

SHORT COMMUNICATION

Screening of Maize Germplasm for Multiple Disease Resistance

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Maize is predominantly grown during *kharif* season in tropical and sub-tropical environments in an area of 6.4 million hectares and production of 11.47 million tonnes is third important cereal crop in India (Anonymous, 2001). The productivity in the country (1.8t/ha) against 7.0 t/ha in temperate areas and world average (3.8t/ha) is very low. Diseases such as Bacterial stalk rot (*Erwinia chrysanthemi* pv. *Zea*), Maydis leaf blight (MLB), (*Dreschslera maydis*) and brown stripe downy mildew (BSDM) (*Sclerophthora reyssiae* pv. *Zea*) are important bottlenecks causing significant reduction in grain yield (Sharma *et al.*, 1993). These diseases can be partially managed by biocides. High rainfall during the crop season restricts the resource starved farmers to use costly chemicals. Under these conditions the cultivation of resistant varieties is economically viable, practically feasible and cost effective alternative. Keeping this in view some Indian hybrids and composites were evaluated against these diseases and resistant stocks against widely prevalent diseases in northern parts of the country are reported herein.

Two hundred sixty six hybrid and composite stocks of Advanced Breeding Material received from Directorate of Maize Research, New Delhi, were planted during Kharif 2000 at experimental farm of RRS Dhaulakuan, following recommended agronomic practices (Anonymous, 2000). Bacterial stalk rot epiphytotics were created by inoculating 75-100 plants/entry using hypodermic syringe method (Anonymous, 1983). The field is inoculum sick with brown stripe downy mildew (*Sclerophthora rayssiae* pv. *zea*), however, to avoid disease escape, 30 days old plants were whorl inoculated with brown stripe downy mildew infected maize leaf bits (Anonymous, 1983). The evaluations against Maydis leaf blight were on natural infection basis. The data were recorded on per cent wilted plants in case of *Erwinia* stalk rot, 20 days after inoculation, whereas the data for brown stripe downy mildew and maydis leaf blight were recorded on 1-5 and 0.5 scale, respectively (Anonymous, 1983). The balanced seed of each entry was evaluated during the subsequent *kharif* (2001) season to confirm their reactions.

The hybrid and composite stocks showing resistance against *Erwinia* stalk rot, brown stripe downy mildew and maydis leaf blight during the year 2000 and 2001 are given in Table 1. None of the entries were free from *Erwinia* stalk rot, brown stripe downy mildew or maydis leaf blight. Stocks Agri MH-101, AH01135, AH-1139, BH-1620, BISCO 103, JK 2002, JH 3773, PAC 70002, Rasi MH-102, Sneha, UMC 12 and WH-1 were resistant with less than 10% stalk rot incidence, 22 entries with disease reaction <2 to BSDM and 24 stocks with 1-2 disease reaction were resistant to maydis leaf blight. In addition 31 hybrids with 10-20% disease incidence, 24 and 26 stocks with disease reaction 2.0-2.5 were moderately resistant to *Erwinia* stalk rot, BSDM and MLB, respectively. It has been observed that frequency of entries resistant to *Erwinia* stalk rot was more frequent in stocks of full season maturity. In case of MLB and BSDM resistance was more frequent in early maturing entries. Sources of resistance among inbreds, hybrids and composites have also been reported against *Erwinia* stalk rot (Thind and Payak, 1985; Ebron *et al* 1987; Basandrai *et al* 200), *maydis* leaf blight (Khan *et al* 1992, Liu *et al* 1990; Sharma and Payak 1990; Basandrai *et al* 2000) and brown stripe downy mildew (Bains *et al* 1989; Basandrai *et al* 2000).

It has been observed that hybrids AH 1103, AH 1135, AH 1139, BISCO 103, BH 1718, BH 1542, BIO 9681, D 996, Ganga 11, JC 1441 (FS)C₁, JH 3773, JH 10044, JH 10054, JH 10056, NMH 99503, Nardi 216, PHS 4790, Rasi MH-1093, Sneha Gold, Seed Tach 204 and Z-13346 showed multiple resistance against all the three diseases. Hybrid BH 1680, FH 3146, JH 3776, PAC 70002, PGM 411, Rasi MH 102, R. 9801, Sneha, Surya 116 and Agri MH 101, BH 1620, BIO 91119, F 2784, HKH 1170, KH 2002, JH 10070, JH 3861, PAC 70002, Rasi MH 102, Sneha, UMC 12, WH 1 showed combined resistance against *Erwinia* stalk rot and brown stripe downy mildew and *Erwinia* stalk rot and maydis leaf blight, respectively. Stocks D-994, F-8007, JH 3861, PAC 70004, 70002, 70005, PGM 411, PHS 4755, 4787, PRO 348, SYN 1(y), Sneha, Seed Tech Surya 11 and X 3342 were resistant to maydis

Table 1. List of maize stocks resistant to *Erwinia* stalk rot (*E. chrysanthemi* pv *zeae*), downy mildew (*Sclerophthora rayssiae*) and *maydis* leaf blight (*Drecheslera maydis*).

Erwinia Stalk rot	
Resistant (<10%)	Moderately resistant (10-20%)
Agri MH-101, AH-1135, AH-1139, BH 1620, BISCO 102, JK 2002, JH 3773, PAC 70002, Rasi MH 102, Sneha, UMC 12, WH 1	AH-1103, BH 1680, -1718, -1542, BIO 9681, -52331, 091119, D 996, F 2784, FH 3146, Ganga 11, HKH 1170, JC 1441 (FS) CI, JH 10056,-10044,-10054,-10070, -3778,-3861, NMH 99503, Nardi 216, PHS 4790, PGM 411, PRO 347, 311, Rasi MH 1093, R 9801, Surya 116, Sneha Gold, Seed Tech 204, X-13346
Brown stripe downy mildew	
Resistant (<2)	Moderately resistant (2.1-2.5)
AH 1103,-1135, BISCO 103, BIO 52231, D 994, F 8007, JH 3861, 3773, 3776, 10054, JC 1441 (FS)C ₁ , PGM 411, PAC 70004, PHS 4755, 4787, R 9801, Rasi MH 102, 1903, Syn 1(Y), Sneha, Seed Tech Surya 11, Seed Tech 204	AH 1139, BH 1680, 1718, 1542, BIO 9681, D 996, FH 3146, Ganga 11, JH 10056, 10044, NMH 99503, Nech 108, Nardi 216, PRO 348, 311, PAC 70002, 70005, PHS 4754, 4790, Surya 116, Seed Tech 101, Sneha Gold, X 3342, 13346
Maydis leaf blight	
Resistant (<2)	Moderately resistant (2-2.5)
AH 1103, BIO 9681, D 994, 996, F 2784, GK 3030, JC 1441(FS)C ₁ , JH 10044,-10054, -10056, -10070,-3773, -3861, PGM 411, PRO 347,-348, PHS 4787,-4790, Surya 116, Seed Tech 101, Seed Tech Surya 11, UMC 12, WH 1, X 3342	Agri MH 101, AH 1135, 1139, BH 1718, -1620,01542, BIO 91119, BISCO 103, F 8007, Ganga 11, HKH 1170, JK 2002, Nech 108, NMH 99503, Nardi 216, PAC 70005, 70004,-70002, PHS 4755, Rasi MH 102, 1093, Sneha, Syn 1(Y), Sneha Gold, Seed Tech 204, X 13346

leaf blight and brown stripe downy mildew. Sources with multiple resistance have been reported against *maydis* leaf blight and brown stripe downy mildew (Dey *et al.* 1983), *Turcicum* leaf blight, *Maydis* leaf blight and brown spot (Kaiser and Pradhan, 1990) and *Erwinia* stalk rot, brown stripe downy mildew and *Maydis* leaf blight (Basandrai *et al.*, 2000).

Interestingly Ganga 11, PRO 311, PRO 348, Sheha, Gold and Surya 11 are identified varieties which can be deployed in disease prone areas. Most of the stocks are hybrids from private companies, if inbred of these stocks are available further studies can be undertaken on characterization of resistance against these diseases.

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