

Effect of Macro and Micro Nutrients with Organics on Uptake and Yield of Baby Corn (*Zea mays* L.) under Rainfed Condition

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Abstract

A field experiment was conducted during *kharif* season of 2005 on deep vertisol to study the effect of macro and micronutrients with organics on uptake and yield of baby corn on rainfed area. The treatments were laid out in randomized complete block design with three replications. At harvest, Application of RDF + 25 kg ZnSO₄ + 10 kg FeSO₄ + 35 kg VC recorded highest uptake of nitrogen (183.10 kg/ha), phosphorus (84.41 kg/ha), potassium (163.84 kg/ha) and micronutrients Zn (413.8 g/ha) and Fe (3023.2 g/ha). Yield of baby corn (64.43 q/ha) and fodder yield (232.33 q/ha) differed significantly over RDF alone and all other treatments except RDF with micronutrient along with the combination of FYM. Application of micronutrients with combination of organics did not show any significant effect on harvest index of baby corn.

Key words : Baby corn, Macro and micronutrients, Uptake, Yield.

Baby corn (*Zea mays* L.) is the unfertilized dehusked maize cob harvested within 2—3 days of silk emergence. The importance and use of the maize product is little known to the Indian farmer's in spite of the reason that it fetches lucrative prices in the national and international market. The lack of knowledge of use and economic importance of this product seem to be the major factors besides availability of production technology for popularization among cultivars. Baby corn, being a recent domestication, it may find a prominent place in most of the intensive cropping system due to its short duration nature. Cultivation of baby corn was initiated in Thailand in early 1980's with export of fresh and canned baby corn. The crop spread to Asian countries too, in India it is being widely cultivated in Meghalaya, Western Uttar Pradesh, Haryana, Maharashtra, Karnataka and Andhra Pradesh and to some extent in Tamilnadu also. However, the stage and purpose of harvest are different in baby corn. It has high nutritive value comparable to many vegetable (1). It is believed that agronomy of baby corn is not much different from that of regular maize crop. For obtaining maxi-

imum yield, baby corn requires 200 kg N (2). However, phosphorus and potassium requirement remain at 60—70 kg P and 40—50 kg K/ha. Further, the availability of these micronutrients decreases when the soil pH is beyond 8. The solubility of Zn for example can decrease thousand fold with each unit increase in soil pH (3). So the availability of these trace elements can be increased with the addition of organic manures. The increased availability can result from solubilization and mobilization by short chain organic acids, amino acids and basis because of the formation of chelation by organic ligands. Hence, addition of organic manures along with micronutrients assumes greater importance.

Methods

A field experiment was conducted to study effect of macro and micro nutrients with combination of organics (vermicompost and FYM) in on uptake and yield of baby corn during 2005 at the University Agriculture Science Dharwad, Regional Agricultural Research Station (RARS), Raichur,

Table 1. Physical and chemical properties of the soil at the experimental site.

Parameters	Values obtained	Methods
Physical Properties		
1. Particle size analysis		
Sand (%)	20.10	International pipette method
Silt (%)	25.28	International pipette method
Clay (%)	54.62	International pipette method
2. Bulk density (Mg/m ³)	1.35	Core sampler method
Chemical Properties		
Soil reaction (pH)	8.06	Potentiometer (5)
EC (dS/m)	0.30	Conductivity (5)
Organic carbon (%)	0.55	Walkely and Black wet-oxidation method (5)
Available nitrogen (kg/ha)	207.00	Alkaline permanganate method (4)
Available P ₂ O ₅ (kg/ha)	24.00	Olsen's method
Available K ₂ O (kg/ha)	376.00	Flame photometer (5)
DTPA-extractable Zn (ppm)	0.26	Atomic absorption spectrometer (5)
DTPA-extractable Fe (ppm)	0.28	Atomic absorption spectrometer

Karnataka which is situated 16°15' N altitude and 77° 20' E longitude at an altitude of 389 m above mean sea level. The physico-chemical properties of the experimental sites are presented (Table 1). The experiment considered 10 treatments viz., combinations of RDF, RDF with or without macronutrients and organics (T₁—RDF, T₂—RDF + 25 kg ZnSO₄/ha, T₃—RDF + 10 kg FeSO₄/ha, T₄—RDF + 25 kg ZnSO₄ + 10 kg FeSO₄/ha, T₅—RDF + 25 kg ZnSO₄ + 25 FYM/ha, T₆—RDF +

10 kg FeSO₄+10 FYM kg/ha, T₇—RDF + 25 kg ZnSO₄ + 10 kg FeSO₄ + 35 kg FYM/ha, T₈—RDF + 25 kg ZnSO₄ + 25 kg Vermicompost / ha, T₉—RDF + 10 kg FeSO₄ + 10 kg Vermicompost / ha, T₁₀—RDF + 25 kg ZnSO₄ + 10 kg FeSO₄ + 35 kg Vermicompost / ha). The experiment was laid out in randomized complete block design with three replications. The nutrient content in FYM and vermicompost were 0.5 : 02 : 05 and 3 : 1 : 1.5 per cent and N : P₂O₅ : K₂O respectively.

Table 2. Nutrient uptake of baby corn as influenced by macro with micro nutrients with combination of organics application.

Treatments (per ha)	N (kg/ha)	P (kg/ha)	Uptake of nutrients		
			K (kg/ha)	Zn (g/ha)	Fe (g/ha)
T ₁ RDF	134.04	33.76	115.77	311.5	1976.3
T ₂ RDF + 25 kg ZnSO ₄	140.35	38.22	121.63	322.2	2063.0
T ₃ RDF + 10 kg FeSO ₄	137.27	38.09	118.73	318.6	2175.0
T ₄ RDF + 25 kg ZnSO ₄ + 10 kg FeSO ₄	143.83	45.19	125.52	327.3	2295.0
T ₅ RDF + 25 kg ZnSO ₄ + 25 kg FYM	151.57	51.66	138.37	356.1	2537.6
T ₆ RDF + 10 kg FeSO ₄ + 10 kg FYM	147.00	47.33	132.62	337.1	2417.2
T ₇ RDF + 25 kg ZnSO ₄ +10 kg FeSO ₄ +35 kg FYM	174.66	67.42	157.83	407.2	2899.4
T ₈ RDF + 25 kg ZnSO ₄ + 25 kg VC	162.04	63.67	148.97	379.3	2754.1
T ₉ RDF + 10 kg FeSO ₄ + 10 kg VC	161.64	59.27	143.28	359.7	2604.3
T ₁₀ RDF + 25 kg ZnSO ₄ + 10 kg FeSO ₄ + 35 kg VC	183.10	71.41	163.84	413.8	3023.2
SE ±	3.50	3.89	3.64	3.10	64.21
CD at 5%	11.41	10.08	10.72	10.51	169.20

Table 3. Baby corn yield, fodder yield (q/ha) and harvest index (%) of baby corn as influenced by zinc and iron application. NS, Non-significant.

Treatments (per ha)	Baby corn yield (q/ha)	Fodder yield (q/ha)	Harvest index (%)
T ₁ RDF	43.28	138.50	23.89
T ₂ RDF + 25 kg ZnSO ₄	45.92	151.57	23.24
T ₃ RDF + 10 kg FeSO ₄	44.20	145.90	23.46
T ₄ RDF + 25 kg ZnSO ₄ + 10 kg FeSO ₄	46.08	158.13	22.82
T ₅ RDF + 25 kg ZnSO ₄ + 25 kg FYM	54.41	185.93	22.77
T ₆ RDF + 10 kg FeSO ₄ + 10 kg FYM	54.20	176.47	23.77
T ₇ RDF + 25 kg ZnSO ₄ + 10 kg FeSO ₄ + 35 kg FYM	64.19	210.83	23.33
T ₈ RDF + 25 kg ZnSO ₄ + 25 kg VC	54.69	201.27	21.31
T ₉ RDF + 10 kg FeSO ₄ + 10 kg VC	54.42	186.87	22.26
T ₁₀ RDF + 25 kg ZnSO ₄ + 10 kg FeSO ₄ + 35 kg VC	64.43	232.33	21.72
SE ±	1.60	8.91	1.07
CD at 5%	4.76	26.46	NS

The source of nutrients urea, diammonium phosphate, muriate of potash, zinc sulfate and ferrous sulfate. The recommended dose of fertilizers (RDF) for baby corn i.e., 150, 75 and 45 kg N, P₂O₅ and K₂O/ha respectively (2), and micronutrients (Zn at 25 kg and Fe at 10 kg / ha) with combination of different doses of organics (vermicompost and FYM). The baby corn was sown in rows 45 cm apart and two seeds of baby corn variety PAC - 792 were hand dibbled apart, using 30 kg/ha seed rate in last week of July during the years. The macro and micronutrients with combination organics (vermicompost and FYM) were applied at time of sowing of crop. All the recommended package of practice was adopted systematically. Soil and plant samples were taken from each treatment of the experiment and then analyzed N, P, and K content using the method described by Subbaiah and Asija, (4), Jackson, (5) and Vyas et al.

Results and Discussion

Nutrient Uptake and Baby Corn Yield

Availability of sufficient nutrients coupled with the improvement in soil properties during the entire crop growth period might have helped in higher nutrient uptake. The higher baby corn yield due to application of RDF + 25 kg ZnSO₄ + 10 kg FeSO₄ + 35 kg VC might be attributed to significantly higher N, P and K (183.10, 71.41 and 163.84 kg/ha respectively) uptake compared to rest of the treatments (Table 2).

The increased baby corn yield and fodder yield could be ascribed due to increased uptake of nutrients.

Vyas et al. (6) reported that the application of organics (FYM and VC) increased the microbial activity in soil and improved the physical and chemical properties of soil, which resulted in better utilization of nutrients as compared to no organics. In the present investigation it was observed that soil application of RDF + 25 kg ZnSO₄ + 10 kg FeSO₄ + 35 kg VC recorded significantly higher total Zn (413.8 g/ha) and Fe (3023.20 g/ha) uptake by baby corn crop when compared to rest of the treatments (Table 2). Singh and Tripathi (7) reported that organic manures produces complexing agents that form organometallic complexes with Zn and Fe, which facilitates its efficient utilization by crops.

Zinc and iron concentration in economic yield was much higher than that of fodder yield, which proves that Zn and Fe absorbed by plant during vegetative growth gets translocated to reproductive organ. The uptake of Zn and Fe increased with organics (FYM and VC) as a consequence of increased growth and yield. This might be due to the reason that chelates produced by FYM and vermicompost had synergistic effect on the absorption of Zn and Fe by baby corn due to their higher solubility or the organics directly contributed towards the supply of Zn and Fe (8).

Significantly higher baby corn yield (with husk) and green fodder yield was recorded in the treatment receiving of RDF with micronutrient combined with organics (vermicompost) over RDF alone (control).

This indicates that babycorn responds well to integrated nutrient management. Application of RDF with micronutrients along with organics, which might be owing to the favorable soil condition and synchronized release of plant nutrients throughout the crop growth period. Higher baby corn yield (64.43 q/ha) and green fodder yield (232.33 q/ha) were also recorded under treatment receiving RDF + 25 kg ZnSO₄ + 10 kg FeSO₄ + 35 vermicompost / ha compared with the yield obtained under the RDF (control) (43.28 and 138.50 q/ha respectively) (Table 3).

This might be due to increased growth and yield contributing attribute which in turn resulted in increased yield and fodder yield of corn. Similar results were also reported by Modak and Chavan (9). Application of micronutrients with combination of organics did not show any significant effect on harvest index of baby corn.

References

1. Panday A. K., Ved Prakasha, V. P. Mani and R. D. Singh. 2000. Effect of rate of nitrogen and time application on yield and economics of baby corn (*Zea mays* L.). *Ind. J. Agron.* 45 : 338—343.
2. Thakur D. R., Om Prakash, P. C. Kharwara and S. K. Bhalla. 1997. Effect of nitrogen and plant spacing on growth, yield and economics of baby corn (*Zea mays*). *Ind. J. Agron.* 42 : 479—483.
3. Tisdale N. and M. Benton. 1989. Analysis of micronutrients. *In Text book of soil chemistry.* 55—56 pp.
4. Subbaih B. Y. and G. L. Asiji. 1956. A rapid procedure for the estimation of available nitrogen in soils. *Curr. Sci.* 25 : 259—260.
5. Jackson W. L. 1973. *Soil chemical analysis.* Prentice Hall of India Pvt. Ltd., New Delhi, India. 182—192 pp.
6. Vyas S. H., M. M. Modhwadia and V. D. Khanpara. 1997. Integrated nutrient management in maize. *J. Res. Gujarat Agric. Univ.* 23 : 12—18.
7. Singh D. V. and B. R. Tripathi. 1979. Effect of nitrogen and zinc application on zinc uptake of wheat. *Ind. J. Agron.* 20 : 70—71.
8. Atwal S. S. Shantha Nagarajan, R. K. Sharma and S. Nagarajan, 1998. Micronutrient in wheat seed quality and yield under rice-wheat system. *Ind. Wheat News.* 4 : 4—5.
9. Modak S. J. and F. N. Chavan. 1999. Response of rice to various levels of zinc and iron with and without FYM in black calcareous soil. *Mad. Agric. J.* 86 : 206—209.