Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(3): 4613-4615
Received: 04-03-2019
Accepted: 06-04-2019

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Response of integrated disease management practices on bacterial leaf blight of rice

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Abstract
Bacterial leaf blight disease caused by *Xanthomonas oryzae* pv. *oryzae*. Disease occurs in two phases – Kresek phase or Wilt phase which usually occurs at active tillering stage results death of the tillers. Other is Leaf blight phase, which is most common phase. In this phase disease initially starts from either one or both side of the leaf margins become water soaked and turns yellow to straw color in wavy pattern. The progress of disease, drying spreads downwards and inwards of the leaf blade causing drying and death of the leaves. 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 chemicals} 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 managed plot disease severity was recorded (59.1%) with (2775 kg/ha) yield in susceptible variety Pusa Basmati-1.

Keywords: Management practices, bacterial leaf blight, rice

Introduction
Bacterial leaf blight (BLB) disease, caused by *Xanthomonas oryzae pv. oryzae* is one of the most serious diseases in most rice growing countries due to its high epidemic potential and destructiveness to high-yielding cultivars in both temperate and tropical regions. Bacterial leaf blight was first noticed by the farmers in Japan 1881. In India the disease was first reported by Srinivasan *et al.* (1959) [3] from Maharastra BLB occurs at all the growth stages of rice and is manifested by either leaf blight or "kresek" symptoms. If plant ever produces panicles, it results in sterile immature grains, which are easily broken during milling. Yield reduction has been recorded about 10-12% in case of mild infection and in case of severe infection reduction in yield has been recorded 50% Rao and Kauffman (1971) [1] and 6-60% by Srivastava and Rao (1966) [5] and Singh & Ahamad (1975) [2]. When there is heavy infection, no grain formation takes place. The causal organism consists of straight rods, with a single polar flagellum, occurs singularly or in pairs or sometimes in chains and is gram negative. The bacterium enters the plants through natural openings or wounds where it survives and multiplies in plant's vascular system, producing typical leaf blight symptoms. Various chemicals including antibiotics has been tested and used against bacterial blight of rice. However none of these proved satisfactory Srivastava (1972) [4]. In the absence of specific chemicals control measures for the disease efforts have been made to develop resistant varieties against the disease Pavgi *et al.* (1964) [6] and Srinivasan *et al.* (1959) [3]. In view of above fact integrated disease management practices were tried to manage the disease by reducing the initial inoculum resulted delayed the occurrence of disease.

Methods and Materials
The experiments were carried out at Crop Research Station, Masodha during WS 2015 and 2016. The BLB infected samples were collected from rice field during crop season. The pathogen was isolated and characterized on the basis of its colony character, Pathogenecity of the pathogen was confirmed by proving the Koch's postulate (1876). The cultures were maintained on slants containing Peptone Sucrose Agar Medium. To evaluate the effect of integrated disease management practices on Bacterial leaf blight of rice under field condition. The experiment was constituted on three rice varieties viz. PB-1(susceptible), NDR-359(MR), Amruth (Hybrid) in Split plot design with four replication adopting net plot size of 5×4m. and a 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 chemicals} were adopted in managed plot. While in non managed plot farmer practice were adopted.

Inoculum and inoculation

The bacterial blight pathogen is multiplied on peptone sucrose agar medium and 48 hours old pure culture of the pathogen is brought in to suspension by adding 10ml. of water per slant to give the concentration of bacterial cells of about 10^8 to 10^9 CFU/ml. inoculated the plant between maximum tillering and booting stage 55 to 60 DAT. The scissors were dipped in bacterial suspension and cut of top 2-3cm. of leaves. Disease observations were recorded in disease managed plot and non managed plot by fixing 5 sampling unit of one square metre in each plot. The disease severity 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 were done by the percentage of leaf area of each plant in a sampled hills covered by the BLB lesions.

Results

From the perusal of table 1 and 2 disease management practices viz. seed treatment, during sowing and use of FYM in the main field, cleaning of main fields and bunds, use of 2/3 dose of Nitrogen reduced the severity of bacterial leaf blight in all three varieties. In the susceptible varieties Pusa Basmati-1 showed severity of BLB 23.1% & 26.3%, with & with 3038 kg/ha & 3200 kg/ha yield was recorded in diseased managed plot where as disease severity has gone 35.8% & 42%, with grain yield of 2263 kg/ha &2350 kg/ha during two consecutive year respectively. While in the MR varieties NDR 359 disease severity 14.6 & 21.7% with grain yield of 4238 kg/ha & 4375 kg/ha was recorded in disease management adopted plot where as in non managed plot disease severity 22.2% & 29.5% with grain yield of 3825 & 3950 kg/ha in both the year. In the case of hybrid variety disease severity was observed in disease managed plot 18.7% & 25.5% with the grain yield 4413 kg/ka & 4650 kg/ha was recorded. As in non managed plot disease severity was recorded 25.8% & 30.4% with grain yield of 3775 kg/ha & 3888 kg/ha.

The result showed in susceptible varieties the response of integrated disease management practices was more than moderate resistant and hybrids. It is also concluded the susceptible varieties those are preferred by farmers/rice growers can be grow by adopting efficient integrated management practice without additional input on plant protection measure.

Table 1: Response of Integrated disease management practices on bacterial leaf blight of rice (WS 2015)

Main plot/Variety	Sub plot- Disease severity (%)		Yield kg/ha	
	DM	NDM	DM	NDM
PB 1 (S)	23.1 (28.7)	35.8 (36.7)	3038	2263
NDR 359 (MR)	14.8 (22.5)	22.2 (28.0)	4238	3825
Amruth(H)	18.7 (25.6)	25.8 (30.4)	4413	3775
CD @5% for main plot (Var.)	3.9		277	
CD @5% for sub plot (m)	2.0		182	
CV (rep-Var.)	11.3		8.3	
CV (rep-Var.-N)	7.6		7.5	

Figure in parenthesis are AT transformed value
DM- Disease management
NDM- No Disease management

Table 2: Response of Integrated Management Practices on bacterial leaf blight of rice (WS 2016)

Main plot/Variety	Sub plot- Disease severity (%)		Yield kg/ha	
	DM	NDM	DM	NDM
PB 1 (S)	26.3 (30.8)	42.0 (40.4)	3200	2350
NDR 359 (MR)	21.7 (27.7)	29.5 (32.9)	4375	3950
Amruth (H)	25.6 (28.3)	30.3 (33.4)	4650	3888
CD @5% for main plot (Var.)	1.8		295	
CD @5% for sub plot (m)	1.5		193	
CV (rep-Var.)	8.3		8.11	
CV (rep-Var.-N)	8.1		7.69	

Figure in parenthesis are AT transformed value
DM- Disease management
NDM- No Disease management

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 bactericide reduced the initial inoculums resulted delayed the initiation of symptom of bacterial leaf blight Laha *et al.* (2016) [7] hence reduced the disease severity and incidence. So that disease can be managed by minimum spray of chemicals and increased the grain yield of rice. Prasad *et al.* (2009, 2016) [8, 9] reported the clean cultivation and uses of organic carbon reduces the disease severity and enhance the grain yield of rice. The present finding are comparable with the observations of above workers.

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