

## Effect of integrated nutrient management on growth and yield of maize (*Zea mays* L.)

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### ABSTRACT

An experiment was conducted during *Rabi* season of 2007-08 on sandy loam soil at Agriculture college, V.C. farm, Mandya, Karnataka to study the effect of integrated nutrient management on growth and yield of maize (*Zea mays* L.). The study comprised of twelve treatments consisting of four different organic sources of nutrients combined with 50, 75 and 100 per cent recommended dose of fertilizer. The results revealed that combined application of recommended dose of NPK (150:75:40 kg/ha) + FYM 10 t/ha recorded higher plant height (213.6 cm), total dry matter production (368.5 g/plant), number of grains per cob (458.5), grain weight per cob (166.9 g), test weight (38.9 g) and grain yield (65.9 q/ha). Lowest plant height (171.6 cm), total dry matter production (250.4 g/plant), number of grains per cob (290.8), grain weight per cob (127.7 g), test weight (27.7 g) and grain yield (47.3 q/ha) were noticed in the treatment receiving 100 per cent recommended dose of NPK through chemical fertilizer (150:75:40 kg/ha).

**Key words :** Growth, yield, maize, INM

### INTRODUCTION

In India maize is grown in an area of 7.89 m.ha with an annual production of 16.78 m.t. with an average productivity of 2100 kg/ha and in Karnataka it is grown in an area of 1.1 m.ha with the production of 2.81 m.t. and the productivity of 3012 kg/ha (Anonymous, 2007). Maize being an exhaustive crop, has very high nutrient demand and its productivity mainly depend upon nutrient management system. The use of major nutrients alone fail to sustain yield levels due to increasing deficiency of secondary and micronutrients and also alteration in the physical and chemical properties of soil which are unfavorable for crop growth. The present hike in the price of chemical fertilizers has compelled the Indian farmers for an alternative nutrient management system. At the same time organic manures alone do not produce spectacular increase in the crop yields, due to their low nutrient status and availability in short period. Dependency on chemical fertilizers alone may not provide a viable economic option. Therefore, to maintain soil productivity on a sustainable basis an integrated nutrient management approach, using both organic and inorganic sources of nutrient should be adopted. In the present context, the use of organic manures must be given prime importance and fertilizer use should be limited to balance the nutrient requirement of the crops. In order to sustain soil fertility and to reap rich harvests of maize, it is imperative that both organic manuring and mineral nutrition have to be

given adequate attention under irrigated conditions. Keeping these points in view, the present study was under taken.

### MATERIALS AND METHODS

The study was carried out during *Rabi* season, 2007 at the Agronomy field unit, Agriculture College, V.C. Farm, Mandya, Karnataka. The soil was sandy loam in texture and neutral in soil reaction (6.73). The soil was low in organic carbon (0.39 %) and available nitrogen (198.9 kg/ha), medium in available phosphorus (25 kg/ha) and potassium (220 kg/ha). Eleven treatments comprising of inorganic and organic sources of nutrients compared with chemical fertilizers alone and these treatments were tried in Randomized Complete Block Design (RCBD) with three replications. The variety used was maize composite-NAC-6004. All the four organic nutrient sources were analyzed for available N, P and K content and the required quantity of farm yard manure, poultry manure, press mud and vermicompost for each plot were calculated based on their nitrogen content. Recommended dose of phosphorus and potassium were applied through chemical fertilizers where ever deficient. As per the treatments these organic sources were applied and were incorporated into soil three weeks before sowing. The inorganic nutrient sources like N, P and K were supplied through urea, SSP and MOP, respectively. The entire dose of phosphorus, potash and fifty per cent of nitrogen were applied. The

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seeds were sown with the spacing of 60cm x 30cm. Irrigation was given as and when required depending upon soil moisture. The growth and yield parameters were recorded at harvest by following standard procedures.

## RESULTS AND DISCUSSION

The results obtained from the present investigation are summarized below :

### Effect on growth :

There was significant increase in plant height and total dry matter production in maize at harvest due to integrated nutrient management practices. Combined application of recommended dose of NPK (150:75:40 kg/ha) + FYM 10 t/ha recorded higher growth parameters *viz.*, plant height (213.6 cm) and total dry matter production (368.6 g/plant) and it was at par with application of 75 % recommended nitrogen through chemical fertilizers + 25 % recommended nitrogen through poultry manure (206.8 cm and 353.7 g/plant, respectively). This may be due to the fact that organic matter functioned as source of energy for all soil micro flora, which brings about transformations of inorganic nutrients held in the soil or applied in the form of fertilizers to readily available form that is utilized by growing plants. Lowest growth parameters *viz.*, plant height (171.6 cm) and total dry matter production (250.4 g/plant) were noticed in the treatment receiving 100 per cent recommended dose of NPK through chemical fertilizer (150:75:40 kg/ha) (Table 1). The lower growth and yield parameters may be due to the volatilization or leaching losses leads to low

availability of nutrients. The results of present investigation on overall improvement in crop growth were in close agreement with Balyan *et al.* (2006).

### Effect on yield :

Application of recommended dose of NPK (150:75:40 kg/ha) + FYM 10 t/ha recorded significantly higher grain yield and yield parameters *viz.*, number of grains per cob (458.5), grain weight per cob (166.9 g), test weight (38.9 g), grain yield (65.9 q/ha) and stover yield (75.4 q/ha) and it was at par with the application of 75 % recommended nitrogen through chemical fertilizers + 25 % recommended nitrogen through poultry manure (432.7, 163.0 g, 37.2 g, 60.6 q/ha and 71.3 q/ha, respectively). Significantly lower yield parameters *viz.*, number of grains per cob (290.8), grain weight per cob (127.7 g), test weight (27.7 g), grain yield (47.3 q/ha) and stover yield (60.6 q/ha) were noticed in the treatment receiving 100 per cent recommended dose of NPK through chemical fertilizer (150:75:40 kg/ha) (Table 2). The increased grain yield may be due to higher yield parameters *viz.*, number of grains per cob, grain weight per cob and test weight (Iman *et al.*, 2002). The nutrient supplying capacity of soil was improved by the application of various sources of nutrients such as organic manures and inorganic fertilizers besides improvement in physical, chemical and biological properties of soil. The availability of major and micro nutrients was depending upon the nutrient releasing pattern of these organic and inorganic sources. Soil micro flora brings about transformation of inorganic nutrients held in the soil to readily available form

**Table 1: Plant height and dry matter production as influenced by integrated nutrient management in maize**

Treatments	Plant height (cm)	Total dry matter production (g/plant)
T <sub>1</sub> : 75 % Rec. N through CF + 25 % Rec. N through FYM	189.5	320.5
T <sub>2</sub> : 75 % Rec. N through CF + 25 % Rec. N through Pr.M	185.7	312.5
T <sub>3</sub> : 75 % Rec. N through CF + 25 % Rec. N through P M	206.8	353.7
T <sub>4</sub> : 75 % Rec. N through CF + 25 % Rec. N through V C	195.7	329.7
T <sub>5</sub> : 50 % Rec. N through CF + 25 % Rec. N through FYM + 25 % Rec. N through Pr. M	182.8	296.9
T <sub>6</sub> : 50 % Rec. N through CF + 25 % Rec. N through FYM + 25 % Rec. N through P M	185.1	308.6
T <sub>7</sub> : 50 % Rec. N through CF + 25 % Rec. N through FYM + 25 % Rec. N through V C	183.6	305.8
T <sub>8</sub> : 50 % Rec. N through CF + 25 % Rec. N through Pr. M + 25 % Rec. N through P M	187.9	313.2
T <sub>9</sub> : 50 % Rec. N through CF + 25 % Rec. N through Pr. M + 25 % Rec. N through V C	188.4	302.7
T <sub>10</sub> : 50 % Rec. N through CF + 25 % Rec. N through V C + 25 % Rec. N through P M	203.9	344.6
T <sub>11</sub> : Rec. NPK (150:75:40 kg/ha) + FYM (10 t/ha)	213.6	368.6
T <sub>12</sub> : 100 % Rec. NPK through CF (150:75:40 kg/ha)	171.6	250.4
S.E.±	5.81	3.45
C.D. (P=0.05)	17.04	10.2

CF: Chemical fertilizer

VC: Vermicompost

FYM: Farm Yard Manure

Pr. M: Pressmud

PM: Poultry manure

Rec: Recommended

**Table 2: Yield and yield parameters as influenced by integrated nutrient management in maize**

Treatments	Number of grains per cob	Grain weight per cob (g)	Test weight (g)	Grain yield (q/ha)	Stover yield (q/ha)
T <sub>1</sub> : 75 % Rec. N through CF + 25 % Rec. N through FYM	406.3	156.4	34.8	56.2	67.7
T <sub>2</sub> : 75 % Rec. N through CF + 25 % Rec. N through Pr.M	391.3	152.2	33.4	55.6	66.1
T <sub>3</sub> : 75 % Rec. N through CF + 25 % Rec. N through P M	432.7	163.0	37.2	60.6	71.3
T <sub>4</sub> : 75 % Rec. N through CF + 25 % Rec. N through V C	419.4	158.7	35.3	57.2	68.9
T <sub>5</sub> : 50 % Rec. N through CF + 25 % Rec. N through FYM + 25 % Rec. N through Pr. M	357.6	146.7	32.7	54.5	64.4
T <sub>6</sub> : 50 % Rec. N through CF + 25 % Rec. N through FYM + 25 % Rec. N through P M	376.6	151.7	33.3	55.7	65.5
T <sub>7</sub> : 50 % Rec. N through CF + 25 % Rec. N through FYM + 25 % Rec. N through V C	360.0	148.7	32.4	55.0	64.9
T <sub>8</sub> : 50 % Rec. N through CF + 25 % Rec. N through Pr. M + 25 % Rec. N through P M	378.2	150.2	33.3	55.9	65.2
T <sub>9</sub> : 50 % Rec. N through CF + 25 % Rec. N through Pr. M + 25 % Rec. N through V C	358.6	147.3	32.3	54.4	64.7
T <sub>10</sub> : 50 % Rec. N through CF + 25 % Rec. N through V C + 25 % Rec. N through P M	426.6	160.4	36.2	58.8	70.4
T <sub>11</sub> : Rec. NPK (150:75:40 kg/ha) + FYM (10 t/ha)	458.5	166.9	38.9	65.9	75.4
T <sub>12</sub> : 100 % Rec. NPK through CF (150:75:40 kg/ha)	290.8	127.7	27.7	47.3	60.6
S.E.±	23.02	5.10	1.43	2.31	2.39
C.D. (P=0.05)	67.5	14.9	4.19	6.79	7.01

CF: Chemical fertilizer  
Pr. M: Pressmud

VC: Vermicompost  
PM: Poultry manure

FYM: Farm Yard Manure  
Rec: Recommended

which are by the growing plants (Ashok kumar *et al.*, 2005). Application of 100 per cent NPK + 10 t FYM/ha might have supplied the adequate amount of available nutrients at different stages due to release of sufficient amount of nutrients by mineralization at a constant level that result in higher plant growth and dry matter production which leads to increasing in yield and yield attributes. The findings of Zaman *et al.* (1998) confirm the results

### Conclusion :

The field trial thus revealed that an integrated supply of farm yard manure or poultry manure with chemical fertilizers in maize minimized the use chemical fertilizers to a great extent resulting in better growth and grain yield of maize.

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