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EFFECT OF FERTILITY MANAGEMENT ON YIELD AND ECONOMICS OF TRADITIONAL SCENTED RICE VARIETIES IN LOW LANDS

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ABSTRACT

Field experiment was conducted during wet season of 2005 and 2006 at the Ghaghraghat, Behraich (Uttar Pradesh) to find out suitable varieties and economic fertility level for rice in low lands. The value of yield attributes like panicles m^{-2}, panicle weight and grain weight $panicle^{-1}$ was significantly higher with 'Kalanamak' followed by Indrabhog, Jawaphool and Badshahbog. Variety' Kalanamak' produced significantly higher grain and straw yield than rest of the varieties.The percent increase in grain yield by Kalanamak was recorded to be 33.3, 55.9 and 55.9 over Indrabhog, Jawaphool and badshahbhog, respectively. Application of 100% RDF through inorganic fertilizers being on par with 50% RDF as inorganic fertilizers + 50% RDN as farm yard manure but produced significantly higher mean grain and straw yield (1.46 t ha^{-1} and 2.23 t ha^{-1}) respectively over rest of the fertility treatments. During both the years, variety' Kalanamak', 'Indrabhog' and 'Neelabhat' produced higher grain yield at 100% RDF applied through inorganic fertilizers. However, 'Jawaphool' and ' Badshah bhog' gave higher yield at 50% RDF as inorganic fertilizers + 50% RDN through farm yard manure. Variety ' Kalanamak' also gave the higher net income (Rs. 10243ha^{-1}) and benefit: cost ratio (1.99). Application of 100% RDF through inorganic fertilizers gave the maximum net profit (Rs. 12583ha^{-1}) and benefit: cost ratio (2.01) followed by 50% RDF as inorganic fertilizers + 50% RDN through farm yard manure. Variety '=Kalanamak' give the higher net income of Rs. 10,243.00 ha^{-1} and BCR, 1.99 followed by 'Indrabhog' and 'Badshahbhog'

Keywords: Fertility management, yield economics, rice varieties, low lands.

INTRODUCTION

Yield of traditional scented rice varieties is often low due to tall stature and low tillering ability and they lodged if higher dose of fertilizers is applied. Integrated nutrient management involves use of inorganic fertilizer, organic manures, and bio-fertilizers, which helps in maintaining soil fertility, sustainable agriculture productivity and improvement farmer's profitability. The beneficial effect of farm yard manures on rice either alone or in combination with fertilizers have been observed by Kumar *et al.* (2001). The response of rice varieties may be varied under different fertility management. Thus, yield potential of traditional scented rice varieties can be maximized if integrated nutrient management practices are followed. There is, therefore, need to test scented rice varieties with different fertility management practices for exploiting their yield potential and higher profitability in low lands. Thus, the present investigation was undertaken to find out the effect of fertility management on traditional scented rice varieties in low lands.

MATERIAL AND METHODS

Field experiments were conducted during wet season of 2005 and 2006 at the Crop Research Station, Ghaghraghat, Bahraich (U. P.) using scented rice varieties in low lands. The soil of experimental site was sandy loam in texture, low in organic carbon, 4.8 gm kg^{-1} available N 187, available phosphorus, 8.6 and medium in potash 190.6 kg ha^{-1}. The treatments comprised of 5 traditional scented rice varieties viz.: Kalanamak, Badshabhog, Indrabhog, Jawaphool and Neelabhat and 5 fertility management practices viz: control ,50% of recommended dose of fertilizers (RDF) as inorganic fertilizers, 100% recommended dose(RDF) as inorganic fertilizers, 50% recommended dose of fertilizers (RDF) as inorganic fertilizers + 50% recommended dose of nitrogen (RDN) as farm yard manure, and 100% recommended dose of nitrogen (RDN) as farm yard manure were tested in splitplot design keeping varieties in mainplot and fertility levels in sub-plot replicated 4 times. Thirty days old seedling of all rice varieties were transplanted in

puddled field at 25x10cm spacing using 2-3 seedling hill^{-1} on July 25, 2005 and July 30, 2006. The crop was fertilized with a recommended dose i.e. 40 N+ 40 P_20_5+40 K_20 kg ha^{-1} and fertilized as per treatments using urea, SSP and muriate of potash, respectively as source of nitrogen, phosphorus and potash. The half quantity of nitrogen alongwith full dose of phosphorus and potash was applied at transplanting, and rest dose of nitrogen was top dressed as urea in two splits at tillering and panicle initiation stage. The rice crop received 2 irrigations at panicle initiation and pre maturity stage. The required quantity of farm yard manure (0.5% N, 0.45% P_2O_5, 0.5% K_2O) as per treatment was applied and mixed 15 days before at final field preparation. Observations on yield attributes were recorded at harvest of crop from 5 panicles selected randomly from each plot. The economics of treatments was worked out keeping prevailing prices year wise and then averaged over two years. The statistical analysis was carried out according to standard methods (Gomez and Gomez, 1984). Soil samples of experimental site collected before start of experiment were analyzed following standard laboratory procedure for organic carbon, available N, P and K (Black, 1965).

RESULTS AND DISCUSSION

Varieties: Yield attributes of rice were affected significantly due to varieties and fertility management (Table 1). The number of panicles m^{-2}, panicle weight and grain weight panicle^{-1} were significantly highest with variety 'Kalanamak' followed by Indrabhog, Jawaphool and 'Badshahbhog'. The lowest values of above yield attributes were recorded with variety 'Neelabhat'. Variety 'Jawaphool' and 'Badshahbhog' were on par with each other but recorded the higher values of panicles m^{-2}, panicle weight and grains panicle^{-1} as compared to variety 'Neelabhat'. Among the varieties tested, 'Kalanamak' and 'Indrabhog' produced significantly higher mean grain (1.84 t ha^{-1}.) and straw yield (2.78 t ha^{-1}) as compared to 'Badshahbhog', 'Jawaphool', and 'Neelabhat' during both years as well as on pooled (Table 1). The higher yield with 'Kalanamak' and Indrabhog was mainly due to higher values of yield attributes like panicles m$^{-2,}$ panicle weight and grains panicle^{-1} (Table 1). The mean per cent increase in grain yield by 'Kalanamak' was recorded to be 33.3, 55.9, and 55.9 over 'Indrabhog', 'Jawaphool' and 'Badshahbhog', respectively. The variety 'Neelabhat' recorded the lowest grain yield in both the years. The variety 'Jawaphool' and 'Badshahbhog' were on par with grain yield of 1.18 and1.18 t ha^{-1} respectively. Straw yield also exhibited the same trend as in case of grain yield.

Table 1: Yields, yield attributes and economics of rice as affected by varieties and fertility management

Treatment	Grain yield (t ha$^{-1)}$			Straw yield (t ha$^{-1)}$			Panicles m^{-2}	Panicles weight (g)	Grain weight Panicle^{-1} (g)	Net income (Rs ha^{-1})	B:C Ratio
	2005	2006	Mean	2005	2006	Mean					
Varieties											
Kalanamak	1.92	1.75	1.84	2.84	2.65	2.78	198	1.83	1.31	10243	1.99
Badshahbhog	1.21	1.16	1.18	1.84	1.68	1.76	170	1.49	0.89	3151	1.24
Indrabhog	1.44	1.32	1.38	2.20	1.98	2.09	188	1.76	0.97	6510	1.54
Jawaphool	1.22	1.14	1.18	1.87	1.74	1.80	176	1.53	0.83	2918	1.24
Neelabhat	0.45	0.44	0.45	0.72	0.67	0.70	150	1.19	1.70	(-)7540	-
SEm^{+-}	0.08	0.06	0.08	0.12	0.09	0.11	01	0.02	0.05		
CD (P=0.05)	0.21	0.15	0.18	0.31	0.23	0.27	09	0.06	0.13		
Fertility management											
Control	0.77	0.71	0.74	1.19	1.09	1.14	132	1.22	0.79	295	1.29
50%RD-IF	1.05	0.96	1.01	1.61	1.45	1.53	169	1.37	0.85	6409	1.56
100%RD-IF	1.54	1.41	1.47	2.34	2.13	2.23	200	1.79	1.01	12583	2.01
50% RD- IF+ 50% RDN (FYM)	1.50	1.41	1.46	2.28	2.13	2.20	197	1.80	0.98	10379	1.71
100% RDN (FYM)	1.36	1.28	1.32	2.08	1.94	2.00	183	1.62	0.91	3765	1.10
SEm+.	0.05	0.05	0.05	0.05	0.03	0.05	2	0.04	0.04		
CD (P=0.05)	0.15	0.13	0.13	0.14	0.09	0.12	5	0.15	0.11		

IF- Inorganic Fertilizer

Fertility management: Yield attributes viz; panicle weight and grain weight panicle^{-1} and yield were affected significantly due to fertility management (Table 1). Significantly higher values of panicle m^{-2}, panicles weight and grain weight panicle^{-1} were recorded with 100% RD F through inorganic fertilizers as compared to rest of the treatments (Table 1). The higher values of yield attributes with 100% RDF treatment were mainly attributed to higher availability of plant nutrients. Kumari *et-al.* (2010) reported the higher values of yield attributes of scented rice with recommended dose applied through inorganic fertilizers. Increasing fertility level from 0 to 100% RDF increased the grain and straw yield significantly over control. Yield is the manifestation of various yield components, application of 100% RDF through inorganic fertilizers or 50% RDF through inorganic fertilizers + 50% RDN through Farm yard manure being on par but produced significantly higher grain yield over rest of treatments. This could be attributed to higher values of yield attribute with above treatment. These findings are in agreement with the observations of Srinivas *et al*. (2010) and Singh et al. (2006). The higher yield and yield attributes with combined use of nutrients as compared to 50% RDF through inorganic fertilizers or 100% RDN through FYM could be attributed to integrated effect on all physico-chemical properties as well as available nutrients status of soil that facilitated in maintaining better soil physical condition and continuous supply of nutrients throughout the crop growth. Similar findings were reported by Srinivas *et al.* (2010). The per cent increase in grain yield due to 100% RDF through inorganic fertilizers was recorded to be 99.3, 46.3 and 1.2 over control, 100 % RDN through farmyard manure or 50 % RDN through Farm yard manure + 50% RDF through inorganic fertilizer, respectively.

Table 2: Interaction effect of rice varieties and fertility management on grain yield (q ha^{-1})

Treatments	Fertility level					Mean
	Control	50% RDF-IF	100% RDF-IF	50% RDF-IF + 50% RDN FYM	100% RDN - FYM	
Varieties	**2005**					
Kalanamak	11.7	16.4	24.6	23.5	19.9	19.22
Badshahbhog	7.4	10.0	14.3	14.4	14.2	12.06
Indrabhog	10.0	12.9	17.3	16.5	15.3	14.40
Jawaphool	7.6	10.3	14.2	14.8	14.0	12.18
Neelabhat	2.0	3.0	6.7	6.0	4.7	4.48
Mean	7.74	10.52	15.42	15.64	13.62	-
CD (P = 0.05) Variety 2.07, FL 1.98, VxFL 2.53						
2006						
Kalanamak	10.7	15.3	22.6	21.2	17.8	17.52
Badshahbhog	6.6	9.0	12.9	13.5	13.3	11.06
Indrabhog	9.2	11.6	15.8	15.5	13.9	13.20
Jawaphool	6.9	9.5	12.8	14.5	13.5	11.44
Neelabhat	1.9	2.8	6.3	5.8	5.3	4.42
Mean	7.06	9.64	14.08	14.1	12.76	-
CD (P = 0.05) Variety 1.48, FL 1.58, VxFL 2.36						

.**Interaction effect:** The interaction of varieties and fertility management affected the grain yield significantly during both the years (Table 2). Variety 'Kalanamak' produced significantly higher grain yield as compared to rest of the varieties at all fertility management practices. Variety 'Kalanamak', Indrabhog' and 'Neelabhat' produced significantly higher grain yield when fertilized with 100% RDF through inorganic fertilizers. However, variety Jawaphool and Badshahbhog produced higher grain yield with 50% RDF through inorganic fertilizers + 50 % RDN through farmyard manure in both years. Each variety was on par at 100% RDF through inorganic fertilizer or 50% RDF through inorganic fertilizers + 50% RDN through FYM

but produced significantly higher grain yield over rest of fertility management during both the years. Each variety produced significantly lower yield when fertilized with 100% RDN through farmyard manure. This was because of lower supply of nutrient with above treatments as compared to combined use of inorganic and organic or 100 % RD F through inorganic fertilizers.

Economics: Among the varieties tested, Kalanamak accrued maximum net income (Rs 10243/ha) and benefit: cost ratio (1.99) followed by Indrabhog with net income of Rs 6510 ha^1 and benefit: cost ratio (1.54). Variety Badshahbogh and Jawaphool gave similar benefit: cost ratio (1.24). The higher net income and benefit: cost ratio with Kalanamak and Indrabhog was mainly due to higher grain and straw yield. Applications of 100% RDF through inorganic fertilizers gave the highest net income of Rs 12583 ha^{-1} and benefit: cost ratio (2.01) followed by 50 % RDF through inorganic fertilizers + 50 % RDN through farm yard manure with net income of Rs 10379 ha^1 and benefit: cost ratio of 1.71. Kumari *et al* (2010) also reported higher net return and benefit: cost ratio with 100% RDF by inorganic fertilizers in scented rice. The lowest net income and benefit: cost ratio (Rs 3765 ha^1 and 1.10), respectively was recorded with 100% RDN through farmyard manure. The higher net profit and BCR with 100% RDF through inorganic fertilizers was mainly due to less cost incurred with higher yield as compared to higher cost incurred with lower yield by 50% RDF + 50 % RDN, and 100% RDN through Farm yard manure.

It is concluded that variety 'Kalanamak' may be fertilized with either 100% RDF through inorganic fertilizers or 50 % RDF through inorganic fertilizers + 50 % RDN through FYM to obtain maximum grain yield and higher profit from rice in low lands

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