RESEARCH ARTICLE

PATHOGENICITY OF *PYRICULARIA ORYZAE* ISOLATES FROM DIFFERENT AGRO-CLIMATIC ZONES OF CHHATTISGARH

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Abstract: The fungus *Pyricularia oryzae* Cavara is the causal agent of rice blast disease. Yield reduction of 10-20% in susceptible rice varieties but in severe cases the yield loss caused by *P. oryzae* may reach upto 80-100%. The highly significant differences were observed among the 63 blast isolates in pathogenicity test. The highest PDI 96.30 per cent was recorded in four isolates and the lowest PDI 51.85 per cent were found in sixteen isolates.

Keywords: Rice blast, *P. oryzae,* PDI, Pathogenicity

INTRODUCTION

Rice (*Oryza sativa* L.) is a primary food that feed more than half of the world's population. Chhattisgarh, the central eastern state is also called as the "Rice bowl of India". The total area of rice in Chhattisgarh is 3.75 million ha with production of 7.71 Mt and productivity is 2050 kg/ha during 2016-17 (Anonymous, 2017). Rice (*Oryza sativa L.*) crop suffers with many diseases caused by fungi, bacteria, viruses, phytoplasma, nematodes and other non-parasitic disorders. Among the fungal diseases, blast disease caused by *Pyricularia oryzae* Cavara is considered as a major threat to rice production because of its wide spread distribution and its destructiveness under favorable conditions. The fungus *Pyricularia oryzae* Cavara is the causal agent of rice blast disease. Yield reduction of 10-20% in susceptible rice varieties but in severe cases the yield loss caused by *P. oryzae* may reach upto 80-100%.

MATERIALS AND METHODS

The seeds of the susceptible variety HR-12 were sown in the plastic cups. When the seedlings were three-weeks-old, they were inoculated with spore suspension (Seven days fresh culture from oat meal agar (OMA) was taken into sterile distilled water and stirred to make a spore suspension at 1 $x10^5$conidia/ml) obtained from the culture grown on oat meal agar. Seedlings were sprayed with sixty three isolates from different agro-climatic zones of Chhattisgarh state were covered with a polythene bag. Inoculated plants were kept for incubation in moist chamber at 28^0C with >95% RH. After incubation the plants were kept in glass house and observations were made for development of blast symptoms on the leaves. Re-isolations were made for sixty three isolates to compare with original isolates and stored in refrigerator for future use. Leaf blast severity of each isolate was recorded on individual plant basis using progressive 0-9 scale (IRRI, 1996) (Prasad *et al*., 2011 and Saifulla *et al*., 2011).

RESULTS AND DISCUSSION

The pathogenicity test of sixty three *P. oryzae* isolates of different agro-climatic zones of Chhattisgarh were tested on susceptible rice cultivar, HR-12 under glasshouse conditions and proved by Koch's postulates. Highly significant differences were observed among the isolates for leaf blast disease using IRRI scale, 1996. The results were summarized in Table 1 and Figure 1 shows that the highest PDI *i.e.*, 96.30 per cent and lowest PDI *i.e.*, 51.85 per cent was recorded over sixty three isolates. The maximum PDI *i.e.*, 96.30 per cent was recorded in four different isolates (PO-CG-16, PO-CG-37, PO-CG-40 and PO-CG-55) followed by 92.59 per cent PDI was observed in two isolates (PO-CG-1 and PO-CG-4), 88.89 per cent PDI in two isolates (PO-CG-2 and PO-CG-57). Similarly, 85.19 per cent PDI was recorded in eight isolates (PO-CG-9, PO-CG-12, PO-CG-13, PO-CG-44, PO-CG-45, PO-CG-49, PO-CG-50 and PO-CG-56), 81.48 and 74.07 per cent PDI was recorded in PO-CG-3 and PO-CG-7 isolates, respectively. 70.37 per cent with PDI of were found respectively in six isolates (PO-CG-15, PO-CG-35, PO-CG-39, PO-CG-48, PO-CG-59 and PO-CG-60), 66.67 per cent PDI in two isolates (PO-CG-38 and PO-CG-51), 62.96 per cent PDI in seven isolates (PO-CG-14, PO-CG-21, PO-CG-31, PO-CG-41, PO-CG-43, PO-CG-58 and PO-CG-63), 59.26 per cent PDI in twelve isolates (PO-CG-5, PO-CG-8, PO-CG-11, PO-CG-18, PO-CG-23, PO-CG-26, PO-CG-29, PO-CG-32, PO-CG-46, PO-CG-54, PO-CG-61 and PO-CG-62) and 55.56 per cent PDI in two isolates (PO-CG-27 and PO-CG-52), were found respectively. The lowest PDI 51.85 per cent was found in sixteen isolates *i.e.*, PO-CG-6, PO-CG-10, PO-CG-17, PO-CG-19, PO-CG-20, PO-CG-22, PO-CG-24, PO-CG-25, PO-CG-28, PO-CG-30, PO-CG-33, PO-CG-34, PO-CG-36, PO-CG-42, PO-CG-47

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and PO-CG-53. These results are in close proximity with the findings of Saifulla *et al*., 2011, Prasad *et al*., 2011, Ghatak *et al*., 2013 and Ramesh Babu *et al*., 2017. Thus the fungus causing the leaf blast disease in rice crop under different regions of Chhattishgarh was established as *Pyricularia oryzae* Cavara.

CONCLUSION

Pathogenicity tests of these isolates revealed that highly significant differences were observed among the 63 isolates. The result indicated that highest PDI 96.30 per cent were recorded in four isolates *i.e*., PO-CG-16, PO-CG-37, PO-CG-40 and PO-CG-55 and the lowest PDI 51.85 per cent were found in sixteen isolates *i.e*., PO-CG-6, PO-CG-10, PO-CG-17, PO-CG-19, PO-CG-20, PO-CG-22, PO-CG-24, PO-CG-25, PO-CG-28, PO-CG-30, PO-CG-33, PO-CG-34, PO-CG-36, PO-CG-42, PO-CG-47 and PO-CG-53.

Table 1. Pathogenicity of rice blast isolates collected from different agro climatic zones of Chhattisgarh under artificially inoculated conditions on susceptible rice cultivar (HR-12)

S. No.	Isolates	Score (IRRI, 1996)	PDI*
1	PO-CG-1	8.3	92.59
2	PO-CG-2	8.0	88.89
3	PO-CG-3	7.3	81.48
4	PO-CG-4	8.3	92.59
5	PO-CG-5	5.3	59.26
6	PO-CG-6	4.7	51.85
7	PO-CG-7	6.7	74.07
8	PO-CG-8	5.3	59.26
9	PO-CG-9	7.7	85.19
10	PO-CG-10	4.7	51.85
11	PO-CG-11	5.3	59.26
12	PO-CG-12	7.7	85.19
13	PO-CG-13	7.7	85.19
14	PO-CG-14	5.7	62.96
15	PO-CG-15	6.3	70.37
16	PO-CG-16	8.7	96.30
17	PO-CG-17	4.7	51.85
18	PO-CG-18	5.3	59.26
19	PO-CG-19	4.7	51.85
20	PO-CG-20	4.7	51.85
21	PO-CG-21	5.7	62.96
22	PO-CG-22	4.7	51.85
23	PO-CG-23	5.3	59.26
24	PO-CG-24	4.7	51.85
25	PO-CG-25	4.7	51.85
26	PO-CG-26	5.3	59.26
27	PO-CG-27	5.0	55.56
28	PO-CG-28	4.7	51.85
29	PO-CG-29	5.3	59.26
30	PO-CG-30	4.7	51.85
31	PO-CG-31	5.7	62.96
32	PO-CG-32	5.3	59.26
33	PO-CG-33	4.7	51.85
34	PO-CG-34	4.7	51.85
35	PO-CG-35	6.3	70.37
36	PO-CG-36	4.7	51.85
37	PO-CG-37	8.7	96.30
38	PO-CG-38	6.0	66.67
39	PO-CG-39	6.3	70.37
40	PO-CG-40	8.7	96.30
41	PO-CG-41	5.7	62.96
42	PO-CG-42	4.7	51.85
43	PO-CG-43	5.7	62.96

S. No.	Isolates	Score (IRRI, 1996)	PDI*
44	PO-CG-44	7.7	85.19
45	PO-CG-45	7.7	85.19
46	PO-CG-46	5.3	59.26
47	PO-CG-47	4.7	51.85
48	PO-CG-48	6.3	70.37
49	PO-CG-49	7.7	85.19
50	PO-CG-50	7.7	85.19
51	PO-CG-51	6.0	66.67
52	PO-CG-52	5.0	55.56
53	PO-CG-53	4.7	51.85
54	PO-CG-54	5.3	59.26
55	PO-CG-55	8.7	96.30
56	PO-CG-56	7.7	85.19
57	PO-CG-57	8.0	88.89
58	PO-CG-58	5.7	62.96
59	PO-CG-59	6.3	70.37
60	PO-CG-60	6.3	70.37
61	PO-CG-61	5.3	59.26
62	PO-CG-62	5.3	59.26
63	PO-CG-63	5.7	62.96

PO- *Pyricularia oryzae*, CG- Chhattisgarh, PDI- Per cent Disease Index

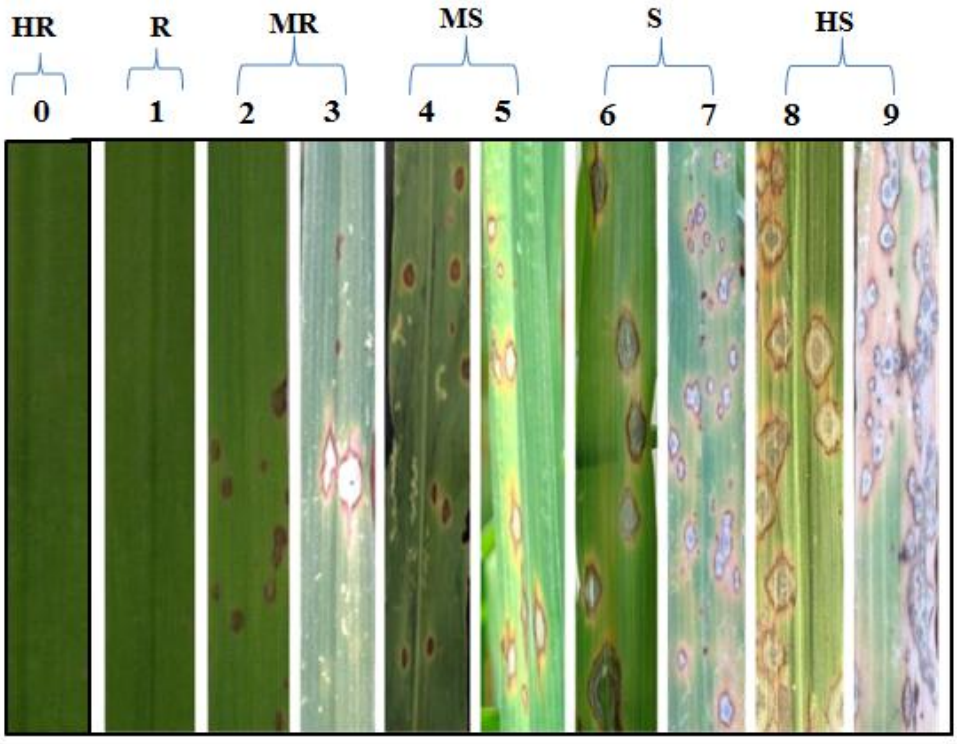

Fig. 1. Leaf blast severity based on disease rating scale (0-9)

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