Screening of Extra Early Maize Inbred under artificial epiphytotic condition for North-Western Himalayan region of India

Chandrashekara, C*., Jha, S. K., Agrawal, P. K., Singh, N.K. and Bhatt, J. C.

Vivekananda Parvatiya Krishi Anusandhan Sansthan, (ICAR), Almora (Uttarakhand), India

*chandrupath@gmail.com

Abstract

A field study was conducted to identify the sources of resistance against turcicum leaf blight (TLB) in maize. Thirty five inbreds were evaluated under artificial epiphytotic conditions at Hawalbagh, Almora (1250 m above mean sea level altitude) and a hot spot location for TLB in India. Out of these 35 inbreds, 10 entries were found resistant, 18 were moderately resistant, 3 were susceptible and 4 were highly Susceptible to the TLB. The inbred lines *viz*., V373, V398, V407, V418, VQL2 and CM 145 showed high degree of resistance to both TLB and Maydis Leaf Blight (MLB) where as V351, V414, VQL1 and CM212 were found to be highly susceptible.

Introduction

Maize (*Zea mays* L.) is one of the most important cereals in the world due to its high yield potential and great demand as food, feed and industrial purpose. The area, production and productivity of maize have increased significantly in last few decades. However, at one or other point of time, the sustainability of the maize production to meet the futuristic demand is remains to be debatable due to existing biotic and abiotic stresses as well as unexpected outcome of the global phenomenon of climate change. Indian Himalayan states have been centre of maize cultivation since long back and contributing significantly to maize production as well demand. Due to relatively low temperature and high humidity during the maize growing season, Turcicum leaf blight (TLB) and Maydis Leaf blight (MLB) are the two major diseases remains to be problematic to highland maize farmers in Himalayan region.

The turcicum leaf blight of maize (syn. Northern leaf blight) incited by the fungus *Exserohilum turcicum* (Pass.) Leonard and Sugs. [(Synonyms; *Drechslera turcica* (Pass.),

Shoemaker. *Helminthosporium turcicum* (Pass.)] is an important foliar disease of maize worldwide. In India, this disease is prevalent in the states of Karnataka, Himachal Pradesh, Uttarakhand, Orissa, Andhra Pradesh and North Eastern Hill states. It also affects the *Rabi* maize in the plains of India. Turcicum leaf blight is the endemic in maize growing areas of the North Western Himalayan regions and considered to be very important in terms of its geographical distribution and potential to cause yield losses. TLB can be severe in mid-altitude tropical regions where high humidity, low temperature, and cloudy weather prevail during the maize growing season (Singh, 2004). Yield losses can easily exceed 50% if the disease appears before flowering (Raymundo *et al*., 1981; Tefferi *et al.*, 1996). However the losses get reduced if the infection takes place at a later stage. The Genetics of resistance is determined in most of maize genotypes quantitatively and has been used for control of this disease (Sangit Kumar *et al*, 2011). Resistance was partially dominant and controlled by many genes (Van der Plank 1968; Caldwell 1968; Nelson 1973). The present study was carried out to identify sources of resistant against TLB prevalent in the North-Western Hill regions of India.

MATERIALS AND METHODS

Field screening against TLB was carried at the Hawalbagh Research farm (29° 38’ 3’’ N and 79° 37’ 49’’ E), Almora, Uttarakhand, which is one of the hot spot for *Turcicum* leaf blight in India. The experiments were conducted to identify new sources of resistance. Thirty five inbred lines developed at VPKAS, Almora were evaluated during *Kharif* 2010 (wet season) in randomized block design with two replications, under artificial epiphytotic condition. Each test line was sown in three rows of 3 m and rows were spaced at 60 cm. Spreader rows of highly susceptible local inbred V351 were planted at regular intervals as a source of secondary inoculum for the disease development. The recommended package of practices was followed during crop growth.

The inoculum of *Exserohilum turcicum* prevalent in North Western Himalayas was prepared by growing the fungal mycelium on sorghum grains. After proper fungal growth (after seven days), the grains were dried under the shade at room temperature. A fine powder of these grains was prepared with the help of a mixer–grinder. For the creation of proper disease pressure, a pinch of this powder was put in the leaf whorl of

each plant. Each plot was inoculated with a conidial suspension at the 4-5 leaf stage, followed by three more inoculations at 7-8 days intervals. Even if there was frequent rainfall during the crop season, still the crop experienced intermittent short dry spells. Hence the plots were irrigated by knapsack sprayer to maintain the relative humidity of more than 80%. The disease first gets manifested after 8-12 days of inoculation among different test materials. The disease appeared in infector rows earlier and became severe by the time of silking. The disease severity was recorded after two weeks of inoculation. Genotypes were screened under artificial epiphytotic conditions in a scale of 0–5 rating as per CIMMYT protocol (CIMMYT, 1985; Singh *et al*. 2004).

RESULTS AND DISCUSSION

A total of 35 maize inbred lines along with resistant and susceptible checks were screened for TLB. On the basis of disease reaction and rating scale, the performance of all the maize inbred lines was classified into four groups: a score of 1-2 was considered resistant, >2.5-3.5 was moderately resistant, >4.0 was susceptible, and >4.5 was highly susceptible (Table 1).

Table 1. Classification of 35 maize inbred lines based disease reaction and rating scale

Reaction	**Inbred line**
Resistant	V336, V346,V373, V398, V400, V401, V407, V418, VQL2, CM145
Moderately Resistant	V152, V334, V335, V338, V340, V341, V345, V372, V383, V390, V403, V404, V405, V409, V410, VQL17, CM141, CM153
Susceptible	V25, V402, V406
Highly susceptible	V351, V414, CM212, VQL1

The present study resulted in identification of 10 resistant inbred lines. Among them V373, V398, V407, V418, VQL2 CM 145 were with least disease incidence for not only to TLB but also to other diseases, including maydis leaf blight. About 18 inbred lines were observed to be moderately resistant to TLB. In general, resistant and moderately resistant test materials were greater in number than susceptible and highly susceptible types. The new sources of TLB resistance identified in the present study will

be helpful for their deployment in breeding program and as donors for different basic and applied research.

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