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Effect of fertilizers and varieties of hybrid rice (*Oryza sativa* L.) on growth, yield and quality in eastern U.P

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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 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, SHP03, SHP-04, SHP-05, SHP-06 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. All the growth characters i.e. plant height, number of tillers and dry matter accumulation increased significantly with increases fertility levels at all the growth stages of the crop. Highest plant height, number of tillers and dry matter accumulation were found with fertility levels N₁₈₀ P₉₀ K₉₀ kg ha⁻¹ which was at par with N₁₅₀ P₇₅ K₇₅ kg ha⁻¹ and significant superior over N₁₂₀ P₆₀ K₆₀ kg ha⁻¹ at all the growth stages of crop. Maximum plant height, number of tillers and dry matter accumulation were recorded with hybrid SHP-04 which was at par with hybrid NDRH-02. At harvest plant height was recorded (133.97 and 135.72 cm), number of tillers (455.14 and 457.00 m⁻²) and dry matter accumulation (1521.18 and 1569.61 gm⁻²) with hybrid SHP-04. 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 (Table-I), 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

Keywords: effect of fertilizers varieties of hybrid rice growth quality in eastern U.P

Introduction

Rice (*Oryza sativa* L.) is most important cereal crop in India but its productivity is very low compared countries like China, USA, and Japan. Effective fertilizer (N, P, K) management plays an important role in improving the growth, yield and quality of hybrid rice. 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). potassium is equally important as it stabilizer yield and continuous application of K improves all soil properties. 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, SHP03, SHP-04, SHP-05, SHP-06 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

All the growth characters i. e. plant height, number of tillers and dry matter accumulation increased significantly with increases fertility levels at all the growth stages of the crop.

Highest plant height, number of tillers and dry matter accumulation were found with fertility levels $N_{180} P_{90} K_{90}$ kg ha⁻¹ which was at par with $N_{150} P_{75} K_{75}$ kg ha⁻¹ and significant superior over $N_{120} P_{60} K_{60}$ kg ha⁻¹ at all the growth stages of crop. Maximum plant height, number of tillers and dry matter accumulation were recorded with hybrid SHP-04 which was at par with hybrid NDRH-02. At harvest plant height was recorded (133.97 and 135.72 cm), number of tillers (455.14 and 457.00 m⁻²) and dry matter accumulation (1521.18 and 1569.61 g m⁻²) with hybrid SHP-04. Dwivedi *et al.* 2006^[1] and meena *et al.* 2003 also reported similar results. 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 $N_{180} P_{90} K_{90}$ kg ha⁻¹ (Table-I), which showed an increase of 8.9 and 9.9% grain yield over $N_{120} P_{60} K_{60}$ kg ha⁻¹ and remained at par with $N_{150} P_{75} K_{75}$ kg ha⁻¹ during 2008 and 2009, respectively. Similar findings have been also reported by Dwivedi.

On an average maximum protein content (9.47%) was recorded by fertility level of $N_{180} P_{90} K_{90}$ kg ha⁻¹ and in hybrid SHP-04 recorded maximum protein content (9.71%) which was at par with NDRH-2 and lowest protein content of (8.99%) recorded with SHP-06. Similar result reported by Varma *et al.* (2004)^[3].

Table 1: Grain yield, protein content and growth characters as affected by fertility levels and hybrid rice

Treatment	Grain yield (q ha ⁻¹)		Protein content (%)		Growth characters					
	2008-09	2009-10	2008-09	2009-10	Plant height (cm)		Tillers (m ⁻²)		Dry matter accumulation (g m ⁻²)	
					2008-09	2009-10	2008-09	2009-10	2008-09	2009-10
Fertility levels										
$N_{120}P_{60}K_{60}$	56.72	57.62	9.13	9.25	113.42	114.21	401.16	403.39	1291.84	1325.36
$N_{150}P_{75}K_{75}$	63.71	64.50	9.32	9.39	121.36	123.73	426.93	427.64	1434.32	1478.98
$N_{180}P_{90}K_{90}$	65.36	67.54	9.44	9.50	125.35	126.64	443.92	446.64	1464.89	1504.78
S. Em. ±	1.32	1.17	0.04	0.03	1.75	2.54	5.10	5.44	16.34	18.79
C. D. (5%)	4.56	4.05	0.13	0.11	6.06	8.80	14.99	15.97	56.53	59.62
Hybrids										
SHP-01	58.93	59.68	9.07	9.24	112.87	114.84	410.30	411.97	1338.92	1356.48
SHP-02	61.14	61.54	9.51	9.55	117.13	118.43	414.69	415.26	1373.83	1427.74
SHP-03	62.35	62.84	9.01	9.12	120.49	120.96	423.36	425.99	1397.93	1438.41
SHP-04	71.37	72.01	9.69	9.74	133.97	135.72	455.14	457.00	1521.18	1569.61
SHP-05	60.56	61.13	9.26	9.30	121.83	123.46	416.87	419.25	1410.05	1450.42
SHP-06	52.46	57.86	8.94	9.05	107.05	109.34	418.28	421.48	1316.58	1348.46
NDRH-2	66.70	67.48	9.57	9.62	125.97	127.96	429.36	430.29	1418.29	1463.49
S. Em. ±	1.78	1.70	0.05	0.05	3.36	3.17	12.97	12.33	38.78	37.46
C. D. (5%)	5.06	4.81	0.15	0.16	9.52	9.00	36.67	34.88	109.96	106.23

Conclusion

Thus, it may be concluded that for obtaining higher growth character, yield and protein content 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 eastern Uttar Pradesh.

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