



Reactions of maize genotypes against banded leaf and sheath blight

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Abstract

Forty inbred lines of maize were indexed against banded leaf and sheath blight (BLSB) caused by *Rhizoctonia solani* f. sp. *sasakii*. The lines were artificially inoculated under pot culture conditions. Out of forty, four inbred lines viz., BAJIM08-90-1-6-1, BAJIM 6128, CML437-B-B, and CML 164 were found highly resistant (HR) with disease score of 1. Bajaura Makka 1, HKI 488, HKI 1105, CML 165, CML 336, CML 439, CML 437, BML 6, CML414, L 292, CML 437-B-B, L 265, BAJIM 95-60-5, CML 460, Sarhad-HSRB, LM 13, VQL 2, CML 169, and HKI 162 were rated as resistant with disease score of 3. The remaining inbred lines were highly susceptible.

Key words: Reaction, maize inbred lines/hybrids, BLSB, *Rhizoctonia solani* f. sp. *sasakii*

Maize (*Zea mays* L.) is an important cereal crop contributing towards world agricultural economy as food, feed and industrial products. Banded leaf and sheath blight (BLSB) of maize is caused by a destructive and versatile pathogen *Rhizoctonia solani* f. sp. *sasakii*. The disease causes huge crop losses in terms of grain and straw yield ranging from 11.0 to 40.0% (Singh and Sharma 1976). In India, this disease was first reported from Tarai region of Uttar Pradesh (Payak and Renfro 1966). Afterwards, Payak and Sharma (1981) reported the disease from Madhya Pradesh, Rajasthan, Haryana, Punjab and Himachal Pradesh. With the introduction of maize hybrids, the disease has become a major constraint for maize production in the state. Since the pathogen is soil borne, the disease starts from first leaf sheath to upward and even upto the ears to cause maximum damage. Warm-humid weather favours the development and spread of the disease. An optimum temperature of about 28°C with relative humidity >88% favours rapid disease progress (Sharma 2005). The pathogen is characterized by formation of dull brown sclerotia on the host (Plate 1). Characteristic symptoms include concentric bands and rings on infected sheaths and leaves which are brown, tan or grey in color. The disease starts appearing on the first and second leaf sheath above the

ground and eventually spreads to the ear causing ear rot. Ear rot is characterized by light brown, cottony mycelium on the ear and the presence of small, round, black sclerotia. The pure cultures of *Rhizoctonia solani* f. sp. *sasakii* are shown in Plate 2.

Evaluation of maize germplasm Artificial inoculation

Forty maize inbred lines procured from Hill Agricultural Research and Extension Centre, Bajaura were evaluated against BLSB under pot culture conditions in the growth chamber of the Department of Plant Pathology, COA, CSK HPKV, Palampur with susceptible cultivar 'Kanchan' as a check. Five seeds of each entry were sown in a pot with three replications. Pots were marked with level of entries and kept in the green house. Twelve days old culture of *R. solani* f. sp. *sasakii* was mass multiplied in potato broth for inoculum production. Maize seedlings were artificially inoculated with cotton bits (dipped in inoculum of the casual fungus) on the axial of leaf sheath and blade. Pots were regularly sprinkled with water to maintain moisture. Watering of plants was done regularly twice a day in the morning and evening. The germinating seedlings of maize entry were covered with polythene bags having pores to maintain humidity >85%.



Plate 1: Dull brown sclerotia at basal sheath of inoculated maize seedlings

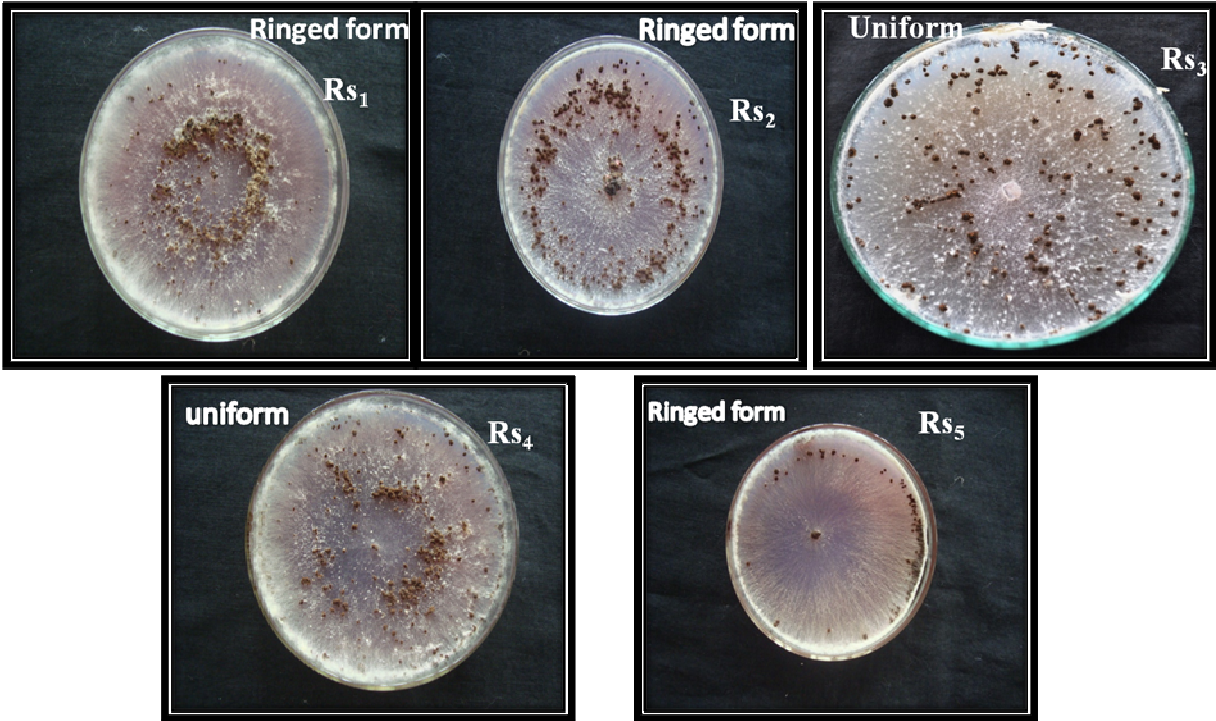


Plate 2. Cultures of *Rhizoctonia solani* f. sp. *sasakii*

After 20 days of inoculation, when seedlings collapsed completely in susceptible cultivar ‘Kanchan’, data were recorded for BLSB using 0-9 scale given by Wang and Dai (2001) to work out per cent disease index (PDI) as follows:

$$\text{PDI} = \frac{\text{Sum of all ratings of diseased seedlings}}{\text{Total number of observations} \times \text{highest rating}} \times 100$$

Disease score	PDI	Symptom of disease	Reaction
0	0	No	I
1	0.1 – 20	Disease spots below 4 th sheath under ear	HR
3	20.1 – 40	Disease spots below 3 rd sheath under ear	R
5	40.1 – 60	Disease spots below 2 nd sheath under ear	MR
7	60.1 – 80	Disease spots below 1 st sheath under ear	S
9	80.1- 100	Disease spots over sheaths under ear	HS

I = Immune, HR = highly resistant, R = resistant, MR = moderately resistant, S = susceptible, HS = highly susceptible.

Reactions of maize inbred lines

Reactions of maize inbred lines against *Rhizoctonia solani* f. sp. *sasakii* are presented in the Table 1. Four inbred lines viz., BAJIM08-90-1-6-1, BAJIM 6128, CML437-B-B, and CML 164 were found highly resistant with disease score of 1. The inbred lines viz. Bajura Makka 1, HKI 488, HKI 1105, CML 165, CML 336, CML 439, CML 437, BML 6, CML414, L 292, CML 437-B-B, L 265, BAJIM 95-60-5, CML 460, Sarhad-HSRB, LM 13, VQL 2, CML 169, and HKI 162 were rated as resistant with disease score of 3.

Maize lines HKI 164-4 (1-3)-2, BAJIM 08-2, BAJIM 6130, B 57, L 290, CML 466, CML 460, LQPM 30, LQPM 34-1 and VQL 1 fell under the disease score of 5 and rated as moderately resistant. All others were susceptible (DMRQPM 60, Bajura Makka, Girija and Early Composite) or highly susceptible (BAJIM-2780, BAJIM 8211 and BAJIM 3396). The results of disease score of genotypes/inbred lines were also shown in the Plate 3.

Kar (1998) reported inbred maize lines CM117 and CM211 as resistant to banded leaf and sheath blight caused by *R. solani* f. sp. *sasakii* and Bhavana and Gadag (2009) also reported inbred lines Pop 145 and Suwan-1 with high degree of tolerance to BLSB.

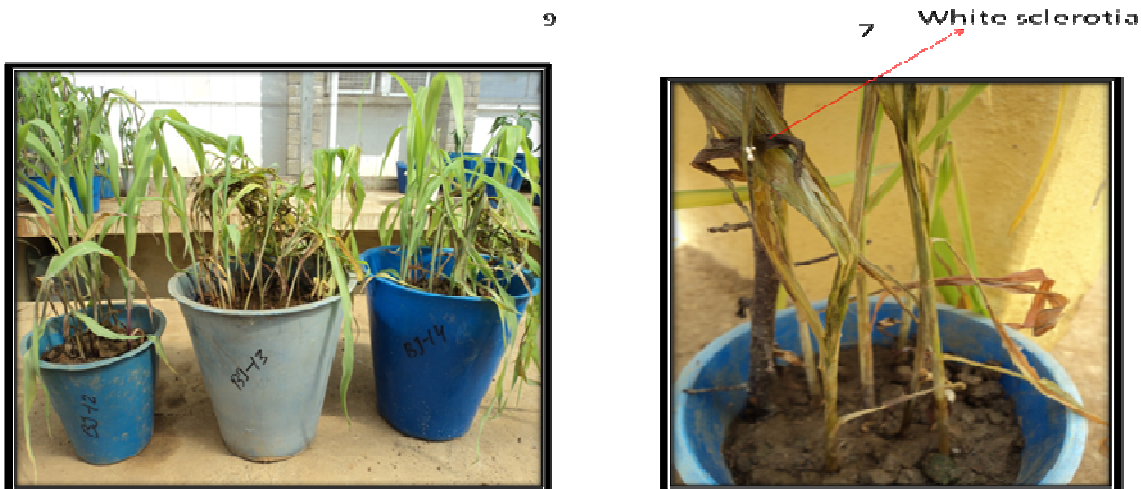


Plate 3. Reactions of maize lines to *R. solani* f. sp. *sasakii* under pot conditions

Table 1. Reactions of maize lines to *Rhizoctonia solani* f. sp. *sasakii* under pot conditions

Disease score	Genotype	Reaction
0	No	Immune (I)
1	BAJIM08-90-1-6-1, BAJIM 6128, CML437-B-B and CML 164	Highly Resistant (HR)
3	Bajuara Makka 1, HKI 488, HKI 1105, CML 165, CML 336, CML 439, CML 437, BML 6, CML414, L 292, CML 437-B-B, L 265, BAJIM 95-60-5, CML 460, Sarhad-HSRB, LM 13, VQL	Resistant (R)
5	HKI 164-4 (1-3)-2, BAJIM 08-2, BAJIM 6130, B 57, L 290, CML 466, CML 460, LQPM 30, LQPM 34-1 and VQL 1	Moderately Resistant (MR)
7	DMRQPM 60, Bajuara Makka, Girija and Early Composite	Susceptible (S)
9	BAJIM-2780, BAJIM 8211 and BAJIM 3396	Highly Susceptible (HS)

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