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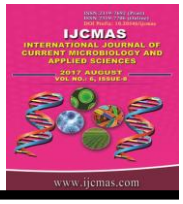

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Effect of Fertilizer Based on Soil Testing for Better Production of Maize (*Zea mays* L.) in South Rajasthan, India

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A B S T R A C T

The field experiment on farm trial (OFT) was conducted on maize during two consecutive *Kharif* seasons of the year 2009-10 and 2010-11 in order to develop fertilizer prescriptions for the desired yield targets treatments viz., farmers practice, recommended practice and soil testing based fertilizers application. For taking higher production of crop a viable approach is needed to supply the crop with nutrients that limit its production. The present study deals with this issue. In this experiment application of chemical fertilizers along with biofertilizer based on soil testing increased 19.86 per cent in economic yield than the farmers practice during pooled of the two years. The net return also showed an increase of Rs. 5976/- ha^{-1} under soil testing based fertilizer application than farmer practices during the year.

Introduction

Maize (*Zea mays* L.) is a major crop of Chittorgarh district in the Rajasthan. It is the basic important stable food of the mass consumption of Mewar area of Rajasthan. One of the major constraints of traditional farming is low productivity due to non-adoption of recommendation fertilizer application specially integrated nutrient management on soil test based. In Rajasthan it is grown on 1.0 million ha area with production 1.21 m ton and productivity of 1374 kg ha^{-1} (Solanki *et al.*, 2014) Agriculture is the main stay of life in district Chittorgarh of Rajasthan with an average gross cropped area of 118320 ha.

The district has a Sub Humid Southern Plains humid climate with average temperature of the district varies from 30-45^{0}C in summer and 5-25^{0}C in winter. Maximum yield potential of maize can be realized by adopting new and high yielding maize hybrids is associated with balance nutrient and consequently its availability in the soil. Fertilizer may affect the vegetative and reproductive growth resulting decline in seed maize yield due to Imbalance use.

Soil testing is a scientific technique used for assessing external nutrient need of crops to achieve profitable response. It provides

current qualitative information on the nutrient and the nutrient supplying capacity of soil. It is the basis for making scientifically sound and management decision about the requirement of specific kind of fertilizers and soil amendments. In general, a simple soil test determines the EC, pH, organic carbon, phosphorus and potassium status of soil. Based on the estimated value, soils are categorized into two classes, viz., low and medium with respect to a particular nutrient.

Indiscriminate use of fertilizers in maize crop tilting mostly towards nitrogenous, P & K fertilizers becomes a major threat to sustainable farming. Under such circumstances, nitrogen is simply used as a shovel to mine the other nutrients from soil and deteriorate its productive quality. Higher nitrogen application may be able to raise the yield upto a certain level but it removes 2 to 5 times more phosphorus, potassium and sulphur from soil than the normal limit.

The specific yield equation based on soil health besides ensuring sustainable crop production also steers the farmers towards economic use of costly fertilizer inputs depending on their financial status and prevailing market price of the crop under consideration (Bera *et al.*, 2006).

The continuous over mining of these nutrients without adequate external supply leads to deterioration of inherent fertility status of soil and fails to produce the desired yield. The situation is much critical under maize production system as the amount of nutrient removed by maize is quite high.

In this context, use of fertilizers based on soil testing might be able to play a vital role in ensuring balanced nutrition to crop and also preventing wasteful expenditure on the use of costly mineral fertilizers (Benipal *et al.*, 2001).

Materials and Methods

An on- farm testing (OFT) was conducted at the locations in Mangodada, taluka of Chittorgarh district of Rajasthan state during 2009-10 and 2010-11. Maize cv. PHEM-2 was grown under the irrigated conditions. Soils of the experimental sites were testes and rated as per the data given in table 1. in general the soils were neutral in reaction. Organic carbon content was found low in all the locations. Available phosphorus under medium rating and available potassium status of the soil was estimated as medium. In all the locations the availability of phosphorus and potassium were low and medium, respectively.

Generally farmers were utilizer more NPK fertilizers than recommendation, which resulted into high cost of cultivation and also affected the soil health. Therefore the treatments were finalized based on the compared in these trials in order to check the performance of exiting production practices with the soil testing based fertilizer application technique. The details of the treatment are given in table 2.

Results and Discussion

The results presented in table 3 indicated that maize yields were influenced due to different treatments. The increasing trend in yield was observed under different treatment. Treatment T_3 recorded higher yield of maize (36.58 q ha^{-1}) as compared to treatment T_2 and T_1.

The same trend of results is also found by Kodmelwar *et al.,* (1979) who reported that the use of non-symbiotic nitrogen fixing *Azotobacter* seed inoculation increased crop yields to the tune of 26 per cent in wheat in different locations. Similarly, Verma and Bhattacharya (1990) also observed increased in yield of wheat and maize with the

application of organic manure in combination with be due to adequate and correct supply of nutrients exhibited a positive impact on the economic yield further, it was observed that farmers practice (T_1) recorded lower yield than that of recorded under exiting recommended practices (RDF). Kalaichelvi and Chinnusamy (2005) also fond increment in yield attributes of maize with application of 100 per cent STCR recommended level rather than 75 and 50 per cent STCR recommended level. Soil testing based fertilizer application (T_3) recorded higher yield to the tune of 7.94 and 20.52 per cent, over treatment T_2 and T_1, respectively. With regards to economics, again T_3 treatment recorded maximum gross return (Rs. 43896 ha^{-1}), net return (Rs. 21296 ha^{-1}) and B: C ratio (1.94) as compared to treatment T_1 and T_2.

Table.1 Soil nutrient of selected location (Average)

Parameters	Result	Category
pH	7.6	Normal
Electrical Conductivity (dSm^{-1})	0.38	Normal
Available P (Kg ha^{-1})	16.0	Medium
Available K (kg ha^{-1})	188.0	Medium
Organic carbon (%)	0.30	Low

Table.2 Treatment details

Treatments	Treatment details
T_1 Farmer's Practices	Farmer's practices (90 kg N+30 kg P_2O_5 ha^{-1})
T_2 Recommended Practices (RDF)	90 kg N + 30 kg P_2O_5 + 30 kg K_2O ha^{-1}
T_3 Soil testing based fertilizers application	100 kg N + 40 kg P_2O_5 +30 kg K_2O ha^{-1} + Azotobactor & PSB culture as seed treatment

Table.3 Yield and economics as influence by different treatments (Pooled of two years)

Treatments	Maize Yield q ha^{-1}	Cost of Cultivation Rs	Gross Return Rs	Net Returns (Rs)	B:C Ratio
T_1 Farmer's Practices	30.35	21100.00	36420.00	15320.00	1.72
T_2 Recommended Practices	33.88	21950.00	40656.00	18706.00	1.85
T_3 Soil Testing based fertilizers application	36.58	22600.00	43896.00	21296.00	1.94

Conduct refinement trial on effect of fertilizers on the bases of soil testing possibly increased the net return by Rs. 5976/- ha^{-1}. Fertilizer is the key factor to enhance productivity.

However, without efficient management of this costliest input, it may reduce the farmer's profitability as well as also adversely affect the soil quality. Several well established soil testing laboratories are operating in the state under various organizations.

This facility can be affectively utilized with a systematic approach for location specific fertilizer recommendation.

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