RESEARCH ARTICLE

YIELD MAXIMIZATION OF HYV AND SCENTED VARIETIES OF RICE

D.K. Gupta* and V.K. Singh

RMD College of Agriculture & Research Station, Ajirma, Ambikapur, Surguja (Chhattisgarh) – 497001 email id.: gupta_dinesh11@yahoo.co.in
Department of Agronomy,
Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.), 492 012 India

Received-08.08.2017, Revised-24.08.2017

Abstract: The field experiment on "Yield maximization of HYV and scented varieties of rice" was conducted during *kharif* seasons of 2015 at the Research Farm, IGKV, RMD College of Agriculture & Research Station Ambikapur, Surguja (Chhattisgarh). In experiment first the main plot consisted two treatment of varieties *viz.* Chandrahasni (V_1) and Bamleshwari (C_2). While the sub- plot consisted of seven treatments of nutrient management *viz.* N_1- 20×10 cm with RDF(120:60:40 NPK kg/ha), N_2- 20×10 cm with 125% RDF(10% N at flowering)+5t FYM, N_3- 15×10 cm with 125% RDF(10% N at flowering)+5t FYM, N_4- 20×10 cm with 150% RDF(K in two splits + 10% N at flowering)+5t FYM/ha, N_5- 15×10 cm with 150% RDF(K in two splits +10% N at flowering)+5t FYM/ha, N_6- 20×10 cm with 150% RDF(K in two splits + 10% N at flowering)+10t FYM/ha and N_7- 15×10 cm with 150% RDF(K in two splits + 10% N at flowering)+10t FYM/ha. In experiment second the main plot consisted two treatment of varieties *viz.* Jeerafool (V_1) and Pusa Basmati (C_2). While the sub- plot consisted of seven treatments of nutrient management *viz.* N_1- 20×10 cm with RDF(60:50:50 NPK kg/ha), N_2- 20×15 cm RDF+5t FYM, N_3- 20×15 cm with RDF + 5t FYM + 5 t GM, N_4- 20×15 cm with 75% RDF+10t FYM/ha, N_5- 20×15 cm with 50% RDF+10t FYM/ha+ 10 t GM + mechanical weeding, N_6- 20×15 cm with 50% RDF+10t FYM/ha+ 10 t GM + mechanical weeding + silicon spray + ZnSo4 and N_7- 20×15 cm with 150% N + 10 t FYM +Staking. The both experiment was laid out in split plot design with three replication. In experiment first the rice variety Bamleshwari recorded significantly higher grain (7.93t/ha) and biological yield (16.82 t/ha) over Chandrahasni (6.97t/ha) and (14.74t/ha) which was 13.7 and 14.1% higher. In case of nutrient management practices the higher grain and biological yield was obtained with closer spacing and 150% RDF +10 t FYM (7.83 and 16.67 t/ha) followed by same geometry and dose of NPK + 5t FYM/ha (7.70 and 16.55 t/ha) the yields with these two treatments were at par, however wider spacing (20×10cm) 150% RDF+10t FYM gave marginally lower grain 2.2 and total yield 1.4% over closer spacing 15×10 cm. 150% RDF + 5t FYM/ha may be on account of higher plant population (33% higher hills/m^2) per unit area and the difference of only organic manure FYM 5t/ha. In experiment second the Local scented fine rice variety Jeerafool had significantly tallest plants while Pusa Basmati-1 had the shortest plants, number of total tillers, effective tillers (panicle/m2) and 1000-grain weight were significantly higher under Pusa Basmati -1 but panicle length number of grains/ panicle and panicle weight were significantly higher under jeerafool over Pusa Basmati -1. The data grain yield showed significant differences in the both rice cultivars. Jeerafool produced 11.4 % higher grain yield over Pusa Basmati-1. Application of 50% NPK of RDF with 10 t FYM + 10 t GLM+, mechanical weeding + silicon 3% spray+ 20 kg/ha ZnSo4 produced grain and biological yield of 4.3 and 9.16 t/ha, respectively while both the yields were almost equal in application of 150% N only with 10t FYM + staking and the yield were also at par with the treatment i.e, 50% NPK + 10t FYM + 10t GLM + mechanical weeding.

Keywords: Yield maximization, Rice, Fertilizer, Production

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. In world, rice has occupied an area of 156.7 million hectares, with a total production of 650.2 million tonnes in 2007 (FAO, 2008). In Asian countries, rice is the main major staple crop covering about ninety per cent of rice grown in the world, with two countries, China and India, growing more than half of the total crop. Rice provides about two-third of the calorie intake for more than two billion people in Asia and a third of the calorie intake of nearly one billion people in Africa and Latin America.

Chhattisgarh popularly known as "Rice bowl of India" occupies an area around 3610.47 thousand hectares with the production of 5.48 million tonnes and productivity of 1517 kg per hectare (Anonymous 2008-09). The prime causes of low productivity of rice in Chhattisgarh are limited irrigation (28.0 %), lack of improved varieties suitable to different ecosystems low imbalance use of fertilizer and insufficient weed management.

The rice yields are stagnating or declining in post green revolution era mainly due to imbalance in fertilizer, soil degradation, type of cropping system practiced, lack of suitable rice genotypes and other agro-techniques. Partial substitution of chemical fertilizer with organic sources of nutrients is useful in different rice-based cropping systems. The use of excessive chemical fertilizer & pesticide are causing environmental hazard. It is therefore necessary to develop a suitable production system in this context proper selection of varieties, optimum density (spacing) per unit area and appropriate nutrient management are important for achieving higher yields. Hence, there is a need to identify suitable verity, planting geometry & standardize the conjunctive use of nutrients. A judicious combination

*Corresponding Author

of organic and inorganic fertilizer can maintain long term soil fertility and sustain higher productivity of crops. Urea with organic materials minimizes N loss and increase N-use efficiency (Mishra, 1992). Farmyard manure (FYM) is being used as a major source of organic matter in field crops. Limited availability of this manure is, however, an important constraint in its use as a source of nutrients.

MATERIAL AND METHOD

The present investigation was carried out at College Research Farm of Indira Gandhi Krishi Vishwavidyalaya, RMD College of Agriculture and Research Station, Ambikapur (C.G.) India during the *kharif* season (July-November) 2015. The soil of experimental field was sandy loam in texture, acidic in reaction (pH 6.2), low in available nitrogen, phosphorus and medium in potassium. The experiment was laid out in split plot design with three replication.

EXPT-A: The main plot consisted two treatment of varieties *viz.* Chandrahasni (V_1) and Bamleshwari (C_2). While the sub- plot consisted of seven treatments of nutrient management *viz.* N_1- 20×10 cm with RDF(120:60:40 NPK kg/ha), N_2- 20×10 cm with 125% RDF(10% N at flowering)+5t FYM, N_3- 15×10 cm with 125% RDF(10% N at flowering)+5t FYM, N_4- 20×10 cm with 150% RDF(K in two splits + 10% N at flowering)+5t FYM/ha, N_5- 15×10 cm with 150% RDF(K in two splits +10% N at flowering)+5t FYM/ha, N_6- 20×10 cm with 150% RDF(K in two splits + 10% N at flowering)+10t FYM/ha and N_7- 15×10 cm with 150% RDF(K in two splits + 10% N at flowering)+10t FYM/ha.

EXPT-B: The main plot consisted two treatment of varieties *viz.* Jeerafool (V_1) and Pusa Basmati (C_2). While the sub- plot consisted of seven treatments of nutrient management *viz.* N_1- 20×10 cm with RDF(60:50:50 NPK kg/ha), N_2- 20×15 cm RDF+5t FYM, N_3- 20×15 cm with RDF + 5t FYM + 5 t GM, N_4- 20×15 cm with 75% RDF+10t FYM/ha, N_5- 20×15 cm with 50% RDF+10t FYM/ha+ 10 t GM + mechanical weeding, N_6- 20×15 cm with 50% RDF+10t FYM/ha+ 10 t GM + mechanical weeding + silicon spray + ZnSo4 and N_7- 20×15 cm with 150% N + 10 t FYM +Staking.

RESULT AND DISCUSSION

EXPT: A - The two varieties, Chandrahasni and Bamleshwari exhibited differences in growth, yield attribution and finally grain & total dry matter productions. Rice variety Bamleshwari recorded significantly higher grain (7.93t/ha) and biological yield (16.82 t/ha) over Chandrahasni (6.97t/ha) and (14.74t/ha) which was 13.7 and 14.1% higher.

In case of nutrient management practices the higher grain and biological yield was obtained with closer spacing and 150% RDF +10 t FYM (7.83 and 16.67 t/ha) followed by same geometry and dose of NPK + 5t FYM/ha (7.70 and 16.55 t/ha) the yields with these two treatments were at par, however wider spacing (20×10cm) 150% RDF+10t FYM gave marginally lower grain 2.2 and total yield 1.4% over closer spacing 15×10 cm. 150% RDF + 5t FYM/ha may be on account of higher plant population (33% higher hills/m^2) per unit area and the difference of only organic manure FYM 5t/ha. The lowest yields (grain and total dry matter) was recorded under 20×10 cm with RDF (120: 60:40 kg NPK/ha) and this was mainly due lower values of growth and yield attributes. The higher yields were achieved in plots where inorganic and organic sources were added with either 125 or 150% higher RDF +5 or 10 t FYM/ha. The findings are agreement with Lakpale *et al*.,(1999) reported that 150% RDF +10 t FYM or 150% RDF + 5t FYM/ha could produce comparable yield with latter owing to slow and steady release of N, resulting in efficient utilization. The superior performance of these 2 treatments may also be owing to improvement in physical, chemical and microbiological environment of soil favouring increased availability of macro and micro-nutrients (Sengar *et al*., 2000).

EXPT: B - Local scented fine rice variety Jeerafool had significantly tallest plants while Pusa Basmati-1 had the shortest plants, number of total tillers, effective tillers (panicle/m2) and 1000-grain weight were significantly higher under Pusa Basmati -1 but panicle length number of grains/ panicle and panicle weight were significantly higher under jeerafool over Pusa Basmati -1. The data on biological and grain yield showed significant differences in the both rice cultivars. Jeerafool produced 11.4 and 14.2 % higher grain and biological yield, respectively over Pusa Basmati-1.The findings are agreement with Sarawgi *et al*., (2006).

Application of 50% NPK of RDF with 10 t FYM + 10 t GLM+, mechanical weeding + silicon 3% spray+ 20 kg/ha ZnSo4 produced grain and biological yield of 4.3 and 9.16 t/ha, respectively while both the yields were almost equal in application of 150% N only with 10t FYM + staking and the yield were also at par with the treatment i.e, 50% NPK + 10t FYM + 10t GLM + mechanical weeding. The treatments received 100% NPK + 5t FYM or 100% NPK + 5t FYM + 5t/ha GLM or 75 % NPK + 10t FYM/ha gave increased grain and biological yield performance over 100% NPK alone (RDF). Enhanced plant height and dry matter accumulation at 60 DAT with the treatments of 100% NPK, 50% NPK, 75%NPK or 100% N only combined with 5t or 10t of FYM and GLM might have increased the values of yield – attributing characters, viz, total tillers, effective tillers/m^2, grains/panicle and panicle weight though the panicle length and seed weight remained unaffected. The increase in plant height may be due to the greater availability and steady supply of essential plant

nutrients during the entire period of crop growth. However, when organic source of nutrients applied and supplemented with inorganic sources of nutrients enhanced the nutrient availability and helped in increasing plant growth. The results are in agreement with the finding of Jha *et al*. (2004) and Sarawgi *et al*., (2006). Similar results had also reported by Mhaskar *et al*.(2005).Therefore, it may concluded that integrated nutrient management improves the growth and yield of scanted rice a well as impairs the soil health with adequate nutrient balance after harvest of rice.

Table 1. Growth and yield attributes as influenced by HYV varieties of rice and nutrient management

Treatment	Plant height (cm)	Dry matter accumulation (g/m2)		Tillers (m2)	Panicles (m2)	Panicle length (cm)	Grains/panicle (No)	Panicle weight (g)	1000-grain wt. (g)
		60 DAT	90DAT						
Varieties									
V1-Chandrahasni	98.6	655	1063	391	352	24.7	172.9	3.55	23.30
V2-Bamleshwari	100.3	713	1175	430	360	20.8	114.8	3.56	31.75
SEm±	1.80	6.0	44	4	8	0.6	16.8	0.08	0.34
CD at 5%	NS	18.5	NS	12	NS	2.1	51.1	NS	1.04
Nutrient Management									
N_1- 20×10 cm with RDF(120:60:40 NPK kg/ha)	93.7	586	945	370	321	23.0	134.3	3.09	27.90
N_2- 20×10 cm with 125% RDF(10% N at flowering)+5t FYM	95.0	607	993	379	318	21.8	135.2	3.47	27.62
N_3- 15×10 cm with 125% RDF(10% N at flowering)+5t FYM	98.8	662	1075	401	360	22.7	141.5	3.64	27.32
N_4- 20×10 cm with 150% RDF(K in two splits + 10% N at flowering)+5t FYM/ha	102.3	708	1182	403	345	23.2	160.5	3.78	27.70
N_5- 15×10 cm with 150% RDF(K in two splits +10% N at flowering)+5t FYM/ha	100.2	702	1140	444	392	22.5	136.3	3.67	27.25
N_6- 20×10 cm with 150% RDF(K in two splits + 10% N at flowering)+10t FYM/ha	103.2	767	1273	415	359	23.4	157.0	3.76	27.52
N_7- 15×10 cm with 150% RDF(K in two splits + 10% N at flowering)+10t FYM/ha	103.0	756	1221	462	397	22.8	142.2	3.86	27.38
SEm±	1.7	4	21	7	9	0.4	9.2	0.16	0.25
CD	5.0	13	60	21	27	NS	NS	0.49	NS

Table 2. Yield and economics as influenced by HYV varieties of rice and nutrient management

Treatment	Yield (ton/ha)			Harvest index (%)	Cost of cultivation (Rs./ha)	Net Income (Rs./ha)	B:C ratio
	Grain	Biological	Straw				
Varieties							
V1-Chandrahasni	6.97	14.74	7.78	47	37837	69717	1.84
V2-Bamleshwari	7.93	16.82	8.89	47	37837	84740	2.24
SEm±	0.28	0.36	-	-	-	-	-
CD	0.89	1.13	-	-	-	-	-
Nutrient Management							
N_1- 20×10 cm with RDF(120:60:40 NPK kg/ha)	6.97	14.57	6.96	48	33720	73613	2.18

N_{2}- 20×10 cm with 125% RDF(10% N at flowering)+5t FYM	7.27	15.00	7.27	48	37002	74827	2.02
N_{3}- 15×10 cm with 125% RDF(10% N at flowering)+5t FYM	7.40	15.65	7.40	47	37002	77323	2.09
N_{4}- 20×10 cm with 150% RDF(K in two splits + 10% N at flowering)+5t FYM/ha	7.47	15.72	7.46	48	38284	76874	2.01
N_{5}- 15×10 cm with 150% RDF(K in two splits +10% N at flowering)+5t FYM/ha	7.70	16.55	7.70	47	38284	81021	2.11
N_{6}- 20×10 cm with 150% RDF(K in two splits + 10% N at flowering)+10t FYM/ha	7.53	16.32	7.50	46	40284	76182	1.89
N_{7}- 15×10 cm with 150% RDF(K in two splits + 10% N at flowering)+10t FYM/ha	7.83	16.67	7.83	47	40284	80828	2.01
SEm±	0.07	0.13	-	-	-	-	-
CD	0.22	0.39	-	-	-	-	-

Sale price of produce: Grain@ 14000 and straw @ 1300/t

Table 3. Growth and yield attributes as influenced by scented varieties of rice and Nutrient Management

Treatment	**Plant height (cm)**	**Dry matter accumulation at 60 DAT (g/m2)**	**Tillers (m2)**	**Panicle (m2)**	**Panicle length (cm)**	**Grains/panicle (No)**	**Panicle weight (g)**	**1000-Seed weight**
Varieties								
V1-Jeerafool	137.4	630	371.9	296.8	26.71	276.14	2.31	12.17
V2-Pusa Basmati-1	99.7	612	489.4	396.3	24.55	103.95	1.72	25.31
SEm±	2.2	14	13.2	19.0	0.36	15.14	0.12	0.28
CD	6.6	NS	40.0	58.0	1.08	46.12	0.35	0.85
Nutrient Management								
N_{1}-RDF (60:50:50)kg	112.7	584	369.7	308.8	24.95	151.67	1.61	18.77
N_{2}-RDF+5t FYM	111.0	600	402.5	335.8	26.00	167.50	1.83	18.92
N_{3}-RDF+5t FYM 5t GM	117.7	627	414.0	320.3	25.70	193.50	2.06	18.65
N_{4}-75%RDF +10t FYM	117.5	645	433.3	345.8	25.62	192.83	2.03	18.28
N_{5}- 50% RDF+10t FYM + 10t GM+ Mechanical weeding	125.0	619	455.8	350.7	25.73	213.33	2.09	18.60
N_{6}- 50% RDF+10t FYM+10t GM+ Mechanical weeding+ Silicon Spray +$ZnSo_4$	122.8	625	469.7	375.0	25.58	201.67	2.21	18.65
N_{7}- 150% N +10t FYM+ Staking	123.2	616	469.7	383.3	25.82	209.83	2.32	19.32
SEm±	2.4	7	8.5	13.9	0.49	9.08	0.10	0.28
CD	7.0	20	24.8	40.5	NS	26.51	0.30	NS

N1: 20x10 cm and N2-N7: 20x15

Table 4. Yield and economics as influenced by scented varieties of rice and nutrient management

Treatment	Yield (ton/ha)			Cost of cultivation (Rs./ha)	Net Income (Rs./ha)	B:C ratio
	Grain	Biological	Straw			
Varieties						
V1-Jeerafool	3.94	8.82	4.88	35079	57945	1.65
V2-Pusa Basmati-1	3.52	7.72	4.20	35079	47821	1.36
SEm±	0.07	0.11	-	-	-	-
CD	0.20	0.33	-	-	-	-
Nutrient Management						
N_1-RDF (60:50:50)kg	2.9	6.90	3.99	32822	36385	1.11
N_2-RDF+5t FYM	3.2	7.45	4.21	34822	41931	1.20
N_3-RDF+5t FYM 5t GM	3.6	8.10	4.46	36322	49556	1.36
N_4-75%RDF +10t FYM	3.7	8.10	4.38	34765	52769	1.52
N_5- 50% RDF+10t FYM + 10t GM+ Mechanical weeding	4.0	8.78	4.77	33207	61214	1.84
N_6- 50% RDF+10t FYM+10t GM+ Mechanical weeding+ Silicon Spray +$ZnSo_4$	4.3	9.16	4.86	34181	66776	1.95
N_7- 150% N +10t FYM+ Staking	4.3	9.10	4.80	33761	67079	1.98
SEm±	0.1	0.23	-	-	-	-
CD	0.4	0.66	-	-	-	-

N1: 20x10 cm and N2-N7: 20x15 cm

Sale price of produce: Grain@ 22000 and straw @ 1300/t

REFERENCES

Jha, S.K., Tripathi, R.S. and Malaiya, S. (2004). Influence of integrated nutrient management practices on growth and yield of scented rice (*Oryza sativa* L.). *Annals Agricultural Research* **25** (1): 159-161.

Lakpale, R., Pandery, N. and Tripathi, R.S. (1999). Effect of levels of nitrogen and preconditioned urea on grain yield and N status in plant and soil in rainfed rice. *Indian journal of Agronomy* **44** (1): 89-93

Mhaskar, N.V., Thorat, S.T. and Bhagat, S.B. (2005). Effect of nitrogen levels on leaf area index and grain yield of scented rice vaieties. *Journal Soils and Crops.* **15** (1): 218-220.

Mishra, M.M. (1992). Enrichment of organic manures with fertilizers. (In) Non-traditional sectors for Fertiliser Use, pp. 48-60. Tendon, H.L.S. (Ed.) fertilizer Development and Consultant Organization, New Delhi.

Sarawgi, S.K, Sarawgi, A.K., Purohit, K.K. and Khajanji, S.N. (2006). Effect of nutrient management on tall and short to medium slender scented rice verities in alfisol of Chhattisgarh plain. *Journal of Agricultureal Issues* **11** (1): 91-93.

Sengar, S.S., Wade, L.J., Baghel, S.S., Singh, R.K. and Singh, G.(2000). Effect of nutrient management on rice in rainfed low land of southeast M.P. *Indian Journal of Agronomy* **45** (2): 315-322.