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Effect of integrated disease management practices on sheath blight of rice

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Abstract
Sheath blight is one of the most important disease of rice causing up to 25% annual loss. Since there are no any varieties are resistant to this disease and management of the disease is only by use of chemical fungicide. These fungicides are hazards to environment and animals including human beings. These chemical molecules create problems in exporting of rice due to residual effect. Therefore integrated disease management is one of the alternative for better management of sheath blight. Three rice varieties viz. PB-1(susceptible), NDR359 (MR) and PA 6201(Hybrid) were used to evaluate the effect of Integrated disease management practices {seed treatment, use of FYM, cleaning of bunds and field, reduced (2/3) dose of Nitrogen with need based spray of fungicides} on disease severity of rice. Management practices adopted plot reduced the severity (25.42%) of sheath blight of rice and increase the grain yield (3662 kg/ha) as in non IDM adapted plots, disease severity was recorded (59.1%) with (2775 kg/ha) yield in susceptible variety Pusa Basmati-1.

Keywords: Management practices, sheath blight, rice

Introduction
Rice (*Oryza sativa* L.) is a most important food crop of the world. Production and productivity of rice is affected by many biotic and abiotic factors. Biotic factor includes many diseases caused by fungi, bacteria, viruses, nematodes and several physiological disorders which cause annual loss to the tune of 12 to 25 % of the total production, while fungal diseases alone cause annual loss of 12 to 20 percent of its production. Among the fungal diseases, Sheath blight of rice caused by *Rhizoctonia solani* Kuhn is one of them. It is regarded as one of the most widely distributed disease of Rice. The disease was initially reported by Miyake from Japan in 1910 while in India it was first reported by Paracer and Chahal in 1963 from Gurudaspur of Punjab state.

The pathogen mainly infects leaf sheath but symptoms may be produced on any aerial part of the rice plant. The lesions first appear on the leaf sheath at /or above water level as water soaked circular to oblong ellipsoid to ovoid, somewhat irregular greenish gray patches. They turn into discrete lesions with pale to grayish white centre. Sclerotia are formed on or near these spots depending on the weather conditions. It causes yield losses to the extent of 59 to 69 per cent (Venkat Rao *et al.*, 1990, and Naidu 1992) [5]. The disease is managed by application of systemic fungicides and antibiotics. All the rice cultivars are susceptible to the pathogen and no any resistant variety has been reported for this disease. The present study was undertaken to evaluate the response of integrated management practiced on severity and incidence of this disease.

Methods and Materials
The experiment were carried out at Crop Research Station, Masodha during WS 2013 and 2014. The sheath blight infected sample were collected from rice fields. The pathogen was isolated and characterized on the basis of its morphological and cultural characteristic, Pathogenecity of the pathogen was confirmed by proving the Koch's postulate (1876). The cultures were maintained on slants containing Potato Dextrose Agar medium. To evaluate the effect of integrated disease management practices on sheath blight of rice under field condition. The experiment was constituted on three rice varieties viz. PB-1(susceptible), NDR-359(MR), PA 6201 (Hybrid) in split plot design with four replication adopting net plot size of 5×4m with spacing of 20×15cm. Integrated disease management practices {seed treatment, use of FYM, cleaning of bunds and field, reduced (2/3) dose of nitrogen with need based spray of fungicides} were adopted in managed plot. While in non managed plot farmer practice were adopted.

Inoculum and inoculation

The pathogen was multiplied from pure culture on Autoclaved rice culms bits (5-7cm.). Rice plants were inoculated at tillering stage (35-40 DAT) by placing the inoculums between the tillers just above the water lines.

Disease observations were recorded in disease managed plot and non managed plot by fixing 5 sampling unit of one square meter in each plot. The disease severity and incidence were recorded in percent and increased in yield (kg/h) was calculated by using following formula;

$$\text{Percent increase in Yield} = \frac{\text{Yield in treated} - \text{yield in check plot}}{\text{Yield in untreated plot}} \times 100$$

The degree of severity estimated by on the basis of plant tissue affected by the disease and express as percentage of the total area. This was calculated by the percentage of leaf and sheath area of each tillers in a sampled hills covered by the sheath blight lesions. Percentage of the disease incidence were calculated on 15 plants per sampling units, by counting the number of infected tillers.

Results

From the perusal of table 1 and 2 disease management practices viz. seed treatment, use of FYM in the main field, cleaning of main fields and bunds, use of 2/3 dose of Nitrogen reduced the severity and incidence of sheath blight in all three varieties. In the susceptible varieties Pusa Basmati-1 showing sheath blight severity 25.4% & 26.3%, incidence 16.6% & 22.8%, with 3662 kg/ha &3243 kg/ha yield was recorded in diseased managed plot where as disease severity has gone 59.1% & 66%, incidence 32.67% & 45.2% with grain yield of 2775 kg/ha &2225 kg/ha during two consecutive year respectively. While in the MR varieties NDR 359 disease severity 18.55 & 21.7%, incidence 15.4% & 19.5% with grain yield of 5037 kg/ha & 4412 kg/ha was recorded in disease management adopted plot where as in non disease managed plot disease severity 27.4% & 35.2%, incidence 18.1% & 25.2% with grain yield of 4575 &3750kg/ha in both the year. In the case of hybrid variety disease severity was observed in disease managed plot 20.5% & 25.5%, incidence 13.3% & 17.2% with the grain yield 6375 kg/ka & 6187 kg/ha was recorded. As in non managed plot disease severity was recorded 26.4% & 30.4%, incidence 13.8% & 20.6% with grain yield of 5912 kg/ha & 5675 kg/ha.

The result showed on susceptible varieties the response of integrated disease management practices was more than moderate resistant and hybrids. It also revealed that susceptible varieties those are preferred by farmers/rice growers can be grow by adopting efficient integrated management practice with low cost inputs.

Discussion

The management practices seed treatment, use of FYM, cleaning of bunds and field, reduced (2/3) dose of Nitrogen with need based spray of fungicides reduced the initial inoculums resulted delayed the initiation of symptom of sheath blight hence reduced the disease severity and incidence. So that disease can be managed even some time without spray or minimum spray of chemical fungicides and increased the grain yield of rice. Devi. *et al*. (1987) [1] and Krishnakant *et al*. (2015) also found the best curative and protective effects of Validamycin, Bio-Pesticides and Propiconazole against sheath blight of rice. Upmanyu *et al*. (2002) [3] also reported that spray of Carbendazim were most effective in reducing sheath blight severity and increased the grain yield. The minimization of disease severity may be one of the possible reasons for enhancement of grain yield. Singh *et al*. (2016) also reported the compatibility of different fungicide with insecticide for the management of sheath blight.

Table 1: Response of Integrated disease management practices on sheath blight of rice (WS 2013)

Main plot/Variety	Sub plot- Disease severity (%)		Sub plot- Disease incidence (%)		Yield kg/ha	
	DM	NDM	DM	NDM	DM	NDM
PB 1 (S)	25.4 (30.2)	59.1 (50.2)	16.7 (24.1)	32.7 (34.8)	3662	2775
NDR 359 (MR)	18.50 (25.43)	27.4 (31.5)	15.4 (23.1)	18.1 (25.1)	5037	4575
PA 6201(H)	20.5 (26.8)	26.4 (30.9)	13.3 (21.3)	13.8 (21.7)	6375	5912
CD @5% for main plot (Var.)	2.45		1.98		285	
CD @5% for sub plot (M)	1.46		1.63		183	
CV (rep-Var.)	8.17		6.50		7.94	
CV (rep-Var.-N)	7.87		7.06		7.21	

Table 2: Response of Integrated Management Practices on sheath blight of rice (WS 2014)

Main plot/Variety	Sub plot- Disease severity (%)		Sub plot- Disease incidence (%)		Yield kg/ha	
	DM	NDM	DM	NDM	DM	NDM
PB 1 (S)	26.3 (30.83)	66.0 (54.33)	22.85 (28.54)	45.2 (42.23)	3243	2225
NDR 359 (MR)	21.67 (27.72)	35.17 (36.35)	19.45 (26.14)	25.52 (30.31)	4412	3750
PA 6201 (H)	25.57 (28.34)	30.35 (33.4)	17.17 (24.46)	20.62 (26.97)	6187	5675
CD @5% for main plot (Var.)	1.81		1.69		310	
CD @5% for sub plot (M)	1.5		1.31		165	
CV (rep-Var.)	7.5		7.66		8.19	
CV (rep-Var.-N)	8.57		8.14		7.34	
Figure in parenthesis are AT transformed value DM- Disease management NDM- No Disease management						

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