

FERTILIZER PRESCRIPTIONS UNDER STCR-IPNS FOR HYBRID MAIZE IN INCEPTISOL (*VERTIC USTROPEPT*)

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ABSTRACT

The field experiment was conducted to refine the fertiliser prescription equation for hybrid maize on an Inceptisol (Periyenackampalayam soil series- *Vertic ustropept*), conducted at farmer's holding of Allapalayam village, Annur block, Coimbatore District of Tamil Nadu in Western Zone of Tamil Nadu during Rabi 2015-16. Inceptisol. The soil of experimental field was sandy clay loam with alkaline pH and non-saline in nature. The soil was low in organic carbon and available N, medium in available P and high in available K. The available Zn, Cu, Fe, and Mn were in sufficient status. Basic parameters were calculated from the data generated from the field experiment. Using the basic parameters, crop nutrient requirement per quintal of grain production, contribution of soil available nutrients, contribution of fertilizer nutrients and contribution of farm yard manure were worked out. It was found that hybrid maize requires 1.76, 0.58 and 1.62 kg of N, P₂O₅ and K₂O per quintal of grain produced. Using the basic parameters, fertiliser prescription equations were developed based on integrated plant nutrition system (IPNS). It was estimated that, application of FYM @ 12.5 t ha⁻¹ with 28% moisture, 0.53%, 0.26% and 0.50% of N, P and K, respectively along with NPK fertilizers, the extent of saving inorganic fertiliser for hybrid maize was 40, 20 and 30 kg of fertiliser N, P₂O₅ and K₂O, respectively. So, that integrated use of organic manure and chemical fertilizers is beneficial in improving crop yield and uptake by maize hybrid. Thus to maintain consistent soil fertility with high rate of productivity soil test based fertiliser recommendation along with integrated nutrient management will benefit the farmer in saving of fertilizer and sustaining soil health.

INTRODUCTION

Maize (*Zea mays L.*) is a dominant crop in the farming system belongs to family Poaceae and is an annual, determinate crop ranks third most important cereal crop after rice and wheat in India. Hybrids play a vital role in successful maize husbandry. It is one of the most important cereals grown over diverse environment and geographical ranges for human food, fodder for livestock and raw materials for industries. Achieving high maize yield requires adequate and balanced supply of plant nutrients (Barbieri *et al.*, 2008) as declining soil fertility is a prominent constraint for maize production (Okoko and Makworo, 2012). So, that integrated use of organic manure and chemical fertilizers is beneficial in improving crop yield.

MATERIALS AND METHODS

The experiment was conducted during Rabi season in Allapalayam village, Annur block, Coimbatore District, Western Zone of Tamil Nadu, Southern India during in the year 2015 to 2016. The experimental soil was

Periyanaickenpalayam soil series -Vertic Ustropept) (mixed black calcareous soil). The Maize Hybrid TNAU CO 6 was sown in experimental plot having thirteen treatments with three replications. The experiment was laid out in Randomized block design with the treatments are T1-STCR-NPK alone- 100% of FD for 5 t ha⁻¹, T2-STCR-NPK alone- 125% of FD for 5 t ha⁻¹, T3-STCR-NPK alone- 150% of FD for 5 t ha⁻¹, T4-STCR-NPK alone- 175% of FD for 5 t ha⁻¹, T5-STCR-NPK alone- 200% of FD for 5 t ha⁻¹, T6-STCR-IPNS - 100% of FD for 5 t ha⁻¹+ FYM @ 12.5 t ha⁻¹, T7-STCR-IPNS - 125% of FD for 5 t ha⁻¹+ FYM @ 12.5 t ha⁻¹, T8-STCR-IPNS - 150% of FD for 5 t ha⁻¹+ FYM @ 12.5 t ha⁻¹, T9 -STCR-IPNS - 175% of FD for 5 t ha⁻¹+ FYM @ 12.5 t ha⁻¹, T10-STCR-IPNS - 200% of FD for 5 t ha⁻¹+ FYM @ 12.5 t ha⁻¹, T11-FYM @ 6.25 t ha⁻¹alone, T12-FYM @ 12.5 t ha⁻¹alone, T13-Absolute control.

The fertilizer prescription equations with and without FYM were developed for maize grain by using basic data NR, Cs, Cf were calculated by adopting the methodology by Ramamoorthy *et al.* (1967) and those from Cf were

estimated as described by Santhi *et al.* (2010). The methodology adopted in the present investigation viz., the prescription procedure outlined by Truog (1960) and modified by Ramamoorthy *et al.* (1967) as “Inductive cum Targeted yield model”.

RESULTS AND DISCUSSION

Basic Parameters Nutrient Requirement

Adoption of appropriate site and situation specific nutrient prescriptions will become one of the technological interventions for boosting the yield of maize in the sequence. Nutrient requirement to produce one quintal of hybrid maize 1.76 Kg of N, 0.58 Kg of P₂O₅ and 1.62 Kg of K₂O (Table 2) and (Fig. 1). Relatively, higher quantity of N was required followed by K₂O and P₂O₅ to produce unit quantity of hybrid maize. The requirement of N was 1.08 times higher than K and 3.03 times higher than P₂O₅. Similar trend of nutrient requirement for N, P₂O₅ and K₂O was also reported by Coumarvel (2012) for maize in Palaviduthi soil series (*Typic rhodustalf*) in Tamil Nadu and Singh *et al.*, (2015) for maize at Varanasi in Inceptisol.

Percent Contribution of Nutrients from Soil (Cs)

The ability of the crop to remove nutrients from the soil has been calculated in terms of the per cent contribution of nutrients from soil (Cs) to the total uptake in absolute control plots. In the present investigation, it was found that the soil has contributed 33.16 per cent of available N, 43.66 per cent of P₂O₅ and 16.61 per cent of K₂O (Table 2) and (Fig. 2) respectively towards the total N, P and K uptake by hybrid maize.

Among the three nutrients, relative supply of nutrients was in the order of P>N>K. Similar findings were reported by Praveena Katharine *et al.*, (2013) for cotton in Periyanaickenpalayam soil series (*Typic Ustropept*) of Tamil Nadu.

Percent Contribution of Nutrients from Fertiliser (Cf)

The per cent contribution of nutrients from fertiliser nutrients (Cf) towards the total uptake by hybrid maize was 43.91, 36.90 and 77.63 per cent (Table 2) and (Fig. 2) respectively for N, P₂O₅ and K₂O and followed the order of K₂O > N > P₂O₅. The estimated per cent contribution of nutrients from fertilisers (Cf) to total uptake clearly revealed that the amount of contribution by fertiliser K₂O was 1.76 times higher than N and 2.10 times as that of P₂O₅.

Contribution of Nutrient from FYM

The per cent contribution of N, P₂O₅ and K₂O from FYM (Cfym) was computed in the present investigation to evaluate the extent of reduction in NPK fertiliser requirements of hybrid maize through IPNS. The estimated

per cent contribution of N, P₂O₅ and K₂O from FYM (Cfym) were 36.35, 9.85 and 41.60 respectively for hybrid maize which indicated that relatively higher contribution was recorded for N and K₂O followed by P₂O₅. The present findings corroborated with the findings of Praveena Katharine *et al.* (2013) and Singh *et al.* (2015).

Fertilizer Prescription Equations for Hybrid Maize

Where, FN, FP₂O₅ and FK₂O are fertilizer N, P₂O₅ and K₂O in kg ha⁻¹, respectively; T is the grain yield target in q ha⁻¹; SN, SP and SK respectively are alkaline KMnO₄-N, Olsen-P and NH₄OAc-K in kg ha⁻¹ and ON, OP and OK are the quantities of N, P and K supplied through FYM in kg ha⁻¹.

STCR - NPK alone	STCR - (NPK + FYM)
FN = 4.01T - 0.76SN	FN = 4.01T - 0.76SN - 0.83ON
FP ₂ O ₅ = 1.57T - 2.71SP	FP ₂ O ₅ = 1.57 T - 2.71SP - 0.61OP
FK ₂ O = 2.09T - 0.26SK	FK ₂ O = 2.09T - 0.26SK - 0.65OK

CONCLUSION

STCR-IPNS based fertilizer prescription envisages a balanced form of nutrient supply to the hybrid maize and maintains the soil fertility with magnitude of higher economic production. In the present investigation, soil test based fertilizer prescription equations for desired yield target with the graded level fertiliser for hybrid maize was developed using the basic parameters obtained. These fertiliser prescription equations could serve as a basis to prescribe the actual quantities of fertiliser doses under IPNS when FYM was applied along with NPK fertilisers. Thus to maintain consistent soil fertility with high rate of productivity, STCR-IPNS based fertilizer prescription becomes essential.

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