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Effect of coir pith amended poultry compost (CPAPC) on physiological parameters of maize (*Zea mays* L.)

P. SANDHYA RANI
Agricultural Research Station, Darsi, PRAKASAM (A.P.) INDIA

ABSTRACT

Composting of poultry droppings were done with industrial waste of coir pith from coconut coir industry. The nutrient content of coir pith amended poultry compost (CPAPC) content 45.7%, E.C (d sm^{-1}) 0.3, P^H 5.60 and C/N ratio 124. Field experiment was conducted to assess the agronomic effectiveness of CPAPC along with inorganic fertilizers at different levels on Maize crop. Eleven treatments were taken up with CPAPC @ 2.5 and 5 t ha^{-1} with the addition of inorganic fertilizers at 100%, 75%, 50%, 25% and without. Similarly inorganic (100% NPK) was tried without organic manure. The results of field experiments *viz*., available soil nutrients, uptake of nutrients, grain yield in maize were found to be the highest in T_3 where NPK 100 % and CPAPC at 5t ha^{-1} were added. The treatments T_5 and T_7 (T_5 - 75% NPK + 5t ha^{-1} CPAPC, T_7 – 50% NPK + 5 t ha^{-1} CPAPC) closely followed the effectiveness of T_3. Since the agronomic effectiveness of T_7 was higher with increased benefit cost ratio than T_3. The reduction in nutrient concentration of N, P and K was recorded in the plants. Also similar pattern of concentration of micronutrients was exhibited. But the uptake of NPK and micronutrient showed steady increase. The biometric characters, yield parameters and grain concentrations were higher in T_3 followed by T_5 and T_7. The grain yield and Stover yield also exhibited similar trend. T_7 where 50% inorganic fertilizers were reduced and 5 t ha^{-1} of CPAPC was added was found to be beneficial for yield and soil health. The benefit cost ratio of T_7 (50% NPK + 5 t ha^{-1} CPAPC) was 4.22 where as that of T_3 (100% NPK + 5 t ha^{-1}) was 4.03. Among the treatments tested T_7 - 50% NPK and 5 t ha^{-1} of CPAPC was optimum for maize crop.

Key words : CPAPC, Coir pith amended poultry composs

INTRODUCTION

Maize (*Zea mays* L.) is one of the three most important cereals next to rice and wheat. It has got immense potential and is, therefore, called as "miracle crop" and also "Queen of cereals". Maize has high yield potential and responds greatly to Nitrogen (Parthipan, 2000), Phophorus (Sankaran *et al.*,2005) and various enzymes (Tisdale *et al.*,1990).Different combinations of coir pith amended poultry composts were tried to test the efficacy.Treatment T_7 with 50% NPK and 5 t/ha, Of CPAPC along with 50% of recommended dose of fertilizers was found to be optimum for getting higher yields.

Treatmental structure of field experiments

Treatments	Details
T_1	100% NPK
T_2	100% NPK + 2.5 t ha^{-1} CPAPC
T_3	100% NPK + 5 t ha^{-1} CPAPC
T_4	75% NPK + 2.5 t ha^{-1} CPAPC
T_5	75% NPK + 5 t ha^{-1} CPAPC
T_6	50% NPK + 2.5 t ha^{-1} CPAPC
T_7	50% NPK + 5 t ha^{-1} CPAPC
T_8	25% NPK + 2.5 t ha^{-1} CPAPC
T_9	25% NPK + 5 t ha^{-1} CPAPC
T_{10}	0% NPK + 2.5 t ha^{-1} CPAPC
T_{11}	0% NPK + 5 t ha^{-1} CPAPC

MATERIALS AND METHODS

The experiment was laid out in a Randomised Block Design with three replications and eleven treatments were assaigned to experimental units at random. Soil and plant samples were collected at vegetative (SI), tasseling (SII) and harvest (SIII) stages.

Methods of analysis of plant samples:

The plant samples were analysed by Microkjeldahl's method (A.O.A.C.1962), Phophorous by vanodomolybdate method (Jackson,1973), Potassium by triple acid extract method (Jackson,1973), Total micro nutrients (Zn,Fe,Mn,Cu) by Atomic absorption Spectrophotometer method by Lindsay and Norvell (1978). The uptake of nutrients *viz.*, N,P,K, Mn, Fe, Zn and Cu was calculated by multiplying the contents of the nutrients with the respective dry matter weights of the plant samples at the appropriate stage.

The data obtained from the present investigation were subjected to statistical scrutiny following the methods of Snedecor and Cochran (1967) and Panse and Sukhatme (1967).

In each experimental plots, five plants were chosen at random and tagged in all the replications. Biometric parameters were recorded and the mean values were worked out.

The plant height was measured in cm from Zero node to the top.The plants were randomly selected and removed at active vegetative, tasseling and harvest stages. The

samples were first air dried in the shade and then oven dried at 60^0C. The samples were weighed.

The following yield components were recorded at harvest from the tagged plants.The cobs were collected, air dried in shade and their weights were recorded.

One hundred grains were taken at harvest from the selected cobs and their weights were recorded.The number of grains / row was counted and the mean values were calculated.

The number of grains per cob was counted and the mean values were calculated.

The length of cob was measured in cm. the girth of cob was measured in cm.

Enumeration of microbial population :

Enumeration of bacteria was done using nutrient glucose agar medium (Rangaswami, 1966) adopting serial dilution plate technique. One ml of 10^{-4} dilution was pipetted out into sterile plates and then poured with Ken Knight's agar medium (Allen, 1953).

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant disucssion have been presented under following heads:

Field experiment on maize:

Influence of treatments on the biological properties of soil :

Among the treatments, the population of bacteria ranged from 28.64 x 10^{-6} g^{-1} to 76.0 x 10^{-6} g^{-1} of soil during vegetative stage.Highest population of bacteria was recorded in T_3 (76.0 x 10^{-6}) followed by T_5, T_7, T_2 and T_9 during the vegetative stage of the crop growth.

The fungal population reduced as the crop advanced to the maturity.Higher populations of actinomyceties was recorded in T_3, T_5, T_7, T_9 and T_2 as the crop advanced to maturity.

The biometric characters like plant height, plant girth, drymatter production etc., dominance of T_3 was continued followed by T_5,T_7, T_9, T_{11} and T_2 (Table 2 and 3). There was tremendous increase in the height of plant during the S II compared with S I. The plant height ranged from 130 to 166 cm during the tasselling stage.

Influence of treatments on micronutrients uptake by straw:

The uptake of Fe varied from 34.25 to 49.34 g ha^{-1} during the S I, from 69.99 to 158.57 g ha^{-1} at S II and from 89.07 to 192.53 g ha^{-1} at S III. The treatments that showed dominance in Fe uptake were T_3, T_5, T_7, T_2 and T_4. However, it was not influenced by treatments (Table 4).

The uptake of Zn increased as the crop growth advanced. The uptake of Zn ranged from 12.38 to 15.03 g ha^{-1} during the vegetative stage and from 57.01 to 84.45 g ha^{-1} during the S II (Table 4). At the stage of maturity, treatments dominant in Zn uptake were T_3, T_5, T_7, T_9, T_{11}, and T_2. The interaction between the treatments and stages was significant.

The uptake of Mn was at an increasing trend during crop growth period. During vegetative stage, Mn uptake

Table 1 : Influence of treatments on biological properties of soil at different stages of maize

Treatments	Bacteria x 10^6 g^{-1} of soil			Fungal x 10^3 g^{-1} of soil			Actinomycetes x 10^4 g^{-1} of soil		
	S I	S II	S III	S I	S II	S III	S I	S II	S III
T_1 – NPK – 100%	28.6	16.3	13.0	10.3	7.3	5.3	11.0	8.3	5.3
T_2 – NPK – 100% +CPAPC @ 2.5 t ha^{-1}	58.3	45.0	20.3	12.6	9.3	7.3	14.0	10.6	7.6
T_3 – NPK – 100% + CPAPC @ 5 t ha^{-1}	76.0	59.6	29.0	14.0	10.0	8.3	16.3	12.6	9.6
T_4 – NPK – 75% + CPAPC @ 2.5 t ha^{-1}	51.0	36.6	18.3	12.0	9.0	7.0	13.3	10.3	7.3
T_5 – NPK – 75% + CPAPC @ 5 t ha^{-1}	71.3	53.0	24.0	13.6	9.6	8.0	15.3	12.0	9.3
T_6 – NPK – 50% + CPAPC @ 2.5 t ha^{-1}	43.3	27.3	17.0	11.3	8.3	6.6	13.0	10.0	6.3
T_7 – NPK – 50% + CPAPC @ 5 t ha^{-1}	65.0	46.3	20.3	12.6	9.3	7.6	15.0	11.0	8.6
T_8 – NPK – 25% + CPAPC @ 2.5 t ha^{-1}	36.3	21.0	16.3	11.3	8.0	6.3	12.3	9.3	6.0
T_9 – NPK – 25% + CPAPC @ 5 t ha^{-1}	53.6	39.6	18.0	11.6	8.3	7.0	14.3	10.3	8.0
T_{10} – NPK – 0% + CPAPC @ 2.5 t ha^{-1}	31.0	17.0	14.0	10.3	7.3	5.0	12.0	8.6	5.0
T_{11} – NPK – 0% + CPAPC @ 5 t ha^{-1}	47.0	33.6	15.0	10.3	8.0	7.3	14.0	10.0	7.3
	S.E. ±	C.D. (P=0.05)		S.E. ±	C.D. (P=0.05)		S.E. ±	C.D. (P=0.05)	
S	0.290	0.579		0.133	0.265		0.137	0.274	
T	0.355	1.109		0.254	0.508		0.263	0.525	
SXT	0.962	0.923		0.440	NS		0.455	0.908	

S I – Vegetative stage; S II – Tasseling stage; S III – Post harvest.

Table 2 : Treatmental influence on biometric characters of maize at different stages

Treatments	Plant height (cm)			Plant girth (cm)		
	S I	S II	S III	S I	S II	S III
T_1 – NPK – 100%	48	132	163	2.2	3.5	5.1
T_2 – NPK – 100% + CPAPC @ 2.5 t ha^{-1}	64	157	186	2.8	4.3	5.6
T_3 – NPK – 100% + CPAPC @ 5 t ha^{-1}	75	166	211	3.2	4.6	6.0
T_4 – NPK – 75% + CPAPC @ 2.5 t ha^{-1}	59	150	191	2.7	4.1	5.4
T_5 – NPK – 75% + CPAPC @ 5 t ha^{-1}	74	161	201	3.1	4.5	5.8
T_6 – NPK – 50% + CPAPC @ 2.5 t ha^{-1}	51	144	183	2.6	4.0	5.3
T_7 – NPK – 50% + CPAPC @ 5 t ha^{-1}	70	155	195	3.0	4.3	5.6
T_8 – NPK – 25% + CPAPC @ 2.5 t ha^{-1}	50	137	173	2.5	3.7	5.1
T_9 – NPK – 25% + CPAPC @ 5 t ha^{-1}	62	148	190	2.8	4.2	5.4
T_{10} – NPK – 0% + CPAPC @ 2.5 t ha^{-1}	48	130	163	2.2	3.4	5.0
T_{11} – NPK – 0% + CPAPC @ 5 t ha^{-1}	57	145	181	2.6	4.0	5.1
	S.E. ±	C.D. (P=0.05)		S.E. ±	C.D. (P=0.05)	
S	0.742	1.484		0.015	0.029	
T	1.422	2.841		0.029	0.057	
SXT	2.464	4.922		0.049	0.099	

S I – Vegetative stage; S II – Tasseling stage; S III – Post harvest.

Table 3 : Influence of treatments on dry matter production (kg ha^{-1}) of maize at different stages

Treatments	S 1	S 2	S 3
T_1 – NPK – 100%	1582	6017	12036
T_2 – NPK – 100% + CPAPC @ 2.5 t ha^{-1}	1675	7257	15170
T_3 – NPK – 100% + CPAPC @ 5 t ha^{-1}	1754	8571	16551
T_4 – NPK – 75% + CPAPC @ 2.5 t ha^{-1}	1652	7155	14764
T_5 – NPK – 75% + CPAPC @ 5 t ha^{-1}	1743	8364	16275
T_6 – NPK – 50% + CPAPC @ 2.5 t ha^{-1}	1617	6846	14278
T_7 – NPK – 50% + CPAPC @ 5 t ha^{-1}	1734	8196	15827
T_8 – NPK – 25% + CPAPC @ 2.5 t ha^{-1}	1592	6651	13669
T_9 – NPK – 25% + CPAPC @ 5 t ha^{-1}	1726	7782	15608
T_{10} – NPK – 0% + CPAPC @ 2.5 t ha^{-1}	1572	6258	12541
T_{11} – NPK – 0% + CPAPC @ 5 t ha^{-1}	1715	7566	15195
	S.E. ±	C.D. (P = 0.05)	
S	9.839	19.657	
T	18.842	37.641	
S x T	32.035	65.196	

Table 4 : Influence of treatments on micronutrient uptake by straw in maize

Treatments	Fe (g ha^{-1})			Zn (g ha^{-1})		
	S I	S II	S III	S I	S II	S III
T_1 – NPK – 100%	34.92	69.99	89.07	12.95	57.01	82.26
T_2 – NPK – 100% + CPAPC @ 2.5 t ha^{-1}	42.38	112.49	152.70	14.20	70.12	105.71
T_3 – NPK – 100% + CPAPC @ 5 t ha^{-1}	49.34	158.57	192.53	15.03	84.45	118.91
T_4 – NPK – 75% + CPAPC @ 2.5 t ha^{-1}	40.48	101.60	143.21	13.82	68.49	102.88
T_5 – NPK – 75% + CPAPC @ 5 t ha^{-1}	47.68	144.70	170.34	14.85	31.83	115.99
T_6 – NPK – 50% + CPAPC @ 2.5 t ha^{-1}	37.41	93.32	121.36	13.46	65.24	98.99
T_7 – NPK – 50% + CPAPC @ 5 t ha^{-1}	45.48	133.32	153.52	14.70	79.54	112.12
T_8 – NPK – 25% + CPAPC @ 2.5 t ha^{-1}	35.11	82.91	105.21	13.13	63.02	93.83
T_9 – NPK – 25% + CPAPC @ 5 t ha^{-1}	43.62	118.54	135.79	14.59	75.29	109.50
T_{10} – NPK – 0% + CPAPC @ 2.5 t ha^{-1}	34.25	80.87	91.13	12.38	59.16	85.59
T_{11} – NPK – 0% + CPAPC @ 5 t ha^{-1}	41.61	110.46	115.48	14.42	72.89	105.98
S.E. ±		595.465			0.292	
CD (P = 0.05)		1189.585			0.584	

Table 5 : Influence of treatments on micronutrients uptake by maize straw

Treatments	Mn (g ha^{-1})			Cu (g ha^{-1})		
	S I	S II	S III	S I	S II	S III
T_1 – NPK – 100%	8.32	19.66	26.63	46.71	136.87	190.64
T_2 – NPK – 100% + CPAPC @ 2.5 t ha^{-1}	9.27	25.77	37.54	45.54	184.87	283.11
T_3 – NPK – 100% + CPAPC @ 5 t ha^{-1}	9.75	32.26	44.16	61.11	237.00	356.34
T_4 – NPK – 75% + CPAPC @ 2.5 t ha^{-1}	9.71	24.78	34.92	53.43	179.73	257.73
T_5 – NPK – 75% + CPAPC @ 5 t ha^{-1}	9.62	31.06	42.06	59.47	227.72	337.60
T_6 – NPK – 50% + CPAPC @ 2.5 t ha^{-1}	8.43	23.36	33.00	50.58	167.49	236.11
T_7 – NPK – 50% + CPAPC @ 5 t ha^{-1}	9.50	29.95	39.97	58.40	276.32	313.84
T_8 – NPK – 25% + CPAPC @ 2.5 t ha^{-1}	8.21	22.43	31.15	48.77	203.67	220.61
T_9 – NPK – 25% + CPAPC @ 5 t ha^{-1}	9.27	27.73	35.66	55.58	250.52	293.04
T_{10} – NPK – 0% + CPAPC @ 2.5 t ha^{-1}	7.95	20.30	26.54	45.19	179.91	194.89
T_{11} – NPK – 0% + CPAPC @ 5 t ha^{-1}	9.11	26.04	36.08	54.26	239.39	265.10
	S.E. ±		C.D. (P=0.05)	S.E. ±		C.D. (P=0.05)
S	0.207		0.414	132.954		NS
T	0.396		0.792	254.587		NS
SXT	0.687		1.372	440.958		NS

S I – Vegetative stage; S II – Tasseling stage; S III – Post harvest.
N.S.-Non significant

ranged from 7.95 to 9.75 g ha^{-1}, during stage II it varied from 19.66 to 32.26 g ha^{-1} and at the harvest stage, it ranged from 26.54 to 44.16 g ha^{-1}. The interaction between the treatments and stages was significant (Table 5).

The uptake of Cu was at an increasing trend during the crop growth period. The uptake of Cu was from 45.19 to 61.11 g ha^{-1}, 136.87 to 237.00 g ha^{-1} and 190.64 to 356.34 g ha^{-1} at the vegetative, tasselling and harvest stages, respectively (Table 5). The interaction between the treatments was not significant.

Influence of treatments on yield :

The grain yield of maize was the highest in T_3 (5786 kg ha^{-1}), whereas the lowest was recorded in T_1 (3233 kg ha^{-1}). The dominance of treatments was recorded in T_3, T_5 and T_7. The treatments were highly significant. Even organic manure alone treatments (T_{10} and T_{11}) recorded higher yield over 100% NPK treatment (T_1) (Table 6).

Table 6 : Influence of treatments on yield of grain and straw (kg ha^{-1}) in maize

Treatments	Grain	Straw
T_1 – NPK – 100%	3233	9476
T_2 – NPK – 100% + CPAPC @ 2.5 t ha^{-1}	5131	11838
T_3 – NPK – 100% + CPAPC @ 5 t ha^{-1}	5786	12755
T_4 – NPK – 75% + CPAPC @ 2.5 t ha^{-1}	4857	11341
T_5 – NPK – 75% + CPAPC @ 5 t ha^{-1}	5516	12363
T_6 – NPK – 50% + CPAPC @ 2.5 t ha^{-1}	4270	10548
T_7 – NPK – 50% + CPAPC @ 5 t ha^{-1}	5134	12125
T_8 – NPK – 25% + CPAPC @ 2.5 t ha^{-1}	3898	9753
T_9 – NPK – 25% + CPAPC @ 5 t ha^{-1}	4820	11607
T_{10} – NPK – 0% + CPAPC @ 2.5 t ha^{-1}	3344	9329
T_{11} – NPK – 0% + CPAPC @ 5 t ha^{-1}	4419	11126
S.E. ±	35.991	43.266
C.D. (P = 0.05)	75.077	90.252

Higher straw yields were obtained from the treatments T_3, T_5 and T_7, which yielded 12755, 12363 and 12125 kg ha^{-1}, respectively. The lowest straw yield was recorded with T_{10} (9329 kg ha^{-1}). The treatments were highly significant.

Influence of treatments on yield parameters of maize:

The mean values of the grain rows/cob varied from 10.3 (T_{10}) to 15.0 (T_3) due to treatments and it was significantly influenced (Table 7).

The width of the cob ranged from 3.7 (T_1 and T_{10}) to 5.2 (T_3)(Table 7) . The dominance of treatments in case of cob width exhibited by T_3, T_2, T_5, T_4 and T_7. The interaction was significantly influenced by treatments.

The weight of the 100 grains ranged from 20.2 (T_{10}) to 28.7 g (T_3). Significant variations were observed due to treatments. The lowest weight of 100 grains was recorded with T_{10} whereas it was highest in T_3.

There was considerable difference among the treatments in case of grain numbers per row. The highest value was recorded in T_3, followed by T_5, T_7, T_2 and T_4 *i.e.* 34.0, 33.4, 33.3 and 30.6.The highest numbers of grains per cob were recorded in T_3, (394) and the lowest in T_{10} (312). The interaction between the treatments was significant. The cob length was found to vary significantly among the treatments. The cob length was higher in T_3, T_5, T_7, T_2 and T_9. The interaction between the treatments was significant (Table 8).

Table 7 : Influence of treatments on yield parameters in maize

Treatments	Grain row / cob	Cob width (cm)	100 grain weight (gm)
T_1 – NPK – 100%	11.6	3.7	21.4
T_2 – NPK – 100% + CPAPC @ 2.5 t ha^{-1}	13.6	5.0	26.3
T_3 – NPK – 100% + CPAPC @ 5 t ha^{-1}	15.0	5.2	28.7
T_4 – NPK – 75% + CPAPC @ 2.5 t ha^{-1}	12.6	4.7	24.1
T_5 – NPK – 75% + CPAPC @ 5 t ha^{-1}	13.6	4.9	27.1
T_6 – NPK – 50% + CPAPC @ 2.5 t ha^{-1}	11.6	4.4	22.3
T_7 – NPK – 50% + CPAPC @ 5 t ha^{-1}	13.0	4.6	26.3
T_8 – NPK – 25% + CPAPC @ 2.5 t ha^{-1}	11.3	4.1	20.2
T_9 – NPK – 25% + CPAPC @ 5 t ha^{-1}	12.3	4.3	25.4
T_{10} – NPK – 0% + CPAPC @ 2.5 t ha^{-1}	10.3	3.7	20.2
T_{11} – NPK – 0% + CPAPC @ 5 t ha^{-1}	11.3	4.1	24.1
S.E. $\pm$	0.431	0.088	0.170
C.D. (P = 0.05)	0.899	0.183	0.355

Table 8 : Influence of treatments on yield parameters in maize

Treatments	Grain Nos./row	Grain Nos./cob	Cob length (cm)
T_1 – NPK – 100%	22.3	315	12.9
T_2 – NPK – 100% + CPAPC @ 2.5 t ha^{-1}	30.6	375	15.5
T_3 – NPK – 100% + CPAPC @ 5 t ha^{-1}	34.0	394	16.5
T_4 – NPK – 75% + CPAPC @ 2.5 t ha^{-1}	28.6	354	14.6
T_5 – NPK – 75% + CPAPC @ 5 t ha^{-1}	33.4	390	16.0
T_6 – NPK – 50% + CPAPC @ 2.5 t ha^{-1}	26.6	343	14.2
T_7 – NPK – 50% + CPAPC @ 5 t ha^{-1}	33.3	382	15.7
T_8 – NPK – 25% + CPAPC @ 2.5 t ha^{-1}	25.0	324	13.6
T_9 – NPK – 25% + CPAPC @ 5 t ha^{-1}	27.3	373	15.2
T_{10} – NPK – 0% + CPAPC @ 2.5 t ha^{-1}	22.3	312	12.7
T_{11} – NPK – 0% + CPAPC @ 5 t ha^{-1}	26.0	353	14.5
S.E. $\pm$	0.693	2.266	0.128
C.D. (P = 0.05)	1.446	4.727	0.268

Influence of treatments on NPK concentration in maize grain:

The nitrogen content in grain varied from 1.69% to 2.14% among different treatments. The highest N content was recorded in T_3 (2.14%), whereas the lowest was recorded in T_{10} (1.69%) (Table 9). The superiority of N content was recorded in T_3, T_5, T_7, T_2 and T_9. The phosphorus content in grain varied from 0.09% to 0.28% per cent. The P content was high in T_3, followed by T_5, T_7, T_2 and T_9. The potassium content in grain ranged from 1.03% to 1.22%. The highest grain K was in T_3 followed by T_5, T_7, T_9 and T_2. There was significant difference among the treatments.

Influence of treatments on major nutrient uptake in grain:

Nitrogen, phosphorus and potassium uptake by grain varied from 56.7 to 123.8, 3.23 to 16.58 and 34.0 to 70.7 kg ha^{-1}, respectively. All the three major nutrient uptake by grain was significantly influenced by treatments. Considering inorganics alone (T_1), the application of CPAPC at 2.5 and 5 t ha^{-1} alone and in combination with 100% inorganic NPK was highly beneficial (Table 9).

Influence of treatments on Micronutrients concentration in grain:

The Fe content ranged from 41.55 to 44.74 ppm among the treatments. Higher Fe contents were recorded with T_5, T_7, T_3, T_9 and T_2. The Zn content in grain ranged from 47.36 to 53.85 ppm among the treatments. Zinc content in grain was significantly influenced by treatments. The Mn content in the grain was higher in T_3, T_5, T_7, T_9 and T_{11}. The concentration ranged from 25.55 to 31.85 ppm. The Cu content ranged from 10.56 to 14.84 ppm in the grain. Higher amounts of Cu were recorded in T_3, T_5, T_7, T_2 and T_9. The contents of Mn and Cu were

Table 9 : Influence of treatments on grain nutrient concentration (per cent) and uptake in maize

Treatments	Nutrient concentration			Uptake (kg ha^{-1}) in grain		
	N	P	K	N	P	K
T_1 – NPK – 100%	1.82	0.10	1.05	58.8	3.52	34.0
T_2 – NPK – 100% + CPAPC @ 2.5 t ha^{-1}	2.01	0.19	1.15	103.4	9.75	59.1
T_3 – NPK – 100% + CPAPC @ 5 t ha^{-1}	2.14	0.28	1.22	123.8	16.58	70.7
T_4 – NPK – 75% + CPAPC @ 2.5 t ha^{-1}	1.95	0.15	1.12	94.8	7.60	54.7
T_5 – NPK – 75% + CPAPC @ 5 t ha^{-1}	2.10	0.26	1.20	116.0	14.34	66.3
T_6 – NPK – 50% + CPAPC @ 2.5 t ha^{-1}	1.85	0.12	1.10	79.0	5.26	47.0
T_7 – NPK – 50% + CPAPC @ 5 t ha^{-1}	2.06	0.20	1.18	105.7	10.61	60.5
T_8 – NPK – 25% + CPAPC @ 2.5 t ha^{-1}	1.80	0.10	1.07	70.4	4.03	41.8
T_9 – NPK – 25% + CPAPC @ 5 t ha^{-1}	2.00	0.18	1.15	96.9	8.99	55.5
T_{10} – NPK – 0% + CPAPC @ 2.5 t ha^{-1}	1.69	0.09	1.03	56.7	3.23	34.4
T_{11} – NPK – 0% + CPAPC @ 5 t ha^{-1}	1.95	0.15	1.11	86.1	6.92	49.3
S.E. $\pm$	0.011	0.006	0.013	6.87	0.304	5.35
C.D. (P = 0.05)	0.024	0.014	0.027	14.33	0.635	11.17

Table 10 : Influence of treatments on micronutrients concentration (ppm) and uptake (kg ha^{-1}) in grain in maize

Treatments	Nutrient concentrate				uptake (kg ha^{-1}) in grain			
	Fe	Zn	Mn	Cu	Fe	Zn	Mn	Cu
T_1 – NPK – 100%	41.74	47.36	25.85	10.76	13.50	15.31	8.36	3.45
T_2 – NPK – 100% +CPAPC @ 2.5 t ha^{-1}	44.26	51.73	29.65	13.24	22.71	26.54	15.21	6.79
T_3 – NPK – 100% + CPAPC @ 5 t ha^{-1}	44.74	53.85	31.85	14.84	26.31	31.16	18.43	8.59
T_4 – NPK – 75% + CPAPC @ 2.5 t ha^{-1}	43.74	50.65	28.74	12.75	21.24	24.60	13.96	6.19
T_5 – NPK – 75% + CPAPC @ 5 t ha^{-1}	45.15	53.26	31.26	14.16	24.91	29.38	17.24	7.81
T_6 – NPK – 50% + CPAPC @ 2.5 t ha^{-1}	42.84	49.26	27.80	11.84	18.30	21.04	11.87	5.05
T_7 – NPK – 50% + CPAPC @ 5 t ha^{-1}	44.83	52.46	30.76	13.68	23.02	27.06	15.79	7.01
T_8 – NPK – 25% + CPAPC @ 2.5 t ha^{-1}	42.16	48.37	26.37	11.16	16.43	18.85	10.23	4.35
T_9 – NPK – 25% + CPAPC @ 5 t ha^{-1}	44.45	51.75	30.35	12.75	21.42	24.94	14.63	6.14
T_{10} – NPK – 0% + CPAPC @ 2.5 t ha^{-1}	41.55	47.65	25.55	10.56	13.89	15.93	9.27	3.53
T_{11} – NPK – 0% + CPAPC @ 5 t ha^{-1}	43.25	50.63	30.12	12.32	19.11	22.37	13.30	5.31
S.E. $\pm$	0.014	0.014	0.027	0.012	0.156	0.195	0.282	0.067
C.D. (P = 0.05)	0.029	0.030	0.057	0.026	0.325	0.406	0.589	0.141

significantly influenced by treatments (Table 10).

Influence of treatments on the uptake of micronutrients in grain:

The uptake of all the four micronutrients in grain was significantly influenced by treatments. The uptake of Fe ranged from 13.50 to 26.3 g ha^{-1}. The higher Fe contents were corded in T_3, T_5, T_7, T_2 and T_9. The uptake of Zn ranged from 15.31 to 31.16 g ha^{-1}. The uptake was higher in the treatments T_3, T_5, T_7, T_2 and T_9. The interaction between the treatments were significant. The uptake of Mn ranged from 8.36 to 18.43 g ha^{-1} (Table 10).

The uptake of Cu ranged from 3.53 to 8.29 g ha^{-1}. Cu uptake was higher in treatments T_3, T_5, T_7 and T_2. The influence of application of CPAPC at 2.5 and 5.0 t ha^{-1} on the micronutrient uptake was observed.

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