

## EFFECT OF CULTIVAR, FUNGICIDE SPRAY AND NITROGEN FERTILIZATION ON MANAGEMENT OF RICE BLAST UNDER TEMPERATE ECOSYSTEM

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**Abstract:** A field experiment was conducted at Mountain Research Centre for Field Crops, Khudwani during kharif, 2009, 2010 and 2011 to assess the effect of nitrogen application and fungicidal sprays on rice blast disease using local popular susceptible variety (K-448) and resistant variety (Shalimar Rice-1). Leaf and neck blast was reduced by 19.6 and 15.6 per cent at recommended dose of nitrogen (120Kg/ha) in susceptible variety (Jehlum), respectively. Single spray of tricyclazole 65 WP (0.06%) along with recommended dose of nitrogen recorded leaf and neck blast control of 49.4 and 85.5 per cent as against 26.7 and 23.4 per cent, respectively, with higher dose of nitrogen. Need based sprays of tricyclazole 65 WP (0.06 %) reduced leaf blast by 85.5 and 67.5 per cent and neck blast by 91.0 and 77.8 per cent with recommended and higher dose of nitrogen, respectively. Higher rate of nitrogen application in resistant variety (SR-1) showed non significant effect on blast severity. SR 1 with recommended dose of nitrogen recorded higher yield (64.6q/ha) and net returns (Rs. 51272/ha), followed by Jehlum with the application of recommended dose of nitrogen and need based sprays of tricyclazole.

**Key Words:** Fungicide, Nitrogen, *Pyricularia grisea*, Rice blast.

### INTRODUCTION

Rice (*Oryza sativa* L.) is staple food in Kashmir and continuous research efforts have therefore been made to produce varieties with improved levels of disease resistance (Sanghera and Wani, 2008). The crop in valley is frequently challenged by various biotic and abiotic stresses throughout the growing season (Sanghera et al. 2011). Among all rice blast caused by *Pyricularia grisea* Sacc [Telipomorph *Magnaporthe grisea* (Hebart) Brarr] is one of the important factors for low productivity of rice in the valley. It causes 5-70 per cent yield loss depending upon the stage of the crop infected and severity of the disease (Dubey, 1995). Rice blast epidemics are often more severe in temperate and subtropical ecosystems, especially when effective management strategies are not implemented. Among several factors which influence the occurrence and severity of blast, rate of nitrogen fertilization has been found to affect the severity of the disease to a great extent (Kapoor and Sood, 2000). Jehlum (K 448), a high yielding variety with highly acceptable grain quality of rice, is being

cultivated over a large area under Kashmir conditions. The variety being the nitrogen responsive has been found applied with higher doses of nitrogenous fertilizers and farm yard manure. Present study was conducted to ascertain the response of Jehlum variety to higher doses of nitrogen in terms with or without fungicidal sprays in terms of yield and blast severity as an effort to find an integrated management of the disease.

## **MATERIALS AND METHODS**

A field experiment on effect of rate of nitrogen application and of fungicidal sprays on naturally occurring blast disease using local popular susceptible variety (Jehlum) and resistant variety (Shalimar Rice-1) was conducted in a randomized block design with four replications at rice research and regional station, Khudwani during Kharif, 2009, 2010 and 2011. Seedlings of the test varieties were transplanted at 15x15 cm in 10 m<sup>2</sup> plot. Treatments consisted of variety Jehlum with two nitrogen levels viz., recommended dose of nitrogen (120 kg N/ha) and higher dose of nitrogen (150 kg N/ha), each kept both unsprayed and sprayed with single and need based number of sprays of Tricyclazole 65 WP @ 0.06%. Shalimar rice -1 with two levels of nitrogen viz., recommended and higher dose of nitrogen also included the treatments. A susceptible variety (K-448) with higher dose of nitrogen served as check. Observations on leaf blast incidence and severity were taken at milk stage and neck blast incidence between milk and dough stage. Evaluation was made by the standard evaluation system of rice on 0-9 scale (IRRI, 2003).

## **RESULTS AND DISCUSSION**

The results presented in Table 1 revealed that the increase in amount of nitrogen application in Jehlum significantly increases the leaf and neck blast. Leaf and neck blast control of 19.6 and 15.6 per cent, respectively, was achieved by using recommended dose of nitrogen as against higher dose of nitrogen. However, blast severity on resistant variety (Shalimar Rice-1) was not significantly affected by rate of nitrogen fertilization. Leaf and neck blast control of 95.7 and 100.0 per cent, respectively, was registered by using resistant variety alone for blast control. Krishnaswami (1952) confirmed that increased application of nitrogenous fertilizer increases the disease proneness of susceptible varieties but had little or no effect on resistant ones. The increase in blast severity with the increase in rate of nitrogen application has been reported by many workers (Kapoor and Sood, 2000; Long et al. 2000) and has been attributed to increased plant transpiration by the increase in leaf area index which thereby

Table 1: Effect of rate of nitrogen fertilization and number of fungicidal sprays on blast disease and yield of rice

Treatments	Leaf blast severity (%)				Disease control (%)	Neck blast incidence (%)				Disease control (%)	Grain yield (q/ha)				Increase in Yield (%)
	2009	2010	2011	Mean		2009	2010	2011	Mean		2009	2010	2011	Mean	
Resistant variety (Shalimar Rice-1) + 120 kg N	1.20 (1.0)*	0.4 (0.6)	1.6 (1.2)	1.1 (1.0)	95.7	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	100.0	64.8 0	65.2 0	64.0 0	64.6	19.2
Resistant variety (Shalimar Rice-1) + 150 kg N	1.3 (1.1)	1.1 (1.0)	1.1 (1.1)	1.2 (1.1)	95.3	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	100.0	64.5 0	64.9 0	63.2 0	64.2	18.4
Susceptible variety (Jehlum) + 120 kg N	25.5 (5.0)	15.2 (3.9)	20.7 (4.5)	20.5 (4.5)	19.6	19.7 (25.4)	6.8 (2.7)	15.7 (3.9)	14.1 (3.6)	15.6	52.6 3	59.5 0	55.5 0	55.7	2.7
Susceptible variety (Jehlum)+ 120 kg N+ single spray of Tricyclazole 75 WP @ 0.06%	18.6 (4.3)	9.1 (3.0)	11.2 (3.3)	13.0 (3.6)	49.4	13.6 (21.6)	3.7 (2.0)	7.4 (2.7)	8.2 (2.7)	50.9	55.6 0	62.3 0	60.3 0	59.4	9.5
Susceptible variety (Jehlum) + 120 kg N+ need based sprays of Tricyclazole 75 WP @0.06%	4.3 (2.1)	2.6 (1.6)	4.2 (2.0)	3.7 (1.9)	85.5	2.3 (8.6)	0.3 (0.9)	1.9 (1.4)	1.5 (1.2)	91.0	62.2 6	64.7 0	61.6 0	62.8	15.8
Susceptible variety (Jehlum) + 150 kg N + Single spray of Tricyclazole 75 WP @0.06 %	25.1 (5.0)	12.1 (3.5)	19.0 (4.3)	18.7 (4.3)	26.7	21.8 (27.8)	5.6 (2.5)	11.1 (3.3)	12.8 (3.4)	23.4	52.6 6	60.6 0	56.3 0	56.5	4.2
Susceptible variety (Jehlum) + 150 kg N+ need based sprays of Tricyclazole 75 WP (.06%)	12.2 (3.4)	5.0 (2.2)	7.9 (2.8)	8.4 (2.8)	67.5	5.3 (13.0)	1.4 (1.4)	4.6 (2.1)	3.7 (1.8)	77.8	60.6 0	63.5 0	62.4 0	62.2	3.1
Susceptible variety (Jehlum) + 150 kg N (check)	32.2 (5.7)	17.5 (4.2)	26.9 (5.2)	25.5 (5.0)	-	25.8 (30.5)	7.3 (2.8)	17.2 (4.1)	16.7 (4.0)	-	51.7 6	56.5 0	54.1 0	54.2	-
C.D at 5%	2.8	0.3	0.3	0.2		2.4	0.2	0.3	0.3		0.54	0.63	0.42	0.37	

\*Figures in parentheses are square root transformed values

increases the susceptibility of host tissue (Stone et al. 1979). Blast severity with higher dose of nitrogen significantly decreased with the application of Tricyclazole 65 WP @ 0.06% as leaf blast control of 26.7 and 23.4 per cent and neck blast control of 67.5 and 77.8 per cent, was observed by the use of single and need based number of sprays, respectively. Recommended dose of nitrogen along with single and need based number of sprays of tricyclazole could achieve the leaf and neck blast control of 49.4 and 50.9 per cent and 85.5 and 91.0 per cent, respectively. The effectiveness of tricyclazole against blast has been reported earlier (Bhat et al. 2012; Gaje and Prasad, 2007 and Osman et al. 2004). Prajapati et al. (2004) found tricyclazole significantly superior in decreasing the leaf and neck blast and increasing the yield. Grain yield improved to the tune of 15.6 per cent with the use of resistant variety along with recommended dose of nitrogen over check. Higher nitrogen dose could not increase grain yield in Shalimar Rice-1. This may be attributed to increased spikelet sterility at higher nitrogen dose. These findings are in conformity with those of Mubarak (2008).

Economical analysis (Table 2) revealed that SR 1 with recommended dose of nitrogen recorded higher net returns (Rs.51272/ha) and additional income of Rs 12840/ha over check. Jehlum with application of RDN and need based sprays of tricyclazole remained second in order with net returns of Rs.75360/ha. and additional income of Rs. 9680/ ha. From the present study it can be concluded that use of blast resistant variety SR-1 with recommended dose of nitrogen is the best approach to overcome the yield losses due to rice blast disease in blast prone areas of Kashmir valley. However, if use of susceptible variety is the only option to the farmers, balanced use of nitrogenous fertilizers along with need based number of sprays of Tricyclazole 65 WP@0.06 per cent can be used as an integrated approach in the management of the disease.

**Table 2. Economics of rice variety jehlum with or without protective measures for blast disease under varying levels of nitrogenous fertilizer**

Variety	Rate of nitrogenous fertilizer	No. of sprays	Cost of cultivation (Rs. ha <sup>-1</sup> )	Gross returns (Rs. ha <sup>-1</sup> )*	Net returns (Rs. ha <sup>-1</sup> )	Additional income over check	Returns per rupee invested
Shalimar Rice 1	120 kg N/ha	No spray	26248	77520	51272	12840	1.95
	150 kg N/ha	No spray	26608	77040	50432	12000	1.89
Jehlum (K-448)	120 kg N/ha	No spray	26248	66840	40592	2160	1.55
		Single Spray	26748	71280	44532	6100	1.66
		Need based spray (2 sprays)	27248	75360	48112	9680	1.76
	150 kg N/ha	No spray (check)	26608	65040	38432	-	1.44
		Single Spray	27108	67800	40692	2260	1.50
		Need based spray (4 sprays)	28608	74640	46032	7600	1.61

\*Gross return is on the basis of grain yield only

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