

PRECISION NUTRIENT MANAGEMENT THROUGH USE OF LCC AND NUTRIENT EXPERT IN HYBRID MAIZE UNDER LATERITE SOIL OF INDIA

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ABSTRACT

Nutrient management has played a crucial role in achieving self sufficiency in food grain production. Energy crisis resulted in high price index of chemical fertilizers. Coupled with their limited production, fertilizer cost, soil health, sustainability and pollution have gave rise to interest in precision nutrient management tools. Field experiment was conducted to study the effect of variety and nutrient management on the growth and productivity of maize under lateritic belt of West Bengal during *kharif* season of 2013 at the farmers' field located in Birbhum district of West Bengal, on sandy loam lateritic soil having low fertility status and acidic reaction (pH5.6). The experiment consisted of the five levels of fertilizer i.e, F1 = control, F2 = state recommendation (150:75:75), F3= nutrient expert (120:34:51), F4=farmers practices (80:40:40), and F5= Basal application of 50:75:75 with split N application on basis of LCC, and two level of varieties viz.,V1= Rajkumar,V2= Sona, thus making ten treatment combinations, which were replicated thrice and was laid out in randomized block design(RBD). The "Nutrient Expert" is a Decision support tool developed by IPNI (International Plant Nutrition Institute) & CIMMYT. The values for growth parameter like plant height, length and girth of cob, number of cob per plant, harvest index were observed. It was the found that the growth parameter as well as yield component and yield were significantly affected by different level of fertilizer and different varieties. The result indicated that different schedules of fertilizer expressed significant effect on plant height, cob girth and length, grain per cob, grain weight per cob, test weight, Maize grain yield and stover yield at

harvest. It was found that the application of split N on the basis of LCC gave highest yield and yield parameter values. The application of nutrient on the basis of recommendation obtained from the decision support system like “Nutrient expert” also proved satisfactory. The gross return, net return and Benefit: cost ratio indicated that the application of nutrients on basis of nutrient expert recommendation proved economically more remunerative.

Key words: Hybrid maize, LCC, Nutrient management, Nutrient Expert, Yield, economics

INTRODUCTION

Nutrient management has played a crucial role in achieving self sufficiency in food grain production. The need for precise and responsive management of N fertilizer in Maize is compelling for both economic and environmental reasons. Static fertilizer recommendations based on average response lead to excessive fertilization in some years and inadequate fertilizers in years with high N losses. The uncertainty in optimum N rate poses risks for profit losses which is exacerbated by the asymmetric profit response of maize to N rates. The associated higher cost of under fertilization relative to over fertilization drives farmers to apply imbalanced rates. This uncertainty can be addressed by providing more accurate location and time specific recommendations that increase accuracy and reduce uncertainty (Clune et al., 2013). The “Nutrient Expert” a Decision support tool developed by IPNI (International Plant Nutrition Institute) & CIMMYT is an easy to use, interactive and computer based decision support tool that can rapidly provide nutrient recommendations for individual farmers’ field in the presence or absence of soil testing data. The precise application of nutrients through the use of these tools can raise the profitability of the production system and may reduce environmental pollution. Very little work has been done to use the improved tools for nutrient management in the lateritic soil of West Bengal. In this context, an experiment was carried out to study the precision nutrient management through use of LCC and “Nutrient Expert” in Hybrid maize under lateritic soil of West Bengal, India.

MATERIALS AND METHODS

A field experiment was conducted to study the precision nutrient management through use of LCC and “Nutrient Expert” in Hybrid maize under lateritic soil of West Bengal, India during the *kharif* season of 2013 at the

farmer's field in Chella Kamarpara village, Chella G.P, Chella Mouza of Illambazar Block, Birbhum, West Bengal which is situated at 23° 37.374' latitude and 87 ° 37.170'E longitudes with an average altitude of 58.9 m above mean sea level under sub-humid, sub-tropical belt of West Bengal. The soil was slightly acidic (pH- 5.65) and it was low in Nitrogen (200 kg N/ha) and medium in phosphorus (20 kg P₂O₅/ha) and potassium (112 kg K₂O/ha).

The experiment was conducted with Hybrid Maize varieties. The experimental area comes under Red and Lateritic zone of West Bengal. The experiment consisted of the five levels of fertilizer i.e, F1 = control, F2 = state recommendation (150:75:75), F3= farmers practices (80:40:40), F4= nutrient expert (120:34:51), and F5= Basal application of 50:75:75 with split N application on basis of LCC , and two level of varieties viz.,V1= Rajkumar,V2= Sona, thus making ten treatment combinations, which were replicated thrice and was laid out in randomized block design(RBD). In F5, three splits of nitrogen were applied @ 25kg N/ha in each split thus the total dose of nitrogen applied was @ 125 kg N/ha. Composite surface soils were collected for available N,P, K analysis. Agronomic efficiency (AE) of N,P,K was calculated as described by Cassman et al., 1998.

RESULT AND DISSCUSSION

Table 1: Effect of precise nutrient management on the growth and yield of maize

Treatment	Plant height (cm)	Dry matter at harvest (gm /plant)	Spad Chlorophyll Meter Reading	Grain yield/ha(ton)	Stover yield (ton)
Control	166.5	70.30	15.8	1.14	4.29
State Recommendation	180.05	79.12	24.6	3.52	5.69
Farmer's practice	175.6	79.20	19.4	2.67	4.63
Nutrient expert	180.4	81.75	26.2	4.64	6.59
LCC based application	180.5	76.31	29.8	4.47	6.49
SEm	4.3	3.1	2.3	0.42	0.53
CD	11.8	9.3	7.4	1.3	1.6
Sona	173.08	76.5	24.9	4.16	6.24
Rajkumar	180.08	79.3	27.5	3.39	6.38
SEm	3.6	2.7	3.33	0.7	0.72
CD	10.4	9.0	10.	2.3	2.9

Table 2: Effect of precise nutrient management on the yield attributes of maize

Treatment details	Yield attributes						
	Average wt of cob(gm)	Length of cob (cm)	Girth of cob (cm)	No of row/co b	No of Column /cob	No of grain/co b	Shellin g %
Control	152.23	22.2	11.33	23	13	311	83.04
State Recommendation	173.67	26.8	15.92	28	15	365	84.87
Farmer's practice	159.00	23.67	13.6	26	14	340	85.69
Nutrient expert	178.87	27.34	15.92	28	16	363	86.38
LCC based application	177.34	28.5	15.83	26	16	351	87.16

SEm	4.2	1.1	1.5	0.7	0.8	7.67	1.8
CD	12.6	3.3	4.2	NS	NS	23	5.4
Sona	167.34	25.83	16.08	27	15	391	83.95
Rajkumar	176	26.67	14.83	29	13	381	83.26
SEm	5.8	0.9	1.0	0.5	0.8	9.2	1.2
CD	17.4	2.8	2.9	1.5	NS	27.8	NS

Table 3: Effect of precise nutrient management on the Agronomic efficiency (AE), Recovery efficiency (RE in %), Physiological efficiency (PE) of Hybrid maize

Treatment details	Agronomic efficiency (AE)	Recovery efficiency (RE)	Physiological efficiency (PE)
Control			
State Recommendation	15.86	37.07	42.79
Farmer's practice	19.12	41.21	46.40
Nutrient expert	29.16	53.59	54.42
LCC based application	26.64	49.98	53.30
SEm	0.40	0.96	0.74
CD	1.3	2.4	2.1

There were temporal differences in various agronomic parameters. The values for growth parameter like plant height, length and girth of cob, number of cobs per plant, harvest index were observed. It was the found that the growth parameter as well as yield component and yield were significantly affected by different level of fertilizer and different varieties. The result indicated that different schedules of fertilizer expressed significant effect on plant height, cob girth and length, grain per cob, Maize grain yield and stover yield at harvest. It was found that the application of nutrient on the basis of recommendation obtained from the decision support system like "Nutrient expert" gave highest yield and yield parameter values. The application of nutrient on the basis of LCC also proved satisfactory. The AE and RE of N was also highest in Nutrient expert treated plot and it was significantly higher than all other treatments. The PE was also highest in Nutrient expert treated plot and it was statistically at par with LCC based application. Similar response was observed by Maiti and Das, 2006 in Rice and Kumar et al, 2013 in Maize.

CONCLUSION

This indicates that production and use efficiency of nutrients can be increased with the

use of nutrient expert tool and LCC based application in Maize.

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