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Short Communication

# MULTIPLE DISEASE RESISTANCE IN INDIAN MAIZE HYBRIDS AND COMPOSITS

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**Two hundred fifty hybrids and composites in maize were tested for resistance to bacterial stalk rot, brown stripe downy mildew maydis leaf blight. It was observed that hybrids KH 150, X-1174 MV, PRO 312, PRO 316, JH 3189, MMH 69, EH 230792, X-1123G and composite Navjot, Prabhat, L118 and Deccan 107 were identified as multiple resistant lines which may be directly used for cultivation in disease prone areas.**

Key words : Maize, *Zea mays*, resistance, bacterial stalk rot, Maydis leafblight, brown stripe downy mildew

Maize is third important cereal crop in India after rice and wheat. During 1997-98, maize was grown in an area of 6.3 million hectares with production of 10.8 m. tonnes and productivity of 1,722 kg/ha. Predominantly maize crop in India is grown during *kharif* season. Diseases cause a significant reduction in grain yield (Sharma *et al.*, 1993). Though the diseases can be managed with chemicals and fungicides, but cultivation of resistant varieties is an eco-friendly, cost effective and practically feasible method. The present paper embodies information on identification of some Indian hybrids and composites resistant to bacterial stalk rot (*Erwinia chrysanthemum* pv. *zea*), *Maydis* leaf blight (*Dreschslera cochlicobolus*) and brown stripe downy mildew (*Scleropathora rayssiae* pv. *zeae*), the widely prevalent diseases in northern parts of the country.

The material comprised 250 hybrid and composite stocks of Advanced Evaluation Trials($1^{st}$ and $2^{nd}$ year) received from Directorate of Maize Research, New Delhi. The stocks were planted during *kharif* 1995 at experimental farm of RRS Dhaulakuan, following recommended agronomic practices. Artificial epiphytotic conditions for bacterial stalk rot were created by inoculating about 75-100 plants per entry with 48h old cell suspension of *E. chrysanthemi* pv. *zeae* at pretasseling stage using hypodermic syringe method (Anonymous, 1983). The field was sufficiently sick with inoculum of brown stripe downy mildew (*Scleropthora rayssiae* pv. *zeae*). Additionally, in an effort to avoid disease escape, 30 days old plants were whorl inoculated in the evening hours. The Maydis leaf blight observations were based on natural infection. The data for *Erwinia* stalk rot were recorded on percent wilted plants, 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 (Annonymous. 1983). A part of seed of each entry was retained and was evaluated during the subsequent *kharif* season (1996) to confirm their reaction to the diseases.

The hybrid and composite stocks showing resistance against *Erwinia* stalk rot brown stripe

Table 1. Maize (*Zea mays* L.) stocks resistant to *Erwinia* stalk rot, brown stripe downy mildew and *Maydis* leaf blight

| Erwinia stalk rot (*E. chrysanthemi* pv. *zeae*) | |
|---|---|
| Free resistant (0- > 10%) | Modertately resistant (10-..20%) |
| JH1345, JH1354, JH1558, JH1386, JH1413, JH3125, JH3181, JH3189 | AH54, JH1385, JH1387, JH3180, JH3221, JH3222, JH3482, KH5052, Deccan 107, NAVJOT, SC92026 |
| **Brown stripe downy mildew (*Scelerophthora rayssiae* var. *zeae*)** | |
| Free/resistant (1->2) | Moderately resistant (2-> 2.5) |
| AH34, AH739, AH742, BH 1041, BH3034, BH3037, L 110, L122, A15, D 742, EV.92, EH3022, EH 50836, EH203792, F733, FH 3040, FH 3046, FH 3047, FH 3050, HKH 943, JH 1345, JH1353, JH 1354, JH 1385, JH 1386, JH 1387, JH 3188, JH3188, JH 3125, JH3193, JH 3221, JH 3226, JH 3459, JH 3469, JH3495, KH510, KH3151, KH 93451, MMH69, MMH81, MMH 82, MMH579, MMH830, MMH82, Navjot, PMZ 115, PRO310, PRO314, PRO317, SURYA X-1123, X-1123G, X-1174WV, 3054W, AH 742, AH 60, BIO 9684(Y), BH 3034, EM 3027, EH 22, JC 3224, JH 1368, JH 1458, JH 1345, JH 1353, JH 1368, JH 1385, JH 1386, JH 1387, JH 3037, JH 3047 JH 3181, JH 3221, JH 3222, JH 3224, JH 3226, JH 3461, JH 3482, JH 3500, JK 1493, JK 3193, KH 5002, H510, KH 93451, MMH 308, MMH 830, PRO 317, PRO 310, Parbhat, SC 92026, SSF 53042, X-1123G | AH776, AH60, L-118, L-113903, Exp. Comp. 9102, Exp. comp. 85134, Exp. Comp. 8551, EH 50824, EH 50534, EHF 1151, E H 22, FH 3036, HKH 950, HKH 947, HKH 941, JH 1368, JH 458, JH 1413, JH 3136, JH 3180, JH 3181, JH 3189, JC3218, JH 3222, JH 3425, JH 3500, JC 3224, JH 3037, JK 194, JH 3047, KH 5009, KH 5052, KH 5005, IMH 333, MMH 501, MMH 4324, PRO 316, PMZ 202, PRO 312 R 21, R 44, SSF 92387, SSF 93448, AH 54, AH 714, AH 739, AH 776, BIO 9561 (Y) BIO 9626(Y), BIO 9718, BH 3037, L 110, L113, Comp. A-15, D-742, D 903, De, Exp. Comp. 9120, EH 2037, EH 50836, EV 92, F-733, FH 3028, FH 3036, FH 3040, FH 3046, HKH 943, HKH 950, JH 1354, JH 1413, JH 3125, JH 3136, JH 3180, JH 3188, JH 3189, JH 3425, JH 3459, JH3469, JH 3495, JH 4593, KH5009, KH 5052, KH 93151, MMH 4324, MDR Synthetic, MMH 69, MMH 81, MMH 82, Navjot PMZ 115, PRO 312, R, 21, R 44, SSF 93448, Y 1124 WW, SSF 92387 (w). |

downy mildew and Maydis leaf blight during the year 1995 and 1996 are given in table 1. Two hybrid JH 1386 and JH 3226 were free from brown stripe downy mildew and none of the stocks was free from *Erwinia* stalk rot and *Maydis* leaf blight. Cultivars JH 1345, JH 1354, JH 1386, JH 1413, JH 1558, JH 3125, JH 3181, JH 3184 and JH 3189 with less than 10% stalk rot incidence were resistant, and 9 hybrid with 10-20% disease incidence were moderately resistant to *Erwinia* stalk rot. Fifty one entries were resistant (disease reaction < 2) and 38 entries were moderately resistant (disease reaction 2-3) to brown stripe downy mildew. Thirty five stock with 1-2 disease reaction, were resistant and 59 stocks, with diseases reaction 2.1 < 3, were moderately resistant to *maydis* leaf blight. It has been observed that frequency of entries resistant to *Erwinia* stalk rot was more in stocks of full season maturity. In case of *maydis* leaf blight and brown stripe downy mildew resistance was more frequent in early maturing entries. Sources of resistance among inbreds, hybrids and composites have been identified against *Erwinia* stalk rot (Anonymous, 1983, Ebron *et al.*, 1987), *maydis* leaf blight (Anonymous, 1983); Khan *et al.*, 1992; Liu *et al.*, 1990; Sharma and Payak, 1990) and brown stripe downy mildew (Anonymous, 1983; Bains *et al.*, 1989).

It has been observed that hybrids JH 1345, JH 1354, JH 1387, JH 3125, JH 3180, JH 3181, JH 3221, JH 3222, KH 5052 and SC 92026 showed multiple resistance against all the three diseases. Hybrid JH 3482 and JH 1386 showed combined resistance against *Erwinia* stalk rot and *maydis* leaf blight, and *Erwinia* stalk rot

and brown stripe downy mildew, respectively. Stocks AH 742, AH 60, MMH 830, KH 5009, SSF 92387, AH 776, BIO 9718 (W), PRO 312, MMH 4324, HKH 950, JH 3459, JH 3469, JH 3495 Parbhat, MMH 69, D 903, HKH 943, PRo 310, FH 3046, FH 3050, FH3036, L122, BH 3034, KH 93151, EH 203792 X 1123a, A 15, KH 93451, JK 3193, MMH 81, MMH 82, AH 732, SSF 93448, L 113, EH 50534, R 21 and R 44 were resistant to *Maydis* leaf blight and brown stripe downy mildew. Sources with multiple resistance have been reported against Maydis leaf blight and brown stripe downy mildew (Day *et al.*, 1993) *Turcicum* leaf blight, Maydis leaf blight and brown spot (Kaiser and Pardhan, 1990). Probably it is the first report on identification of hybrids or composites with combined resistance against *Erwinia* stalk rot, Maydis leaf blight and brown stripe downy mildew.

Interestingly, hybrids KH 510, X-1174 WV, PRO 312, PRO 316, JH 3189, MMH 69, EH 230792, X-1123G and composites, Navjot, Parbhat, L-118 and Deccan 107 are identified varieties, which may be directly recommended for cultivation in diseases prone areas.

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