INFLUENCE OF INTEGRATED NUTIRENT MANAGEMENT PRACTICES ON NUTRIENT UPTAKE AND POST HARVEST SOIL AVAILABLE STATUS OF HYBRID MAIZE

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Abstract

Field experiments were conducted to study the influence of integrated nutrient management practices on productivity of hybrid maize at the Experimental farm, Department of Agronomy, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu. The treatments were tested in RBD and replicated thrice. The effect of application of 150 % 'N' (75 % N through fertilizer + 75 % N through FYM) + (S.T +S.A) *Azospirillum* favourably influence the productivity of hybrid maize in the highest cob yield per hectare, which was higher than that of the control. Among the various treatments, treatment T_7 - 150 % N (75 % N through fertilizer + 75 % N through FYM) + seed treatment and soil application of *Azospirillum* significantly recorded the highest uptake of nitrogen, phosphorus, and potassium.

The post harvest available nutrients were also significantly influenced by integrated nutrient management practices. Among the various treatments, treatment T_7 150 % N (75 % N through fertilizer + 75 % N through FYM) + seed treatment and soil application of *Azospirillum* significantly recorded the highest post harvest soil available nutrients of nitrogen, phosphorus, and potassium. The economic analysis of various treatments imposed revealed that application of 150 % 'N' (75 % N through fertilizer + 75 % N through FYM) + (S.T +S.A) *Azospirillum* recorded the highest net return of Rs. 53066 which ultimately resulted in registering the highest net rupee invested of 2.67

Introduction

Maize (*Zea mays* L.) is the third important cereal crop next to rice and wheat in the world. Maize has been an important cereal crop because of its high production potential and it is an efficient converter of solar energy into dry matter. Compared to any other cereal crop it has adaptability to wide range of environments and the crop has very high genetic yield potential, hence called as the " Queen of cereals". Besides being a potential source of food for human being, it is also used for feeding cattle, poultry and industries for the production of starch, syrup, alcohol, acetic acid, lactic acid, etc .Globally maize is grown over an area of 168 million hectares with a production of 945.8 million tonnes. In India, maize occupies an area of 8.67 million hectares with a production of 21.73 million tonnes and the productivity of 2.54 t ha^{-1}. Maize being a C4 plant

has high yield potential and depends upon nutrient supplying capacity of the soil. However, its potential could not be utilized fully due to lack of proper agronomic management practices like nutrient management, season and variety.

The productivity of maize is highly dependent on its nutrient management. It is well known that maize is a heavy feeder of nutrients. Sustainable yield levels could be achieved only by applying appropriate combination of organic manures and chemical fertilizers . The rising prices and lack of availability of inorganic fertilizer at right time to the farmers due to poor transport facility necessitates some alternative ways of nutrient supply and more over the mineral fertilizers alone cannot meet the requirement of crops in a cropping system. Hence with the integration of organic, inorganic and biofertilizers sustainable yield levels could be achieved.

MATERIALS AND METHODS

Field experiments were conducted in the Experimental farm, Department of Agronomy, Faculty of Agriculture, Annamalai University, Annamalai nagar with hybrid maize. The treatments comprised of

T_1 - Control (no fertilizer and no organic manure)

T_2 – 100 % 'N ' through fertilizer (RDN)

T_3 – 125 % 'N ' through fertilizer (RDN)

T_4 – 150 % 'N' through fertilizer (RDN)

T_5 – 100 % 'N ' (50 % N through fertilizer + 50 % N through FYM) + (S.T + S.A) *Azospirillum*

T_6 – 125 % ' N ' (62.5 % N through fertilizer + 62.5 % N through FYM) + (S.T + S.A) *Azospirillum*

T_7 – 150 % ' N' (75 % N through fertilizer + 75 % N through FYM) + (S.T + S.A 0 *Azospirillum*

T_8 – 100 % 'N ' (50 % N through fertilizer + 50 % N through vermicompost) + (S.T + S.A) Azospirillum

T_9 – 125 % 'N '(62.5 % N through fertilizer + 62.5 % N through vermicompost) + (S.T + S.A)*Azospirillum.*

T_{10} - 150 % N (75 % N yhrough fertilizer + 75 % N through vermicompost) + S.T + S.A (*Azospirillum)*

* S.T - Seed treatment

* S.A - Seed application

RESULTS AND DISCUSSION

Yield attributes

The yield potential of hybrid maize is determined by the yield attributes and the values of the yield attributes were in accordance with that of growth parameters. Among the various treatments imposed the

treatments with 150 % 'N ' (75 % N through fertilizer + 75 % N through FYM) + seed treatment and soil application of *Azospirillum* (T_7) exhibited an accelerated effect on yield attributes due to supply of mineral N , which was dominant at early stage of crop growth and its rapid nutrient availability and supply to the crop. This is due to supplemental supply of N by *Azospirillum*, which also promoted the crop growth and development. This improvement in yield parameters in maize was observed by Huang et al., (2007). Who also observed higher yield parameters in hybrid maize due to integrated use of inorganic fertilizer, FYM along with biofertilizer over the control. Similar results were also recorded by Sharma et al., (2005).

Table 1. Effect of INM on the Yield parameters of Hybrid Maize

Treatments	Cob length (cm)	Cob diameter (cm)	No. of grains per cob	Cob yield (Kg ha $^{-1}$)	Stover yield (Kg ha $^{-1}$)
T_1	13.16	3.48	140.70	2640	5178
T_2	14.64	4.06	251.52	3582	6783
T_3	15.65	4.60	258.60	3868	7194
T_4	15.92	5.02	268.07	4161	7580
T_5	16.71	5.75	287.13	4751	8127
T_6	17.54	6.39	308.28	5402	8869
T_7	18.53	7.06	328.47	6341	9965
T_8	16.19	5.30	277.53	4448	7854
T_9	17.01	6.02	298.73	5071	8471
T_{10}	17.90	6.64	317.74	5693	9139
S.Ed	0.12	0.11	4.36	131	120
CD (P = 0.05)	0.26	0.24	9.4	282	260

Among the various treatments, treatment T_7 150 % N (75 % N through fertilizer + 75 % N through FYM) + seed treatment and soil application of *Azospirillum* significantly recorded the highest uptake of nitrogen, phosphorus, and potassium

Table 2. Effect of INM on the nutrient uptake of N,P & K on Hybrid maize

Treatment	Nitrogen (Kg ha $^{-}$)	Phosphorous (Kg ha $^{-1}$)	Potassium (Kg ha $^{-1}$)
T_1	89.05	35.14	104.30
T_2	102.94	44.30	120.37
T_3	116.52	51.24	143.10
T_4	130.08	58.06	160.04
T_5	158.65	71.56	194.37
T_6	186.25	85.08	227.60
T_7	215.02	98.96	261.52
T_8	143.72	64.82	176.77
T_9	172.56	78.64	210.84
T_{10}	201.26	92.54	244.58
S. Ed	6.18	2.95	7.57
CD(P=0.05)	13.36	6.39	16.37

Post- Harvest soil available nutrients

The post harvest available nutrients were also significantly influenced by integrated nutrient management practices. Among the various treatments, treatment T7 150 % N (75 % N through fertilizer + 75 % N through FYM) + seed treatment and soil application of *Azospirillum* significantly recorded the highest post harvest soil available nutrients of nitrogen, phosphorus, and potassium.

Table 2. Effect of INM on Post harvest nutrient status of soil (Kg ha^{-1})

Treatments	Nitrogen(Kg ha^{-1})	Phosphorus(Kg ha^{-1})	Potassium(Kg ha^{-1})
T_1	85.05	9.51	98.62
T_2	100.18	12.43	116.34
T_3	112.30	15.72	125.82
T_4	126.42	18.68	142.54
T_5	156.48	24.69	157.22
T_6	180.76	32.42	172.64
T_7	202.82	38.43	190.52
T_8	140.62	21.60	149.33
T_9	170.02	28.77	164.89
T_{10}	191.42	35.41	181.78
S.Ed	4.89	1.33	2.89
CD (p=0.05)	10.58	2.89	6.26

CONCLUSION

The results of the experiments revealed that the application of 150 % 'N ' (75 % N through fertilizer + 75 % N through FYM) + (S.T +S.A) *Azospirillum* favourably influenced the yield parameters *viz* ., cob length, cob diameter, number of grains per cob, cob yield, stover yield. The above treatment also projected an increased cob yield over the control.In the same treatment, Among the various treatments, treatment T_7 150 % N (75 % N through fertilizer + 75 % N through FYM) + seed treatment and soil application of *Azospirillum* significantly recorded the highest uptake of nitrogen, phosphorus, and potassium. The post harvest available nutrients were also significantly influenced by integrated nutrient management practices. Among the various treatments, treatment T_7 150 % N (75 % N through fertilizer + 75 % N through FYM) + seed treatment and soil application of *Azospirillum* significantly recorded the highest post harvest soil available nutrients of nitrogen, phosphorus, and potassium. In the above treatment the nutrient uptake and post harvest soil available

nutrients recorded the maximum values, without affecting the soil fertility while maintain the soil health and sustainability of hybrid maize crop.

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