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Occurrence of rice blast disease caused by *Pyricularia oryzae* under mid-hills and sub-tropics conditions of Jammu

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Abstract

Five rice growing districts of Jammu division viz., Doda, Jammu, Poonch, Rajouri and Ramban were surveyed for severity of leaf blast of rice. The overall range of disease severity in Jammu division was observed between 7.23-35.56 per cent during *Kharif* 2018 and 9.12-37.22 per cent during *Kharif* 2019. The highest disease severity of 35.56 and 37.22 per cent was observed in Gatha village of Doda district, whereas, it was the lowest (7.23 and 9.12 per cent) in Akalpur village of Jammu district during *Kharif* 2018 and 2019 seasons, respectively. The rice blast showed the highest occurrence in hilly regions of Jammu district, as it is the hot spot for the disease with ideal predisposing conditions for the disease.

Keywords: disease severity, Jammu, *Pyricularia oryzae*, rice blast

Introduction

Rice is one of the major *Kharif* crop of Jammu division being cultivated both in hilly and plain regions. The economy of Jammu and Kashmir is predominantly agrarian, rice being the staple food and the most important food crop occupying an area of almost 140 thousand hectares (Amjad and Sofi, 2018) [8]. Among the major constraints in the production and productivity of rice in the state, the rice blast disease is major problem and takes a heavy toll of the produce (Anwar *et al.*, 2009) [3]. Rice blast caused by *Pyricularia oryzae* is endemic to most hilly rice-growing areas of Jammu division due to prevailing blast-conducive environments during the crop season. The pathogen manifests itself at the seedling, tillering and flowering stages of crop growth causing losses on account of leaf, node and neck-blast in the state (Kapadia *et al.*, 2013) [5]. Frequent epiphytotic of the disease in the state for the last about fifteen years have been inflicting heavy qualitative and quantitative losses to the growers. The disease emerged as a major problem in the Jammu and Kashmir state prior to 1950's (Anonymous, 1963) [1]. With the evolution and wide spread cultivation of blast tolerant varieties, the blast incidence in Kashmir remained under check till suddenly the disease surfaced in late 1990's. In order to provide a baseline information on the status of the disease in the major rice growing areas in the Jammu division, the present investigation was taken up to analyze the disease severity of rice blast.

Material and Methods

A fixed plot survey was carried out during *Kharif* 2018 and 2019 seasons to know the status of severity of rice blast disease. The farmers' fields in Bhala, Dradu, Gatha, Pranu, Sartangal and Rainda villages of Bhandarwah block of Doda district; Kotli Arjan Singh and Baspur villages of R.S. Pura block, Basi Khurd and Chak Hasal villages of Bishnah block, Akalpur and Gajansoo villages of Marh block of Jammu district; Chandak, Dhokri and Bandi Chechian villages of Poonch block and Samote, Lassana and Potha of Suraankot block of Poonch district; Khandali and Nagrota villages of Rajouri block, Rajdhani and Saj villages of Thannamandi block, Darhal and Chowkian villages of Darhal block of Rajouri District; Chareel, Gund Adalkoot, Nagam, Doligam, Kaskoot and Zainhal villages of Banihal block of Ramban district were surveyed. Five fields at each location were selected randomly in each village in order to record the disease severity. The fields were assessed by recording the disease on 10 plants/field for rice blast severity. Per cent disease severity was recorded by scoring the percentage leaf area affected by blast disease lesions. Disease severity was recorded on 0-9 scale, Standard Evaluation System (SES) for rice (Anonymous, 1996) [2]. Per cent disease index (PDI) was calculated by using the following formula (Wheeler, 1969) [7].

$$\text{Per cent disease index (PDI)} = \frac{\text{Sum of individual disease ratings}}{\text{Total no. of plants observed} \times \text{maximum grade}} \times 100$$

The following 0 to 9 scale was adopted for recording the blast severity on leaves.

score	Description
0	No lesions
1	Small brown specks of pinpoint size or larger brown specks without sporulating centre
3	Small, roundish to slightly elongated necrotic sporulating spots, about 1-2 mm in diameter with a distinct brown margin or yellow halo
5	Narrow or slightly elliptical lesions, 1-2 mm in breadth, more than 3 mm long with a brown margin
7	Broad spindle-shaped lesion with yellow, brown, or purple margin
9	Rapidly coalescing small, whitish, greyish, or bluish lesions without distinct margins

Results

During Kharif season of 2018

Five districts under survey viz., Jammu, Ramban, Doda, Rajouri and Poonch recorded huge variation in disease severity at different locations. The overall range of disease severity in Jammu division remained between 7.23-35.56 per cent with an overall mean disease severity of 24.28 per cent (Table 1). The average disease severity in Doda district ranged from 30.51-35.56 per cent. However, maximum disease severity (35.56%) was recorded in Gatha village of Bhaderwah block and lowest disease severity was found in Sartangal village of Bhaderwah block (30.51%). In Jammu district, the average disease severity ranged from 7.23-15.78 per cent. The maximum disease severity (15.78%) was recorded in Chak Hasal village of Bishnah block and lowest disease severity was found in Akalpur village of Marh block (7.23%). In Poonch district, the average disease severity ranged from 22.38-25.56 per cent. The highest disease severity (25.56%) was recorded in Potha village of Surankot

block and lowest disease severity was found in Bandi Chechian village of Poonch block (22.38%). In Rajouri district, the average disease severity ranged from 20.56-29.34 per cent. However, the highest disease severity (29.34%) was recorded in Rajdhani village of Thanamandi block and lowest disease severity (20.56%) was found in Khandali village of Rajouri block. In Ramban district, the average disease severity ranged from 24.45-29.28 per cent. However, the highest disease severity (29.28%) was recorded in Chareel village of Banihal block, whereas lowest disease severity was found in Zainhal village of Banihal block (24.45 %).

During Kharif season of 2019

The overall range of disease severity in Jammu division ranged between 9.12-37.22 per cent with an overall mean disease severity of 26.90 per cent (Table 1). The average disease severity in Doda district ranged from 33.60-37.22 per cent. However, maximum disease severity (37.22%) was recorded in Gatha village of Bhaderwah block and lowest disease severity was found in Sartangal village of Bhaderwah block (33.60%). In Jammu district, the average disease severity ranged from 9.12-16.89 per cent. The highest disease severity (16.89%) was recorded in Chak Hasal village of Bishnah block whereas, lowest disease severity was found in Akalpur village of Marh block (9.12%). In Poonch district, the average disease severity ranged from 24.89-29.89 per cent. The highest disease severity (29.89%) was recorded in Potha village of Surankot block and lowest disease severity was found in Lassana village of Surankot block (24.89%). In Rajouri district, the average disease severity ranged from 24.81-33.48 per cent. The highest disease severity (33.48%) was recorded in Rajdhani village of Thanamandi block whereas, lowest disease severity (24.81%) was found in Khandali village of Rajouri block. In Ramban district, the average disease severity ranged from 25.06-31.78 per cent. The highest disease severity (31.78%) was recorded in Chareel village of Banihal block and lowest disease severity was found in Zainhal village of Banihal block (25.06 %).

Table 1: Status of rice blast (*Piricularia oryzae*) during the cropping season 2018 and 2019 at different locations of Jammu division

District	Location	Village	Disease Severity (%)		
			2018	2019	Mean
Doda	Bhaderwah	Bhala	32.67	36.89	34.78
		Dradu	33.03	34.89	33.96
		Gatha	35.56	37.22	36.39
		Pranu	31.11	34.29	32.70
		Sartangal	30.51	33.60	32.06
		Rainda	32.45	34.39	33.42
		Mean± S.E.(m)	32.56±0.72	35.21±0.61	33.88±0.66
Range	30.51-35.56	33.60-37.22	32.06-37.39		
Jammu	R.S. Pura	Kotli Arjan Singh	11.67	14.39	13.03
		Basapur	12.89	15.49	14.19
	Bishnah	Basi Khurd	13.07	15.90	14.49
		Chak Hasal	15.78	16.89	16.34
	Marh	Akalpur	7.23	9.12	8.18
		Gajansoo	9.89	10.53	10.21
		Mean± S.E.(m)	11.76±1.20	13.72±1.29	12.74±1.23
Range	7.23-15.78	9.12-16.89	8.18-16.34		
Poonch	Poonch	Chandak	25.45	28.23	26.87
		Dhokri	25.09	27.33	26.45
		Bandi Chechian	22.38	25.56	23.97
	Surankot	Samote	24.11	27.05	25.58
		Lassana	22.48	24.89	23.69
		Potha	25.56	29.89	27.49
		Mean± S.E.(m)	24.19±0.59	27.16±0.74	25.67±0.64
Range	22.38-25.56	24.89-29.89	23.69-27.49		

Rajouri	Rajouri	Khandali	20.56	24.81	22.69		
		Nagrota	22.84	25.89	24.37		
	Thannamandi	Rajdhani	29.34	33.48	31.41		
		Saj	28.67	31.27	29.97		
	Darhal	Darhal	27.11	30.38	28.75		
		Chowkian	25.72	29.17	27.45		
			Mean± S.E.(m)	25.71±1.40	29.17±1.34	27.44±1.37	
			Range	20.56-29.34	24.81-33.48	22.69-31.41	
Ramban	Banihal	Chareel	29.28	31.78	30.53		
		Gund Adalkoot	27.54	29.78	28.66		
		Nagam	28.60	29.33	28.97		
		Doligam	25.39	28.33	26.86		
		Kaskoot	27.89	29.11	28.50		
		Zainhal	24.45	25.06	24.76		
				Mean± S.E.(m)	27.19±0.72	28.90±0.77	28.05±0.72
				Range	24.45-29.28	25.06-31.78	24.76-30.53
Jammu Division		Overall Mean	24.28	26.90	25.59		
		Overall Range	7.23-35.56	9.12-37.22	8.18-37.39		

Discussion

Present investigation was the first comprehensive survey in the different districts Jammu division which revealed prevalence of rice blast in *Kharif* season during 2018-19. During survey, maximum disease severity (35.56% in 2018 and 37.22% in 2019) was recorded in Gatha village of Baderwah block. However, minimum disease severity was found in Akalpur village of Marh block (7.23% in 2018 and 9.12% in 2019). Similar observations have been reported by Anwar *et al.* (2009) ^[3] in the temperate districts of Kashmir for the severity of rice blast. They reported that the leaf blast severity ranged from 3.7 to 41.3 percent. Dar *et al.* (2010) ^[4] conducted survey in six districts of Kashmir viz; Anantnag, Budgam, Baramulla, Pulwama, Kupwara and Srinagar and observations on prevalence and distribution of blast disease caused by *P. oryzae* were recorded. Maximum disease incidence of 25 per cent and severity of 15 percent of nodal blast and maximum incidence 25 per cent of most destructive phase- neck blast was recorded from the district Kupwara. Rasool *et al.* (2016) ^[6] reported that highest leaf and neck blast incidence (80.67 and 19.36 per cent) was observed in Anantnag, whereas it was the lowest (18.33 and 1.03 per cent) in Kakapora in district Pulwama. The leaf blast intensity ranged from 10.82 per cent in district Bandipora to 29.59 per cent in district Kulgam. The highest neck blast intensity (4.83%) was recorded at Duroo Shahabad, whereas the lowest (0.77%) was observed at Ajus in district Bandipora. The differences in rice blast severity in different stages of the crop, at different locations and in different years, may be because of differences in the varieties grown, agronomic practices, environmental factors and the variability in the pathogen populations.

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