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Research Article
Farmyard Manure

Studies on the Influence of Farmyard Manure and Vermicompost on Mineral Analysis on Red Gram (Cajanus cajan L.,)

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Cajanus cajan is mostly grown for its edible seeds, it is a species with many uses. Despite having half the energy content of charcoal, pigeon pea stems make a suitable fuel source because of their propensity for rapid growth. The present investigation was carried to find out the influence of FYM and Vermicompost on growth of red gram (Cajanus cajan (L.). The growth characters such as shoot length, root length, plant height, leaf length, leaf width, leaf area number of leaver per plant, number of hairy roots, shoot girth, number of branches per plants of red gram seedlings as influenced by the application of Vermicompost and FYM application was found. The biochemical such as chlorophyll, carbohydrates, protein , amino acids and sugars were observed. The macro and micronutrient contents such as Nitrogen, Phosphorous Potassium, Calcium, Magnesium, Zinc, Copper, Iron, and Manganese contents of red gram seedlings as viz., 10, 30, 45th days after sowing(DAS) influenced by the application of vermicompost and FYM is observed. The maximum growth was recorded in treatment five when compared with others respectively.

Keywords: red gram, fym, vermicompost, protein

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1. Introduction

One of the most widely grown tropical and subtropical legumes for its edible seeds is the pigeon pea (*Cajanus cajan* (L.) Huth). According to Bekele-Tessema (2023), pigeon peas are drought-resistant, hardy, and rapidly growing. In regions where rainfall is unpredictable and droughts are expected to occur, its drought resilience makes it crucial for food security (Crop Trust, 2022). When other forages are unavailable at the conclusion of the dry season, pigeon peas offer exceptional value as green forage (Sloan *et al*., 2009).The tall, short-lived perennial leguminous shrub known as pigeon pea can grow up to 2–5 meters in height, but it typically reaches 1-2 meters. It rapidly acquires a toxic depth of two meters. The crop owes its popularity to the fact that being a leguminous plant; it is capable of fixing atmospheric nitrogen and thereby restores nitrogen content in the soil. Its deep root system helps in extracting nutrients and moisture from deeper soil layers thus making it suitable for rainfed condition. Pigeon pea is a long duration pulse crop mainly being cultivated in poor soils under rainfed condition and the crop has capacity to thrive well under low input and adverse condition (Kumar and Paslawar 2017).

Hence, there is a scope to develop the organic nutrient management practices for *pigeon pea* under rain fed condition. Continuous use of only chemical fertilizers in intensive cropping system is leads to imbalance of nutrients in soil, which has an adverse effect on soil health and also on sustainable crop yields. Hence, In order to achieve the sustainability in crop production development of Organic package of practices for major crops in general and pigeon pea in particular is the need of the hour.Pigeon pea stems and branches are frequently utilized for basketry. Trials have indicated that pigeon peas may be used as a raw material for paper pulp, among other applications. As a windbreak, cover crop, shade plant, and green manure (see Environmental impact below), pigeon peas also benefit the environment when used in alley cropping (Cook *et al.,* 2005).

Common Names: Pigeon pea /no-eye pea / no-eyed pea / tropical green pea,
English Name: Cajan pea
Tamil Name: துவரை
Species Name: *Cajanus cajan*(L.) Huth
Family Name: Fabaceae

Cajanus cajan is native to either India or North-Eastern Africa (Ecocrop, 2016). According to Van der Maesen (1989), it has been cultivated for at least 3,000 years. Because of its deep taproot, heat tolerance, and rapid growth, it is now a tropical and subtropical species that is especially well-suited for rain-fed agriculture in semi-arid regions (Mallikarjuna *et al*., 2011). It thrives in areas with temperatures between 20° and 40°C with no frost since it is extremely heat-tolerant (FAO, 2016a). Tall plants can withstand light frost, while pigeon peas continue to thrive at temperatures near 0°C despite their sensitivity to it. It thrives in areas with more than 625 mm of annual rainfall, but it can withstand dry spells rather well. World production of pigeon peas was 4.85 million t in 2014. The main producers were India (3.29 million t, 65% of world production), Myanmar (0.57 million t), Malawi (0.3 million t), Kenya (0.28 million t) and Tanzania (0.25 million t). Most of the production occurred in Asia (79.1%), followed by Africa (17.6%) and the Americas (2.5%) (FAO, 2016).Pigeon peas can be cultivated for their seeds, fodder, or both. There are several cultivars that serve two purposes. Pigeon peas have been successfully cultivated in pure stands or seeded with pangola grass (*Digitaria eriantha*) in Brazil, Cynodon dactylon, and molasses grass (*Melinis minutiflora*) in Hawaii (FAO, 2016a). It is feasible to combine cereal grains like millet, sorghum, or maize (Bekele-Tessema, 2007; Cook *et al*., 2005). Pigeon peas are not advised for use in fodder production when combined with other legumes (Cook *et al.,* 2005). At least 20 kg of seeds per hectare can be spread out or planted in rows. In a weed-free, well-prepared, deep seedbed, seeds should be spread (drilled, disseminated, or hand-dibbled) at a distance of 2.5 to 10 cm.

Thus, the following aspects have been found to be covered by the current study to use pot culture experiments to determine the impact of FYM and Vermicompost on red gram (*Cajanus cajan* L.) germination research. To determine the impact of Fym and Vermicompost on the morphometric analysis of red gram (*Cajanus cajan* L.) using pot culture experiments by different sampling days, such as 10, 30, and 45 DAS, respectively (root length, shoot length, number of leaves per plant, number of roots per plant, fresh weight, and dry weight).to determine how FYM and Vermicompost affected the estimate of sugar, protein, amino acids, carbs, And chlorophyll from red gram (*Cajanus cajan* L.) fruits on different sample days, such as 10, 30, and 45 DAS respectively.

2. Materials and Methods

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2.1. Materials

2.1.1. Seed materials: The Tamil Nadu Pulse Research Institute in Semmandalam, Cuddalore, Tamil Nadu, India, provided the red gram (*Cajanus cajan* L.) seeds.

2.1.2. Fertilizers: The same Tamil Nadu Rice Research Institute in Aduthurai, Tamil Nadu, provided the vermicompost. Farm Yard Manure (FYM) was procured from neighbouring villages in the Thanjavour District of Tamil Nadu, namely srikandapuram Village, Kuttalam Taluk Mayiladuthurai District of Tamil Nadu.

2.1.3. Treatment Details: T_1- Control, T_2- 10% FYM+Vermicompost@RDF, T_3-25% FYM+Vermicompost@RDF, T_4-50% FYM+Vermicompost@RDF and T_5-100% FYM+Vermicompost@RDF

2.2. Location of Experimental Site: Field tests were conducted at the Botanical Garden, Botany Department, Government Arts College for Men College, Kumbakonam, Tamil Nadu, India. The study was conducted in 2024 between January and March. The experimental site was situated at 13.24 n latitude and 89.41 e longitude, with an elevation of 5.79 meters above mean sea level (msl).

2.3. Morphological Parameters Such As

2.3.1. Seedling Growth (cm/seedling): To record the seedling growth, twenty seedlings were chosen at random from each treatment. A centimeter scale was used to measure the growth of the seven-day-old red gram seedlings, and the results were noted.

2.3.2. Dry Weight (g/seedling): To record the seedling growth, twenty seedlings were chosen at random from each treatment. A centimetre scale was used to measure the growth of the seven-day-old red gram seedlings, and the results were noted.

2.3.3. Biochemical Analyses: Chlorophyll (Arnon, 1949), Carotenoid (Kirk and Allen, 1965), Estimation of carbohydrates (Dubois *et al.*, 1956), protein (Lowry *et al.*, 1951), amino acids (Moore and Stein, 1948), sugars (Nelson, 1944), and Non-reducing sugars (Nelson, 1944).

2.3.4. Estimation of Macro and Micronutrients: Such as Total nitrogen (Jackson, 1958; Quoted by Yoshida *et al.,* 1972), Phosphorus (Black, 1965 quoted by Yoshida *et al.*, 1972), Potassium (Williams and Twine, 1960), Calcium and magnesium (Yoshida et al., 1972), Zinc, copper, iron and manganese (DeVries and Tiller, 1980).

3. Results and Discussion

The present investigation was carried to find out the influence of FYM and Vermicomposting on growth of red gram (*Cajanus cajan* (L.). Organic farming is a holistic system designed to optimize the productivity and fitness of diverse communities in the agro ecosystem including living organisms viz. soil organisms, plants, livestock and human being etc. organic farming plays a vital role in maintaining biological diversity, decrease soil and ground water contamination, optimize biological productivity (Watson *et al*. 2002), maintain long-term soil fertility by optimizing conditions for biological activity in the soil (Ramesh *et al.* 2005). Production technology for organic pigeon pea primarily involves three management practices viz. efficient crop management, appropriate nutrient management and effective plant protection measures. Among them nutrient management plays important role. In addition to organic manures such as FYM, recycling of organic wastes through composting, green manures and biological inputs like vermicompost and bio-fertilizers etc., Constitute important components for plant nutrient management in organic farming and it is indispensable to identify the better source of nutrient and quantity to meet the nutrient requirement of Pigeon pea.

Vermicompost application also suppresses the growth of many fungi like *Pythium, Rhizoctonia* and *Verticillium*; as a result many plant diseases are suppressed when vermicompost is applied in ample quantity in the field (Hoitink and Fahy 1986). Due to all these reasons treatment T5 has recorded highest yield.

Nutrient status of the soil is influenced by soil physico chemical and biological properties. Organic manure application will improve the soil fertility and availability of nutrients through slow mineralization and slow release of nutrients which in turn results in availability of nutrients throughout the growing period of the crop (Dudhat *et al.,* 1997).

Different nutrient management treatments failed to influence the potassium status of soil significantly. However, the available potassium was found highest in T5 over rest of the treatments. These results are in close conformity with the findings of Nagar *et al.* (2015).

3.1. Laboratory Experiments

3.1.1. Growth parameters of Red Gram (*Cajanus cajan* L.,) Seedlings

The growth characters such as shoot length, root length, plant height, leaf length, leaf width, leaf area number of leaver per plant, number of hairy roots, shoot girth, number of branches per plants of red gram seedlings as influenced by the application of Vermicompost and FYM is presented in Table 1,2,3 and Plates I. The highest shoot length, root length, plant height, leaf length, leaf width, leaf area number of leaver per plant, number of hairy roots, shoot girth, number of branches per plants of red gram seedlings as influenced by the application of 100% vermicompost and FYM applications were recorded in red ram seedlings grown with combined application of treatments five. The lowest shoot length, root length, plant height, leaf length, leaf width, leaf area number of leaver per plant, number of hairy roots, shoot girth, number of branches per plants of red gram seedlings as influenced by the treatments one on 10,30, and 45Th days after sowing respectively.

Table 1: Studies on the effect of Vermicompost and FYM on growth of red gram *Cajanus cajan* (L.) on 10th DAS(cm/seedlings)

S.No	Parameters	Treatments				
		T1	T2	T3	T4	T5
1	Shoot length (cm)	15.0	17.2	18.6	18.3 0549	20.4
2	Root length (cm)	14.9	16.5	16.7	15.9 0.477	16.2
3	Plant height (cm)	29.9	33.7	34.3	33.2	36.6
4	Leaf length (cm)	6.9	8.1	8.3	8.1	8.9
5	Leaf width (cm)	2.8	3.9	4.0	3.9	4.8
6	Leaf area (cm2)	9.6	31.6	16.6	15.7	21.4
7	No. of leaves/plant	8 0.24	10 0.3	14	23	27
8	No. of hairy roots	17	30	29	31	35
9	Shoot girth (cm)	1.8	2.6	2.8	2.6	3.1
10	No. of branches/plant	1±0.03	2±0.06	2±0.06	2±0.06	2 0.06

±Standard deviation
T1- Control, T2- 10% Vermicompost+FYM@RDF, T3-25% Vermicompost+FYM@RDF,T4-50% Vermicompost+FYM@RDF and T5-100% Vermicompost+FYM@RDF

Table 2: Studies on the effect of Vermicompost and FYM on growth of red gram *Cajanus cajan* (L.) on 30th DAS(cm/seedlings)

S. No	Parameters			Treatements		
		T1	T2	T2	T3	T5
1	Shoot length (cm)	25.9 0.777	25.6 0.768	28.8 0.864	29.3 0.879	30.6 0.918
2	Root length (cm)	14.1 0.423	15.2 0.456	19.5 0.585	17.2 0.516	22.3 0.669
3	Plant height (cm)	39.7 1.191	40.8 1.224	48.3 1.449	46.5 1.395	52.9 1.587
4	Leaf length (cm)	8.0 0.24	11.4 0.342	9.3 0.279	10.5 0.315	11.3 0.339
5	Leaf width (cm)	3.7 0.111	4.7 0.141	4.8 0.144	4.1 0.123	4.9 0.147
6	Leaf area (cm2)	14.8 0.444	29.1 0.873	22.3 0.669	21.5 0.645	32.5 0.975
7	No. of leaves/plant	23 0.69	57 1.73	49 1.47	48 1.44	69 2.07
8	No. of hairy roots	18 0.54	62 1.86	53 1.59	58 1.74	79 2.37
9	Shoot girth (cm)	2.7 0.081	3.8 0.114	3.9 0.117	3.9 0.117	4.3 0.129
10	No. of branches/plant	2 0.06	6 0.18	5 0.15	5 0.15	8 0.24

±Standard deviation
T1- Control, T2- 10% Vermicompost+FYM@RDF, T3-25% Vermicompost+FYM@RDF,T4-50% Vermicompost+FYM@RDF and T5-100% Vermicompost+FYM@RDF

Table 3: Studies on the effect of Vermicompost and FYM on growth of red gram *Cajanus cajan* (L.) on 45th DAS(cm/seedlings)

S. No	Parameters	Treatments'				
		T1	T2	T3	T4	T5
1	Shoot length (cm)	32.3 0.969	34.3 1.029	33.2 0.996	34.1 1.023	35. 7 1.071
2	Root length (cm)	17.3 0.519	19.4 0.582	19.4 0.582	18.2 0.546	20.3 0.609
3	Plant height (cm)	49.6 1.488	53.7 1.611	52.6 1.578	52.3 1.65	56.0 1.68
4	Leaf length (cm)	8.9 0.267	10.3 0.309	10.7 0.321	11.5 0.345	12.3 0.369
5	Leaf width (cm)	3.9 0.117	5.1 0.153	4.9 0.147	4.9 0.147	5.5 0.165
6	Leaf area (cm2)	17.4 0.522	26.3 0.789	26.2 0.786	28.2 0.846	33.8 1.014
7	No. of leaves/plant	40 1.3	45 1.35	60 1.8	65 1.95	70 2.1
8	No. of hairy roots	49 1.47	51 1.53	49 1.47	53 1.59	65 1.95
9	Shoot girth (cm)	2.7 0.081	3.9 0.117	3.9 0.117	3.8 0.114	4.3 0.129
10	No. of branches/plant	4 0.12	5 0.15	5 0.15	5 0.15	7 0.21

±Standard deviation

T_1- Control, T_2- 10% Vermicompost+FYM@RDF, T_3-25% Vermicompost+FYM@RDF,T_4-50% Vermicompost+FYM@RDF and T_5-100% Vermicompost+FYM@RDF

3.2. Photosynthetic Pigments

Chlorophyll is an integral component of plant pigments and plays a vital role in the process of photosynthesis. It is the molecule that absorbs sunlight and uses its energy to synthesis carbohydrates from CO_2 and water. It has been proved that chlorophyll play an important role in the ATP generation and prevention of essential plant constituents (Kochot *et al.,* 1998). Chlorophyll analysis is one of the important biochemical parameters, which is used as an index of plant production capacity. Chlorophyll a, b and total chlorophyll content is an indication of photosynthetic and metabolic activity. Carbohydrate is one of the main constituents of living organisms. It mainly improves the plant growth and yield of crop plants. The application of individual and combined state of organic manures gradually increased the carbohydrate content of crop plants when compared to control plant.

The higher carbohydrate content was observed at 45 days old plants when compared with other sampling days. The accumulation of the carbohydrate contents due to various fertilizers application was conformity with the earlier studies of several workers in different species such as potato (Mahendran and Kumar, 1998), *Pisum sativum* (Nirmal *et al.,* 2006), *Albizia lebbek* (Kumudha and Gomathinayagam, 2007) and maize (Tejeda *et al.,* 2008). Protein is one of the reserved food materials which are utilized for the growth of seedlings and further growth of plants. The increase in protein content was recorded in the crop grown in combined application and it was followed by application of inorganic fertilizers and organic manures. Similar findings were recorded in various crops by Desai *et al.* (2001); Aneja *et al.* (2006); Kumudha *et al.* (2006); Nirmal *et al.* (2006); Kumudha and Gomathinayagam (2007); Tejeda *et al.* (2008). This could be due to the transportation of the nitrogen observed by the plants at various stages of its growth (Doran and Smith, 1987).Amino acid is the monomer of protein, the common reserve food material manufactured by plant system. An increase in amino acid and protein contents were reported in red gram crop grown under recommended doses of organic manure applications. The inorganic fertilizers and organic manures applied plants showed a higher content when compared to control. Similar findings of increasing trend in amino acid due to fertilizer application were reported in *Albizia lebbek* (Yadav and Lourduraj, 2005b; Kumudha and Gomathinayagam, 2007) and maize (Tejeda *et al.,* 2008).

Sugar is an important energy constituent that needed for all the living organisms. Plants manufacture this organic substance during photosynthesis and breakdown during respiration. The concentration of soluble sugars indicated the physiological activity of plant organisms. The sugar contents (reducing sugars, non-reducing sugars and total sugars) increased are highly in fertilizers applied plots. The increased accumulations of sugars in tomato crop due to the fertilizers application are in conformity with the earlier studies in various crops such as potato (Mahendran and Kumar, 1998), *Pisum sativum* (Nirmal *et al.,* 2006), *Albizia lebbek* (Kumudha and Gomathinayagam, 2007) and maize (Tejeda *et al.,* 2008).

The photosynthetic pigments such as total chlorophyll, carbohydrate, protein and amino acids contents of red gram seedlings as viz., 10, 30, 45th days after sowing(DAS) influenced by the application of vermicompost and FYM is presented in Table 4,5,and 6. The highest total chlorophyll, carbohydrate, protein and amino acids contents of red gram seedlings as viz., 10, 30, 45th days after sowing(DAS) of red gram seedlings as influenced by the application of vermicompost and FYM applications were recorded in red gram seedlings grown with combined application of treatments five respectively.

Table 4: Studies on the effect of Vermicompost and FYM on growth of red gram *Cajanus cajan* (L.) on 10th DAS(cm/seedlings)

S. No	Parameters			Treatments		
		T1	T4	T3	T2	T5
1	Totalchlorophyll	3.4 0.102	7.5 0.225	7.7 0.231	13.6 0.408	19.5 0.585
2	Carbohydrate	1.7 0.051	3.37 0.101	7.07 0.212	12.9 0.387	13.80 0.414
3	Protein	7.7 0.231	6.8 0.204	6.8 0.204	7.6 0.228	10.3 0.309
4	Amino acids	6.6 0.198	12.1 0.363	13.4 0.402	15.4 0.462	14.9 0.447
5	Total sugars	10.72 0.321	10.50 0.315	11.43 0.343	13.98 0.419	14.74 0.442

±Standard deviation
T_1- Control, T_2- 10% Vermicompost+FYM@RDF, T_3-25% Vermicompost+FYM@RDF,T_4-50% Vermicompost+FYM@RDF and T_5-100% Vermicompost+FYM@RDF

Table 5: Studies on the effect of Vermicompost and FYM on growth of red gram *Cajanus cajan* (L.) on 30th DAS(cm/seedlings)

S. No	Parameters	Treatments				
		T1	T2	T4	T3	T5
1	Total chlorophyll	16.4 0.492	18.3 0.549	19.7 0.591	21.4 0.642	25.4 0.762
	Carbohydrate	9.2 0.276	11.2 0.336	12.9 0.387	14.8 0.444	16.8 0.504
2	Protein	15.1 0.453	18.3 0.549	14.6 0.438	13.2 0.396	22.5 0.675
3	Aminoacids	15.0 0.45	17.3 0.519	18.3 0.549	18.1 0.543	20.1 0.603
4	Total sugars	12.38 0.371	14.33 0.429	11.50 0.345	12.59 0.37	16.55 0.497

±Standard deviation
T_1- Control, T_2- 10% Vermicompost+FYM@RDF, T_3-25% Vermicompost+FYM@RDF,T_4-50% Vermicompost+FYM@RDF and T_5-100% Vermicompost+FYM@RDF

Table 6: Studies on the effect of Vermicompost and FYM on growth of red gram *Cajanus cajan* (L.) on 45th DAS(cm/seedlings)

S. No	Parameters		Treatments			
		T1	T2	T3	T4	T5
1	Chlorophyll	15.2 0.462	15.3 0.459	19.4 0.582	19.7 0.561	22.4 0.672
2	Carbohydrate	16.2 0.486	18.2 0.546	19.8 0.594	21.9 0.657	26.8 0.804
3	Protein	17.1 0.513	20.3 0.609	23.2 0.696	24.6 0.738	29.5 0.885
4	Aminoacids	13.0 0.39	16.3 0.489	13.1 0.393	15.3 0.459	20.7 0.621
5	Total sugars	14.90 0.447	16.78 0.503	14.97 0.449	15.91 0.477	17.98 0.539

±Standard deviation
T_1- Control, T_2- 10% Vermicompost+FYM@RDF, T_3-25% Vermicompost+FYM@RDF,T_4-50% Vermicompost+FYM@RDF and T_5-100% Vermicompost+FYM@RDF

3.3. Macro and Micro Nutrient Status of Red Gram(*Cajanus cajan* L.,)

The macro and micronutrient contents such as Nitrogen, Phosphorousm Potassium, Calcium, Megnesium, Zinc, Copper, Iron, and Manganese contents of red gram seedlings as viz., 10, 30, 45th days after sowing(DAS) influenced by the application of vermicompost and FYM is presented in Table 7,8,and 9 respectively. The highest Nitrogen, Phosphorousm Potassium, Calcium, Megnesium, Zinc, Copper, Iron, and Manganese contents of red gram seedlings as viz., 10, 30, 45th days after sowing(DAS) of red gram seedlings as influenced by the application of vermicompost and FYM applications were recorded in red gram seedlings grown with combined application of treatments five respectively. Macronutrients are the nutrients your body needs in larger amounts, namely carbohydrates, protein, and fat. These provide your body with energy, or calories. Micronutrients are the nutrients your body needs in smaller amounts, which are commonly referred to as vitamins and minerals. Macronutrients, or macros, are essential nutrients the body needs in large quantities to remain healthy. Macronutrients provide the body with 43 energy, help prevent disease, and allow the body to function correctly. There are three main types of macronutrients: proteins, fats, and carbohydrates. Nutritional analysis of GLVs except moisture was carried out on dry basis and has been given in the Table 2. The moisture content of green leafy vegetables was found to be highest for C.

Halicacabum (77.80%), while D. elata showed the lowest value of 62.86%. P. latifolia, M. pentaphylla, A. pomacea and P. grandis has the moisture content of 69.38%, 73.99%, 73.20% and 71.43% respectively. The high moisture content may induce a greater activity of water soluble enzymes and co-enzymes involved in metabolic activities of these leafy vegetables (Iheanacho and Ubebani, 2009).

The earlier findings showed that C. halicacabum have ash content of 7.3±0.08 (Ashish et al., 2013), which is very close to this study. However, P. grandis was reported to have 5.04% (Jayakumar et al., 2011) which is little lower than our findings. Commonly consumed leafy vegetables like Amaranthus viridis and Alternanthera sessilis have ash content of 1.85% and 1.5%, respectively.

Table 7: Effect of application of Vermicompost and FYM on Macro and micro nutrient content (ppm) of Red gram *Cajanus cajan* L., on 10 days

Treatments	N	P	K	Ca	Mg	Zn	Cu	I	Mn
T1	183.7472±5.51	18.3272±0.54	9.5572±0.28	109.5572±3.28	39.7572±1.19	25.6672±0.76	14.3472±0.43	164.3372±5.10	23.7572±0.71
T2	186.7972±5.50	22.7872±0.68	13.1172±0.39	112.9572±3.38	42.7872±1.28	27.9472±0.83	17.1072±0.51	168.7272±5.06	24.9872±0.74
T3	186.1172±5.58	22.0072±0.66	12.98720.38	112.3372±3.36	42.3372±1.26	27.3372±0.81	16.8472±0.50	167.1172±5.01	24.1172±0.72
T4	186.4272±5.59	22.5572±0.67	13..0072±0.39	112.7272±3.38	42.5172±1.27	27.5672±0.82	17.0072±0.51	168.3372±5.04	24.7172±0.74
T5	187.1172±5.61	23.1072±0.69	13.4272±0.40	113.5472±3.40	43.1172±1.29	28.3272±0.84	17.3372±0.52	169.4725.07	25.4172±0.75

±Standard deviation72**T1- Control, T2- 10% Vermicompost+FYM@RDF, T3-25% Vermicompost+FYM@RDF,T4-50% Vermicompost+FYM@RDF and T5-100% Vermicompost+FYM@RDF**

Table 8: Effect of application of Vermicompost and FYM on Macro and micro nutrient content (ppm) of Red gram *Cajanus cajan* L., on 30 days

Treatments	N	P	K	Ca	Mg	Zn	Cu	I	Mn
T1	186.7472±5.60	21.7472±0.65	10.7472±0.32	115.74072±3.47	42.7172±7.28	27.78872±0.83	16.5272±0.49	168.4272±5.05	25.6472±0.76
T2	192.0072±5.760	24.65272±0.739	13.52172±0.40	13.95272±0.41	45.11872±1.34	28.3372±0.34	18.4472±0.55	169.7472±5.09	27.1172±0.81
T3	192.4172±5.77	24.8872±0.74	13.71172±0.41	14.00072±0.420	45.55172±0.136	28.65172±0.855	18.62872±0.558	170.00072±5.100	27.33872±0.820
T4	192.5272±5.77	24.98072±0.74	13.9472±0.41	14.1172±0.44	45.7472±1.37	28.7772±0.80	18.7472±0.56	170.3372±5.10	27.5572±0.82
T5	192.7872±5.78	125.1172±0.75	14.3872±0.43	14.33072±0.42	46.1172±1.38	29.3272±0.87	19.2872±0.57	171.32072±5.13	28.1172±0.84

±Standard deviation72**T1- Control, T2- 10% Vermicompost+FYM@RDF, T3-25% Vermicompost+FYM@RDF,T4-50% Vermicompost+FYM@RDF and T5-100% Vermicompost+FYM@RDF**

Table 9: Effect of application of Vermicompost and FYM on Macro and micro nutrient content (ppm) of Red gram *Cajanus cajan* L., on 45 days

Treatments	N	P	K	Ca	Mg	Zn	Cu	I	Mn
T1	187.4172±5.62	23.2272±0.69	13.5472±0.40	113.7472±3.41	43.2272±1.29	28.5572±0.85	17.5272±0.52	169.5172±5.08	25.6672±0.16
T2	188.2372±5.646	24.5672±0.736	13,9872±0.419	113.9872±3.419	44.0072±1.320	28.6772±0.860	17.9872±0.593	169.5472±5.086	25.7672±0.772
T3	188.7572±5.662	24.9872±0.749	14.2172±0.426	114.0072±3.420	45,8772±1.376	28.7872±0.853	18.4372±0.552	169.8972±5.096	26.0072±0.780
T4	190.2372±5.706	25.0072±0.750	14.3572±0.430	114.4372±3.432	45.8872±1.376	28.8972±0.866	19.1172±0.573	170.4372±5.112	27.5672±0.826
T5	193.0072±5.79	25.33072±0.75	14.5272±0.43	114.5572±0.43	46.32172±1.38	29.5572±0.88	19.22072±0.57	171.5572±5.14	28.3372±0.84

±Standard deviation72**T1- Control, T2- 10% Vermicompost+FYM@RDF, T3-25% Vermicompost+FYM@RDF,T4-50% Vermicompost+FYM@RDF and T5-100% Vermicompost+FYM@RDF**

4. Conclusion

Vermicomposting technology is known throughout the world and is one of the fastest growing sectors for recycling of organic wastes in waste management.

In addition, vermicomposting will be helpful for managing domestic solid waste problems and could stabilize wastes with low toxicity, pathogens and heavy metals. The solid waste management could successfully promote vermicomposting as a viable alternative for the disposal of solid wastes. Vermicomposting in developing countries could prove to be useful in many instances. Some aspects of the process may be labour intensive when mechanized equipment such as frontend loaders, trammel screens, tractors, etc., Vermicomposting offer good potential to turn waste material into a valuable soil plant environment eco-friendly.

PLATE I

Selection of red gram *Cajanus cajan* L., seeds

Various doses of Vermicompost and FYM on growth of red gram *Cajanus cajan* (L.) on 10th DAS(cm/seedlings)

T1- Control, T2- 10% Vermicompost+FYM@RDF, T3-25% Vermicompost+FYM@RDF,T4-50% Vermicompost+FYM@RDF and T5-100% Vermicompost+FYM@RDF

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