



Short Note

Evaluation of maize inbreds and their hybrids against bacterial stalk rot, banded leaf and sheath blight under mid hill conditions

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Abstract

Maize (*Zea mays* L.) is one of the most important *Kharif* cereal crops of Himachal Pradesh. It is mainly used as food, feed, fodder and fuel in the State and is grown over a wide range of agro-climatic conditions. The importance of biotic stresses and their ever-increasing global concern cannot be underestimated. Losses occurring every year due to one reason or another are massive and invariably result in fluctuating production and market price. During the recent past the spread of different hybrids in the state has increased the severity of different diseases in maize. Most important among them are banded leaf and sheath blight caused by *Rhizoctonia solani* f.sp. *sasakii* and Bacterial stalk rot incited by *Erwinia chrysanthemi* pv. *zear*. The existing local maize biodiversity in the state is still rich in resistance to such diseases. To combat this rising problem, an effort was made to develop the inbred lines of maize from local germplasm showing resistance to these diseases. Twelve diverse inbred lines were crossed to three inbred testers in L x T design. These twelve inbred lines, three testers and resulting 36 hybrids along with a single cross hybrid Vivek 23 (check) were evaluated under Randomized Complete Block Design under field conditions. The crosses L₁ x T₃, L₂ x T₂, L₂ x T₃, L₃ x T₂ and L₁₀ x T₁ were found to be resistant to Bacterial Stalk rot. All the inbred lines except L₁ and testers T₁ and T₂ were moderately resistant, while crosses L₄ x T₁, L₅ x T₃, L₆ x T₂, L₆ x T₃ and L₁₀ x T₂ were resistant to the banded leaf and sheath blight.

Key words: Maize, inbred, hybrid, bacterial stalk rot, banded leaf & sheath blight.

Maize (*Zea mays* L.) is one of the nature's most efficient energy storing devices. It is the third most important cereal in India after rice and wheat and contributes more than 7 per cent in national food basket and provides food, feed, fodder, fuel and also serves as a source of basic raw material for the number of industrial products. In Himachal Pradesh

also, maize is the principal crop for food and feed. Although local cultivars have a number of desirable characters but susceptibility to prevalent diseases remain a problem which reduces its quality and yield. Diseases cause about an average loss of 13.2 per cent in grain yield in India (Ahuja and Payak, 1983). Among various diseases of maize, banded leaf and

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sheath blight caused by fungus *Rhizoctonia solani* f.sp. *sasakii* has attained the status of most economically important disease and becoming a serious problem in Himachal Pradesh. Bacterial stalk rot of maize incited by *Erwinia chrysanthemi* pv. *zeae* is also widely prevalent in India and a major problem in subtropical areas in low hills and valley areas of H.P. Keeping the above point in view a study was conducted under field conditions to evaluate locally developed inbred lines of maize and their hybrids against bacterial stalk rot (BSR) and banded leaf and sheath blight (BLSB) of maize.

Twelve diverse inbred lines of maize, viz. L₁, L₂, L₃, L₄, L₅, L₆, L₇, L₈, L₉, L₁₀, L₁₁ and L₁₂ were crossed to three testers viz. CM 126 (T₁), CM 200 (T₂) and CM 212 (T₃) in line x tester fashion during *Kharif* 2009 to generate a total of 36 hybrids. These 36 hybrids along with 15 parents and one check (Vivek-23) were planted in RBD with three replications in two plots of 3.0 x 1.2 m² at HP Agriculture University farm, Palampur characterized by sub-temperate mid hill zone with high rainfall during the monsoon. The per cent incidence of stalk rot was recorded by counting wilted and healthy looking plants. The disease scoring was done as per the method of Shekhar (2005). The disease rating (0-5) for BLSB was noted randomly on ten infected plants from each replication under natural condition by using scale as given by Sharma (2005).

In case of bacterial stalk rot, the lines, testers and crosses were grouped as highly resistant, resistant, moderately susceptible and highly susceptible (Table 1). All lines and testers T₁ and T₂ were moderately susceptible to the disease. Crosses L₁x T₃, L₂x T₂, L₂x T₃, L₃x T₂ and L₁₀x T₁ were resistant to the disease showing disease incidence of 5-10%. Kalia *et al.* (2003) and Subekti and Salazar (2007) have also reported resistance in maize lines and hybrids to bacterial stalk rot. In case of BLSB, the lines, testers and crosses were grouped as highly resistant, resistant, moderately resistant, moderately susceptible, susceptible and highly susceptible reaction (Table 2). Anshu *et al.* (2007) evaluated twenty nine tropical maize inbred lines for resistance to banded leaf and sheath blight and found that many of the Indian and CIMMYT inbred lines were susceptible to the disease. Shekhar (2004), Singh and Saxena (2005) screened resistance in maize lines and hybrids against BLSB. Sharma *et al.* (2005) screened forty four inbred lines of maize for resistance to banded leaf and sheath blight. Out of which twenty four inbred lines showed intermediate reaction (2.25 to 4.0 score) and the rest were found susceptible (4.1 to 5.0 score) to the disease. All lines except L₁ were moderately resistant to the disease. Madhavi *et al.* (2012) reported that out of 12 inbred lines, BH11 showed moderate resistance to the banded leaf and sheath blight and none were found tolerant. Testers T₁



Banded leaf and sheath blight



Bacterial stalk rot

and T₂ were moderately resistant whereas T₃ was moderately susceptible. Crosses L₄ x T₁, L₅ x T₃, L₆ x T₂, L₆ x T₃ and L₁₀ x T₂ were resistant to the disease. All crosses except L₁ x T₁, L₄ x T₁, L₅ x T₃, L₆ x T₂, L₆ x T₃ and L₁₀ x T₂ were moderately resistant to the disease. The hybrids L₁ x T₃, L₂ x T₂, L₂ x T₃, L₃ x T₂ and L₁₀ x T₁

were found to be resistant to bacterial stalk rot and while crosses L₄ x T₁, L₅ x T₃, L₆ x T₂, L₆ x T₃ and L₁₀ x T₂ were resistant to the banded leaf and sheath blight. Saxena *et al.* (2004) also reported resistance in short duration single cross hybrid of maize to bacterial stalk rot and banded leaf and sheath blight of maize.

Table 1. Disease reactions of different lines, testers and crosses to bacterial stalk rot

Disease incidence (%)	Reaction	Lines	Testers	Crosses
< 5	Highly resistant	---	---	---
5-10	Resistant	---	---	L ₁ x T ₃ , L ₂ x T ₂ , L ₂ x T ₃ , L ₃ x T ₂ and L ₁₀ x T ₁
11-25	Moderately susceptible	All lines	T ₁ and T ₂	All crosses except L ₁₁ x T ₃ , L ₁ x T ₃ , L ₂ x T ₂ , L ₂ x T ₃ , L ₃ x T ₂ and L ₁₀ x T ₁
>25	Highly susceptible	---	T ₃	L ₁₁ x T ₃

Table 2. Disease reactions of different lines, testers and crosses to banded leaf and sheath blight

Disease incidence	Rating scale	Reaction	Lines	Testers	Crosses
0	0	Highly resistant	---	---	---
1-10	1	Resistant	---	---	L ₄ x T ₁ , L ₅ x T ₃ , L ₆ x T ₂ , L ₆ x T ₃ and L ₁₀ x T ₂
11-25	2	Moderately resistant	All except L ₁	T ₁ and T ₂	All except L ₁ x T ₁ , L ₄ x T ₁ , L ₅ x T ₃ , L ₆ x T ₂ , L ₆ x T ₃ and L ₁₀ x T ₂
26-50	3	Moderately susceptible	L ₁	T ₃	---
51-75	4	Susceptible	---	---	---
>75	5	Highly susceptible	---	---	---

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