



COMBINED EFFECT OF PRESSMUD, FARMYARD MANURE, GYPSUM AND ZINC SULPHATE FOR ENHANCED CROP PRODUCTIVITY IN COWPEA (*VIGNA UNGUICULATA* L.)

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Abstract

The agroindustrial waste pressmud was composted and along with farmyard manure, gypsum and zinc sulphate was used for the study of seedling, vegetative parameters and yield of cowpea. The composted pressmud significantly increased the seedling parameters namely length of epicotyls, hypocotyls, root length, number of lateral roots, plant fresh weight and plant dry weight. On the 30th Days After Sowing (DAS) the shoot length, plant fresh weight and dry weight in T₃ treatment (composted pressmud + farmyard manure) (14.10cm, 3.41g, 1.09g) were increased when compared to the control (8.41cm, 1.20g, 0.83g). On the 45th DAS shoot length was increased in T₃ (composted pressmud + farmyard manure). Root length (24.88 cm) number of leaves (10.66) and number of nodules were significantly increased in T₂ (composted pressmud) treatment. The yield parameters length of pod and weight of pod (5.58cm, 0.35g respectively) were increased in T₃ treatment (composted pressmud + farmyard manure) and number of seeds per pod (6.50) weight of seeds per pod (0.30g)

were increased in T₄ (composted pressmud + farmyard manure+ gypsum) treatment respectively. Hence from the present investigation it is clear that pressmud can be recycled and along with farmyard manure, gypsum and zinc sulphate. It can be used as a cheaper source of organic nutrients for plant growth.

Key words: composted pressmud, farmyard manure, gypsum.

Introduction

India has a vast scope for re-utilization of renewable agricultural wastes like farmyard manure, industrial wastes like pressmud and industrial byproduct like gypsum and zinc sulphate. Cow pea (*Vigna unguiculata* L.) Walp is commonly referred to as southern pea, black eye pea and pea. Worldwide cow pea production has increased dramatically in the last 25 years. Cow peas are grown mostly for their edible beans, although the leaves, fresh peas and fresh pea pods can also be consumed. The protein in cow pea seed is rich in the amino acids, lysine and tryptophan compared to cereal grains. This will definitely lay the

foundation for developing novel value added cowpea products. Therefore, this work was undertaken to study the integrated effect of composted pressmud, farmyard manure, gypsum and zinc sulphate for sustainable production of cowpea.

Materials and Methods

Collection of Agro – Industrial Waste

The agro-industrial waste pressmud was collected in large amounts from Gomuki Sugar Factory, Kallakurichi and Villupuram District.

Bioassay Estimation

The seeds of cow pea were soaked in beaker containing equal amount of different concentration of compost extracts for 12 hours. One set was kept as control by soaking the seed in water. The seeds were arranged in germination towels. The following concentration of composts were used T_1 - control, T_2 - 1 percent pressmud, T_3 - 2 percent pressmud, T_4 - 3 percent pressmud, T_5 - 4 percent pressmud, and T_6 - 5 percent pressmud. The parameters such as Root length, length of epicotyl, length of hypocotyl and number of lateral roots were recorded after seven days of growth. Thus the influence of pressmud on germination of seedlings was determined.

Pot Culture Experiment

a. Treatment application and cultivation

The pots were filled with 7kg of sandy loam soil. The compost pressmud, farmyard manure, gypsum and zinc sulphate was

above five seeds were sown in each pot with three replication. After germination three healthy plants were maintained per pot. Plant protection measures and other cultural practices were followed as recommended by Tamil Nadu Agricultural University, Coimbatore.

b. Treatment details

- T_1 - Control
- T_2 - Composted pressmud 12.5 t ha⁻¹
- T_3 - Composted pressmud 12.5 t ha⁻¹ + farmyard manure 12.5 t ha⁻¹
- T_4 - Composted pressmud 12.5 t ha⁻¹ + farmyard manure 12.5 t ha⁻¹ + gypsum 12.5 t ha⁻¹
- T_5 - Composted pressmud 12.5 t ha⁻¹ + farmyard manure 12.5 t ha⁻¹ + zinc sulphate 12.5 t ha⁻¹

Vegetative Parameters

On the 30 DAS (Days After Sowing) and 45th DAS (cow pea) the plants were uprooted from the pot and the vegetative characters were noted like the number of leaves, number of nodules, shoot length, root length, plant fresh weight and plant dry weight.

Yield Parameters

On the 70th DAS (cow pea) the plants were uprooted from the pot and the yield parameters like length of the pod, weight of the pod, number of seed per pod and weight of the seed per pod were observed.

Statistical Analysis

The data obtained from various biometrical observations and yield parameters were subjected to the statistical

Results and Discussion

The experimental result pertaining to the composted pressmud, farmyard manure, gypsum, zinc sulphate, biometric parameters of cow pea during seedling,

vegetative growth and yield parameters during the pot culture experiment on legume *Vigna unguiculata* (L.) walp var. co (cp) 7 were analyzed and the details of which are presented in Table 1, 2 and 3.

Table 1. Effect of Composted Pressmud Extract on Cowpea Seedling Growth

Treatment	Epicotyl length (cm)	Hypocotyl length (cm)	Root length (cm)	Number of lateral root
T ₁ - Control	9.77	9.70	12.32	25.17
T ₂ - 1%	10.73	11.73	13.83	29.86
T ₃ - 2%	12.47	10.05	18.25	35.83
T ₄ - 3%	13.52	13.05	15.12	35.33
T ₅ - 4%	17.18	10.73	16.87	32.17
T ₆ - 5%	14.50	14.17	14.98	25.50
SEd	0.7414	0.7538	1.5618	1.7092
CD (0.05)	1.5270	1.5524	3.2165	3.5202
CD (0.01)	2.0668	2.1012	4.3546	4.7647

Table 2. Effect of Composted Pressmud, Farmyard Manure, Gypsum and Zinc Sulphate on Vegetative Stage of Cowpea

Treatment	Shoot length (cm)		Root length (cm)		Number of leaves		Number of nodules		Plant fresh weight (g)		Plant dry weight (g)	
	Days											
	30	45	30	45	30	45	30	45	30	45	30	45
T ₁	8.41	12.90	10.66	21.68	4.16	8.50	0.50	6.83	1.20	3.54	0.39	0.83
T ₂	12.26	13.18	12.53	24.88	5.50	10.66	0.83	11.83	2.62	4.31	1.09	0.96
T ₃	14.10	15.50	13.16	22.00	6.16	9.83	0.66	3.66	3.41	3.96	0.94	0.85
T ₄	8.01	12.33	12.98	16.58	4.16	10.33	2.66	1.66	1.59	2.81	0.60	0.65
T ₅	7.63	10.38	7.80	14.65	5.50	10.66	0.33	9.33	2.00	3.02	0.48	0.59
SEd	1.18221		1.81727		0.81506		0.53241		0.48283		0.16559	
CD (0.05)	2.38116		3.66028		1.64166		1.07235		0.97251		0.33352	

Table 3. Effect of Composted Pressmud, Farmyard Manure, Gypsum and Zinc Sulphate on Yield Parameters of Cowpea

Treatment	Length of pods (cm)	Weight of pods (g)	Number of seeds per pod	Weight of seeds per pod (g)
T ₁	4.67	0.20	5.67	0.12
T ₂	5.11	0.30	5.57	0.09
T ₃	5.58	0.35	6.33	0.25
T ₄	5.18	0.32	6.50	0.30
T ₅	4.72	0.25	5.03	0.08
SEd	0.2272	0.0352	0.3202	0.0300
CD (0.05)	0.4718	0.0718	0.6672	0.0625
CD (0.01)	0.6435	0.0980	0.9099	0.0853

i. Seedling growth experiment

a. Effect of composted pressmud extract on seedling growth (Table 1).

The composted pressmud extract was more significant in all the treatments regarding seedling growth. In 12 hours soaking experiment of cow pea, the epicotyls length was significantly increased with T₅ (17.18 cm) when compared to the control T₁ (9.77 cm) and other treatments T₂ (10.73 cm) and T₃ (12.47 cm). The hypocotyl length was significantly increased in T₄ (13.05 cm) and T₆ (14.17 cm) when compared to control T₁ (9.70 cm). The root length was highest in T₃ (18.25 cm) and T₅ (16.87 cm) when compared to control T₁ (12.32 cm). The number of lateral root was highest when compared to the control T₁ (25.17 cm). The similar results were supported by Mekki *et al.*, (2013) on composting of agro industrial waste and the

ii. Pot culture experiment

Effect of composted pressmud, farmyard manure, gypsum and zinc sulphate on vegetative characters of cow pea (Table 2).

a. Shoot length and root length

On the 30th DAS the treatment T₃ (14.1 cm), T₂ (12.2 cm) showed the highest value in shoot length when compared to control T₁ (8.4 cm). On 45th DAS a significant value was obtained in T₃ (15.5 cm), T₂ (13.1 cm) when compared with control T₁ (12.9 cm). On the 30th DAS root length of cow pea was significantly increased in the treatments T₃ (13.1 cm), T₄ (12.9 cm) over the control T₁ (10.6 cm). On the 45th DAS the treatments composted pressmud T₂ (24.8 cm), T₃ (22.0 cm) treatment such as FYM had a greater influence than control T₁ (21.6 cm)

noted in Bengal gram due to the addition of pressmud compost (Deshmukh, 2004). Pressmud supplies nitrogen, macro and micro nutrients. Nitrogen is an active constituent of protoplasm, enzyme and chlorophyll. They act as a catalytic agent in accelerating cell division and photo assimilation which, boosts plant growth and also improved the plant building structures.

b. Number of leaves

The treatments influenced the number of leaves of cow pea over the control T_1 (4.1). On the 30th DAS a significant increase was observed in T_3 (6.1), T_2 (5.5), T_5 (5.5). On the 45th DAS the increased value was observed in T_2 (10.6) and T_4 (10.3) over the control T_1 (8.5). The result is in agreement with the Babcznska *et al.*, (2008) and Prabakaran, (2003). The presence of available nitrogen and organic matter improved the physico-chemical and biological properties of the soil, thus resulting in better vegetative growth and photosynthesis.

c. Number of nodules

On the 30th DAS the number of nodules was significantly increased with T_4 (2.6), T_2 (0.8), T_3 (0.6) when compared to control T_1 (0.5). On the 45th DAS the number of nodules were highly increased with treatment T_2 (11.8), T_5 (9.3) when compared to the control T_1 (6.8). The similar work was supported by Kumar and Rao, (2012) and Eusufzai *et al.*, (1999). Nitrogen fixing microorganisms enhance the nutrient

d. Plant fresh weight and Plant dry weight

The treatment such as composted pressmud + farmyard manure T_3 (3.41 g), T_2 (2.62 g) significantly increased the fresh weight over the control T_1 (1.20 g) on the 30th DAS of growth. On the 45th DAS a favourable increase was noted with composted pressmud T_2 (4.31 g), farmyard manure T_3 (3.96 g) over control T_1 (3.54 g). The application of composted pressmud significantly increased the plant fresh weight.

On the 30th DAS plant dry weight increased in T_2 (1.09 g), T_3 (0.94 g), T_4 (0.60 g) when compared to the control T_1 (0.39 g). On the 45th DAS when compared with control T_1 (0.83 g) the dry weight of T_2 (0.96 g) and T_3 (0.85 g) increased. This is in agreement with the work of Makoi and Nadkidemi (2007) and Anburani *et al.*, (2003). The increase may be due to the availability of nitrogen and phosphorus through the mechanism of reduction, chelation and favorable changes in soil.

iii. Effect of composted pressmud, farmyard manure, gypsum and zinc sulphate on yield parameters of cow pea (Table 3)

a. Length and weight of pods

The increased length of pod was observed in the treatments T_3 (5.58 cm). The other treatments increased slightly over control T_1 (4.67 cm). The weight of pod was increased in the treatment T_3 (0.35 g) when compared to the control T_1 (0.20 g). The similar findings were reported by Mathers

due to the application of different types of organic manures which contributed to more nutrients supply available for the crops in the soil.

b. Number and weight of the seeds per pod

The number of seeds in T₃ and T₄ (6.33 and 6.50) are greater when compared with control T₁ (5.67). Increase in number of seeds per pod was reported by Yadegari *et al.* (2008) in bean. The weight of the seeds per pod is observed higher in T₄ (0.30 g) and other treatment (0.12g) which is in agreement with findings of Akilandeswari (2003) in green gram. In these results T₃ composted pressmud and T₄ composted pressmud+ farmyard manure + gypsum enhanced the humus content and improved soil conditions which resulted in healthier and more nutrition status of plants. Hence,

a maximum number of seeds were obtained in above treatments.

Conclusion

Agro industrial wastes can be recycled and used as a cheaper source of organic nutrients. Integrated nutrient management alleviates the effect of inorganic elements responsible for toxicity hazards and prevents the physical, chemical degradation of soil thereby contributes to the restoration of soil health.

It is evident from the present investigation that the composted pressmud, farmyard manure, gypsum and zinc sulphate treatment increases the biometrical and yield parameters of cow pea. Hence it was concluded that the pressmud on composting can be effectively used as organic manure.

REFERENCES

1. Akilandeswari, A. (2003), Impact of composted pressmud on seed germination, seedling growth, biometric and yield parameters of green gram and soyabean, Avinashilingam Deemed University, M.Sc. Thesis.
2. Anburani, A., Manivanna, K. and Shakila, A. (2003), Integrated nutrient and weed management on yield and yield parameters in brinjal (*Solanum melongena* L.). Annamalai Plant Archives, 3(1), 85 - 88.
3. Babczynska, A., Kozlowski, M., Sawczyn, T. and Augustyniak, M. (2008), Effects of zinc and female aging on nymphal life history in a grasshopper from polluted sites, *J. Insect Physiol.*, 54 (1), 41-50.
4. Deshmukh, A.M. (2004), Interaction effect of rhizobium and pressmud compost on growth of gram (*Cicer arietinum*), *J. Curr. Sci.*, 8, 3.
5. Eusufzai, A.K., Solaiman, A.M. and Ahmed, J.U. (1999), Response of some chickpea varieties to *Rhizobium* inoculation in response of nodulation biological nitrogen fixation and dry matter yield. *Bangla. J. Microbiol.*, 16 (2), 135 - 144.

7. Kumar, S.R.S. and Rao, K.V.B. (2012), Biological nitrogen fixation". *Int. J. Adv. Life. Sci.*, 1, 1-6.
8. Makoi, J.H.H.R. and Nadkidemi, P.A. (2007), Reclamation of sodic soils in Northern Tanzania, using locally available organic and inorganic resources, *African J. Biotechnol.*, 6 (16), 1926-1931.
9. Mathers, A.C. and Stewart, B.A. (2001), Sunflower nutrient uptake, growth and yield as affected by nitrogen or manure and plant population. *Agron. J.*, 74 (4), 911-915.
10. Mekki, A., Arous, F., Aloui, F. and Suyadi, S. (2013), Disposal of agro-industrials wastes as soil amendmets. *AJES*. 9 (6), 458-469.
11. Prabakaran, C. (2003), Economic and quality assessment of organically growth tomato. *Madras Agricultural Journal*, 90 (10-12), 759-767.
12. Yadegari, M., Rahman, H.A., Noormohammadi, G. and Ayneband, A. (2008), Evaluation of bean seeds inoculation with rhizobium phaseoli and plant growth promoting rhizo bacteria on yield and yield components, *Pakistan J. of Bio. Sci.*, 11 (15), 1935-1939.