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STUDIES ON INFLUENCE OF ACTIVATED EM ENRICHED COMPOSTS ON PRODUCTIVITY ENHANCEMENT IN HYBRID MAIZE (*ZEA MAYS* L.)

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Abstract

Field experiment was conducted to study the use of EM enriched compost on maize productivity. The experiment was conducted in randomized block design and replicated thrice with ten treatments which includes recommended dose of fertilizers with or without different doses of EM inoculated pressmud, EM inoculated FYM, pressmud and FYM alone and absolute control. The yield components of maize *viz*., number of grains cob^{-1} and cob length was favourably influenced by recommended dose of fertilizer with 12.5 t ha^{-1} of EM inoculated pressmud compost. This treatment also recorded the highest grain yield of 6482 kg ha^{-1}. The least grain and stover yields was recorded in control treatment. In respect of economics, recommended dose of fertilizer with 12.5 t $ha^{-1}$of EM inoculated pressmud compost (T_3) treatment recorded the higher net return of Rs. 49,841. In general, considering the above results it can be concluded that application of recommended dose of fertilizer along with 12.5 t ha^{-1} of EM inoculated pressmud compost to maize crop can be recommended for the farmers for achieving higher yields and better net income.

Keywords : *Zea mays* L., FYM.

Introduction

Maize is one of the most important cereal crops grown all over the globe and has relatively higher production potential, wider adaptability and multifarious uses. Due to its high yield potential, it is called queen of cereals. (Sudhakar *et al.,* 2011). It is now the third most important cereal crop in the world. At present maize is grown over an area of 168 million hectares with a production of 945.8 million tonnes in the world. In India, maize occupies an area of 8.55 million hectares with a production of 21.73 million tonnes and the productivity is 2.54 t ha^{-1} (Gangaiyah, 2013).

Inorganic fertilizers for increasing cereal crop production is inevitable in the present circumstances. But this had declined the soil fertility in the long term. Inorganic chemical fertilizers cannot be avoided completely. Hence, continuous application of chemical fertilizers alone is not desirable as it will deteriorate soil health. Organic manures may increase soil fertility and thus the crop production potential possibly by changes in soils physical and chemical properties and microbial community and activity etc.

The environmental management is based on recycling of waste. Benefits of compost include environmentally sound method of recycling animal wastes (*viz*., FYM, poultry), sewage and agro industrial waste (pressmud), improves soil physical properties. The most outstanding characteristic of EM is that it includes both aerobic and anaerobic species co-existing symbiotically in most beneficially productive manner. EM mainly consist of lactic acid bacteria (*Lactobacillus* spp.), yeast (*Saccharomyces* spp.) and photosynthetic bacteria *(Rhodopseudomeonas* spp.) which co-exist for the benefit of whichever environment they are introduced. EM plays an important role in composting of organic wastes and converts all waste into very good manures within a short period of time. Hence, a field experiment was conducted to study the impact of EM enriched composts on growth and yield enhancement in maize.

Materials and Methods

An experiment was conducted, to study the use of EM enriched compost on growth and yield of maize (*Zea mays*) in Annamalai university experimental farm, Tamil Nadu. The soil of the experimental field was clay loam texture with low in available nitrogen, medium in available phosphorus and high in available potassium. The maize hybrid P 3502 (duration 90-105 days) was chosen for the study.

The experiment was conducted in randomized block design and replicated thrice with ten treatments *viz*., T_1- Control (No fertilizer and no organic manure), T_2- Recommended dose of fertilizer,T_3 – Recommended dose of fertilizer with 12.5t ha^{-1} of EM inoculated pressmud compost, T_4 – Recommended dose of fertilizer with 11.5 t ha^{-1} of EM inoculated pressmud compost,T_5 – Recommended dose of fertilizer with 10.5 t ha^{-1} of EM inoculated pressmud compost, T_6 – Recommended dose of fertilizer with 12.5 t ha^{-1} of pressmud compost, T_7 – Recommended dose of fertilizer with 12.5 t ha^{-1} of EM

inoculated FYM, T_8- Recommended dose of fertilizer with 11.5t ha^{-1} of EM inoculated FYM, T_9- Recommended dose of fertilizer with 10.5 t $ha^{-1}$of EM inoculated FYM,T_{10}- Recommended dose of fertilizer with 12.5 t ha^{-1} of FYM. The 4-5 month old pressmud compost and farm yard manure were used in the study.

The ridges and furrows were formed. The recommended seed rate of 15 kg ha^{-1} was sowing with a spacing of 60 cm x 25 cm. The recommended dose fertilize is: 135:62.5:50 kg N, P_2O_5 and K_2O per hectare was followed. Half dose of N and full dose of P_2O_5 and K_2O were applied basally. The remaining N was applied as top dressing at 25 and 45 DAS in two equal splits.

Preparation of Activated EM solution

EM is basic liquid/ mother liquid stock solution which is used as base inoculums for developing effective microorganism, the inactivated microorganism in EM can be activated. Take one kg of jaggery solution in a plastic bucket. Mix with 18-20 litre chlorine free water and also with one litre EM stock solution. Mix the solution thoroughly and close the bucket with cover. Stir the solution 2-3 minutes regularly upto one week.

Preparation of EM compost

Organic waste raw material like press mud, farm yard manure were used for making EM compost. The organic waste raw material was inoculated with AEM solution @ 5 lit/tonne of raw material and heaped. Sprinkle water daily to maintain the moisture content 60%. After 30-45 days the compost was ready to matured and apply in field where as conventional method takes around 150 days for its maturity. After maturity the compost was of good quality, with a good texture and pleasant odour.

Results and Discussion

Growth Parameters (Table 1)

Application of different composts with chemical fertilizers significantly influenced on growth parameters viz., plant height and LAI of maize. Among the treatments, treatment T_3- recommended dose of fertilizers with 12.5 t ha^{-1} of EM (effective microorganism) inoculated pressmud compost registered higher plant height of 216.42 cm at harvest and LAI of 7.28 at 60 DAS. This was on par with the treatment T_7- Recommended dose of fertilizer with 12.5 t ha^{-1} of EM inoculated FYM recorded the higher plant height and LAI. The control treatment (T_1) recorded lowest plant height of 143.02 cm at harvest and LAI of 2.81 at 60 DAS. The increase in plant height was mainly due to the reason of more availability of nutrient released from pressmud compost throughout the growing season in addition to the chemical fertilizers. These results are in accordance with the findings of Saha *et al.* (2010). The higher LAI was due to more number of leaves per unit area and size of successive leaves. This might be due to higher nutrient availability through development of a conducive environment by soil microbes.

Table 1 : Effect of EM Inoculated Agricultural Organic Wastes on Maize growth and yield parameters

TREATMENT	Plant height at harvest (cm)	LAI 60 DAS	Cob length (cm)	No. of grains per cob^{-1}
T_1-Control (No fertilizer and no organic manure)	143.02	2.81	13.72	270
T_2 -RDF (Recommended dose of fertilizer)	174.27	3.89	14.68	288
T_3 -R-DF + 12.5 t ha^{-1} of EM inoculated pressmud compost	216.42	7.28	18.90	412
T_4 -RDF + 11.5 t ha^{-1} of EM inoculated pressmud compost	206.18	6.34	17.20	380
T_5-RDF + 10.5 t ha^{-1} of EM inoculated press mud compost	190.04	4.81	15.87	325
T_6-RDF+ 12.5 t ha^{-1} of pressmud compost	202.92	6.03	16.86	371
T_7 -RDF + 12.5 t ha^{-1} of EM inoculated FYM	212.60	6.03	18.04	397
T_8 -RDF + 11.5 t ha^{-1} of EM inoculated FYM	199.04	5.57	16.54	352
T_9 -RDF + 10.5 t ha^{-1} of EM inoculated FYM	185.26	4.58	15.52	306
T_{10} -RDF + 12.5 t ha^{-1} of FYM	197.56	5.28	16.29	344
SE_d	4.36	0.12	0.37	7
CD(P=0.05)	9.15	0.26	0.78	16

Yield Components (Table 1)

The yield components viz., cob length and number of grains cob^{-1} were recorded at the time of maize crop harvest. The yield components were markedly influenced by various composts along with chemical fertilizer application. Among the treatments, application of recommended dose of fertilizer with 12.5 t ha^{-1} of EM inoculated pressmud composts (T_3) recorded significantly higher cob length of 18.90 cm and number of grains cob^{-1} of 412. The next higher yield component

was recorded by treatment T_7 - Recommended dose of fertilizer with 12.5 t ha^{-1} of EM inoculated FYM. The lowest yield components were registered in treatment T_1 (control).The steady supply of nutrients through mineralization of EM inoculated pressmud compost might have contributed for higher cob length. This might be due to more LAI which lead to higher photosynthesis and resulted in higher cob length leads to more number of grains cob^{-1}. This finding was in line with the reports of Dadarwal *et al*. (2009).

Yield

Grain yield (Table 2)

Application of different composts with chemical fertilizers significantly influenced the maize grain yield. Among the treatment, application of recommended dose of fertilizers along with 12.5 t ha^{-1} of EM inoculated pressmud compost registered higher grain yield of 6482 kg ha^{-1}. It was on par with the treatment T_7 - recommended dose of fertilizers with 12.5 t ha^{-1} of EM inoculated FYM. The control (T_1) treatment recorded least grain yield of 2456 kg ha^{-1}. EM inoculated pressmud compost have induced quick decomposition and timely release of nutrient rich inorganic matter, N, P, Ca and trace elements which enhance and contribute to increase growth and yield parameters, which has ultimately increased grain yield of maize (Nathiya, 2013)

Stover Yield (Table 2)

The stover yield was significantly influenced by different composts along with chemical fertilizer application. Among the treatments, treatment T_3- recommended dose of fertilizer with 12.5 t ha^{-1} of EM inoculated pressmud compost registered highest stover yield of 11,314 kg ha^{-1}. The next best is T_7- recommended dose of fertilizer along with 12.5 t ha^{-1} of EM inoculated FYM registered higher stover yield. The treatment registered the least stover yield of T_1-control is 6444 kg ha^{-1}.

Economics (Table 2)

The computed data on economic indices like net return was worked out. Among the treatments, treatment T_3 (RDF with 12.5 t ha^{-1} of EM inoculated pressmud compost, registered higher net income of Rs. 49,841. This was followed by the treatment T_4- recommended dose of fertilizer with 11.5 t ha^{-1} of EM inoculated pressmud compost. The control treatment (T_1) recorded least net return of Rs. 8694. Application of EM inoculated pressmud compost and inorganic fertilizer increased growth and yield characters and consequently on grain yield in maize. These factors favourably contributed to increased net income. Similar result was reported by Muhammad and Khattak (2009).

Conclusion

Application of recommended dose of fertilizer with Effective Microorganism inoculated pressmud @ 12.5 t ha^{-1} was found to be the most efficient in increasing the plant growth parameters, yield parameters, grain yield, stover yield and higher net returns in maize.

Table 2 : Effect of EM Inoculated Agricultural Organic Wastes on Maize on yield and economics

TREATMENT	Grain yield (Kg ha^{-1})	Stover yield (Kg ha^{-1})	Net income (Rs ha^{-1})
T_1-Control (No fertilizer and no organic manure)	2456	6444	8694
T_2 -RDF (Recommended dose of fertilizer)	4010	8260	22250
T_3 -R-DF + 12.5 t ha^{-1} of EM inoculated pressmud compost	6482	11314	49841
T_4 -RDF + 11.5 t ha^{-1} of EM inoculated pressmud compost	5938	10747	43330
T_5-RDF + 10.5 t ha^{-1} of EM inoculated press mud compost	4865	9585	30173
T_6-RDF+ 12.5 t ha^{-1} of pressmud compost	5710	10568	41304
T_7 -RDF + 12.5 t ha^{-1} of EM inoculated FYM	6212	10992	42690
T_8 -RDF + 11.5 t ha^{-1} of EM inoculated FYM	5542	10322	34915
T_9 -RDF + 10.5 t ha^{-1} of EM inoculated FYM	4675	9330	24615
T_{10} -RDF + 12.5 t ha^{-1} of FYM	5410	10117	33729
SE_d	126	230	-
CD(P=0.05)	264	483	-

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