Screening of rice genotypes for resistance to bakanae disease

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Bakanae disease caused by Fusarium moniliforme Sheld. [teleomorph: Gibberella fujikuroi (Sawada) Ito] is one of the important diseases of paddy occurring in all the rice growing countries (4). In India, the disease has been reported to cause moderate to severe losses in the states of Uttar Pradesh, Assam, Andhra Pradesh and Tamil Nadu (5, 6, 7). In Haryana, the disease incidence has been increasing considerably since its first record during Kharif 1988 (3). Though the disease attacks both the groups of paddy i.e. high yielding dwarf and scented tall varieties (export quality), it is more common on the latter group in the state. The present paper reports the sources of resistance in both the scented and non-scented groups of paddy.

A collection of 221 scented and non-scented rice genotypes were tested for their resistance to bakanae disease during Kharif 1993 and 1994 at CCS HAU Regional Research Station, Uchani, Karnal. A pathogenic isolate of Fusarium moniliforme was grown on PDA in culture bottles at 30 ± 1°C for 15 days. The conidia were harvested in sterilized distilled water with gentle brushing and adjusted to a concentration of $2 \times 10^7$ conidia/ml for inoculation based on preliminary studies.

Thirty day old seedlings of each genotype were uprooted, washed and inoculated by dipping their roots in freshly prepared inoculum suspension for two hours. Inoculated seedlings were transplanted in two rows of 5 m at 20 × 15 cm spacing in puddled field having practically no standing water to avoid washing of inoculum. Field was irrigated 24 h after transplanting. The crop was raised following recommended agronomic practices.

The observations on disease incidence were recorded 15 and 30 days after transplanting and genotypes were classified in different categories following Standard Evaluation System for Rice (1).

Amongst 124 scented genotypes evaluated, two genotypes, viz., C 4-64 (green base) and Karjat × 13-21 were resistant, eight were moderately resistant and the rest were susceptible to this disease (Table 1). The commonly grown scented tall varieties, viz., Basmati 370 and Taroari Basmati (export quality) were rated as susceptible whereas, recently developed scented dwarf cultivars Haryana Basmati-1 (HKR 228) and Pusa Basmati-1 exhibited moderately susceptible and susceptible reactions, respectively.

Out of 97 non-scented genotypes evaluated, four genotypes, viz., BR 1067-84-1-3-2-1, BR 1257-31-1-1, BR 4363-8-11-4-9 and IR 58109-109-1-1-3 were highly resistant while genotypes AS 34011, BG 936, CNA 3886, HKR 86-104, IR 39464-54-1-3-2-1-3 and PR 106 were found resistant. Of the remaining genotypes, 52 were graded as moderately resistant and 35 as moderately susceptible to highly susceptible. Two promising genotypes HKR 42 and HKR 46, and commonly grown cultivars HKR 126, PR 110 and Jaya were found moderately resistant.

It is evident from the results that resistance against bakanae is more in non-scented than in scented genotypes. Two bakanae resistant genotypes BR 4363-8-11-4-9 and IR 58109-109-1-1-3, and few moderately resistant genotypes, viz., HKR 91-107, HKR 91-114, HKR 91-119 and PR 2235-113-85-20 have been known to have resistance to bacterial blight and stem rot diseases also (2, 8). Some of the genotypes, viz., BR 802-118-4-2, BR 827-35-2-1-HR 6, HKR 42, HKR 46, HKR 91-106, HKR 91-018, HKR 91-110, HKR 91-112, HKR 91-130, IR 51673-50-2-1 (IRON 89-59), IR 57301-195-3-3, RP 2240-52-4-8, and RP 49455-20-2-3-3-1 moderately resistant (disease score 3) to bakanae in the present study, have also been reported to possess moderate resistance to stem rot (2, 8). Genotype IR 51673-50-2-1 (IRON 89-59) also possessed resistance to sheath blight in laboratory (8).
Table 1. Screening of rice genotypes against bakanae disease

<table>
<thead>
<tr>
<th>Disease rating*</th>
<th>Number</th>
<th>Genotype</th>
<th>Number</th>
<th>Genotype</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR 0</td>
<td>-</td>
<td></td>
<td>4</td>
<td>BR 1067-84-1-3-2-1, BR 1257-31-1-1, BR 4367-8-11-4-9, IR 58109-109-1-1-3</td>
</tr>
<tr>
<td>R 2</td>
<td>C 4-64 (green base), Karjat × 13-21</td>
<td>6</td>
<td>AS 34011, BG 936, CNA 3886, HKR 86-104, IR 39464-54-1-3-2-1-3, PR 106</td>
<td></td>
</tr>
<tr>
<td>MR 8</td>
<td>Guinata, Hansraj, HKR 91-417, Kamod, Lua Nhe, Macunting, Milpal, S-1732</td>
<td>52**</td>
<td>BR 802-118-4-2, BR 827-35-2-1-HR, 6, HKR 42, HKR 46, HKR 126, HKR 91-104, HKR 91-108, HKR 91-110, HKR 91-112, HKR 91-119, HKR 91-120, IR 51673-50-2-1, IR 57301-195-3-3, Jaya, PR 110, RP 2235-113-85-20, RP 2240-52-4-8, RP 49455-20-2-3-3-1</td>
<td></td>
</tr>
<tr>
<td>MS 28**</td>
<td>Basmati 385, HKR 90-403, HKR 90-404, HKR 91-405, HKR 91-408, HKR 91-413, HKR 228 (Haryana Basmati-1), HKR 238</td>
<td>31**</td>
<td>CT 6777-8-4-7-1-4 P, HKR 86-3, HKR 86-7, HKR 91-120, IR 64, Leiz Hong 152, PR 103, Pusa 33</td>
<td></td>
</tr>
<tr>
<td>S 52**</td>
<td>Basmati 370, HBC 19 (Taraori Basmati) Basmati Kota, HKR 90-413, HKR 90-414, HKR 90-421, HKR 91-406, Pusa Basmati-1</td>
<td>3</td>
<td>CR 367-568-11 SP, Haryana Gaurav, HKR 91-121</td>
<td></td>
</tr>
<tr>
<td>HS 34**</td>
<td>Basmati 113, Basmati 213, Basmati 397, Basmati 502, Dehradun local, HBC 135</td>
<td>1</td>
<td>IR 45058-17-1-3</td>
<td></td>
</tr>
</tbody>
</table>

*Disease incidence of 0, < 1, 1-5, 6-25, 26-50 and 51-100 per cent was rated as highly resistant (HR), resistant (R), moderately resistant (MR), moderately susceptible (MS), susceptible (S), and highly susceptible (HS), respectively.

**Only selected materials which included commercially grown cultivars, identified genotypes with good yield potential, export quality or possessing multiple disease resistance are mentioned.

The resistant sources identified can be utilized in rice breeding programme against bakanae disease.

REFERENCES


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