

Periodic Research

Correlation Studies between Nutrient Uptake and Yield of Transplanted Rice



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Abstract

A field experiment was conducted in *kharif*-2012 at Instructional-cum-Research Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh) India. The aim of the experiment was to study the effect of pelleted integrated nutrient management on nutrient use efficiency and yield of transplanted rice. The result showed that plant height ($r=0.760$), number of leaves plant⁻¹ ($r=0.766$), dry matter accumulation (0.765), effective tillers hill⁻¹ ($r=0.646$) and number of filled spikelets ($r=0.642$) were positively correlated and contributed in yield increment. The total nitrogen uptake, phosphorus uptake and potassium uptake also showed significantly positive correlation with the plant height, number of leaves, dry matter accumulation, effective tillers hill⁻¹, number of filled spikelets and yield.

Keywords : Correlation, Nutrient Uptake, Pelleted Nutrient Management, Nutrient Use Efficiency

Introduction

Rice (*Oryza sativa* L.) is the world's most important crop and the primary source of food for more than half of the world's population. Rice accounts for 35 to 75 % of the calories consumed by more than 3 billion Asians and is planted to about 154 million hectare annually or on about 11% of the total world's cultivated land. India is second largest producer after China and has an area of over 45.5 million hectares (Gujja and Thiyagarajan, 2012) and production 105.31 million tonnes with productivity 2393 kg ha⁻¹ (Anonymus, 2013). Rice, a major staple crop of India and Chhattisgarh, is being cultivated in different ecological zones with wide variations in productivity. Plant nutrients are such important agro-inputs which directly affect the productivity and are often subjected to different kind of losses. To prevent such losses and to maintain the sustainability in soil fertility and yield, proper nutrient management is required, which can be achieved by integration of organic and inorganic sources of nutrients. With the increasing trend in use of chemical fertilizers, growing ecological concerns, conservation of energy and reduction in the use of organic manures have created considerable interest for the use of organics as a source of plant nutrients with blending of chemical fertilizer as an integrated nutrient management system. Therefore, information needs to be generated with respect to proper dose of organic manures along with inorganic fertilizers, to develop the suitable nutrient management practices for better quality and productivity of rice and to increase nutrient use efficiency.

Material and Methods

The experiment was conducted during *kharif*-2012, at Instructional-cum-Research Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh) India. The soil of experimental farm was neutral in pH (7.65), low in nitrogen (201 kg ha⁻¹), medium in phosphorus (19.6 kg ha⁻¹) and high in potassium (282 kg ha⁻¹). The test variety used was MTU 1010 and experiment was conducted in RBD design with thirteen treatments in three replications. The treatments were T₁ : Conventional 100:60:40 kg N: P₂O₅:K₂O ha⁻¹, T₂ : Conventional 2.5t FYM + 80:50:30 kg N: P₂O₅:K₂O ha⁻¹, T₃ : Conventional 2.5t FYM + 60:40:20 kg N: P₂O₅:K₂O ha⁻¹, T₄ : Conventional 5t FYM + 50:30:20 kg N: P₂O₅:K₂O ha⁻¹, T₅ : Conventional 1t PM + 50:30:20 kg N: P₂O₅:K₂O ha⁻¹, T₆ : Conventional 2.5t FYM + 0.5t PM + 50:30:20 kg N: P₂O₅:K₂O ha⁻¹, T₇ : Pelleted 100:60:40 kg N: P₂O₅:K₂O ha⁻¹, T₈ : Pelleted 2.5t FYM + 80:50:30 kg N: P₂O₅:K₂O ha⁻¹, T₉ : Pelleted 2.5t FYM + 60:40:20 kg N: P₂O₅:K₂O ha⁻¹, T₁₀ : Pelleted 5t FYM + 50:30:20 kg N: P₂O₅:K₂O ha⁻¹, T₁₁ : Pelleted 1t PM + 50:30:20 kg N: P₂O₅:K₂O ha⁻¹, T₁₂ : Pelleted 2.5t FYM + 0.5t PM+50:30:20 kg N: P₂O₅:K₂O ha⁻¹ and T₁₃ : Control. The nutrients were supplied with fertilizers- urea,

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DAP, SSP and MOP and organic manures- FYM and poultry manure in different combinations as per the treatments. The nitrogen application was splitted into three parts, one third nitrogen was applied as basal and rest were applied at tillering and panicle initiation stages, while full dose of phosphorus and potassium were given as basal dose. The observations were recorded at fifteen days interval after 15 DAT-60 DAT and at harvest for growth parameters and after harvest the yield was recorded separately and computed by the help of statistical analysis.

Result and Discussion

Correlation Coefficients (r) between Agronomic Characters and Yield of Rice

The study indicated that agronomic characters (plant height, number of leaves, dry matter accumulation, effective tillers hill⁻¹ and number of filled spikelets) influenced the yield of rice. Correlation coefficient analysis of growth, grain yield and its component characters are presented in Table 1. The correlation matrix indicated that dry matter accumulation was positively and significantly correlated with plant height (r=0.735) and number of leaves (r=0.821) at 0.05% level of significance. The effective tillers hill⁻¹ was positively and significantly correlated with number of leaves (r=0.613) and dry matter accumulation (r=0.654) at 0.05% level of significance. The number of filled spikelets was positively and significantly correlated with dry matter accumulation (r=0.754) at 0.05% level of significance. The test weight was positively and significantly correlated with dry matter accumulation (r=0.606) at 0.05% level of significance. The correlation studies indicated that yield was positively and significantly correlated with plant height (r=0.760) at 0.05% level of significance. The yield was positively and significantly correlated with number of leaves plant⁻¹ (r=0.766) at 0.05% level of significance. The yield was also positively and significantly correlated with dry matter accumulation (r=0.765), effective tillers hill⁻¹ (r=0.646) and number of filled spikelets (r=0.642) at 0.05% level of significance. Therefore, these characters are most important for higher grain yield. Jyothi *et al.* (2014) reported that yield attributing characters showed

positive and significant correlation with yield at 0.01 per cent level of significance.

Correlation Coefficient (r) between Nitrogen, Phosphorus and Potassium Uptake and Growth and Yield of Rice

The correlation matrix (Table 1) shows that interaction between major nutrient uptake and growth and yield had positive and significant correlation. The plant height (r= 0.824), number of leaves (r=0.840), dry matter accumulation (r=0.837), effective tillers hill⁻¹ (r=0.677), number of filled spikelets (r=0.710) and yield (r=0.966) was positively and significantly correlated with nitrogen uptake at 0.05% level of significance. The plant height (r=0.725), number of leaves (r=0.826), dry matter accumulation (r=0.874), effective tillers hill⁻¹ (r=0.674), number of filled spikelets (r=0.721), yield (r=0.873) and total nitrogen uptake (r=0.920) was positively and significantly correlated with total phosphorus uptake at 0.05% level of significance. The plant height (r=0.791), number of leaves (r=0.777), dry matter accumulation (r=0.772), number of filled spikelets (r=0.754), yield (r=0.839), total nitrogen uptake (r=0.910) and total phosphorus uptake (r=0.870) was positively and significantly correlated with total potassium uptake at 0.05% level of significance. Yu *et al.* (2013) reported that significant correlation existed between yield and total nitrogen, phosphorus and potassium absorption amounts with correlation coefficient 0.80, 0.73 and 0.77 respectively.

References

1. Anonymous, 2013. Annual Report 2012-13. Department of Agriculture and cooperation, Ministry of Agriculture, Government of India, New Delhi. pp. 4.
2. Gujja, B. and Thiyagarajan, T.M., 2012. Knowledge and practice SRI (system of rice intensification), reducing agriculture foot print and ensuring food security. Hyderabad. pp.12.
3. Jyothi, V.S., Krishnna, T.G., Kavitha,P. and Reddy, M.S. 2014. Correlation studies between physico-chemical and nutrient uptakes of paddy in phosphorus rich vertisols. International Journal of Applied Biology and Pharmaceutical Technology 5(4):164-168.
4. YU Qiao-gang, YE Jing, YANG Shao-na, FU Jian-rong, MA Jun-wei, SUN Wan-chun, JIANG Li-na, WANG Qiang and WANG Jian-mei.2013.Effects of Nitrogen Application Level on Rice Nutrient Uptake and Ammonia Volatilization. Rice Science 20 (2): 139-147.

Table 1: Correlation Matrix of Plant Characters As Influenced by Conventional and Pelleted Integrated Nutrient Management

Characters	2	3	4	5	6	7	8	9	10	11
1	0.695	0.735*	0.718	0.759	0.469	0.760*	0.311	0.824*	0.725*	0.791*
2		0.821*	0.613*	0.679	0.545	0.766*	0.253	0.840*	0.826*	0.777*
3			0.654*	0.724*	0.606*	0.765*	0.374	0.837*	0.874*	0.772*
4				0.697	0.388	0.646*	0.305	0.677*	0.674*	0.661
5					0.554	0.642*	0.176	0.710*	0.721*	0.754*
6						0.453	0.149	0.506	0.506	0.520
7							0.562	0.966*	0.873*	0.839*
8								0.435	0.351	0.153
9									0.920*	0.910*
10										0.870*

*At 0.05% level of significance

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| 1. Plant height | 2. Number of leaves | 3. Dry matter accumulation |
| 4. Effective tillers hill ⁻¹ | 5. Number of filled spikelets | 6. Test weight |
| 7. Yield | 8. Harvest index | 9. Total nitrogen uptake |
| 10. Total phosphorus uptake | 11. Total potassium uptake | |