International Archive of Applied Sciences and Technology
Int. Arch. App. Sci. Technol; Vol 10 [4] December 2019 : 172-174
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[ISO9001: 2008 Certified Organization]
www.soeagra.com/iaast.html

IAAST
ONLINE ISSN 2277- 1565
PRINT ISSN 0976 - 4828

CODEN: IAASCA ORIGINAL ARTICLE

DOI: .10.15515/iaast.0976-4828.10.4.172174

Effect of Site Specific Nutrient Management On Residual Status of Available N, P, K and Zn of Rice in *Vertisol*

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ABSTRACT
A field experiment was carried out during the kharif season (June–October) of 2016 at the Research Farm of the Indira Gandhi Agricultural University, Raipur (C.G.), India to study the "Effect of site specific nutrient management on uptake of nutrient of rice in vertisol". The experiment was laid out in a Randomized block design with three replications and eight treatments namely i.e. RDF(100:60:40:5 NPK and Zn kg ha^{-1}),SSNM based on nutrient expert (120:60:60:5, NPK & Zn kg ha^{-1}), SSNM based on leaf color chart (60:60:60:5, NPK & Zn kg ha^{-1}, rest 50% N based on LCC), SSNM-N, SSNM-P, SSNM-K, Control (N_0, P_0, K_0) and Farmer Fertilizer Practices (N_{80}, P_{40}, K_0).The results was that available nitrogen in soil at harvest stage found- nitrogen 196.67 kg ha^{-1} ,Total phosphorus 16.52 kg ha^{-1} and 498.33 kg ha^{-1} potassium was recorded under treatment T_2 SSNM based (NE) similarly the available Zinc content in soil at harvest stage of rice was found higher in treatment T_3- SSNM on LCC (0.8 mg kg^{-1}) . Overall concluded that treatment based on nutrient expert (NE) recommendations proved superiority over applied different treatments on yield ,nutrients uptake (N,P,K & Zn) involved balance removal as required by rice(cv. Rajeshwari) as well sustaining soil available nutrient status.
Key words: *Leaf color chart (LCC), Site specific nutrient management, Uptake, Nutrient Use Efficiency.*

Received 10.08.2019 Revised 21.09.2019 Accepted 14.11.2019

CITATION OF THIS ARTICLE
A K Mannade, Anurag, K Bhandulkar. Effect of Site Specific Nutrient Management On Residual Status of Available N, P, K AND Zn of Rice in *Vertisol*. Int. Arch. App. Sci. Technol; Vol 10 [4] December 2019 :172-174

INTRODUCTION

Rice (*Oryza sativa* L.) is cultivated in more than hundred countries and undoubtedly a dominant staple food of world and 91 per cent of the world's area and production of rice grown and consumed in Asia [1]. Rice is grown in a wide range of climatic conditions *viz.,* temperature ranging from 17 to 33°C, rainfall 100 to 5100 mm with an altitude of 2600 meters from mean sea level .Demand for rice is growing every year and it is estimated that by 2025 AD the requirement would be 140 million tonnes.

SSNM aims at dynamic field-specific management of N, P, and K fertilizer to optimize the balance between supply and demand of nutrients. The plants need for N, P, or K fertilizer are determined from the gap between the supply of a nutrient from indigenous sources, as measured with a nutrient omission plot, and the demand of the rice crop for that nutrient, as estimated from the total nutrient required by the crop to achieve a yield target for average climatic conditions. SSNM ,a decision support system provides – before planting – a pattern for splitting an estimated total N fertilizer requirement among pre-set application times [3-5]. Fertilizer P and K recommendations with SSNM are based on the indigenous supply of these nutrients from soil, organic materials, and irrigation water considering nutrient removal with grain and straw. Needs for micronutrients such as zinc and sulfur are based on local recommendations. The SSNM avoids indiscriminate use of nutrients by preventing excessive and or inadequate nutrient inputs, and it not only reduced the fertilizer cost but also reduced the usage of pesticides

MATERIAL AND METHODS

A field experiment was carried out during the kharif season (June–October) of 2016 at the Research Farm of the Indira Gandhi Agricultural University, Raipur (C.G.), India to study the "Evaluate the effect of SSNM on yield and yield attributing parameters of rice in *vertisol*". The experiment was laid out in a Randomized block design with three replications and eight treatments namely i.e. RDF (100:60:40:5 NPK and Zn kg ha-1), SSNM based on nutrient expert (120:60:60:5, NPK &Zn kg ha-1), SSNM based on leaf color chart (60:60:60:5, NPK& Zn kg ha-1, rest 50% N based on LCC), SSNM-N, SSNM-P, SSNM-K, Control (N0, P0, K0) and Farmer Fertilizer Practices (N80, P40, K0). The soil (black soil) was clay loam in texture with alkaline pH (7.3.). It was non saline (EC 0.23 dS m-1) and high in organic carbon content (0.51%). The soil was low in available nitrogen (180 kg ha-1) [6], high in available phosphorus (14.35 kg P2O5 ha-1) [7] and high in available potassium (387 kg K2O ha-1). Available zinc content (1.0 mg kg-1) was above the critical level (0.7 mg kg-1). The treatment means were compared using least significant differences at 5% level of significance.

RESULT AND DISCUSSION

Data pertaining to available N, P, K (kg ha^{-1}) and Zinc (mg kg^{-1}) content in soil after harvest of rice as influenced by different SSNM treatments are presented in Table No. 1 and depicted in fig.1 revealed that available nitrogen in soil at harvest stage found higher under T_2- SSNM on nutrient expert (196.67 kg ha^{-1}) followed by T_3- SSNM on LCC (188.33 kg ha^{-1}) based treatment, T_6- SSNM- K (179.67 kg ha^{-1}) and T_1-RDF (175.6 kg ha^{-1}). The minimum available content of soil at harvest stage in T_7- Control (159.0 kg ha^{-1}) treatment. Similar trend found in available phosphorus higher under T_2- SSNM on nutrient expert (16.52 kg ha^{-1}) followed by T_3- SSNM on LCC (15.86 kg ha^{-1}) based treatment, T_1-RDF (15.74 kg ha^{-1}) and T_4- SSNM- N (13.71 kg ha^{-1}). The minimum available phosphorus content of soil at harvest stage in T_6- SSNM- K (11.95 kg ha^{-1}) treatment and potassium of soil at harvest stage found higher under T_2- SSNM on nutrient expert (498.33 kg ha^{-1}) followed by T_1-RDF (489.33 kg ha^{-1}), T_3- SSNM on LCC (489.00 kg ha^{-1}) based treatment and T_8- FFP (486.00 kg ha^{-1}) and the minimum available potassium content of soil at harvest stage in inT_7-Control (468.00 kg ha^{-1}) treatment and omission of N, P, K, SSNM on LCC based and FFP were statistically at par with each other. The available Zinc content in soil at harvest stage of rice was found higher in treatment T_3- SSNM on LCC (0.8 mg kg^{-1}) followed by T4-SSNM-N treatment (0.73 mg kg^{-1}) and minimum was found in treatment T7- Control (0.47 mg kg^{-1}).T_2 and T_4 were at par. The results are in conformity with the findings of More *et al.* [2] while study the impact of integrated nutrient management on residual fertility status of soil.

Table No. 1 Available N, P, K (kg ha^{-1}) and Zinc (mg kg^{-1}) in soil at harvest of rice as influenced by applied SSNM treatments

Treatment	Residual nutrient status of soil (kg ha^{-1})			
	N	P	K	Zn (mg kg^{-1})
T1 RDF	175.67	15.74	489.67	0.60
T2 SSNM (NE)	196.67	16.52	498.33	0.73
T3 SSNM (LCC)	188.33	15.86	489.00	0.80
T4 SSNM –N	167.33	13.71	485.00	0.73
T5 SSNM-P	171.33	13.68	485.33	0.67
T6 SSNM-K	179.67	11.95	487.33	0.53
T7 (C)	159.00	13.02	468.00	0.47
T8 FFP	171.67	13.35	486.00	0.60
CD (P=0.05%)	NS	NS	36.53	0.20

ACKNOWLEDGEMENT

The first author expresses his heartfelt gratitude to Dr. Anurag Professor, Department of Soil Science and Agricultural Chemistry, Dr. R. K. Bajpai, Professor and Head Department of Soil Science and Agricultural Chemistry, Dr. K..Tedia, Scientist, Department of Soil Science and Agricultural Chemistry, Dr. G. S. Tomar Professor, Department of Agronomy and Dr. A. K. Singh, Professor Department of Agricultural Statistics and Social Science (L), I.G.K.V. Raipur (C.G.) India for their excellent guidance, suggestions and regular encouragement during the course of investigation.

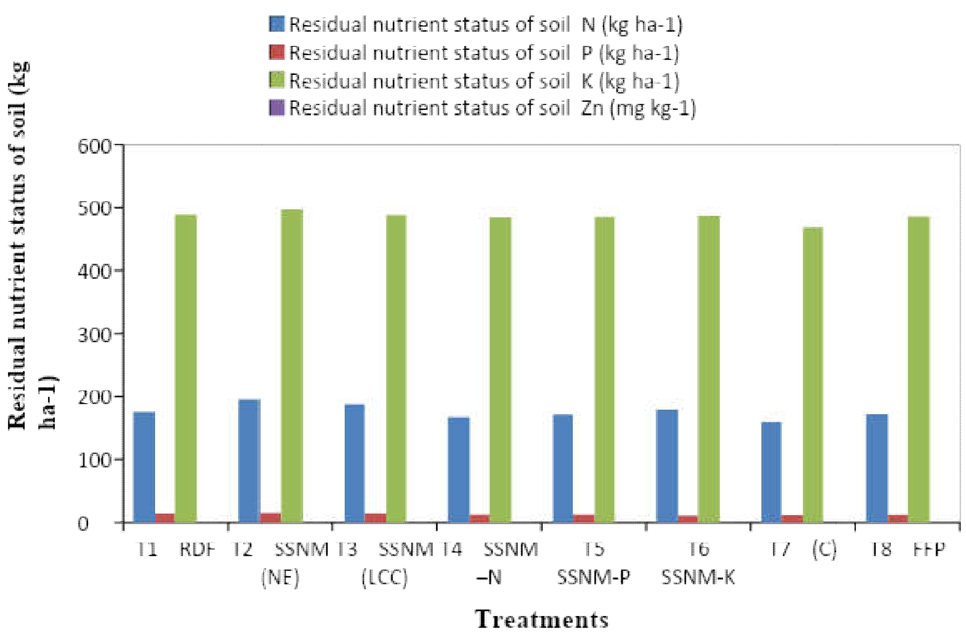

Fig. 1: Available N, P, K (kg ha^{-1}) and Zinc (mg kg^{-1}) in soil at harvest of rice under different SSNM treatments

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