_1 (Absolute Control), T_2 (RDF 25:50:25 (N: P_2O_5: K_2O kg ha^{-1})), T_3 (75% RDF (N: P_2O_5: K_2O kg ha^{-1}) + @ 50% Nutrient Enriched Compost), T_4 (75% RDF (N: P_2O_5: K_2O kg ha^{-1}) + @ 25% Nutrient Enriched Compost), T_5 (50% RDF (N: P_2O_5: K_2O kg ha^{-1}) + @ 50% Nutrient Enriched Compost), T_6 (50% RDF (N: P_2O_5: K_2O kg ha^{-1}) + @ 75% Nutrient Enriched Compost), T_7 (25% RDF (N: P_2O_5: K_2O kg ha^{-1}) + @ 75% Nutrient Enriched Compost), T_8 (25% RDF (N: P_2O_5: K_2O kg ha^{-1}) + @ 100% Nutrient Enriched Compost), T_8 (Nutrient Enriched Compost @ 100% (S) Soil Application).
Biometric observation includes plant height, number of branches, number of pods $plant^{-1}$ and yield were recorded at different critical growth stages (flowering, pod development and harvest) of chickpea.

Plant height (cm) was measured from the base of plant i.e., ground level to the base of the last fully opened leaf at the apex. Number of branches per plant was recorded in 30 and 60 days after sowing and expressed in numbers. Number of pods per plant was recorded in 60 and 80 days after sowing and expressed in numbers. Plants from each net plot were harvested and seeds were separated by threshing, after sun drying the pods. Seed yield obtained in each net plot was weighed (kg) and expressed on hectare basis (kg ha^{-1}). Plants from each net plot were harvested and seeds and straw were separated by threshing, after completion of threshing the separated straw from seed were weighed. Straw yield obtained in each net plot was weighed (kg) and expressed on hectare basis (kg ha^{-1}).

Soil samples were collected before sowing at harvest stage of crop at 0-20 cm depth from each treated plot. The sieved samples were stored in polythene bags with proper labelling for further analysis. Soil was air dried, ground with wooden mortar and pestle and sieved through 2 mm sieve. These soil samples are used to various chemical estimations as per the methods given below.

The chemical properties *viz.,* pH was determined in (1:2.5) soil water suspension using the digital pH meter described by Jackson (1973) [5]. Electrical conductivity was determined in (1:2.5) soil water suspension by using the conductivity bridge meter described by Jackson (1973) [5]. Organic carbon was determined by using the method described by Walkley and Black (1934) [16]. Calcium carbonate was determined by rapid titration method as suggested by (Jackson, 1973) [5]. Available N was determined by alkaline potassium permanganate method as described by Subbiah and Asija (1956) [15]. Available phosphorus was extracted from the soil with 0.5 M sodium bicarbonate (pH 8.5) as an extractant and measured with colorimeter by using 420 nm wave length as described by Olsen *et al.* (1954) [8]. Available potassium was determined by using neutral normal ammonium acetate as an extractant and was measured on flame photometer (Piper, 1966) [10]. It was determined by using the turbidimetry method and measured on spectrophotometer as described by Chopra and Kanwar (1976) [2]. The Fe, Mn, Zn, and Cu were determined by using DTPA extract as described by Lindsay and Norvell (1978) [7].

Results and Discussion

Biometric observation

Plant height, number of branches, number of pods plant^{-1}

Biometric observation includes plant height, number of branches, number of pods plant^{-1} were recorded at different critical growth stages (flowering, pod development and harvest) of chickpea found significantly maximum in treatment T_3 receiving 75% RDF (N: P_2O_5: K_2O) + @ 50% Nutrient Enriched Compost followed by T_4, T_6, T_5, T_8, T_7, T_9 and T_2 treatments and minimum was observed in treatment T_1 *i.e.,* Absolute control at all the stages. Similar results found with Patil *et al.* (2012).

Table 1: Effect of nutrient enriched compost on plant height, number of branches, number of pods plant^{-1} at various growth stages of chickpea.

No.	Treatment	Plant Height (cm)		Number of branches plant^{-1}		Number of Pods plant^{-1}	
		30 DAS	30 DAS	30 DAS	60 DAS	60 DAS	80 DAS
T_1	Absolute control	20.27	3.13	3.13	6.34	43.28	48.74
T_2	RDF 25:50:25 (N: P_2O_5: K_2O Kg/ha)	21.67	3.60	3.60	6.94	48.29	56.08
T_3	75% RDF (N: P_2O_5: K_2O) + @ 50% Nutrient Enriched Compost	28.13	5.10	5.10	8.70	67.20	78.34
T_4	75% RDF (N: P_2O_5: K_2O) + @ 25% Nutrient Enriched Compost	27.00	4.67	4.67	8.27	60.12	72.39
T_5	50% RDF (N: P_2O_5: K_2O) + @ 50% Nutrient Enriched Compost	23.80	4.33	4.33	7.75	58.52	63.11
T_6	50% RDF (N: P_2O_5: K_2O) + @ 75% Nutrient Enriched Compost	24.10	4.41	4.41	8.23	59.30	64.56
T_7	25% RDF (N: P_2O_5: K_2O) + @ 75% Nutrient Enriched Compost	22.63	4.20	4.20	7.66	54.67	61.94
T_8	25% RDF (N: P_2O_5: K_2O) + @ 100% Nutrient Enriched Compost	23.40	4.21	4.21	7.71	57.85	62.82
T_9	Nutrient Enriched Compost @ 100% (S) Soil Application	21.87	3.82	3.82	7.23	52.36	59.36
	SE m±	1.15	0.20	0.20	0.18	3.06	1.62
	CD at 5%	3.45	0.61	0.61	0.56	9.18	4.87
	CV	8.44	8.48	8.48	4.27	9.51	4.46
	Grand mean	23.65	4.16	4.16	7.65	55.73	63.03

Seed and straw yield

The seed and straw yield were recorded after harvest of chickpea found significantly maximum in treatment T_3 receiving 75% RDF (N: P_2O_5: K_2O) + @ 50% Nutrient Enriched Compost followed by T_4, T_6, T_5, T_8, T_7, T_9 and T_2 treatments and minimum was observed in treatment T_1 *i.e.,* Absolute control. Patil *et al.* (2012) [9] reported that effect of compost @ 5 t along with rock phosphate 200 kg / ha has resulted in (2140 kg/ha) seed yield and (3300 kg/ha) straw yield over application of rock phosphate at lower levels with organic manures and absolute control.

Chemical properties

Effect of nutrient enriched compost on physico- chemical properties of soil after harvest of chickpea

The soil pH was in the range of 7.37 to 7.79. Soil pH was increased due to application of fertilizers over initial value. However, results on soil pH were statistically non-significant. These results are in conformity with the findings of Singh *et al.* (2015) [13]. The electrical conductivity of soil ranged from 0.19 to 0.27 at harvesting stage of chickpea. The electrical conductivity was found statistically non-significant. The highest buildup of organic carbon in soil was recorded in T_3 receiving (75% RDF (N: P_2O_5: K_2O) + @ 50% Nutrient Enriched Compost. Our result is corresponding to the findings of Qureshi *et al.* (2014) [11] who reported that compost phosphate enriched manure which organic carbon content of (37.99% to 65.34%). The calcium carbonate content in soil was ranged from 80.29 to 97.74 g kg^{-1} at harvest stage of chickpea. The calcium carbonate content was not influenced significantly due to application of nutrient enriched compost.

Table 2: Effect of nutrient enriched compost on seed and straw yield of chickpea

No.	Treatment	Seed Yield (Kg ha^{-1})	% Increase over absolute control	Straw yield (Kg ha^{-1})	% Increase over absolute control
T_1	Absolute control	1048.67	--	1980.00	--
T_2	RDF 25:50:25 (N: P_2O_5: K_2O Kg/ha)	1127.17	6.96	2288.12	13.46
T_3	75% RDF (N: P_2O_5: K_2O) + @ 50% Nutrient Enriched Compost	1877.67	44.15	3260.67	39.27
T_4	75% RDF (N: P_2O_5: K_2O) + @ 25% Nutrient Enriched Compost	1617.00	35.14	3042.33	34.91
T_5	50% RDF (N: P_2O_5: K_2O) + @ 50% Nutrient Enriched Compost	1446.67	27.51	2609.33	24.11
T_6	50% RDF (N: P_2O_5: K_2O) + @ 75% Nutrient Enriched Compost	1512.10	30.64	2678.00	26.06
T_7	25% RDF (N: P_2O_5: K_2O) + @ 75% Nutrient Enriched Compost	1322.00	20.67	2474.33	19.97
T_8	25% RDF (N: P_2O_5: K_2O) + @ 100% Nutrient Enriched Compost	1421.33	26.21	2519.33	21.40
T_9	Nutrient Enriched Compost @ 100% (S) Soil Application	1220.67	14.08	2441.33	18.89
	SE m±	28.38	--	53.88	--
	CD at 5%	85.09	--	161.55	--
	CV	3.51	--	3.60	--
	Grand mean	1399.25	--	2588.16	--

Table 3: Effect of nutrient enriched compost on physico- chemical properties of soil after harvest of chickpea:

No.	Treatment	Soil Properties			
		pH	EC (dSm^{-1})	OC (g kg^{-1}))	$CaCO_3$ (g kg^{-1}))
T_1	Absolute control	7.79	0.25	4.25	97.74
T_2	RDF 25:50:25 (N: P_2O_5: K_2O Kg/ha)	7.75	0.21	4.42	93.21
T_3	75% RDF (N: P_2O_5: K_2O) + @ 50% Nutrient Enriched Compost	7.37	0.19	6.02	80.29
T_4	75% RDF (N: P_2O_5: K_2O) + @ 25% Nutrient Enriched Compost	7.48	0.22	5.78	82.06
T_5	50% RDF (N: P_2O_5: K_2O) + @ 50% Nutrient Enriched Compost	7.59	0.23	5.59	87.02
T_6	50% RDF (N: P_2O_5: K_2O) + @ 75% Nutrient Enriched Compost	7.59	0.20	5.65	84.33
T_7	25% RDF (N: P_2O_5: K_2O) + @ 75% Nutrient Enriched Compost	7.63	0.27	5.43	91.92
T_8	25% RDF (N: P_2O_5: K_2O) + @ 100% Nutrient Enriched Compost	7.62	0.23	5.53	90.74
T_9	Nutrient Enriched Compost @ 100% (S) Soil Application.	7.65	0.22	5.05	92.13
	SE m±	0.12	0.018	0.12	4.68
	CD at 5%	NS	NS	0.37	NS
	CV	2.75	14.07	4.08	9.13
	Grand mean	7.61	0.22	5.30	88.83

Effect of nutrient enriched compost on nutrient availability in soil under chickpea

The maximum nitrogen availability, phosphorus availability, potassium availability and sulphur availability were recorded with T_3 treatment receiving 75% RDF (N: P_2O_5: K_2O) + @ 50% Nutrient Enriched Compost. In general, among the different treatments, T_3 has shown significantly higher nitrogen availability in soil followed by T_4, T_6, T_5, T_8, T_7, T_9 and T_2 treatment. The minimum nitrogen availability was recorded in treatment T_1 *i.e.,* Absolute control. Experimental results are in corroborating with the findings of Singh & Sharma (2011) [14], Ramadass & Palaniyandi (2007) [12], Chandrashaker *et al.* (2014) [1] respectively.

Table 4: Effect of nutrient enriched compost on nutrient availability in soil under chickpea.

No.	Treatment	Available nitrogen (Kg ha^{-1})	Available phosphorus (Kg ha^{-1})	Available potassium (Kg ha^{-1})	Available sulphur (Mg kg^{-1})
T_1	Absolute control	183.35	8.98	647.22	22.17
T_2	RDF 25:50:25 (N: P_2O_5: K_2O Kg/ha)	187.06	10.19	685.59	27.04
T_3	75% RDF (N: P_2O_5: K_2O) + @ 50% Nutrient Enriched Compost	208.58	19.81	788.32	39.67
T_4	75% RDF (N: P_2O_5: K_2O) + @ 25% Nutrient Enriched Compost	202.36	18.33	769.03	37.58
T_5	50% RDF (N: P_2O_5: K_2O) + @ 50% Nutrient Enriched Compost	196.50	15.42	736.10	33.74
T_6	50% RDF (N: P_2O_5: K_2O) + @ 75% Nutrient Enriched Compost	196.83	16.36	749.10	36.28
T_7	25% RDF (N: P_2O_5: K_2O) + @ 75% Nutrient Enriched Compost	193.95	13.81	714.85	31.78
T_8	25% RDF (N: P_2O_5: K_2O) + @ 100% Nutrient Enriched Compost	194.76	14.58	723.75	32.22
T_9	Nutrient Enriched Compost @ 100% (S) Soil Application	191.03	11.46	705.37	31.38
	SE m±	1.09	0.28	9.66	0.61
	CD at 5%	3.29	0.85	28.97	1.82
	CV	0.97	3.43	2.31	3.25
	Grand mean	194.93	14.32	724.37	32.43

The highest build-up of soil DTPA Fe, DTPA Mn, DTPA Zn, DTPA Cu noticed under application of treatment T_3 *i.e.,* 75% RDF (N: P_2O_5: K_2O) + @ 50% Nutrient Enriched Compost. In general, among the different treatments, T_3 has shown significantly higher nitrogen availability in soil followed by T_4, T_6, T_5, T_8, T_7, T_9 and T_2 treatment. The minimum nitrogen availability was recorded in treatment T_1 *i.e.,* Absolute control. Our results are confirmed with the findings of Habashy *et al.* (2008) [4] who reported that indicate that the availability of Fe, Mn, Zn and Cu were significantly increased

in cases of applied organic compost as well as AM + organic compost. compost as well as AM + organic compost. The solubility of Fe, Mn, Zn and Cu when mycorrhizal was accompanied with organic compost addition than AM inoculation or organic compost added alone.

Table 5: Effect of nutrient enriched compost on DTPA extractable iron, manganese, zinc & copper in soil after harvest of chickpea

No.	Treatment	DTPA Extractable Micro Nutrients (Mg kg^{-1})			
		Fe	Mn	Zn	Cu
T_1	Absolute control	4.09	6.13	0.43	1.94
T_2	RDF 25:50:25 (N: P_2O_5: K_2O Kg/ha)	4.28	6.88	0.46	2.11
T_3	75% RDF (N: P_2O_5: K_2O) + @ 50% Nutrient Enriched Compost	5.74	8.62	0.64	2.94
T_4	75% RDF (N: P_2O_5: K_2O) + @ 25% Nutrient Enriched Compost	5.12	8.14	0.61	2.71
T_5	50% RDF (N: P_2O_5: K_2O) + @ 50% Nutrient Enriched Compost	4.64	7.54	0.56	2.49
T_6	50% RDF (N: P_2O_5: K_2O) + @ 75% Nutrient Enriched Compost	4.77	7.65	0.57	2.55
T_7	25% RDF (N: P_2O_5: K_2O) + @ 75% Nutrient Enriched Compost	4.42	7.15	0.53	2.34
T_8	25% RDF (N: P_2O_5: K_2O) +@ 100% Nutrient Enriched Compost	4.61	7.18	0.54	2.44
T_9	Nutrient Enriched Compost@ 100% (S) Soil Application.	4.32	6.95	0.51	2.27
	SE m±	0.17	0.11	0.01	0.07
	CD at 5%	0.51	0.33	0.04	0.21
	CV	6.32	2.63	4.61	5.09
	Grand mean	4.66	7.36	0.54	2.42

Conclusion

1. Application of 75% RDF (N: P_2O_5: K_2O) + @ 50% Nutrient Enriched Compost has significantly enhanced growth, yield and quality parameter of chickpea.
2. The availability of nutrients like N, P, K, S, Fe, Mn, Zn and Cu improved with the application of 75% RDF (N: P_2O_5: K_2O) + @ 50% Nutrient Enriched Compost.

References

1. Chandrashaker K, Sailaja V, Rao PC. Effect of integrated use of organic and inorganic sources of phosphorus on soil physio-chemical and chemical properties of chickpea (*Cicer arietinum* L.). J Soils and Crops. 2014;24(1):25-33.
2. Chopra SL, Kanwar JB. Analystical Agril Chemistry 56890. Kalyani Publishers, New Delhi, India; c1976. p. 5-10.
3. Erhart E, Hartl W, Putz B. Biowaste compost affects yield, nitrogen supply during the vegetation period and crop quality of agricultural crops. European Journal of Agronomy. 2005;23(3):305-314.
4. Habashy NR, El-Khair AWA, Zaki RN. Effect of organic and biofertilizers on phosphorus and some micronutrients availability in a calcareous soil. Res. J Agric. & Biol. Sci. 2008;4(5):454-552.
5. Jackson ML. Soil chemical analysis, pentice hall of India Pvt. Ltd., New Delhi, India. 1973;498:151-154.
6. Kumar D, Arvadiya LK, Kumawat AK, Desai KL, Patel TU. Yield, protein content, nutrient content and uptake of chickpea (*Cicer arietinum* L.) as influenced by graded levels of fertilizers and bio-fertilizers. Res. J. Chem. Environ. Sci. 2014;2(6):60-64.
7. Lindsay WL, Norvell W. Development of a DTPA soil test for zinc, iron, manganese, and copper. Soil science society of America journal. 1978;42(3):421-428.
8. Olsen SR. Estimation of available phosphorus in soils by extraction with sodium bicarbonate (No. 939). *US* Department of Agriculture; c1954.
9. 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 Journal of Agricultural Sciences. 2012;25(3):326-331.
10. Piper CS. Soil and Plant Analysis, Hans Publishers, Bombay; c1966.
11. Qureshi SA, Rajput A, Memon M, Solangi MA. Nutrient composition of rock phosphate enriched compost from various organic wastes. Journal of Scientific Research. 2014;2(3):47-51.
12. Ramadass K, Palaniyandi S. Effect of enriched municipal solid waste compost application on soil available macronutrients in the rice field. Archives of Agronomy and Soil Science. 2007;53(5):497-506.
13. Singh M, Ingle NA, Kaur N, Yadav P, Ingle E. Effect of long-term smoking on salivary flow rate and salivary pH. Journal of Indian Association of Public Health Dentistry. 2015;13(1):11-13.
14. Singh YP, Sharma A. Effect of sources of phosphorus and microbial inoculation on productivity, nutrient availability in soil and uptake of nutrients by chickpea (*Cicer arietinum*) grown on sandy loam soil. Indian Journal of Agricultural Sciences. 2011;81(9):834.
15. Subbiah BV, Asija GL. A rapid procedure for the estimation of available nitrogen in soils. Current science. 1956;25(8):259-260.
16. 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 science. 1934;37(1):29-38.