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Effect of fertilization and varieties on yield and nutrient uptake of hybrid rice (*Oryza Sativa* L.)

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Abstract

The field experiment was conducted at Agronomy Research Farm of Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad (U. P.) during Kharif season of two consecutive years 2008 and 2009. Twenty one treatment combinations comprised of three levels of fertility (120: 60:60 kg NPK ha⁻¹, 150: 75: 75 kg NPK ha⁻¹ and 180: 90: 90 kg NPK ha⁻¹) with seven hybrids (SHP-O1, SHP-O2, SHP-O3, SHP-O4, SHP-O5, SHP-O6 and NDRH-2) were executed in split plot design keeping fertility levels in main plot with four replications. The soil of experimental plot was silt loam in texture with low in organic carbon and nitrogen, medium in phosphorus and high in potassium. The crop received normal recommended agronomic and plant protection measures. Grain yield increased with increase in fertility levels and highest grain yield (65.36 q ha⁻¹ and 67.54 q ha⁻¹) were recorded under highest fertility level of N₁₈₀ P₉₀ K₉₀ kg ha⁻¹, which showed an increase of 8.9 and 9.9% grain yield over N₁₂₀ P₆₀ K₆₀ kg ha⁻¹ and remained at par with N₁₅₀ P₇₅ K₇₅ kg ha⁻¹ during both of the years. highest values of uptake of 145.35 kg N, 25.60 kg P and 179.5 kg K ha⁻¹ was recorded with N₁₈₀ P₉₀ K₉₀ kg ha⁻¹, which was 21.95 kg N, 4.15 kg P and 43.27 kg K higher over those of lowest fertility level of N₁₂₀ P₆₀ K₆₀ kg ha⁻¹. On an average, maximum nutrient uptake of 160.14 kg N, 28.75 Kg P and 189.10 kg K was recorded with hybrid SHP-O4 which was significantly higher over SHP-O1, SHP-O2, SHP-O3, SHP-O5 and SHP-O6 and was found at par with NDRH-2 during both the years.

Keywords: nitrogen, hybrid rice, nutrients uptake, fertility levels

Introduction

For exploiting the full heterotic potential of hybrids it is necessary to assess the performance of promising hybrids at graded levels of nitrogen. Effective nitrogen management plays an important role in increasing the response of the plant to fertilizers. Inadequate N application adversely affects the grain production, while excess nitrogen may lead to excess vegetative crop growth, favourable conditions for insect pests and diseases (Ohm *et al.* 1996). Therefore, the present investigation was undertaken to study the Performance of rice (*Oryza sativa* L.) hybrids under various fertility level.

Methodology

The field experiment was conducted at Agronomy Research Farm of Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad (U. P.) during Kharif season of 2 consecutive years 2008 and 2009. Twenty one treatment combinations comprised of three levels of fertility (120: 60:60 kg NPK ha⁻¹, 150: 75: 75 kg NPK ha⁻¹ and 180: 90: 90 kg NPK ha⁻¹) with seven hybrids (SHP-O1, SHP-O2, SHP-O3, SHP-O4, SHP-O5, SHP-O6 and NDRH-2) were executed in split plot design keeping fertility levels in main plot with four replications. The soil of experimental plot was silt loam in texture with low in organic carbon and nitrogen, medium in phosphorus and high in potassium. The crop received normal recommended agronomic and plant protection measures.

Results

Grain and straw yield increased with increase in fertility levels and highest grain yield (65.36 q ha⁻¹ and 67.54 q ha⁻¹) and straw yield (74.83 q ha⁻¹ and 75.91 q ha⁻¹) were recorded under highest fertility level of N₁₈₀ P₉₀ K₉₀ kg ha⁻¹ (Table-I), which showed an increase of 8.9 and 9.9% grain and 7.49 and 8.19 % in straw yield over N₁₂₀ P₆₀ K₆₀ kg ha⁻¹ and remained at par with N₁₅₀ P₇₅ K₇₅ kg ha⁻¹ during 2008 and 2009, respectively. Similar findings have been also reported by Dwivedi *et al.* (2006)^[1] and Singh *et al.* (2005). On an average, highest values of uptake of 145.35 kg N, 25.60 kg P and 179.5 kg K ha⁻¹ was recorded with N₁₈₀ P₉₀ K₉₀ kg ha⁻¹, which was 21.95 kg N, 4.15 kg P and 43.27 kg K higher over those of lowest fertility level of

$N_{120} P_{60} K_{60}$ kg ha⁻¹ (Table-2). The differences between both the higher fertility levels were non-significant. Dwivedi *et al.* (2006) [1], Fageria (2005) [2] recorded increase in available nitrogen, phosphorus and potassium with $N_{180} P_{90} K_{90}$ kg ha⁻¹. On an average, highest grain yield of 71.69 q ha⁻¹ and straw yield of 81.63 q ha⁻¹ was recorded by hybrid SHP-04, which was significantly higher than those of other hybrids SHP-01, SHP-02, SHP-03, SHP-05 and SHP-06 and at par with NDRH-2, respectively. On an average, maximum nutrient uptake of 160.14 kg N, 28.75 Kg P and 189.10 kg K was recorded with hybrid SHP-04 which was significantly higher

over SHP-01, SHP-02, SHP-03, SHP-05 and SHP-06 and was found at par with NDRH-2 during both the years. Highest net return of Rs. 45082 and Rs.54495 was recorded with $N_{180} P_{90}$ and K_{90} kg ha⁻¹ with hybrid SHP-04, which was closely followed by the same hybrids fertilized with $N_{150} P_{75}$ and K_{75} kg ha⁻¹ against lowest net return of Rs. 20236 and Rs. 31840 obtained with SHP-06 fertilized with N_{120} , P_{60} and K_{60} kg ha⁻¹ during 2008 and 2009, respectively. The highest B: C ratio of 1.69 and 1.96 was obtained with hybrid SHP-04 at N_{180} , P_{90} , and K_{90} during both the years.

Table 1: Grain and straw yield of paddy and nutrient uptake as affected by fertility levels and hybrid rice

Treatment	Grain yield (qha ⁻¹)		Straw yield (qha ⁻¹)		NPK uptake (kg ha ⁻¹)					
					Nitrogen		Phosphorus		Potassium	
	2008-09	2009-10	2008-09	2009-10	2008-09	2009-10	2008-09	2009-10	2008-09	2009-10
Fertility levels										
$N_{120}P_{60}K_{60}$	56.72	57.62	67.34	67.72	120.74	126.05	21.12	21.78	135.14	137.32
$N_{150}P_{75}K_{75}$	63.71	64.50	73.77	75.72	137.21	144.56	24.56	25.44	169.55	175.47
$N_{180}P_{90}K_{90}$	65.36	67.54	74.83	75.91	142.30	148.40	25.25	25.96	177.47	181.53
S. Em. ±	1.32	1.17	1.50	1.41	1.89	1.67	0.34	0.33	2.59	2.40
C. D. (5%)	4.56	4.05	5.17	4.89	6.56	5.77	1.19	1.14	8.95	8.30
Hybrids										
SHP-01	58.93	59.68	69.12	69.53	123.91	129.29	22.61	23.04	149.87	152.09
SHP-02	61.14	61.54	72.30	71.84	135.29	138.57	22.85	23.56	159.11	159.87
SHP-03	62.35	62.84	74.04	74.25	133.23	138.47	23.90	24.23	162.66	165.76
SHP-04	71.37	72.01	81.34	81.93	158.62	161.66	28.36	29.14	187.09	191.12
SHP-05	60.56	61.13	69.23	69.82	134.09	139.12	24.13	24.64	164.79	167.50
SHP-06	52.46	57.86	60.82	66.71	109.44	123.95	19.17	21.35	132.96	147.37
NDRH-2	66.70	67.48	76.98	77.75	150.84	153.79	26.61	26.73	178.54	182.79
S. Em. ±	1.78	1.70	2.04	1.99	2.92	2.86	0.83	0.79	3.12	3.07
C. D. (5%)	5.06	4.81	5.79	5.63	9.14	8.62	2.52	2.48	9.42	9.25

Conclusion

Thus, it may be concluded that for obtaining higher yield and monetary benefit from rice, hybrid SHP-04 may be adopted with a fertilizer dose of 180 kg N, 90 kg P₂O₅ and 90 kg K₂O ha⁻¹ under irrigated conditions of Uttar Pradesh.

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