

# Effect of Integrated Nutrient Management on the Growth and Yield of Hybrid Maize

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**Research Article**

Volume 3 Issue 2

**Received Date:** April 17, 2018

**Published Date:** May 09, 2018

## Abstract

Field experiment was conducted at Experimental Farm, Department of Agronomy, Annamalai University, Annamalainagar (Tamilnadu) during summer 2016 to study the effect of integrated nutrient management on the growth and yield of hybrid maize. The experiment was laid out in Randomized Block Design with four replications. There were altogether five treatments (Nutrient management) viz., T<sub>1</sub> - 100% RDF alone, T<sub>2</sub> - 100% RDF + Vermicompost @ 2.5 t ha<sup>-1</sup>, T<sub>3</sub> - 100% RDF + Enriched Farmyard Manure @ 750 kg ha<sup>-1</sup>, T<sub>4</sub> - 100% RDF + coir pith Compost @ 5 t ha<sup>-1</sup>, T<sub>5</sub> - 100% RDF + Pressmud Compost @ 5 t ha<sup>-1</sup>, T<sub>6</sub> - 75% RDF alone. The growth and yield components of hybrid maize viz., plant height, leaf area index, dry matter production, cob length, cob diameter and number of grains cob<sup>-1</sup>, 100 grain weight, grain yield, stover yield and harvest index were favorably influenced with 100% RDF + Pressmud compost @ 5 t ha<sup>-1</sup> (T<sub>5</sub>). It was followed with 100% RDF + Enriched Farmyard manure @ 750 kg ha<sup>-1</sup> (T<sub>3</sub>). The results evidently proved 100% RDF + Press mud compost @ 5 t ha<sup>-1</sup> (T<sub>5</sub>) in hybrid maize will be an appropriate Integrated nutrient management practice for achieving sustainable hybrid maize yield with due to care on soil health, fertility and productivity.

**Keywords:** Hybrid Maize; Growth

## Introduction

Maize (*Zea mays* L.) is the third important cereal crop next to rice and wheat in the world. Maize has been an important cereal crop because of its high production potential compared to any other cereal crop and better adaptability to wide range of environments. Since the crop has very high genetic yield potential, it is called as the "Queen of cereals". Maize being a C<sub>4</sub> plant has higher yield potential which also depends on nutrient supplying capacity of the soil. However, its potential could not be

utilized fully due to lack of proper agronomic management practices like efficient nutrient management and good quality variety [1]. Intensive crop rotation and imbalance fertilizer use have resulted in a wide range of nutrients deficiency in fields. For intensive cropping systems, the current recommended fertilizers rates need revision upwards with in balance ratio of vital micronutrients specific to crop to enhance stagnant yields [2]. The productivity of maize is largely dependent on its nutrient management. It is well known that maize is a heavy feeder of nutrients. The INM is a strategy for

advocating judicious and efficient use of chemical fertilizers with matching addition of organic manures [3]. Ponusamy, et al. stated that integration of organic and inorganic manures will go a long way in maintaining sustainable crop production and enhancing soil fertility through their complementary effects [4]. Fertilizer management plays an important role for obtaining satisfactory yield. In order to increase crop productivity nutrient management may be achieved by the contribution of organic sources like press mud compost, vermin compost, coirpith compost and enriched farm yard manure. Therefore, the present study was executed to evaluate the effect of integrated nutrient management on the growth and yield of hybrid maize.

## Materials and Methods

Field experiment was conducted at the Experimental Farm, Department of Agronomy, Annamalai University, Annamalainagar during Dec 2016 - March 2017 to evaluate the studies on integrated nutrient management in hybrid maize (*Zea mays* L.). The experimental site is situated at 11°24' N latitude and 79°44' E longitude at an altitude of +5.79 m above mean sea level. The experiment was carried out in Randomized Block Design with four replications. There were altogether five treatments (Nutrient management) viz., T<sub>1</sub> - 100% RDF alone, T<sub>2</sub> - 100% RDF + vermicompost @ 2.5 t ha<sup>-1</sup>, T<sub>3</sub> - 100% RDF + Enriched Farmyard Manure @ 750 kg ha<sup>-1</sup>, T<sub>4</sub> - 100% RDF + coirpith Compost @ 5 t ha<sup>-1</sup>, T<sub>5</sub> - 100% RDF + pressmud Compost @ 5 t ha<sup>-1</sup>, T<sub>6</sub> - 75% RDF alone. Maize hybrid (Kaveri Super 244) was used in this study. The observations of plant height at maturity, number of grain rows per cob, number of grains per cob, 100-grains weight, grain yield, biological yield and harvest index were recorded. The collected data was analyzed statistically. Soil samples were taken before sowing of crop to depth of 30 cm for physiochemical analysis. The fertilizers were applied to the experimental field as per the recommended fertilizer schedule of 135:62.5:50 kg N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O ha<sup>-1</sup>. Urea (46% N), single super phosphate (16% P<sub>2</sub>O<sub>5</sub>) and muriate of potash (60% K<sub>2</sub>O) fertilizers were used to supply N, P and K nutrients, respectively. The entire dose of phosphorus and potassium were applied basally. A half dose of nitrogen was applied basally and the remaining half doses of nitrogen were applied as two splits on 25<sup>th</sup> and 45<sup>th</sup> days after sowing. In addition as per the treatment schedule the prescribed quantities of the organic manures viz., vermicompost @ 2.5t/ha, enriched farmyard manure @ 750kg/ha, coir pith compost @ 5t/ha and pressmud compost @ 5t/ha were applied along with basal dose.

## Result and Discussion

### Plant Height

Among the INM practices the highest plant height of 60.56cm, 170.49cm & 241.57cm were registered by RDF 100% + pressmud compost @ 5 t ha<sup>-1</sup> (T<sub>5</sub>) at 30, 60 and at harvest stages respectively. This was followed by the treatments 100% RDF + Enriched farmyard manure @ 750 kg ha<sup>-1</sup> (T<sub>3</sub>) were on par with 100% RDF + coirpith compost @ 5 t ha<sup>-1</sup> (T<sub>4</sub>). The least plant height of 37.42cm, 123.36cm & 170.49 recorded by the treatment 100% RDF (T<sub>1</sub>) at 30,60 and at harvest stages (Table. 1). Application of pressmud compost @ 12.5 t ha<sup>-1</sup> along with inorganic fertilizer increase the uptake of N in the soil. This might be the reason for increase in plant height, LAI, DMP accumulation in maize [5].

### Leaf Area Index

Among the INM practices, the highest LAI of 3.62 and 7.18 were registered by RDF 100% + Pressmud compost @ 5 t ha<sup>-1</sup> (T<sub>5</sub>) at 30 and 60 DAS respectively. This was followed by the treatments 100% RDF + Enriched Farmyard Manure @ 750 kg ha<sup>-1</sup> (T<sub>3</sub>) were on par with 100% RDF + coirpith compost @ 5 t ha<sup>-1</sup> (S<sub>4</sub>). The least LAI of 2.18 and 5.32 were recorded by the treatment 100% RDF (T<sub>1</sub>) at 30 and 60 DAS respectively (Table. 1). Application of pressmud compost @ 1.250 kg ha<sup>-1</sup> fertilizer easy availability of essential nutrients to crop there by increased growth components viz., Number of leaves per plant, higher plant height, LAI and DMP [6].

### Cob Length

Among the INM practices, the RDF 100% + Pressmud compost @ 5 t ha<sup>-1</sup> (T<sub>5</sub>) significantly resulted in the highest cob length of 22.68cm. This was followed by the treatment 100% RDF + Enriched Farmyard Manure @ 750 kg ha<sup>-1</sup> (T<sub>3</sub>) were on par with 100% RDF + coirpith compost @ 5 t ha<sup>-1</sup> (T<sub>4</sub>). 100% RDF (T<sub>1</sub>) recorded the least cob length of 13.64 cm (Table. 1). The pressmud has been advocated as good organic manure, application of pressmud significantly increased the availability of nitrogen in soil and thus result in increasing the yield attributes like cob length, cob diameter, Number of grains cob<sup>-1</sup> were increased in maize [7].

### Cob Diameter

Among the INM practices, the RDF 100% + pressmud compost @ 5 t ha<sup>-1</sup> (T<sub>5</sub>) significantly resulted in the highest cob diameter of 4.76cm. It was followed by the treatment 100% RDF + Enriched Farmyard Manure @ 750 kg ha<sup>-1</sup> (T<sub>3</sub>) were on par with 100% RDF + coirpith

compost @ 5 t ha<sup>-1</sup> (T<sub>4</sub>). 100% RDF (T<sub>1</sub>) recorded the least cob diameter of 3.09 cm (Table. 1). Pinjari (2007) reported that yield attributes of corn viz., girth and length of cobs grain cob<sup>-1</sup> and shelling percentage remarkably improved because of the increased levels of N and P which might have resulted in easy and greater availability of N and P to the crop plants which consequently improved the yield and yield attributes of corn.

### Grain Yield

Among the INM practices, RDF 100% + pressmud compost @5 t ha<sup>-1</sup> (T<sub>5</sub>) significantly resulted in the grain yield of 6830.19 kg ha<sup>-1</sup>. This was followed by the treatment 100% RDF + Enriched Farmyard Manure @ 750 kg ha<sup>-1</sup> (T<sub>3</sub>) were on par with 100% RDF + coirpith compost @ 5 t ha<sup>-1</sup> (T<sub>4</sub>). 100% RDF (T<sub>1</sub>) recorded the least grain yield of 4130.81 kg ha<sup>-1</sup> (Table. 2). The effects of INM on grain yield was shown in Table 2. Namitha Joshi and Sonal Sharma reported that application of pressmud

@10 t ha<sup>-1</sup> with inorganic fertilizers increase the nutrient absorption of crop might have enhanced the growth, yield components and grain yield of maize [8].

### Stover Yield

Among the INM practices, RDF 100% + pressmud compost @5 t ha<sup>-1</sup> (T<sub>5</sub>) significantly resulted in the stover yield of 9031.08 kg ha<sup>-1</sup>. This was followed by the treatment 100% RDF + Enriched Farmyard Manure @ 750 kg ha<sup>-1</sup> (T<sub>3</sub>) were on par with 100% RDF + coirpith compost @ 5 t ha<sup>-1</sup> (T<sub>4</sub>). 100% RDF alone (T<sub>1</sub>) recorded the least stover yield of 6781.41 kg ha<sup>-1</sup>(Table. 2). The effects of spacing and INM on stover yield was shown in Table 2. The increase in yield components were more pronounced due to the application pressmud compost with recommended dose of fertilizer might be associated to better amelioration and more supply of nutrients at higher levels of the pressmud [9-14].

Treatments	Plant height(cm)			LAI		Cob length(cm)	Cob diameter(cm)
	30 DAS	60 DAS	Harvest	30 DAS	60 DAS		
T <sub>1</sub> - Recommended dose of fertilizers (RDF)	37.96	123.49	173.49	2.25	5.5	13.92	3.18
T <sub>2</sub> - 100% RDF + Vermicompost @ 2.5 t ha <sup>-1</sup>	44.92	133.47	199.24	2.78	5.86	15.97	4.16
T <sub>3</sub> - 100% RDF + Enriched Farmyard Manure@ 750kg ha <sup>-1</sup>	56.86	156.42	219.57	3.24	6.8	18.36	4.47
T <sub>4</sub> - 100% RDF + coirpith Compost @ 5 t ha <sup>-1</sup>	56.77	152.7	219.36	3.21	6.71	18.28	4.43
T <sub>5</sub> - 100% RDF + Pressmud compost @ 5 t ha <sup>-1</sup>	60.56	170.49	241.57	3.62	7.18	22.68	4.76
T <sub>6</sub> - 75 % RDF Alone	37.42	123.36	170.49	2.18	5.32	13.64	3.09
S.Ed	0.91	3.12	7.29	0.06	0.08	0.14	0.02
CD (P = 0.05)	1.86	6.36	14.85	0.13	0.16	0.29	0.53

Table 1: Effect of INM on Growth and Yield Components of hybrid maize.

Treatments	Grain yield (kg ha <sup>-1</sup> )	Stover yield(kgha <sup>-1</sup> )
T <sub>1</sub> - Recommended dose of fertilizers (RDF)	4382	7790
T <sub>2</sub> - 100% RDF + Vermicompost @ 2.5 t ha <sup>-1</sup>	4456	7915
T <sub>3</sub> -100% RDF + Enriched Farmyard Manure @ 750 kg ha <sup>-1</sup>	5752	9298
T <sub>4</sub> - 100% RDF + coirpith Compost @ 5 t ha <sup>-1</sup>	5174	8719
T <sub>5</sub> - 100% RDF + Pressmud compost @ 5 t ha <sup>-1</sup>	5760	9361
T <sub>6</sub> - 75% RDF Alone	3654	6551
S.Ed	0.09	0.14
CD (P = 0.05)	0.2	0.3

Table 2: Effect of INM on grain and stover yield (kg ha<sup>-1</sup>) of hybrid maize.

## Conclusion and Recommendations

The study was carried out to evaluate the effects of INM on growth and yield characters of hybrid maize. Based on the results of the experiments, it can be concluded that the application of 100% RDF + pressmud compost @ 5 t ha<sup>-1</sup> (T<sub>5</sub>) were found to be the most efficient, economically feasible, scientifically sound, ecologically desirable and practically appreciable. These practices also resulted in the highest grain yield and highest return rupee<sup>-1</sup> invested in addition to sustainable soil fertility management and also recommended for farmer's cultivation.

## References

- Sahrawat KL, Rego TJ, Wani SP, Pardhasaradhi G (2008) Sulphur, boron and zinc fertilization effects on grain and straw quality of maize and sorghum grown on farmers' fields in the semi-arid tropical region of India. *J Plant Nutr* 31(9): 1578-1584.
- Tandon HLS (1997) Experiences with Balanced Fertilization in India. *Better Crops* 11(1): 20-21.
- Reddy CM, Ahmed SR (2009) Influence of organic, inorganic and biological sources in integrated nutrient management practices of sunflower. *Green Farming* 2(9): 584-587.
- Ponnusamy K, Subbain P, Santhi P, Sankaran N (2002) Integrated nutrient management for rainfed sorghum. *Crop Res* 23(2): 243-246.
- Kumarimanimuthu VD (2008) Utilization of agro industrial wastes in maize based cropping system. *Agric Sci Digest* 28(3): 195-197.
- Ahmad M, Afzal M, Ahmad A, Ahmad AUH, Azeem MI (2013) Role of organic and inorganic nutrient sources in improving wheat crop production. *Cercetari Agronomice In Moldova* 46(1): 15-23.
- Dash D, Patro H, Tiwari RC, Shahid M (2010) Effect of organic and inorganic sources of N on growth attributes, grain and straw yield of rice (*Oryza sativa*). *Int J of Pharm & Life Sci* 2(4): 655-660.
- Joshi N, Sharma S (2010) Physio-chemical Characterization of sulphidation pressmud Composted pressmud and Vermicomposted pressmud. *Environment Sci* 2(3): 223-264.
- Muhammad D, Khattak RA (2009) Growth and nutrient concentrations of maize in pressmud treated saline-sodic soils. *Soil and Environ* 28(2): 145-155.
- Anchal D, Lenka NK, Sudhishri S, Patnaik US (2008) Influence of integrated nutrient management on production, economics and soil properties in tomato under on farm conditions in Eastern Ghats of Orissa. *Indian J Agric Sci* 78: 40-41.
- Cathcart RJ, Swanton CJ (2003) Nitrogen management will influence threshold values of green foxtail (*Setaria viridis*) in corn. *Weed Sci* 51(6): 975-986.
- Deshmukh, Kaswala RR, Patil RG, Kaswala AR (2003) Effect of industrial wastes on nutrient availability in clay soil (*Typic Chromuster I*) of South Gujarat. *Indian J Agric Environ Bio Tech* 1: 108-115.
- Kannan K, Selvi V, Singh DV, Khola OPS, Mohanraj R, et al. (2013) Coir pith composting – an alternative source of organic manure for rainfed maize. Institute, Research Centre, ICAR, Udhagamandalam-643 004, Tamil Nadu.
- Pinjari SS (2007) Effect of integrated nutrient management and polythene mulch on the performance of sweet corn under Laterite soils of Konakan Ph.D (Agri) Thesis Dr. Balasaheb Sawant Konakan Krish Viadeeth.