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Optimizing the level of pressmud compost for bhendi

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ABSTRACT

A field experiment was conducted in a sandy clay loam soil with bhendi as the test crop (cv. Arka Anamika) in Sivapuri village, Chidambaram Taluk, Cuddalore district, Tamil Nadu. To study the effect of pressmud compost on plant growth, yield attributes, yield and nutrient uptake by bhendi. The presumed compost was applied @ 5, 7.5, 10, 12.5, 15, 17.5 and 20 t ha-1 as a basal dose. All the experimental plots received a common fertilizer schedule of 100:60:50 kg NPK ha-1 (RDF). The results of the experiment clearly revealed that application of pressmud compost had a significant influence on growth, yield, and uptake of nutrients. Increasing levels of pressmud compost gradually increased the growth attributes. The significantly maximum value was recorded with the application of 15 tonnes of pressmud compost ha-1. Thereafter, there was no significant improvement. A similar trend was observed in the yield attributes and yield of bhendi. Regarding nitrogen, phosphorus and sulphur uptake by plant and fruit, significantly higher values were recorded with 15 tonnes pressmud compost. However, the subsequent increase in pressmud compost application failed to attain the level of statistical significance.

Keywords— *Bhendi, Pressmud compost, Nutrient uptake, N, P*

1. INTRODUCTION

Bhendi or lady's finger belongs to family Malvaceae. It is an annual vegetable crop in tropical and subtropical parts of the world. It is one of the most important nutritious vegetable crops grown around the year in India. Okra is an important fruit vegetable of high commercial and food values. It is primarily valued for its tender, immature green pods in fresh form; however, its curry, soups and edible young leaves are also popular. In India, the largest annual production of bhendi is 63.46 MT from an area at 5.32 lakh hectare (5.7 % of total vegetable area). The average productivity of okra in India is 11.9 MT $ha^{-1}$and in Tamilnadu the productivity is less.

The application of inorganic fertilizers results in a yield increase of this crop. Unfortunately, inorganic fertilizers reduce the quality of arable lands. The continuous use of chemical fertilizers has resulted in creating a potential threat of environmental pollution and causing a deterioration of the nutrient status. To overcome this, scientists prefer biologically dynamic and sustainable farming which stresses the importance of judicious use of organic manures with chemical fertilizers to augment productivity of crops. The crop waste and organic manures can be effectively utilized by way of adopting suitable technologies by integrating with inorganic fertilizer enrichment and composting etc. Apart from chemical fertilizers and organic wastes, industrial wastes like pressmud can also be used in agriculture (Poonkodi and Raghupathy, 2001). It is a good media of both organic and inorganic plant nutrients as it contains organic carbon, nitrogen, phosphorus, potassium, calcium and sulphur and abundance of micronutrients. Composting is an economical and effective way to treat manure for land application. This is because pathogens are destroyed and the heterogeneous solid-state organic matter is transformed into the more stable substance by the activity of bacteria (Aly Sheikha, 2016). Therefore, the objective of the present study was to find out the effect of pressmud compost on yield, yield attributes, growth attributes and uptake of bhendi.

2. MATERIALS AND METHODS

A field experiment was conducted at Sivapuri village in farmers' holding, Chidambaram Taluk, Cuddalore district, Tamil Nadu to find out the effect of pressmud compost on yield, nutrient content and uptake of Bhendi variety Arka Anamika, the test crop under an irrigated condition with eight treatments replicated thrice in a randomized block design. The recommended dose of NPK fertilizers was applied uniformly to all plots. Pressmud compost was applied in different combinations as per the treatment schedule. The details of the treatments are given below:

T_1 - Control
T_2 – Pressmud compost @ 5 t ha^{-1}
T_3 – Pressmud compost @ 7.5 t ha^{-1}

T_4 – Pressmud compost @ 10 t ha^{-1}
T_5 – Pressmud compost @ 12.5 t ha^{-1}
T_6 – Pressmud compost @ 15 t ha^{-1}
T_7 – Pressmud compost @ 17.5 t ha^{-1}
T_8 – Pressmud compost @ 20 t ha^{-1}

The growth attributes, yield attributes and yield were recorded. The nutrient content of plant and fruit at harvest was analysed for N, P and S content and the uptake was obtained from the yield and nutrient content.

3. RESULTS AND DISCUSSION

3.1 Growth attributes

3.1.1 Plant height: The plant height was significantly influenced by the application of pressmud compost in different combinations. Increasing doses of pressmud compost gradually increased the plant height. The application of 20 tonnes of pressmud compost ha-1 (T8) registered the maximum plant height of 131.5 cm. The treatment T7 (17.5 tonnes of pressmud compost ha-1) was next in order recording the plant height of 131.0 cm. This was followed by the treatments T1, T2, T3, T4, T5, T6, T7 and T8. The treatments T8 and T7 and T6 were on par with each other. The treatment T1 (control) recorded the lowest plant height of 100.5 cm. The use of pressmud compost would have facilitated better aeration, adequate drainage and created a favourable soil environment for deeper penetration of roots and higher nutrient extraction from soil (Sabir et al., 2013). There was a highly significant effect with the application of pressmud compost on the plant height which could be attributed to the fact that the nutrients in the pressmud compost might have released gradually through the process of mineralization maintaining optimal soil nutrient levels over a prolonged period of time (Bationo et al., 2004).

3.1.2 Number of leaves plant^{-1}: It was quite clear from the data that the application of pressmud compost in various combinations influenced the number of leaves plant^{-1}. Increasing doses of pressmud compost gradually increased the number of leaves plant^{-1}. The application of 20 tonnes of pressmud compost ha^{-1} (T_8) recorded the maximum number of leaves plant^{-1} (30.3). This was followed by the treatment T_7 (17.5 tonnes of pressmud compost ha^{-1}) which recorded the highest number of leaves/plant of 30.2. The treatments next in order were T_1, T_2, T_3, T_4, T_5, T_6, T_7 and T_8. But the treatments T_8 and T_7 and T_6 were on par with each other. This increase might be due to the fact that the application of NPK and pressmud compost provided adequate N which is associated with high photosynthetic activity and vigorous vegetative growth. Similar observations and statements were given by Kabir (1998) and Azad (2000) in cabbage and Prativa (2011) in tomato.

Table 1: Effect of pressmud compost on growth, yield attributes and yield of bhendi

Treatments	Growth attributes		Yield attributes		Yield (t ha^{-1})	
	Plant height (cm)	No. of leaves plant^{-1}	No. of fruits plant^{-1}	Fruit length (cm)	Fruit	Stover
T_1–Control	100.5	22.1	16.38	19.2	11.83	8.98
T_2–Pressmud Compost @ 5 t ha^{-1}	108.8	24.0	18.0	20.8	13.11	10.11
T_3–Pressmud Compost @ 7.5 t ha^{-1}	114.9	25.5	19.1	22.0	14.31	11.05
T_4–Pressmud Compost @ 10 t ha^{-1}	121.3	27.8	20.2	23.4	15.30	12.00
T_5–Pressmud Compost @ 12.5 t ha^{-1}	125.4	29.0	21.3	24.2	16.41	12.85
T_6–Pressmud Compost @ 15 t ha^{-1}	130.3	29.9	22.6	25.30	17.38	13.73
T_7–Pressmud Compost @ 17.5 t ha^{-1}	131.0	30.2	23.0	25.7	18.00	14.03
T_8–Pressmud Compost @ 20 t ha^{-1}	131.5	30.3	23.2	26.0	18.41	14.12
SED	2.12	0.27	0.28	0.25	0.38	0.34
CD (p=0.05)	4.38	0.56	0.58	0.52	0.79	0.70

3.2 Yield attributes

3.2.1 Number of fruits plant^{-1}: The data presented in Table 1 revealed that the number of fruits plant^{-1} was significantly influenced by the application of pressmud compost in different combinations. Increasing doses of pressmud compost gradually recorded the highest number of fruits plant^{-1}. The application of 20 tonnes of pressmud compost ha^{-1} (T_8) recorded the maximum number of fruits plant^{-1} (23.2). The treatment T_7 (17.5 tonnes of pressmud compost ha^{-1}) was next in order recording the number of fruits plant^{-1} of (23.0). The treatments T_8 and T_7 and T_6 were on par with each other. The treatment T_1 was recorded the lowest number of fruits plant^{-1} (16.38). The yield analysis revealed that the fruit yield increase might be due to increased fruit weight and a number of fruits per plant. The highest yield obtained with pressmud compost manure might be due to the cumulative effect of nutrients released by the composted manure to the soil (Law-Ogbomo, 2013).

3.2.2 Fruit length: Statistically significant differences were observed in the fruit length with the application of pressmud compost in various combinations. The application of 20 tonnes of pressmud compost ha^{-1} (T_8) recorded the maximum fruit length (26.0 cm). This was followed by the treatment T_7 (17.5 tonnes of pressmud compost ha^{-1}) which recorded the number of fruits/plant of 25.7 cm. The treatments next in order was T_1, T_2, T_3, T_4, T_5, T_6, T_7 and T_8 the treatments T_8 and T_7 and T_6 were on par with each other. The treatment T_1 was recorded the minimum fruit length of 19.2 cm. These results are in conformity with the findings of (Subbiah *et al.*, 1982).

3.3 Yield

3.3.1 Fruit: Increasing levels of pressmud compost gradually increased the yield of bhendi fruit. The application of 20 tonnes of pressmud compost ha^{-1} (T_8) recorded the highest fruit yield of 18.41 t ha^{-1}. The treatment T_7 (17.5 tonnes of pressmud compost ha^{-}

[1]) was next in order recording the fruit yield 18.0 t ha^{-1}. This was followed by the treatments T_1, T_2, T_3, T_4, T_5, T_6, T_7 and T_8. The treatments T_8 and T_7 and T_6 were on par with each other. The treatment T_1 was recorded the least fruit yield of 11.83 t ha^{-1} viz. control. The highest fruit yield of bhendi with pressmud compost might be due to accelerated mobility of photosynthates influenced by plant hormones from the source to sink. Similar observations were stated by Susan (1996) and Senjobi *et al.* (2013).

3.3.2 Stover: Of various levels of pressmud compost tried, the application of 20 tonnes of pressmud compost ha^{-1} (T_8) recorded the maximum stover yield (14.12 t ha^{-1}). The treatment next in order was T_7 (17.5 tonnes of pressmud compost ha^{-1}) recording the stover yield of 14.03 t ha^{-1}. The treatments next to this were T_1, T_2, T_3, T_4, T_5, T_6, T_7 and T_8. The treatments T_8 and T_7 and T_6 were not significantly different from each other. The treatment T_1 recorded the lowest stover yield of 8.98 t ha^{-1}.

Table 2. Effect of pressmud compost on nutrient uptake (kg ha^{-1}) of bhendi

Treatments	Nitrogen		Phosphorus		Sulphur	
	Plant	Fruit	Plant	Fruit	Plant	Fruit
T_1–Control	20.1	27.1	7.5	7.9	5.00	7.13
T_2–Pressmud Compost @ 5 t ha^{-1}	23.8	31.2	8.7	9.0	5.93	8.20
T_3–Pressmud Compost @ 7.5 t ha^{-1}	26.4	34.0	9.8	10.2	6.85	9.05
T_4–Pressmud Compost @ 10 t ha^{-1}	28.5	37.2	11.2	11.6	7.52	10.32
T_5–Pressmud Compost @ 12.5 t ha^{-1}	30.2	40.3	12.2	12.9	8.19	11.8
T_6–Pressmud Compost @ 15 t ha^{-1}	31.9	42.2	13.0	13.8	8.88	12.6
T_7–Pressmud Compost @ 17.5 t ha^{-1}	33.0	42.9	13.3	14.0	9.02	12.9
T_8–Pressmud Compost @ 20 t ha^{-1}	33.6	43.1	13.5	14.1	9.15	13.0
SED	0.61	0.68	0.22	0.26	0.15	0.19
CD (p=0.05)	1.26	1.41	0.46	0.54	0.31	0.39

3.4 N uptake

3.4.1 Plant: The data pertaining to nitrogen uptake of bhendi is presented in Table 2. Application of different levels of pressmud significantly influenced the nitrogen uptake by bhendi plant. Among the various combinations tried, application of pressmud @ 20 t ha^{-1} (T_8) registered the maximum nitrogen uptake of bhendi plant (33.6 kg ha^{-1}). This was followed by the treatment T_7 (pressmud @ 17.5 t ha^{-1}) recording the nitrogen uptake of 33.0 kg ha^{-1}. The treatments next in order were T_1, T_2, T_3, T_4, T_5, T_6, T_7 and T_8. The treatments T_8 and T_7 and T_6 were on par with each other. The treatment T_1 recorded the minimum nitrogen uptake by bhendi plant 20.1 kg ha^{-1}.

3.4.2 Fruit: It was clear from the data from table 2. That the application of pressmud @ 20 t ha^{-1} (T_8) registered the maximum nitrogen uptake of bhendi fruit (43.1 kg ha^{-1}). The treatment next in order was T_7 recording the nitrogen uptake of 42.9 kg ha^{-1}. The treatments T_8 and T_7 and T_6 were not significantly different from each other. The lowest nitrogen uptake of bhendi fruit was recorded in control (27.1 kg ha^{-1}). The increase in the uptake of nutrients NPK by bhendi fruit and plant with the application of pressmud compost might be due to optimum nutrients supply for the crop. Similar results were observed by Subbaiah *et al.* (1982) and Bahadur *et al.*, (2004).

3.5 P uptake

3.5.1 Plant: Of the various levels tried, application of pressmud @ 20 t ha^{-1} (T_8) registered the highest phosphorus uptake of 14.1 kg ha^{-1} by bhendi plant. The treatment T_7 was next in order of increasing the phosphorus uptake of bhendi plant (13.3 kg ha^{-1}). This was followed by the treatments T_1, T_2, T_3, T_4, T_5, T_6, T_7 and T_8. The treatments T_8 and T_7 and T_6 were on par with each other. The least phosphorus uptake of bhendi plant was 7.5 kg ha^{-1} in control. Similar kind of results was observed by Grewal and Trehan (1978) and Miller *et al.* (1987).

3.5.2 Fruit: Application of different levels of pressmud significantly influenced the phosphorus uptake by bhendi fruit. Application of pressmud @ 20 t ha^{-1} (T_8) registered the maximum phosphorus uptake of bhendi fruit is 43.1 kg ha^{-1}. This was followed by the treatment T_7 (pressmud @ 17.5 t ha^{-1}) recording the phosphorus uptake of bhendi fruit was 14.0 kg ha^{-1}. The treatments T_8 and T_7 and T_6 were on par with each other. The treatments T_8 and T_7 were on par with each other. The treatment T_1 recorded the lowest phosphorus uptake by bhendi fruit (7.9 kg ha^{-1}).

3.6 S uptake

3.6.1 Plant: It was quite clear from the data that the application of different levels of pressmud significantly influenced the sulphur uptake by bhendi plant. Among the various levels tried, application of pressmud @ 20 t ha^{-1} (T_8) registered the highest sulphur uptake of bhendi plant is 9.15 kg ha^{-1}. The treatment next in order was T_7 recording the sulphur uptake of 9.02 kg ha^{-1}. The treatments T_8 and T_7 and T_6 were on par with each other. The treatment T_1 recorded the least sulphur uptake of bhendi plant (5.0 kg ha^{-1}).

3.6.2 Fruit*:* Of the various doses tried, application of pressmud @ 20 t ha^{-1} (T_8) registered the maximum nitrogen uptake of bhendi fruit is 13.0 kg ha^{-1}. The treatment T_7 was next in order recording the sulphur uptake of 12.9 kg ha^{-1} by bhendi fruit. The treatments T_8 and T_7 and T_6 were on par with each other. The minimum sulphur uptake of bhendi fruit was 7.13 kg ha^{-1} in control.

4. CONCLUSION

The results revealed that incremental additions of pressmud compost up to 20 t ha^{-1} increased the yield attributes, yield and nutrient uptake of bhendi significantly. But there was no significant difference between 20, 17.5 and 15 t of pressmud compost ha^{-}

[1] in registering the values in all the attributes. So, it is concluded that the application of 15 t of pressmud compost ha^{-1} was found to be the optimum dose for bhendi in boosting the yield. The utilization of pressmud compost not only improves productivity but also helps in solid waste utilization.

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