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INCIDENCE OF BACTERIAL BLIGHT OF RICE IN PAKISTAN DURING 2002

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Abstract

Bacterial blight (BB) of rice incited by *Xanthomonas oryzae* pv. *oryzae* created a serious situation in rice during the crop year 2002. It occurs at all stages of the crop and shows either kresek or leaf blight symptoms. If plant produces panicles, the sterility percentage increases as well as the number of immature grains. Grains from diseased plants are easily broken during milling. When there is heavy infection, no grain formation takes place. This survey was conducted during the crop year 2002 in Punjab, Sindh, Balochistan, NWFP and Azad Jammu & Kashmir to study the latest situation of this menace. In Punjab the incidence (% of infected plants) of bacterial blight ranges from 15-100, 10-70, 10-90, 15-65, 0-50, 0-100, 30-80, 45, 50-70 and 40-50 in Sargodha, Hafizabad, Sheikhupura, Sialkot, Narowal, Gujranwala, Gujrat, Lahore, Kasur and Okara respectively and severity (% of infected tissue/area expressed on 0-9 scale) ranges form 1-7, 1-5, 1-5, 1-3, 0-5, 0-9, 3-3,3, 3-5 in Sargodha, Hafizabad, Sheikhupura, Sialkot, Narowal, Gujranwala, Gujrat, Lahore, Kasur and Okara respectively. In Sindh the incidence (%) was 0, 0-5, 5, 0, 5, 0-5, 0-5 in Larkana, Shikarpur, Dadu, Nawab Shah, Thatta, Badin and Jacob Abad respectively and severity was 0, 0-1, 1, 0, 1, 0-1and 1 in Larkana, Shikarpur, Dadu, Nawab Shah, Thatta, Badin and Jacob Abad respectively. In NWFP the incidence (%) range was 0-95, 0-100 and 0 in Lower Dir, Swat and Malakand Agency respectively whereas severity ranged from 0-5, 0-7 and 0 in Lower Dir, Swat and Malakand Agency respectively. In Balochistan the incidence (%) range was 0 and 0-5 in Nasirabad and Usta Muhammad respectively, whereas severity ranged from 0 and 0-1 in Nasirabad and Usta Muhammad respectively, while in Azad Jammu & Kashmir no disease was observed. The causal agent of bacterial blight of rice was confirmed through biochemical, physiological, hypersensitive reaction and pathogenicity.

Introduction

Rice is an important staple crop of Pakistan, in export of agricultural commodities rice stands second after cotton (Monthly Economic Letter, 1998). In 2001-2002 it contributed around 5.7 % of the total national export and the value of exported rice was US $ 363.6 million (Economic Survey, 2001-2002). The rice crop is susceptible to a number of diseases among which bacterial blight of rice caused by *Xanthomonas oryzae* pv. *oryzae* (Ishiyama; Swings *et al.*, 1990) is one of the most destructive diseases of rice throughout the world (Mew, 1987). This disease is also a serious rice problem in other parts of Asia (Alim, 1967; Ou, 1985). In Pakistan the disease was recorded for the first time by Mew & Majiid (1977), later Ahmad & Majiid (1980) observed it on rice varieties IR 6, Palman, Basmati-198 at Rice Research Institute, Kala Shah Kaku and farmer's field. During rice traveling seminar in 1985 its incidence on farmers field was recorded 10-15, 15-20, 20-25% in Sindh, Punjab and NWFP respectively (Akhtar & Sarwar,

1986). Nineteen rice cultivars under NURYT trail in 1985 were tested at 10 locations and its occurrence was noted in almost all provinces of Pakistan (Akhtar & Akram, 1987). Khan *et al.* (2000) narrated that BB incidence is increasing in Pakistan in recent years especially in Kallar belt that is famous for producing high quality rice.

Bacterial blight occurs at all stages of the rice crop and shows either kresek or leaf blight symptoms. If plant produces panicles, the sterility percentage increases as well as the number of immature grains. Grains from diseased plants were easily broken during milling. There may be 50 % reduction in yield in case of severe infection, whereas under mild infection 10-12 % yield reduction has been recorded (Ou, 1985). When there is heavy infection, no grain formation takes place. The present survey was conducted for monitoring bacterial blight incidence and severity in Punjab, Sindh, NWFP, Balochistan and Azad Jammu & Kashmir rice growing areas. Diseased samples were collected for isolation and characterization of the pathogen.

Materials and Methods

Rice growing areas of Punjab, Sindh, NWFP, Balochistan and Azad Jammu Kashmir were surveyed during this study. Rice fields near to roadside were preferred for the survey. The number of locations/fields surveyed was dependent on cropping intensity and pattern. Each halt was after 10 km on the route depending upon the crop intensity. The general appearance of the field was observed for the presence or absence of disease symptoms and the incidence of BB was recorded. For each field, samples were taken at 5 points/hills along a diagonal transect. At each point/ hill 4 plants were examined for disease symptoms and data of incidence and severity was collected. The data on incidence was recorded as percentage of infected plants while severity was recorded as percentage of tissue/area infected. For scoring of severity, 0-9 scale was used *i.e.* 0: no disease, 1: 1-5 %, 3: 6-12 %, 5: 13-25 %, 7: 26-50 %, 9: 51-100 % lesion area (IRRI, 1996). For collection of samples upper 3 leaves of each diseased plant were collected. These were composited and a representative sample was taken for isolation.

The infected tissues were cut into 2x7 mm section from advancing portion of the lesions. Leaf tissues were sterilized in 70 % alcohol for 1 min and were placed in Peptone Sucrose Agar medium, Nutrient Agar and Yeast Dextrose Calcium Carbonate Agar and incubated at 28 °C for 72-96 h. Isolated colonies were checked for biochemical tests, hypersensitive reaction and pathogenicity reaction. Pathogenic isolates were preserved in silica gel or Sterile Distilled Water (SDW).

Results and Discussion

Analysis of variance indicates no significant difference in incidence and severity among districts of Punjab and Sindh provinces whereas, analysis for correlation showed highly positive correlation between incidence and severity in all the provinces.

In Punjab the incidence (%) of bacterial blight ranged from 15-100, 10-70, 10-90, 15-65, 0-50, 0-100, 30-80, 45, 50-70 and 40-50 in Sargodha, Hafizabad, Sheikhupura, Sialkot, Narowal, Gujranwala, Gujrat, Lahore, Kasur and Okara respectively and severity ranges from 1-7, 1-5, 1-5, 1-3, 0-5, 0-9, 3,3,3, 3-5 in Sargodha, Hafizabad, Sheikhupura, Sialkot, Narowal, Gujranwala, Gujrat, Lahore, Kasur and Okara respectively (Table1). There is no significant difference in incidence and severity among Punjab districts (Table 5) but a strong positive correlation (0.884) exits between incidence and severity.

Table 1. Incidence and severity of bacterial blight of rice in Punjab during 2002.

Districts	Incidence (%)		Severity (0-9)	
	Range	Mean	Range	Mean
Sargodha	15-100	64	1-7	5
Hafizabad	10-70	43	1-5	3
Sheikhupura	10-90	36	1-5	3
Sialkot	15-65	34	1-3	1
Narowal	0-50	28	0-5	3
Gujranwala	0-100	41	0-9	3
Gujrat	30-80	55	3	3
Lahore	45	45	3	3
Kasur	50-70	55	3	3
Okara	40-50	47	3-5	3

Table. 2. Incidence and severity of bacterial blight of rice in Sindh during 2002.

Districts	Incidence (%)		Severity (0-9)	
	Range	Mean	Range	Mean
Larkana	0	0	0	0
Shikar Pur	0-5	2.5	0-1	1
Dadu	5	5	1	1
Nawab Shah	0	0	0	0
Thatta	5	5	1	1
Badin	0-5	2.5	0-1	1
Jacob Abad	0-5	4	1	0-1

Table. 3. Incidence and severity of bacterial blight of rice in NWFP during 2002.

Districts	Incidence (%)		Severity (0-9)	
	Range	Mean	Range	Mean
Lower Dir	0-95	20.5	0-5	1
Swat	0-100	38.12	0-7	3
Malakand Agency	0	0	0	0

In Sindh the incidence (%) was 0, 0-5,5, 0.5, 0-5 and 0-5 in Larkana, Shikarpur, Dadu, Nawab Shah, Thatta, Badin and Jacob Abad respectively and severity was 0, 0-1, 1, 0, 1, 0-1 and 1 in Larkana, Shikarpur, Dadu, Nawab Shah, Thatta, Badin and Jacob Abad respectively (Table 2) which are also non significant (Table 5). Both these parameters were found medium correlated (0.529).

In NWFP the incidence (%) range was 0-95, 0-100 and 0 in Lower Dir, Swat and Malakand Agency respectively whereas severity ranges from 0-5, 0-7 and 0 in Lower Dir, Swat and Malakand Agency respectively (Table 3). The F-test indicates no significant difference for incidence in NWFP districts. Which indicates significant difference for severity in NWFP districts at 10 percent level (Table 5). The incidence and severity showed highly positive correlation (0.825).

In Balochistan the incidence (%) range was 0 and 0-5 and severity range was 0 and 0-1 in Nasirabad and Usta Muhammad. A perfect positive correlation (1) exits between incidence and severity in Balochistan also. In Azad Jammu & Kashmir no disease was observed (Table 4).

Table. 4. Incidence and severity of bacterial blight of rice in Balochistan and Azad Jammu & Kashmir during 2002.

Districts	Incidence (%)		Severity (0-9)	
	Range	Mean		Range
Nasir Abad (Balochistan)	0	0	0	0
Usta Muhammad (Balochistan)	0-5	2.5	0.1	1
Muzafarabad (AJK)	0	0	0	0
Mansehra	0	0	0	0

Table. 5. Analysis of variance of incidence and severity of bacterial blight of rice in different provinces.

	Incidence F-value	Severity F-value
Punjab (Selected Distts.)	NS	NS
Sindh (Selected Distts.)	NS	NS
NWFP (Selected Distts.)	NS	**

NS= Non Significant

** = Significant at 10 percent

Bacterial blight incidence is increasing in Pakistan in recent years especially in Kallar belt that is famous for producing high quality rice (Khan *et al.*, 2000). Bacterial blight incidence and severity in Punjab remained high during September-October, due to conducive environment (sudden strong wind & rain) at the time of panicle initiation & flowering of rice cultivars. Super Basmati was the main cultivar in the area and it was highly susceptible to bacterial blight. In Swat and Lower Dir the main cause of high incidence of BB was the mixing of Shoga variety with JP-5, which is outdated and susceptible to BB. Bacterium was isolated from disease samples collected from all the localities and confirmed through biochemical, physiological, hypersensitive and pathogenicity reactions.

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