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## Research Article

# BALANCED NUTRITION THROUGH POULTRY MANURE AND FERTILIZERS ON PRODUCTIVITY OF HYBRID MAIZE (*ZEA MAYS* L.)

**Sangameshwari P., Kumarimanimuthu Veeral D and Kalaimathi P**

Department of Agronomy, Faculty of Agriculture, Annamalai University, Chidambaram 608002, Tamilnadu

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### ABSTRACT

The field experiments were conducted during the Summer season of March- May 2016 and Rabi season of September – November of 2016 at Experimental Farm, Department of Agronomy, Faculty of Agriculture, Annamalai University, Chidambaram to enhance the productivity of hybrid maize through balanced nutrition *i.e.*, integration of poultry manure and chemical fertilizers. The experiment was laid out in randomized block design (RBD) and replicated thrice. The treatment comprised of poultry manure in different levels (2, 4, 6 t ha<sup>-1</sup>) with or without chemical fertilizers and control. The study clearly showed that application of 6 t ha<sup>-1</sup> of poultry manure along with 75% RDF registered the highest growth, yield and yield components. This treatment recorded the maximum plant height of 260.5 cm. The result evidently proved that application of 6 t ha<sup>-1</sup> of poultry manure + 75% RDF (T<sub>7</sub>) will be an appropriate balanced nutrition on the growth and yield of hybrid maize with due care on soil fertility.

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## INTRODUCTION

Maize is an important cereal crop that provides staple food to large number of human population in world. Maize is relatively a short duration crop and capable of utilizing inputs more efficiently and it is potentially capable of producing large quantity of food grains per unit area. Maize productivity is low due to inappropriate nutrient management practices among many other reasons. One of the available strategies to improve the productivity is use of organic manures and chemical fertilizers. Organic manure application is also very less in maize due to non-availability of bulky organic manure, difficulties in transportation and application preference will be towards high value crops. Mineral fertilizers are used to provide soil nutrients in order to maintain optimum soil fertility conditions, healthy growth of plants and quality produce. Chemical fertilizers help the growing crops to withstand stress conditions and in some cases these were used to correct plant nutrients deficiencies. Application of organic manures plays a direct role in plant growth as a source of all the necessary major and micro nutrients in available forms during mineralization which improves both the physical and biological properties of the soil (Abou El-Magd *et al.*, 2005). Nutrients contained in organic manures are released more slowly and are stored for longer periods in the soil, thereby ensuring a long residual effect. To meet crop's nutrients needs, organic manures are however,

required in rather large quantities which now make for a strong advocacy for fortifying these manures with inorganic fertilizers. Balanced nutrition imparts beneficial effects on soil productivity, crop yields and human health through efficient utilization of plant nutrients. Poultry manure is an excellent organic fertilizer, as it contains high nitrogen, phosphorus, potassium and other essential nutrients. In contrast to chemical fertilizer, it adds organic matter to soil which improves soil structures and nutrient availability. Keeping the above points in view, this study was planned to find out the balanced nutrition through integration of poultry manure with fertilizer on hybrid maize. Balanced nutrient management holds a great promise in maintaining yield stability and quality of produce through correction of marginal deficiencies of secondary and micro nutrient, enhancing efficiency of applied nutrient and providing favorable soil physical condition.

## MATERIALS AND METHOD

Field experiments were conducted in the Experimental Farm, Department of Agronomy, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu during March– May 2016 (Summer) and September– November 2016 (*Rabi*) to enhance the productivity of maize through balanced nutrition of poultry manure with chemical fertilizers. The experiment was laid out in a randomized block design (RBD) which comprised of three replication and eight treatments *viz.*, Control (T<sub>1</sub>),

\*Corresponding author: **Sangameshwari P**

Department of Agronomy, Faculty of Agriculture, Annamalai University, Chidambaram 608002, Tamilnadu

poultry manure @ 2 t ha<sup>-1</sup> (T<sub>2</sub>), poultry manure @4 t ha<sup>-1</sup> (T<sub>3</sub>), poultry manure @ 6 t ha<sup>-1</sup> (T<sub>4</sub>), poultry manure @ 2 t ha<sup>-1</sup> + 25% RDF (T<sub>5</sub>), poultry manure @ 4 t ha<sup>-1</sup> + 50% RDF (T<sub>6</sub>), poultry manure @ 6 t ha<sup>-1</sup> + 75% RDF (T<sub>7</sub>) and RDF alone (T<sub>8</sub>). The experimental soil was clay loam in texture with a pH of 7.2. The soil was low in available nitrogen, medium in available phosphorus and high in available potassium. The hybrid NK 6240 was chosen for the study.

As per treatment schedule, poultry manure was applied as basal one week before sowing. The nutrient content of the poultry manure is 2.04% N, 1.08% P<sub>2</sub>O<sub>5</sub> and 0.93% K<sub>2</sub>O. The recommended seed rate of 15 kg ha<sup>-1</sup> and the recommended fertilizer schedule of 250:75:75 kg N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O ha<sup>-1</sup> were adopted. 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 and 45 days after sowing. Irrigation was given immediately after sowing with care to avoid excess flooding of water. Standard after cultivation practices were adopted. The growth components, yield components and yield were recorded as per the prescribed standard procedure.

## RESULTS AND DISCUSSION

### Growth attributes

Among the treatments, poultry manure @ 6 t ha<sup>-1</sup> + 75% RDF favorably increased the growth characters *viz.*, plant height, leaf area index and dry matter production as compared to other treatments. It significantly recorded the highest of plant height of 95, 195 and 257 cm (summer season) and 93, 190 and 264 cm (*Rabi* season) at 30, 60 DAS and at harvest respectively. This was due to the better nutrient uptake and development of the plants due to the combined application of organic manures and mineral fertilizer. This result was agreed with the findings of Makinde, (2007). High leaf area index of 6.20 and 6.7 was recorded at 30 and 60 DAS during both the seasons and it was noticed in the aforesaid treatment due to increase in leaf number as well as size due to enough nutrition can be expected in terms of possible increase in nutrition absorption capacity of maize through better root development and increased translocation of carbohydrates from source to sink (grain) (Aziz *et al.* 2010). The same treatment also recorded the highest DMP of 2132, 7565 and 6808 kg ha<sup>-1</sup> and 2127, 7559 and 6816 kg ha<sup>-1</sup> at 30, 60 DAS and at harvest respectively in Summer and *Rabi* 2016. This is due to better solar radiation interception and photosynthetic rate, contributing to higher values of varied growth attributes. Nyamangara *et al.* (2003) reported that poultry manure application enhanced the nitrogen use efficiency of mineral nitrogen fertilizer by crops when organic fertilizer and inorganic fertilizer are applied together. The least growth attributes *viz.*, plant height of 101 cm, leaf area index of 2.3 and DMP of 3284 kg ha<sup>-1</sup> were recorded in plots which received poultry manure @ 2 t ha<sup>-1</sup>.

### Yield components

The yield attributes *viz.*, cob length, cob diameter and number of grains cob<sup>-1</sup> and test weight were also found to be remarkably increased with poultry manure @ 6 t ha<sup>-1</sup> + 75% RDF as compared to other treatments by registering the maximum cob length of 28.11 cm, cob diameter of 6.07 cm, highest grain number of 480 per cob and grain yield of 7867 kg ha<sup>-1</sup> (Summer season 2016). This is due to combined application of organic and inorganic which might have increased the activity of photosynthesis and enzymes which is responsible for transformation of energy, carbohydrate, fat metabolism and respiration of plant. There must have been adequate mineralization of nutrients and proper

mobilization of the essential nutrient elements like N, P and K by the organo-mineral fertilizers as well as enhancement of soil biophysical properties which brought about better performance. This is in line with the view of Ndukwe *et al.* (2014) that the integration of organic and inorganic fertilizers in maize production is beneficial and sustainable. The same trend was followed in *Rabi* season 2016.

Increase in grain yield might be attributed to improvement in plant height, LAI, which is due to better partition of carbohydrate from leaf to reproductive part. Higher leaf area might have provided larger area for photosynthesis and subsequent higher translocation of organic solute which resulted to higher yield in maize. Combined application of organic and inorganic fertilizer increased the yield of maize than when any of the fertilizer was used alone (Ademiluyi Benson Oluwafemi and FABIYI Esther Funsho, 2015).

**Table 1** Effect of balanced nutrition through poultry manure and chemical fertilizers on growth, yield and yield components of maize: (pooled data for 2 seasons)

Treatments	Plant height at harvest (cm)	Leaf area index	Dry matter production (kg ha <sup>-1</sup> )	Number of grains per cob	Grain yield (kg ha <sup>-1</sup> )
T <sub>1</sub>	93.5	1.95	3278.5	206.5	3690.5
T <sub>2</sub>	117.5	2.55	3786.5	247.5	4284
T <sub>3</sub>	140	3.05	4288.5	288	4883.5
T <sub>4</sub>	189	4.45	5298	316.5	6080.5
T <sub>5</sub>	165.5	3.75	4795	325.5	5483.5
T <sub>6</sub>	237.5	5.80	6305.5	460.5	7275.0
T <sub>7</sub>	260.5	6.45	6812	485.5	7873.5
T <sub>8</sub>	212.5	5	5803	403.5	6677
S.Ed	7.53	0.18	216.90	15.05	249.15
CD(0.05)	16.17	0.39	465.27	32.29	534.44

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