



EFFECT OF NUTRIENT MANAGEMENT ON GROWTH ATTRIBUTES AND YIELD OF MAIZE

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Abstract

The field experiment was conducted, during Kharif season (June to Sep, 2018), to find out the suitable combination of organic manure for higher and sustainable maize production. The experiment was laid out in Randomized Block Design consists of ten treatments, T₁ - Farm yard manure @ 12.5 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹, T₂ - Farm yard manure @ 12.5 t ha⁻¹ + Tagzyme @ 12.5 kg ha⁻¹, T₃ - Pressmud @ 10 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹, T₄ - Pressmud @ 10 t ha⁻¹ + Tagzyme @ 12.5 kg ha⁻¹, T₅ - Composted coir pith @ 12 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹, T₆ - Composted coir pith @ 12 t ha⁻¹ + Tagzyme @ 12.5 kg ha⁻¹, T₇ - Poultry manure @ 6 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹, T₈ - Poultry manure @ 6 t ha⁻¹ + Tagzyme @ 12.5 kg ha⁻¹, T₉ - Vermicompost @ 5 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹, T₁₀ - Vermicompost @ 5 t ha⁻¹ + Tagzyme @ 12.5 kg ha⁻¹ with three replication. The plot size was 5m×4m and seeds of maize variety Co-1 were sown with a spacing of 60×20 cm. The growth attributes and yield of maize viz., plant height, leaf area index, dry matter production, grain yield, were favourably influenced with vermicompost @ 5 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹ (T₉). The results clearly proved that vermicompost @ 5 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹ (T₉) in maize will be a suitable nutrient management practice for achieve higher maize yield with due care on the soil physical condition, productivity and profitability.

Key words : Maize, FYM, Vermicompost, Empower and Tagzyme.

Introduction

Maize (*Zea mays* L.) is the most flexible crop with more extensive versatility in differed agro ecological conditions. Maize be a prominent cereals crops on the world agricultural economy, it is cultivated all over the world as it has most elevated genetic yield potential than any other cereals crop and there is no cereals on earth which has so huge potential. Besides being a potential source of food for human being, it is used for the production of starch, syrup, alcohol, acetic acid, lactic acid etc.

Maize being a C₄ plant has tremendous yield potential and responds well to applied inputs. However, its potential could not be utilized fully due to lack of proper agronomic management practices like nutrient management, season and variety (Sahrawat *et al.*, 2008). Many strategies are being adopted to dispose the organic wastes, yet it has to be safer environments and sustainable for nutrient

conservation. The composting technology is the rapid breakdown of organic matter, which produces the humus. It is generally recognized that utilization of organic manure can accomplish supportability to the crop yield. It is imperative to recognize the natural resources which can be utilized as composts in the crop field.

Continuous uses of inorganic fertilizers leads to decline the soil physical, chemical properties and biological activities in the soil (Mahajan *et al.*, 2008). The only way out to this gloomy development is nutrient balance technology, which would be increase the crop production without harming the precious environment.

FYM not only supply macronutrients but also meet the requirements of micronutrients besides improving soil health. Boosting yield, reducing production cost and improving soil health are three inter -linked components of the sustainable triangle (Shilpashree *et al.*, 2012). Pressmud from sugar mill is another source of organic matter and contains substantial quantities of nutrients for

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improving physical conditions had improvement of soil fertility. Application of pressmud compost had increased the crop yield and soil properties than raw pressmud (Deshmukh *et al.*, 2003). Application of coir pith compost compared to normal practice due to the higher soil moisture content with the application of coir pith compost in maize increased the yield (Kannan *et al.*, 2013). Poultry manure is rich in nutrients; therefore, it is beneficial for crop production and also improves the structural stability of the soil (Duong, 2003). Vermicompost is an organic material broken down by interactions between micro-organisms and earthworm in a mesophilic process, to produce fully sterilized organic soil amendments with low C: N ratio (Ramasamy *et al.*, 2011).

Improving soil fertility is severely constrained due to the decline of organic manure from the livestock system. Hence, it is necessary to find out an alternative source for organic manure. Empower is an organic nutrient not only to the crop, but also to the soil. Empower is collectively combined with humic, fulvic, and amino acids is an excellent ratio. It is a neutral organic product to provide soil and crop with concentrated dose of essential nutrients, vitamins and three elements. The Empower is available in granular and liquid form. The humic acid application increased the crop growth and productivity and help in moisture retention and mitigation of stress is reported by Tahir *et al.* (2011).

Tagzyme (seaweed) extract help to enhance the plant growth through solubilising the phosphorus, nitrogen fixation and production of crop growth regulating substances. It encourage the nutrient uptake by crops and increase photosynthetic activity of plants. Stimulates the plant enzymes and increase their production and involves in the process of chlorophyll formation. Seaweed extract increases the root respirations, root formation and quality of yields and improves their physical appearance. The effect of seaweed granules is due to the microelements and plant growth regulators such as cytokinin present in it (Zodape, 2001).

It is important to identify the best type of available organic resources which can be used as fertilizers and their best combination with appropriate proportion of inorganic fertilizers. The concept of nutrient management is gaining momentum in view of its beneficial effect on physio-chemical soil characteristics, beneficial microbial load and sustainable crop productivity. Imbalanced soil nutrients status as a result of the continuous usage of chemical fertilizers, its escalated costs and pollution hazards to agro-ecological situations are the other factors that weigh in favour of nutrient management studies.

Materials and Methods

The experiment was conducted in Randomized Block Design consists of ten treatments, T₁ - Farm yard manure @ 12.5 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹, T₂ - Farm yard manure @ 12.5 t ha⁻¹ + Tagzyme @ 12.5 kg ha⁻¹, T₃ - Pressmud @ 10 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹, T₄ - Pressmud @ 10 t ha⁻¹ + Tagzyme @ 12.5 kg ha⁻¹, T₅ - Composted coir pith @ 12 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹, T₆ - Composted coir pith @ 12 t ha⁻¹ + Tagzyme @ 12.5 kg ha⁻¹, T₇ - Poultry manure @ 6 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹, T₈ - Poultry manure @ 6 t ha⁻¹ + Tagzyme @ 12.5 kg ha⁻¹, T₉ - Vermicompost @ 5 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹, T₁₀ - Vermicompost @ 5 t ha⁻¹ + Tagzyme @ 12.5 kg ha⁻¹ with three replication. The plot size was 5m×4m and seeds of maize variety “Co-1” were sown with a spacing of 60×20 cm with duration of 105 days. The fertilizer was applied @135 kg N, 62.5 kg P₂O₅ and 50 kg K₂O as per the recommendations to the plots. The organic manure was applied to the plots as per treatment schedule and its combined with the growth activators (Empower and Tagzyme) was recommended @ 12.5 kg ha⁻¹. The growth activators are applied at two equal splits on 7 and 35 DAS to the plots as per treatment schedule. The growth attributes and yield were recorded.

Results and Discussion

Growth attributes (Table 1)

The treatments exert significant influence on Plant height, DMP on 60 DAS and at harvest stage and LAI on 60 DAS.

Plant height

The different nutrient management practices depicted distinct variations on the height of plants at 60 DAS and at harvest stage. Among the treatments, application of vermicompost @ 5 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹ (T₉) is recorded highest plant height of 155.45, 164.87 cm at 60 DAS and at harvest stage, respectively. It was on par with application of poultry manure @ 6 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹ (T₇) that recorded with plant height of 151.77, 162.21 cm at 60 DAS and at harvest stage, respectively. Application of vermicompost @ 5 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹ along with inorganic fertilizer NPK, it increase the uptake of nutrient in the soil. This may be the reason for the increase in plant height in maize. Similar findings were reported by Meena, *et al.*, (2015). Application of Farm yard manure @ 12.5 t ha⁻¹ + Tagzyme @ 12.5 kg ha⁻¹ (T₂) was recorded with least plant height of 114.23, 124.12 cm at 60 DAS and at harvest stage, respectively.

Table1: Effect of different Nutrient Management Practices on growth attributes and yield of maize.

Treatments	Plant height		DMP		LAI 60 DAS	Grain yield (kg ha ⁻¹)
	60 DAS	at harvest	60 DAS	at harvest		
T ₁ - Farm yard manure @ 12.5 t ha ⁻¹ + Empower @ 12.5 kg ha ⁻¹	117.90	125.36	3284	5078	4.27	2059
T ₂ - Farm yard manure @ 12.5 t ha ⁻¹ + Tagzyme @ 12.5 kg ha ⁻¹	114.23	124.12	3269	5041	4.23	2034
T ₃ - Pressmud @ 10 t ha ⁻¹ + Empower @ 12.5 kg ha ⁻¹	131.28	141.95	3579	5580	4.91	2261
T ₄ - Pressmud @ 10 t ha ⁻¹ + Tagzyme @ 12.5 kg ha ⁻¹	122.25	129.06	3326	5101	4.38	2071
T ₅ - Composted coir pith @ 12 t ha ⁻¹ + Empower @ 12.5 kg ha ⁻¹	134.52	143.80	3591	5600	5.02	2270
T ₆ - Composted coir pith @ 12 t ha ⁻¹ + Tagzyme @ 12.5 kg ha ⁻¹	120.58	127.50	3314	5082	4.32	2063
T ₇ - Poultry manure @ 6 t ha ⁻¹ + Empower @ 12.5 kg ha ⁻¹	151.77	162.21	3866	6118	5.73	2507
T ₈ - Poultry manure @ 6 t ha ⁻¹ + Tagzyme @ 12.5 kg ha ⁻¹	136.66	146.26	3603	5639	5.14	2301
T ₉ - Vermicompost @ 5 t ha ⁻¹ + Empower @ 12.5 kg ha ⁻¹	155.45	164.87	3921	6211	5.85	2549
T ₁₀ - Vermicompost @ 5 t ha ⁻¹ + Tagzyme @ 12.5 kg ha ⁻¹	141.64	148.95	3618	5675	5.25	2324
S.Ed	3.90	5.50	108.6	171.9	0.20	77.62
CD ($p=0.05$)	8.18	11.54	228	361	0.41	163

Dry matter production (DMP)

Adaptation of different nutrient management practices marked distinct variations on the DMP of plants at 60 DAS and at harvest stage. Among the treatments, application of vermicompost @ 5 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹ (T₉) is recorded highest DMP of 3921, 6211 kg ha⁻¹ at 60 DAS and at harvest stages, respectively. It was on par with application of poultry manure @ 6 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹ (T₇) that recorded with DMP of 3866, 6118 kg ha⁻¹ at 60 DAS and at harvest stages, respectively. Application of vermicompost @ 5 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹ along with inorganic fertilizer NPK increased the plant growth, crop canopy and effective utilization of available nutrients which ultimately resulted in increased dry matter production over other treatments. Similar findings were reported by Tensingh Baliah *et al.*, (2017). Application of Farm yard manure @ 12.5 t ha⁻¹ + Tagzyme @ 12.5 kg ha⁻¹ (T₂) were recorded with least DMP of 3269, 5041 kg ha⁻¹ at 60 DAS and at harvest stages, respectively.

Leaf area index (LAI)

The nutrient management practices showed distinct variations on the LAI of plants at 60 DAS. Among the treatments, application of vermicompost @ 5 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹ (T₉) is recorded highest LAI of 5.85 at 60 DAS. It was on par with application of poultry manure @ 6 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹ (T₇) that recorded with LAI of 5.73 at 60 DAS. Application of vermicompost @ 5 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹ along with inorganic fertilizer NPK, favoured higher uptake of nutrients by crop, which reflected maximum growth, with leaf length and width which were responsible for higher LAI. Similar findings were reported

by Samsul *et al.*, (2012). Application of farm yard manure @ 12.5 t ha⁻¹ + Tagzyme @ 12.5 kg ha⁻¹ (T₂) was recorded with least LAI of 4.23 at 60 DAS.

Grain yield (Table 1)

The study revealed that all the nutrient management treatments had a significant effect on yield of maize yield at harvest. Among the treatments, application of vermicompost @ 5 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹ (T₉) is recorded highest grain yield 2549 kg ha⁻¹. It was on par with application of poultry manure @ 6 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹ (T₇) recorded with highest grain yield 2507 kg ha⁻¹. The application of inorganic, organic nutrient and growth activator (Empower) to the soil at early stage and vegetative growth stage is favored the vigorous growth and establishment of crop, with sustained nutrient availability leads to better uptake of NPK by the crop might have contributed to the increased yield attributes which had a favorable effect in getting increased yield. Similar findings were reported by Cristina Lazacano and Jorge Domenguez (2011). Application of farm yard manure @ 12.5 t ha⁻¹ + Tagzyme @ 12.5 kg ha⁻¹ (T₂) was recorded with least grain yield 2034 kg ha⁻¹.

Conclusions

On the basis of the above results, it may be concluded that various nutrient management and growth activators have produced profitable yield in maize. Moreover, higher grain yield contributing factors of maize was observed when the plots were incorporated with vermicompost @ 5 t ha⁻¹ + Empower @ 12.5 kg ha⁻¹. Hence application of vermicompost with Empower can be recommended for the maize cultivation. This was found to be the most efficient, cost effective and sustainable agronomic

practices for increasing the grain yield of maize.

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