
Resurgence of some minor diseases on widely cultivated high yielding rice (*Oryza sativa*) varieties in West Bengal

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Studies were undertaken for two years in *Kharif* season to see the resurgence of three minor rice diseases mainly Brown Spot (c.o. *Helminthosporium oryzae*), Narrow brown Spot (c.o. *Cercospora janseana*) and Leaf Scald (c.o. *Rhynchosporium oryzae*) on nine high yielding varieties of rice (*Oryza sativa* L.). The varieties were tested in different locations and the results on disease severity based on the no or size of the infective lesion were pooled together for analysis. All the nine varieties were found to be susceptible to all the foliar diseases irrespective of locations and land situation. Severity of brown spot was more in comparison to narrow brown spot and leaf scald disease and the varieties those are extensively cultivated recorded maximum infection. The rice variety MTU 7029 is widely accepted by the growers for its better yield but this variety is becoming more susceptible not only to minor foliar pathogens but also to many major diseases.

Key words: Resurgence, Rice diseases, Brown Spot, Narrow Brown Spot, Leaf Scald

INTRODUCTION

Rice is the major cereal crop in West Bengal and presently most of the traditional varieties have been replaced by high yielding varieties (HYVs) due to their higher productivity. Scope of extensive choice of varieties, maximum use of nitrogenous fertilizer, continuous cultivation certainly has increased the productivity but at the same time those HYVs are becoming more susceptible not only to major diseases like Blast (BL), Sheath Blight (SB) Bacterial leaf blight (BLB) or Rice Tungro virus (RTV) and simultaneously also to many so called minor foliar diseases like Brown spot (BS, *Helminthosporium oryzae*), Narrow brown spot (NBS, *Cercospora janseana*) and Leaf scald (L.S. *Rhynchosporium oryzae*). In most of the HYVs these foliar diseases have been considered as minor diseases because of their negligible incidence at least for several years after their introduction. Presently the scenario of rice disease has changed and the so called minor diseases are now coming into prominence and may threaten the cultivation of HYVs in near future in West Bengal.

Traditionally in West Bengal there are three rice

seasons of which monsoon (*Kharif / Aman*) is the predominant where almost 90% of the cultivated land is covered with more than 80% of HYVs, while in summer (*Rabi*) entire area is covered with HYVs. Incidence of disease and pest is generally high in monsoon rice. Some of the rice diseases are very widespread and found almost in all rice growing countries of the world and called as 'major rice diseases' and few of them are of low occurrence and considered as 'minor rice diseases.' Many of those minor diseases have recently come forward and signified as major one (Narain 1992, Nato 1994, Chowdhury, 2002; 2004). Considering the importance of those minor diseases an estimation has been made to assess the status of BS, NBS and LS infection on nine popular HYVs that are widely cultivated for last several year in West Bengal.

MATERIALS AND METHODS

Field experiments were conducted at Regional Research Station (RRS), New Alluvial Zone, Chakdah under BCKV, Regional Research Station, Gayeshpur, Chinsura Rice Research Station and the farmer's field of this locality for two years during *kharif* season of 2001 and 2002 to record the

disease incidence and severity of some minor rice diseases. Most of the high yielding varieties (HYVs) of rice were selected and they were MTU-7029 (locally known as Lal Swarna), IET-4786, IET-4094, IET-5656, I#T-1444, IET-9947, MW-10, IR-36 and Sabitri to record their susceptibility to minor fungal pathogens.

Layout of filed experiment was made with RBD design having the plot size of 5 m × 4 m in length and breadth. Thirty days old seedlings were transplanted with a spacing of 15 × 15 cm. between plant to plant and line to line respectively.

Observations of fungal diseases like brown spot, narrow brown spot, and leaf scald in different varieties were taken at fixed interval in the selected field during *kharif* season. For foliar disease 15 leaf samples (third leaf from the top) having the infection site were collected randomly and recorded the number of spots to measure the incidence and severity of BS, NBS and LS diseases. Data represented by percentage of disease incidence and severity were calculated based on the disease rating scale developed by IRRI (1988).

RESULTS AND DISCUSSION

To estimate the incidence of brown spot, lesion number on the third leaf from top of an individual tiller was counted (Dasgupta and Chattopadhyaya, 1975) which showed higher number of lesions per leaf in plant cultivated in farmers plot than the plots of research station for both the years. Irrespective of varieties the number of lesions/leaf and disease severity were found more in MTU-7029 and minimum in Sabitri, however, no significant variation on the severity and lesion number was observed between the two years of observations. Two years data on the disease incidence and severity of BS were pooled together, statistically analysed for comparison within the varieties under similar environmental conditions. Pooled results showed that in all the location MTU-7029 recorded both higher number of lesion and severity of brown spot infestation (Table 1)

Before 1960, brown spot was one of the major rice diseases of traditional tall indica varieties and caused substantial loss in yield in West Bengal (Roy, 1949; Chattopadhyaya and Sengupta, 1952;

Chattopadhyay and Chakrabarti, 1953). Sharma (1980) and Biswas (2000) have summarized the occurrence of major and minor rice diseases before and after introduction of HYVs and pointed out that recently brown spot along with other minor rice diseases are increasing at a high rate with the intensification of rice cultivation. Based on the results of two years field experiment, it could be concluded that resurgence of brown spot has taken place in many of the popular rice cultivars which need proper attention to check the further outbreak by using tolerant varieties.

Narrow brown leaf spot (NBS) of rice caused by *C. janseana* was considered as minor disease but recently the disease has been noticed in many rice varieties particularly from the mid tillering stage. The disease is widespread in many countries of South-East Asia and from India it was first reported from West Bengal by Ganguli (1946) and later some work has been made by Chakrabarti (1964) mostly with traditional varieties. Till now no information on the present status of NBS is available from the West Bengal and the results showed that all the 9 varieties were infected by *C. janseana* in all the five locations for both the years of observation.

Both the disease severity and number of infected lesion in each of the varieties are pooled together and presented in Table 2. Generally in all the locations severity of NBS was found high in MTU-7029 followed by MW-10 excepting in Rice Research Station, Chinsura. Variety IR-36 is extensively cultivated in many States of India for its slender grain quality and the variety was resistant to many rice diseases at the time of its introduction. But present observation for two consecutive years showed considerably high incidence and severity of NBS disease in respect to other varieties in all the locations. Similarly variety IET-4786 presently released by name "Satabdi" in West Bengal is grown continuously in this region for several years as a result both severity and disease incidence were gradually increasing with the intensive cultivation of this variety.

Occurrence of narrow brown leaf spot in Orissa, Tamil Nadu and in Uttar Pradesh is common (Sridhar, 1970; Singh, 1988; Das and Sahu, 1998) and usually becoming more severe when the rice approaches towards maturity. Biswas (2000)

Table 1. Pooled number of spot per leaf and disease severity of brown spot disease caused by *Helminthosporium oryzae* in different varieties of rice under field condition at different locations for two seasons

Variety	Research Stations						Farmers' fields			
	Chakdah		Gayeshpur		Chinsura		Chakdah		Gontra	
	Av. No. of spots/leaf	Severity	Av. No. of spots/leaf	Severity	Av. No. of spots/leaf	Severity	Av. No. of spots/leaf	Severity	Av. No. of spots/leaf	Severity
MTU-7029	55.05 ^a	27.95 ^a (31.87)*	52.78 ^a	24.87 ^a (29.85)	57.13 ^a	24.68 ^a (29.65)	62.58 ^a	28.84 ^a (32.46)	63.18 ^a	28.02 ^a (31.88)
IET-4786	32.25 ^d	17.26 ^{de} (24.53)	37.34 ^c	16.23 ^{ef} (23.74)	32.01 ^{ef}	14.74 ^{ef} (22.55)	36.57 ^{cde}	17.58 ^d (24.77)	35.68 ^e	17.58 ^{ed} (24.77)
IET-4094	43.45 ^b	20.73 ^{bc} (27.05)	46.23 ^b	23.14 ^c (28.87)	41.47 ^c	21.66 ^c (27.72)	48.55 ^b	23.02 ^b (28.57)	45.39 ^c	23.32 ^b (28.82)
IET-1444	36.43 ^c	18.88 ^{cd} (25.74)	41.08 ^c	18.93 ^{cd} (25.78)	38.19 ^{cd}	19.66 ^{cd} (26.29)	39.85 ^c	19.99 ^c (26.52)	40.39 ^d	19.87 ^c (26.45)
IET-5656	28.46 ^e	13.82 ^{gh} (21.76)	32.22 ^d	32.76 ^{de} (21.75)	35.84 ^{de}	13.39 ^{de} (21.44)	31.96 ^e	14.75 ^{ef} (22.56)	32.40 ^f	15.24 ^e (22.95)
IET-9947	29.54 ^{de}	14.99 ^{fg} (22.77)	31.58 ^d	15.12 ^{def} (22.85)	34.07 ^{def}	15.12 ^{def} (22.86)	37.97 ^{cd}	15.36 ^{ef} (23.05)	35.35 ^{ef}	15.49 ^{de} (23.16)
MW-10	46.90 ^b	22.09 ^b (28.00)	41.18 ^c	23.27 ^b (27.41)	51.63 ^b	23.32 ^b (28.86)	51.87 ^b	24.44 ^b (29.59)	51.21 ^b	24.36 ^b (29.55)
IR-36	30.10 ^{de}	15.67 ^{ef} (23.30)	41.71 ^{bc}	16.10 ^d (23.64)	32.64 ^{ef}	16.15 ^{ef} (23.67)	33.81 ^{de}	16.84 ^{de} (24.21)	34.41 ^{ef}	17.22 ^{de} (24.51)
Sabitri	28.39 ^e	13.08 ^h (21.18)	30.18 ^d	13.82 ^e (21.82)	31.07 ^f	14.13 ^f (22.01)	32.02 ^e	14.40 ^f (22.35)	32.91 ^{ef}	15.80 ^{de} (23.40)
SEm(±)	1.268	0.533	1.681	0.467	1.655	0.679	1.759	0.579	1.057	0.609

* Figure in the parenthesis indicate pooled mean of replicated angular transformed values.
Means followed by same letter in each column are not significantly different by DMRT (P = 0.05)

Table 2. Pooled number of spot and disease severity of narrow brown leaf spots caused by *Cercospora janseana* in different varieties of rice under field condition at different locations during kharif 2001 and 2002

Variety	Research Stations						Farmers' fields			
	Chakdah		Gayeshpur		Chinsura		Chakdah		Gontra	
	Av. No. of spots/leaf	Severity	Av. No. of spots/leaf	Severity	Av. No. of spots/leaf	Severity	Av. No. of spots/leaf	Severity	Av. No. of spots/leaf	Severity
MTU-7029	38.44 ^a	21.80 ^a (4.65)*	34.33 ^a	18.26 ^a (4.26)	39.17 ^a	22.07 ^a (4.68)	41.18 ^a	23.81 ^a (4.86)	37.81 ^a	21.64 ^a (4.64)
IET-4786	23.54 ^d	12.29 ^b (3.50)	14.44 ^b	7.87 ^b (2.79)	20.93 ^b	11.77 ^b (3.42)	21.74 ^b	11.73 ^b (3.41)	21.37 ^b	11.49 ^b (3.38)
IET-4094	10.73 ^c	5.62 ^c (2.34)	10.02 ^c	5.96 ^c (2.43)	12.49 ^d	8.63 ^c (2.85)	12.93 ^d	8.16 ^d (2.80)	14.43 ^{cd}	8.33 ^e (2.81)
IET-1444	10.05 ^c	4.64 ^c (2.13)	8.99 ^{cd}	5.20 ^{cd} (2.25)	8.17 ^e	4.57 ^c (2.11)	13.43 ^d	5.73 ^d (2.35)	12.87 ^d	6.22 ^{de} (2.48)
IET-5656	6.17 ^d	2.94 ^d (1.70)	5.91 ^d	3.40 ^d (1.80)	7.26 ^e	4.41 ^{ef} (2.08)	11.08 ^{de}	5.87 ^{de} (2.38)	14.94 ^e	5.32 ^{ef} (2.26)
IET-9947	8.15 ^{cd}	3.32 ^{cd} (1.80)	8.52 ^{cd}	3.96 ^{cd} (1.97)	7.37 ^e	3.54 ^f (1.85)	8.64 ^c	5.30 ^e (2.24)	7.15 ^e	4.01 ^f (1.97)
MW-10	21.45 ^b	11.77 ^b (3.40)	18.54 ^b	9.12 ^b (2.99)	14.91 ^c	7.91 ^c (2.76)	21.88 ^b	10.02 ^b (3.13)	20.16 ^b	11.35 ^b (3.36)
IR-36	10.46 ^c	5.68 ^c (2.36)	10.68 ^c	6.15 ^c (2.46)	12.04 ^d	6.34 ^d (2.49)	16.38 ^c	8.62 ^c (2.92)	16.14 ^c	7.26 ^{ed} (2.69)
Sabitri	9.86 ^c	4.08 ^c (2.01)	8.77 ^{cd}	4.56 ^{cd} (2.12)	7.73 ^e	4.18 ^{ef} (2.03)	9.41 ^e	4.85 ^e (2.16)	7.33 ^e	3.92 ^f (1.97)
SEm(±)	1.031	0.098	1.088	0.096	0.842	0.090	0.864	0.091	1.013	0.113

* Figure in the parenthesis indicate pooled mean of replicated angular transformed values
Means followed by same letter in each column are not significantly different by DMRT (P = 0.05)

Table 3. Pooled number of infection site and disease severity of leaf scald caused by *Rhynchosporium oryzae* in different varieties of rice under field condition at different location for two seasons.

Variety	Research Stations						Farmers' fields			
	Chakdah		Gayeshpur		Chinsura		Chakdah		Gontra	
	Av. No. of spots/leaf	Severity	Av. No. of spots/leaf	Severity	Av. No. of spots/leaf	Severity	Av. No. of spots/leaf	Severity	Av. No. of spots/leaf	Severity
MTU-7029	13.80 ^a	11.50 ^a (3.33)*	10.65 ^a	9.06 ^a (3.00)	11.63 ^a	9.72 ^a (3.10)	15.61 ^a	12.77 ^a (3.57)	12.63 ^a	11.38 ^a (3.36)
IET-4786	7.09 ^b	3.78 ^b (1.95)	4.71 ^b	1.30 ^{bc} (1.09)	5.52 ^b	2.31 ^b (1.49)	5.66 ^b	2.36 ^b (1.49)	5.61 ^b	2.48 ^b (1.56)
IET-4094	2.85 ^c	2.02 ^{cd} (1.37)	2.99 ^c	0.97 ^{bc} (0.94)	5.07 ^b	2.59 ^b (1.58)	4.58 ^{cd}	2.36 ^b (1.50)	5.66 ^b	1.89 ^b (1.36)
IET-1444	2.95 ^c	1.75 ^{cd} (1.21)	2.46 ^{cd}	0.80 ^{bcd} (0.89)	2.20 ^c	1.06 ^{cd} (1.00)	3.77 ^{de}	1.94 ^b (1.36)	3.25 ^{cd}	1.43 ^c (1.05)
IET-5656	2.17 ^c	1.31 ^{cde} (1.10)	1.31 ^d	0.69 ^c (0.80)	2.32 ^c	1.47 ^{cd} (1.14)	2.76 ^e	0.93 ^c (0.92)	2.58 ^d	0.92 ^{cd} (0.92)
IET-9947	2.15 ^c	0.55 ^f (0.72)	2.26 ^{cd}	0.83 ^c (0.86)	2.23 ^{bc}	0.74 ^d (0.87)	2.80 ^{de}	0.79 ^c (0.85)	2.27 ^d	0.65 ^d (0.78)
MW-10	6.05 ^b	2.03 ^c (1.40)	5.34 ^b	1.57 ^b (1.22)	3.77 ^{bc}	1.80 ^{bc} (1.28)	6.98 ^b	2.63 ^b (1.60)	5.27 ^b	2.53 ^b (1.57)
IR-36	2.89 ^c	1.25 ^{de} (1.07)	3.14 ^c	1.55 ^{bc} (1.13)	3.73 ^{bc}	1.80 ^{bc} (1.28)	4.46 ^{cde}	1.99 ^b (1.39)	4.54 ^{bc}	2.08 ^b (1.43)
Sabitri	2.16 ^c	0.69 ^{ef} (0.81)	2.41 ^{cd}	0.69 ^c (0.80)	2.39 ^c	0.88 ^d (0.90)	2.66 ^e	0.81 ^c (0.85)	2.46 ^d	0.79 ^{cd} (0.86)
SEm(±)	0.693	0.113	0.463	0.119	0.642	0.110	0.641	0.087	0.663	0.091

* Figure in the parenthesis indicate pooled mean of replicated angular transformed values

Means followed by same letter in each column are not significantly different by DMRT (P = 0.05)

recorded the incidence of NBS from West Bengal and after that no information is available but present observation clearly showed the existence of the disease in all the rice varieties irrespective of locations. Farmers generally used high rate of N in HYV with rice-rice rotation, which may predispose the rice plant for higher incidence of so called minor diseases.

Considering the wide occurrence of leaf scald in *kharif* rice this study was made to assess their incidence and severity under natural condition and two years data are pooled together and presented in Table 3. Data showed that highest lesion number in MTU-7029 variety varied from 10.65 to 13.80/leaf (third young leaf) followed by IET-4786 (4.71 to 7.09) and in MW-10 (3.77 to 6.98). The remaining varieties had low infection and in few of them differed significantly among each other.

It appears from the results that though the incidence and severity of leaf scald disease were low but in few varieties like MTU-7029, MW-10 and IET-4786 it was found to increase. Incidence of the disease varied with the susceptibility of the variety, age and

nutritional factor (Singh and Sengupta, 1985, 1987; Virmani & Sumo, 1978; Das *et al.* 1994). Virmani and Sumo (1978) tested 400 rice germplasms and suggested that most of the HYVs were susceptible to this disease and also noted that high N increased the susceptibility of the host plant. Besides the foliar symptoms pathogen also caused seed rot, seedling blight and changed the seed colour (Mia and Safeulla, 1986).

Disease incidence and severity of three foliar diseases namely BS, NBS and LS recorded under natural condition for two years of field experiments, clearly indicated that these minor diseases are coming into prominence with the intensive cultivation of rice. Most of the varieties commonly grown by the farmers in different agro-climatic situation were included in this study and field observations giving a positive indication that the so called minor diseases are coming into prominence. In this context critical studies on the causal pathogen, host relation and epidemiological factors are urgently needed to develop proper control methods for obtaining a sustainable yield from these popular and widely accepted varieties of rice in near future.

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