Available Online at http://www.journalajst.com

ASIAN JOURNAL OF SCIENCE AND TECHNOLOGY

ISSN: 0976-3376

Asian Journal of Science and Technology
Vol. 5, Issue 12, pp.905-908, December, 2014

RESEARCH ARTICLE

EFFECT OF DIFFERENT ORGANIC MANURES AND FERTILIZERS ON YIELD AND NUTRIENT UPTAKE OF MAIZE (*ZEA MAYS* L.)

***Virendra Singh Tanwar**

college of Agriculture, Navile, Shimoga instead of 696-B Ganesh Nagar Main, Niwaru Road, Jhotwara, Jaipur, Rajasthan, 302012, India

ARTICLE INFO

Article History:
Received 14th September, 2014
Received in revised form
22nd October, 2014
Accepted 24th November, 2014
Published online 30th December, 2014

Key words:
Neem Coated urea,
Poultry Manure,
Maize

ABSTRACT

A field experiment was conducted using maize as a test crop at Zonal Agriculture Research Station, Navile, Shimoga, Karnataka during 2013. The experiment consists nine treatment laid in three replication using three different organic manures *viz.*, FYM, Vermicompost and Poultry manure with fertilizers and neem coated urea. The results indicated neem coated urea significantly increased nutrient availability and uptake by maize crop. Application of 100 % RD-N through Neem coated urea (4 ml neem oil / 100 g urea) significantly increased the both grain and stover yield of maize over all treatments.

INTRODUCTION

Maize is one of the important cereal crop next to wheat and rice in the world. Maize is called as king of crops and queen of cereal because of its productive potential compared to any other cereal crop. In India it is cultivated over an area of 10 m ha with an annual production and productivity of 14.8 m t and 2.11 t ha^{-1} respectively. In Karnataka, it occupies an area of 6.7 lakh ha with production of 21.40 lakh tones and productivity of 3.36 tha^{-1}. Maize is a rich source of protein, vitamin and minerals. For realizing higher yield and quality produced, soil health is a critical factor. Therefore chemical fertilizers must be integrated with organic manures such as FYM, Vermicompost and Poultry manure which are renewable and eco-friendly to achieve sustainable productivity with minimum deterioration effect of chemical fertilizers on soil health and environmental (Saravanapandian., 1998). In fertilizers combination neem coated urea also included which increased availability of nutrient and increased the yield and nutrient uptake by crop.

MATERIALS AND METHODS

The field experiment was conducted at the Zonal Agricultural Research Station, college of Agriculture, Navile, Shimoga during the *Kharif* 2013.

Corresponding author: Virendra Singh Tanwar
696-B Ganesh Nagar Main, Niwaru Road, Jhotwara, Jaipur, Rajasthan, 302012, India

The soil of the experimental site belongs to *Typic Haplustalf*. The detail of intial soil properties are presented in Table 1. There are nine treatments with three replications. Hybrid maize is used as test crop with spacing (45 cm x 30 cm). The experiment was laid in a randomized complete block design with following treatment, T_1 - 100 % RD- N (no organic manure), T_2- 100 % RD- N + RD – FYM, T_3- 100 % RD- N + 2 times of RD –FYM , T_4- 100 % RD -N + N-equivalent of RD- FYM through Vermicompost ,T_5- 100 % RD- N + 2 times of N-equivalent of RD - FYM through Vermicompost, T_6- 100 % RD- N+ N-equivalent of RD- FYM through Poultry manures, T_7- 100 % RD- N + 2 times of N-equivalent of RD- FYM through Poultry manures ,T_8 - 100 % RD- N through Neem oil coated urea (2 ml neem oil /100g urea), T_9 - 100 % RD -N through Neem oil coated urea (4 ml neem oil /100g urea). All organic manures were applied one week before sowing. Urea was used as a source of mineral N while FYM, Vermicompost and Poultry manure was used as organic manure. Grain and stover yield was recorded after harvest. Grain and Stover were taken and analyzed for different nutrient to determine nutrient uptake by maize crop. Chemical compositions of different manures are presented in Table 2.

RESULTS AND DISCUSSION

Grain and Stover yield of maize

From the result (Table 3), we noticed that all the different source of organic manures and fertilizers significantly increased the grain and stover yield over the 100 % RD-N

(no organic manure) (45.68 and 52.24 q ha^{-1} of grain and stover yield respectively). The treatment 100 % RD-N through Neem coated urea (4 ml neem oil / 100 g urea) recorded significantly highest value of grain and stover yield (69.10 and 80.17 q ha^{-1} grain and stover yield respectively) which is on par with 100 % RD-N through Neem coated urea (2 ml neem oil / 100 g urea) (66.10 and 75.33 q ha^{-1} grain and stover yield respectively).

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

Parameters	Values
Physical properties	
Sand(%)	77.78
Silt (%)	8.50
Clay (%)	13.72
Textural Class	Sandy Loam
Taxonomical classification	*Typic Haplustalf*
Chemical properties	
pH (1:2.5)	5.72
EC (dS m^{-1}) at 25°	0.04
Organic Carbon (g kg^{-1})	4.2
Available N (kg ha^{-1})	229.72
Available P2O5 (kg ha^{-1})	56.31
Available K2O (kg ha^{-1})	142.86
Available S (mg kg^{-1})	8.23

Table 2. Nutrient composition of the organic manures used in the experiment

Manures	N (%)	P (%)	K(%)
FYM	0.50	0.26	0.33
Vermicompost	1.10	0.64	0.34
Poultry manure	1.51	0.78	0.37

These result indicated that the increase in grain and stover yield was related to the availability of nutrient mainly nitrogen by neem coated urea helped in reducing the leaching and volatilization losses thereby accelerated the availability. Use of neem coated urea also saved 20 kg N ha^{-1}. This is in accordance with the finding by Sharma and Prasad (1996) and Upadhyay and Tripathi (2000).

Nutrient concentration in grain and stover of maize

Primary nutrient concentration in grain and stover

From result (Table 4) indicated that primary nutrient concentration in maize grain and stover showed variable response to different types of organic manures and fertilizers. The treatment, 100 % RD-N through Neem coated urea (4 ml neem oil / 100 g urea) recorded significantly higher value of N (0.79 and 1.55 % stover and grain concentration respectively), P (0.36 and 0.38 % stover and grain concentration respectively) and K (1.44 and 0.53 % stover and grain concentration respectively) concentration in grain and stover over the other treatments except the treatment 100 % RD-N through Neem coated urea (2 ml neem oil / 100 g urea). This may be ascribed to increases availability of N, P and K in soil due to mobilization from sources. Neem coated urea reduced the leaching and volatilization losses and also inhibit the nitrification process resulting increased the availability and mobilization of nutrient from source. The findings are similar to those obtained by Sharma and Prasad (1996), Jaiswal and Singh (2000) and Sujatha *et al.* (2008).

Table 3. Effect of different types of organic manures and fertilizers on yield attributes, grain and stover yield of maize

Treatments	Grain yield (q ha^{-1})	Stover yield (q ha^{-1})
T_1: 100 % RD N (no organic manure)	45.68	52.24
T_2: 100 % RD N + RD – FYM	55.26	62.32
T_3: 100 % RD N + 2 times of RD –FYM	50.39	60.42
T_4: 100 % RD N + N-equivalent of RD- FYM through Vermicompost	57.01	65.58
T_5: 100 % RD N + 2 times of N-equivalent of RD - FYM through Vermicompost	52.33	62.29
T_6: 100 % RD N+ N-equivalent of RD- FYM through Poultry manure	65.52	73.53
T_7: 100 % RD N + 2 times of N-equivalent of RD- FYM through Poultry manure	63.63	70.28
T_8: 100 % RD N through Neem oil coated urea (2 ml neem oil /100g urea)	66.10	75.33
T_9: 100 % RD N through Neem oil coated urea (4 ml neem oil /100g urea)	69.10	80.17
S.Em. ±	1.48	2.16
C.D. (p = 0.05)	3.42	6.47

Table 4. Effect of different types of organic manures and fertilizers on nitrogen, phosphorus and potassium content in stover and grain of maize

Treatments	Nitrogen (%)		Phosphorus (%)		Potassium (%)	
	Stover	Grain	Stover	Grain	Stover	Grain
T_1: 100 % RD N (no organic manure)	0.56	0.97	0.20	0.21	1.11	0.40
T_2: 100 % RD N + RD – FYM	0.63	1.11	0.21	0.24	1.30	0.42
T_3: 100 % RD N + 2 times of RD -FYM	0.69	1.24	0.25	0.28	1.35	0.45
T_4: 100 % RD N + N-equivalent of RD- FYM through Vermicompost	0.71	1.18	0.23	0.25	1.32	0.48
T_5: 100 % RD N + 2 times of N-equivalent of RD - FYM through Vermicompost	0.72	1.33	0.28	0.30	1.36	0.50
T_6: 100 % RD N+ N-equivalent of RD- FYM through Poultry manure	0.74	1.30	0.27	0.28	1.34	0.49
T_7: 100 % RD N + 2 times of N-equivalent of RD- FYM through Poultry manure	0.75	1.38	0.30	0.32	1.38	0.52
T_8: 100 % RD N through Neem oil coated urea (2 ml neem oil /100g urea)	0.76	1.51	0.34	0.35	1.42	0.53
T_9: 100 % RD N through Neem oil coated urea (4 ml neem oil /100g urea)	0.79	1.55	0.36	0.38	1.44	0.56
S.Em. ±	0.01	0.03	0.01	0.01	0.02	0.01
C.D. (p = 0.05)	0.03	0.09	0.04	0.04	0.07	0.04

Table 5. Effect of different types of organic manures and fertilizers on total nitrogen, phosphorus and potassium uptake by maize

Treatments	Nitrogen (kg ha^{-1})	Phosphorus (kg ha^{-1})	Potassium (kg ha^{-1})
T_1: 100 % RD N (no organic manure)	73.55	19.75	76.54
T_2: 100 % RD N + RD – FYM	102.95	25.96	104.01
T_3: 100 % RD N + 2 times of RD –FYM	104.23	29.24	104.37
T_4: 100 % RD N + N-equivalent of RD- FYM through Vermicompost	110.52	28.88	113.96
T_5: 100 % RD N + 2 times of N-equivalent of RD - FYM through Vermicompost	114.81	33.15	111.11
T_6: 100 % RD N+ N-equivalent of RD- FYM through Poultry manure	140.36	38.30	130.62
T_7: 100 % RD N + 2 times of N-equivalent of RD- FYM through Poultry manure	140.40	41.68	129.98
T_8: 100 % RD N through Neem oil coated urea (2 ml neem oil /100g urea)	157.10	48.51	141.57
T_9: 100 % RD N through Neem oil coated urea (4 ml neem oil /100g urea)	171.04	55.60	154.72
S.Em. ±	3.49	2.06	4.16
C.D. (p = 0.05)	10.45	6.19	12.49

Table .6 Effect of different types of organic manures and fertilizers on calcium, magnesium and sulphur content in stover and grain

Treatments	Calcium (%)		Magnesium (%)		Sulphur (%)	
	Stover	Grain	Stover	Grain	Stover	Grain
T_1: 100 % RD N (no organic manure)	0.147	0.177	0.058	0.084	0.091	0.117
T_2: 100 % RD N + RD – FYM	0.151	0.183	0.065	0.094	0.093	0.127
T_3: 100 % RD N + 2 times of RD –FYM	0.157	0.185	0.070	0.104	0.097	0.132
T_4: 100 % RD N + N-equivalent of RD- FYM through Vermicompost	0.155	0.184	0.068	0.102	0.097	0.129
T_5: 100 % RD N + 2 times of N-equivalent of RD - FYM through Vermicompost	0.162	0.186	0.073	0.105	0.102	0.136
T_6: 100 % RD N+ N-equivalent of RD- FYM through Poultry manure	0.161	0.185	0.071	0.103	0.097	0.131
T_7: 100 % RD N + 2 times of N-equivalent of RD- FYM through Poultry manure	0.164	0.187	0.075	0.107	0.103	0.139
T_8: 100 % RD N through Neem oil coated urea (2 ml neem oil /100g urea)	0.168	0.193	0.077	0.114	0.107	0.142
T_9: 100 % RD N through Neem oil coated urea (4 ml neem oil /100g urea)	0.173	0.208	0.079	0.117	0.111	0.145
S.Em. ±	0.001	0.002	0.0004	0.001	0.003	0.002
C.D. (p = 0.05)	0.002	0.006	0.0011	0.002	NS	NS

Table 7. Effect of different types of organic manures and fertilizers on total calcium, magnesium and sulphur uptake by maize

Treatments	Calcium (kg ha^{-1})	Magnesium (kg ha^{-1})	Sulphur (kg ha^{-1})
T_1: 100 % RD N (no organic manure)	16.94	7.54	10.88
T_2: 100 % RD N + RD – FYM	20.81	9.93	13.69
T_3: 100 % RD N + 2 times of RD –FYM	20.68	10.51	13.92
T_4: 100 % RD N + N-equivalent of RD- FYM through Vermicompost	22.24	11.15	14.80
T_5: 100 % RD N + 2 times of N-equivalent of RD - FYM through Vermicompost	21.72	11.11	14.78
T_6: 100 % RD N+ N-equivalent of RD- FYM through Poultry manure	25.42	12.76	16.75
T_7: 100 % RD N + 2 times of N-equivalent of RD- FYM through Poultry manure	24.66	12.78	17.06
T_8: 100 % RD N through Neem oil coated urea (2 ml neem oil /100g urea)	29.01	15.25	19.95
T_9: 100 % RD N through Neem oil coated urea (4 ml neem oil /100g urea)	35.64	18.30	23.97
S.Em. ±	1.54	0.78	1.09
C.D. (p = 0.05)	4.62	2.34	3.27

Total primary nutrient uptake by maize

Total Nutrient uptake in maize followed similar pattern of response to various combination of manures and fertilizers treatments (Table 5). The result showed that N, P and K uptake by maize crop significantly increased over the 100 % RD-N (no organic manures). Significantly highest primary nutrient uptake (N, P and K) recorded by 100 % RD-N through Neem coated urea (4 ml neem oil / 100 g urea) (171.04 , 55.60 and 154.72 kg ha^{-1} total N, P and K uptake respectively) over the other treatment which is followed by 100 % RD-N through Neem coated urea (2 ml neem oil / 100 g urea) (157.10 , 48.51 and 141.57 kg ha^{-1} total N, P and K uptake respectively). This mainly depends on crop yield and nutrient concentration in maize crop.

Secondary nutrient concentration in grain and stover

From result (Table 6) indicated that secondary nutrient concentration in maize grain and stover showed variable response to different types of organic manures and fertilizers.

The treatment, 100 % RD-N through Neem coated urea (4 ml neem oil / 100 g urea) recorded significantly higher value of Ca (0.173 and 0.208 % stover and grain concentration respectively), Mg (0.079 and 0.117 % stover and grain concentration respectively) concentration in grain and stover over the other treatments except the treatment 100 % RD-N through Neem coated urea (2 ml neem oil / 100 g urea). But in case of sulphur any significantly different did not observed. This may be ascribed to increases availability of Ca, Mg and S in soil due to mobilization from sources. The findings are similar to those obtained by Ayoola and Makinde (2011).

Total secondary nutrient uptake by maize

Total Nutrient uptake in maize followed similar pattern of response to various combination of manures and fertilizers treatments (Table 7). The result showed that Ca, Mg and S uptake by maize crop significantly increased over the 100 % RD-N (no organic manures). Significantly highest primary nutrient uptake (Ca, Mg and S) recorded by 100 % RD-N through Neem coated urea (4 ml neem oil / 100 g urea) (35.64,

18.30 and 23.97 kg ha^{-1} total N, P and K uptake respectively) over the other treatment which is followed by 100 % RD-N through Neem coated urea (2 ml neem oil / 100 g urea) (29.01, 15.25 and 19.95 kg ha^{-1} total N, P and K uptake respectively). It was influenced by releasing nutrients from sources and biological activity which resulted in more nutrient uptake (Mankinde *et al.,* 2011). From result, it can be conclude that different types organic manures and fertilizers combination neem coated urea recorded significantly higher yield and nutrient concentration in maize which resulting higher nutrient uptake.

REFERENCES

Awan, I. U. and Baloch, M. S., 1999, Nitrogen uptake, chlorophyll content and paddy yield as affected by ordinary urea and slow release fertilizers (Meister-10). *Pak. J. Biological Sci.,* 2(1): 196-198.

Ayoola, O.T. and Mankinde, E. A., 2006, Maize growth, yield and soil nutrient change with N- enriched organic fertilizers. *Federal college of agriculture, Nigeria.*

Dinesh Kumar, Devkumar, C., Rajesh Kumar., Aurovinda Das, Paneerselvam, P. and Shivay, Y. S., 2010, Effect of neem oil coated prilled urea with varying thickness of neem oil coating and nitrogen rates on productivity and nitrogen use efficiency of low land irrigated rice under indo-gangetic plains. *J. Plant Nutrn*., 33: 1939-1959.

Jaiswal, V.P. and Singh, G.R., 2000, Performance of super granule and prilled urea under different planting method in irrigated rice (*Oryza sativa*), *Indian J. of Agri Sci.,* 71(3):187-189.

Mankinde, E. A., Ayeni, S.L. and Ojeniyi, O. S., 2011, Effect of organic, organomineral and NPK fertilizer treatments on the nutrient uptake of *Amaranthus Cruentus*on two types in Lagos, Nigeria, *J. centr. Eur Agri*., Vol. 12(1): 114-123.

Muthuswamy, P., Rajeev, G.S. N. and Krishnamoorthy, K.K., 1975, Mineralization of urea coated with nitrification inhibitors. *J. Indian Soc. Soil Sci.,* 41: 133-137.

Sujatha. M.G., Lingaraju, Y.B., Palled, B.Y. and Ashalatha, K.V., 2007, Importance of integrated nutrient management practice in maize under rainfed condition.*Karnataka J. Agric. Sci.,* 21(3): 334-338.

Upadhyay, S.K. and Tripathi, R.S. 2000, Response of prilled and neem extract Coated urea application timings to rice (*oryza sativa*). *Agric. Sci. Digest.,* 20 (2): 84-86.

****