Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2020; 9(3): 1414-1416
Received: 14-03-2020
Accepted: 18-04-2020

Mahendra Kaushik
Department of Agriculture Govt. of Chhattisgarh, Chhattisgarh, India

Saurabh Jha
Department of Agriculture Govt. of Chhattisgarh, Chhattisgarh, India

BS Parihar
Krishi Vigyan Kendra Kawardha

PK Sinha
Krishi Vigyan Kendra Kawardha

Corresponding Author:
Mahendra Kaushik
Department of Agriculture Govt. of Chhattisgarh, Chhattisgarh, India

Effect on available nutrient and nutrients use efficiency by rice genotypes and fertility levels in Vertisol

Mahendra Kaushik, Saurabh Jha, BS Parihar and PK Sinha

Abstract
The present investigation was carried out at the Instructional Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during *kharif* season of 2010. The experiment was conducted in soil locally known as *kanhar* belongs to order *Vertisols,* having pH 7.86, EC 0.26 (dSm- 1), organic carbon 0.70 percent and available N, P and K 253.7, 13.6 and 620.3 kg ha-1, respectively. The experiment was laid out in strip plot design with three replications. Rice genotypes were recorded higher nutrient use efficiency even at low fertility level under rain fed condition. On the other hand, the available status of NPK and micro nutrients in soil at crop harvest were not influenced by rice genotypes and fertility levels. Soil test based major available nutrients were found to be higher with higher rate of application of N, P and K fertilizers, whereas micronutrients availability showed the reverse trend.

Keywords: Rice, yield, genotype, use efficiency and nutrient

Introduction

Rice is the most consumed cereal grain in the world, constituting the dietary staple food for more than half of the planet's human population. A part from food rice is intimately involved in the culture as well as economy of many societies. Rice is an integral part of creation myth and remains today as leading crop and most preferred food (Huke and Huke, 1997) [2]. Chhattisgarh popularly known as "Rice Bowl of India" occupies an area around 3.61 million hectares with the production of 5.22 mt and productivity of 1517 kg per hectare (Anonymous, 2011c) [1]. The prime causes of low productivity of rice in Chhattisgarh, are drought limited irrigation (28.0%), lack of improved varieties suitable to different ecosystems. In India more than half of the rice area (55%) is rainfed and distribution wise 80% of the rainfed rice areas are in eastern India, Even through the region receives good rainfall, yield losses caused by drought every year reach 2.9 million tonnes annually (Widawsky and O'Toole, 1990). Nutrient use efficiency and grain yield in rice depend upon the level of fertilizer N applied and also on the balance use of other fertilizers, particularly P and K. Fertilizer is one of the key and costliest inputs in realizing the yield potential of high yielding varieties of cereals. Efficient fertilizer use ensures increased production, high profit and environmental protection.

Materials and Methods

A field experiment was conducted at the Instructional Farm, College of Agriculture, Indira Gandhi Krishi Vishwavidhyalaya, Raipur, Chhattisgarh. The present study was carried out during Kharif season of the year, 2010- 2011. The experiment was laid out in strip plot design with three replications, the main plots were seven rice genotypes namely R-RF-69**,** IR-64**,** MTU-1010**,** IR83614-349-B**,** IR84887- B183-CRA-19-1**,** IR-80013-B-141-4-1 and R-RF-65 and sub plots were three fertility levels namely Low fertility level i.e.00:00:00 kg ha-1 N:P:K**,** Medium fertility level i.e. 45:30:20 kgha-1N:P:K and High fertility level 90:60:40 kg ha-1 N:P:K.The collected soil samples were air dried and passed through 2mm sieves for different laboratory analysis. Physiochemical analysis of soil available nutrients like (N.P&K). The available N in the soil sample was determined by alkaline potassium permanganate method (Subbiah and Asija 1956), P by Olsen method and available K by neutral normal ammonium acetate method (Jackson 1973) available sulphur by (Palaskar *et al*. 1981).

Results and Discussions

Available soil nitrogen status: Both rice genotypes and fertility levels did not show any variation in available nitrogen content of soil at harvest of rice crop. However, higher soil available nitrogen (213.24 kg ha-1) was observed where IR-64 (V2) was grown followed by

MTU-1010 (V3) (208.67 kg ha-1), IR 80013-B-141-4-1 (V6) (205.93 kg ha-1), and IR 83614-349-B (V4) (191.99 kg ha-1).Increased fertility levels also tended to increase soil available nitrogen content at harvest which ranged from 197.99 kg ha-1 to 206.52 kg ha- 1 in low and high fertility levels, respectively. Similar N availability in different treatment tested may be due to its higher mobility and leaching losses did not favor the buildup of available soil N status. Interaction between rice genotypes and fertility levels found non significant. Similar results were also found by Pandey *et al.* (1992) [4] and Sikdar *et al*. (2008) [5].

Available soil phosphorus status: Available phosphorus status of soil was not influenced by treatments i.e. rice genotypes at harvesting of rice crop. Increase fertilizer application showed slightly higher available phosphorus status in soil and varied from 11.64 to 14.07 kg ha-1 in low and high fertility levels respectively. The variation soil available P can be due to variation in application of P fertilizer in different fertility treatments. The interaction between rice genotypes and fertility levels were also non significant on nutrient status of post harvest soil. Similar findings are also reported by Singh *et al.* (2006) and Sikdar *et al.* (2008) [5].

Available soil potassium content: Values for soil available potassium after harvesting of rice as influenced by rice genotypes and fertility levels are non significant, however higher soil available potassium was observed in treatment (V6) IR 80013-B-141-4-1 (478.73 kg ha-1), followed by (V4) kaushik *et al.*, Effect of Rice Genotypes and Fertility Levels on Status of Available Nutrient and Nutrients Use Efficiency in Vertisol

Table 1: Effect of rice genotypes and fertility levels on status of available soil nitrogen, phosphorus and potassium after rice harvest.

Treatments	Available N (kg ha-1)	Available P (kg ha-1)	Available K (kg ha-1)
Genotypes (V)			
R-RF -69 (V1)	196.16	13.74	457.02
IR-64 (V2)	213.24	13.11	460.10
MTU-1010 (V3)	208.67	13.52	460.29
IR 83614-349-B (V4)	191.99	13.10	464.70
IR 84899-B183-CRA-19-1 (V5)	202.44	12.62	460.52
IR 80013-B-141-4-1 (V6)	205.93	12.33	478.73
R-RF -65 (V7)	202.09	13.10	463.57
SEm±	6.25	0.54	22.36
CD at 5%	NS	NS	NS
Fertility levels (F) Low (F0)	197.99	11.64	476.62
Medium (F1)	204.28	13.51	458.30
High (F2)	206.52	14.07	455.77
SEm±	9.13	1.09	19.49
CD at 5%	NS	NS	NS
Interaction VxF			
SEm±	12.10	0.86	28.29
CD at 5%	NS	NS	NS

Table 2: Average Nutrients use efficiency influenced by rice genotypes and fertility levels

S. No.	Genotypes	Nitrogen use efficiency			Phosphorus use efficiency			Potassium use efficiency		
		Medium fertility (F1)	High fertility (F2)	Mean	Medium fertility (F1)	High fertility (F2)	Mean	Medium fertility (F1)	High fertility (F2)	Mean
1	1R-RF -69 (V1)	0.33	0.24	0.29	0.19	0.15	0.17	0.90	0.72	0.81
2	IR-64 (V2)	0.33	0.26	0.30	0.20	0.15	0.18	0.93	0.82	0.87
3	MTU-1010	0.42	0.28	0.35	0.22	0.15	0.19	0.96	0.82	0.89
4	IR 83614-349-B	0.39	0.24	0.32	0.22	0.14	0.18	0.95	0.88	0.91
5	IR 84899-B183-	0.38	0.31	0.35	0.27	0.22	0.25	0.91	0.86	0.88
6	IR 80013-B-	0.28	0.24	0.26	0.17	0.14	0.16	0.83	0.76	0.80
7	R-RF -65 (V7)	0.30	0.25	0.28	0.21	0.17	0.19	0.85	0.79	0.82

IR 83614-349-B (464.70 kg ha-1), and lowest in (V1) R-RF -69 (457.02 kg ha-1).With increase in fertility level, soil available potassium was slightly decreased may be due to higher uptake of K from the soil by the crop Interaction between rice genotypes and fertility levels also found non significant. Similar results were also noticed by Suresh *et al.* (2002) and Reddy *et al.* (2007).

Nutrients Use Efficiencies: The (MTU-1010), IR-84887-B0183-19-1 and R-RF-65 lines have shown little bit higher nutrient use efficiencies in spite of lower yield which is due to higher difference in nutrient uptake between control and treated plots. The efficiencies were higher at low fertility level and decreased with higher fertility level. The K use efficiency showed very high values which is due to less crop response to the applied fertilizer K and higher K status of the experimental field. Similar findings were also reported by Swarup, 2010. Fertilizer use efficiencies vary widely and determined by number of interacting factors such as cropping system soil type, organic matter content, method and quantity of fertilizer applied. At usually decrease with increase in fertilizer rates. Nitrogen efficiency based on grain yield rarely exceeds 50 to 60% and can be as low as 20%. First year fertilizer efficiencies are normally 10 to 30% for P and 20 to 60% for K, although efficiencies can be grater over the long-term because of residual properties of these immobile nutrients. Similar results on nitrogen use efficiency as influence by N, P and K levels were also reported by Masthanareddy *et al.* 2009 [3].

References

1. Anonymous. Government of India ministry of agriculture, Dept. of agri & Co- Operation, Patliputra Colony, Patna (Bihar), 2011c, 9.
2. Huke RE, Huke EH. Rice area by type of culture: South, Southeast, and East Asia. IRRI, Los Banos, Philippines, 1997, 413-419.
3. Masthanareddy BG. Nitrogen use efficiency of transplanted rice as influenced by N, P and K levels. Journal of the Society of Soil Science. 2009; 57(3):345-351.
4. Pandey N, Tripathi RS, Mittra BN. Yield, nutrient uptake and water use efficiency of rice and irrigation. Annals of Agriculture Research. 1992; 13:342-347.
5. Sikdar MSI, Rahman MM, Islam MS, Yeasmin MS, Akhter MM. Effect of Nitrogen Level on Aromatic Rice Varieties and Soil Fertility Status. Int. J Sustain. Crop Prod. 2008; 3(3):49-54.