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EVALUATION OF SUGARCANE GENOTYPES AGAINST RED ROT PATHOGEN, *COLLETOTRICHUM FALCATUM* WENT

S. PANDEY, S. S. GILL AND V. P. AGNIHOTRI

Indian Institute of Sugarcane Research, Lucknow 226002

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ABSTRACT

Eighty one varieties of sugarcane were tested against red rot disease under field conditions by standard plug method during 1982-83, 1983-84 and 1984-85. Twelve clones were resistant/moderately resistant whereas twenty seven clones showed intermediate reaction. The remaining varieties were suspectible to highly susceptible.

Key words: *Saccharum* spp., hybrids, red rot resistance, varieties, *Colletotrichum falcatum.*

Among the seed-piece transmissible disease of sugarcane, red rot caused by *Colletotrichum falcatum* (perfect stage: *Glomerella tucumanensis)* is a serious malady in India. In general, the incidence and intensity of this disease is more in the sub-tropical belt as compared to tropical belt [1–3]. Red rot is a disease of standing cane and causes serious losses in yield and juice quality [4, 5], affecting both the producer (farmer) and the processor (miller). In Northern India, excellent commercial varieties like Co 213, Co 312, Co 313, Co 453, Co 997, CoS 510, Cos 562, BO 3, BO 10, BO 17 and BO 54 went out of cultivation due to this disease.

So far, both the thermotherapy and chemotherapy have been found to be of limited use in controlling the disease under field conditions [6]. The only effective, cheap and convenient way to control this destructive disease is by growing resistant genotypes [6–8]. The investigation reported was taken up with the view to screen newly evolved and important varieties of sugarcane against red rot pathogen.

MATERIALS AND METHODS

Field trials were carried out a Lucknow during 1982-83, 1983-84 and 1984-85. Standing canes of 81 varieties of sugarcane (*Saccharum* species hybrids), including Baragua (*S. officinarum*) and Katha (*S. barberi*), were inoculated by the standard plug method [1] in the first fortnight of September every year. A mixture of four virulent races collected from U.P. (Lucknow, Gola, and Meerut) and Bihar (Riga) was used to inoculate the varieties. The canes were split open longitudinally after three months of inoculation and graded following the procedure of Srinivasan and Bhat [9]. The varieties were graded into different categories by using a 1–6 point scale, 1 being highly resistant (HR) and 6 highly susceptible (HS).

Table 1. Reaction of sugarcane varieties to red rot pathogen

Variety	Disease reaction				Variety	Disease reaction			
	1982-83	1983-84	1984-85	mean		1982-83	1983-84	1984-85	mean
Co 6518	MS	MS	MS	4.0	COA 7601	S	HS	S	5.3
Co 6618	HS	HS	HS	6.0	CoA 7602	MR	MS	MS	3.7
Co 6806	HS	HS	HS	6.0	CoA 8001	HS	HS	HS	6.0
Co 6812	S	HS	S	5.3	CoC 671	MS	S	S	4.7
Co 6904	MS	MS	MR	3.7	CoC 772	MR	MS	MR	3.3
Co 6907	HS	S	HS	5.7	CoJ 64	HS	HS	HS	6.0
Co 6914	MS	MS	S	4.3	CoJ 65	S	MS	MS	4.3
Co 7117	MS	MS	MS	4.0	CoJ 67	HS	HS	HS	6.0
Co 7205	S	S	S	5.0	CoJ 74	MS	MS	S	4.3
Co 7208	HS	HS	HS	6.0	CoJ 75	HS	HS	HS	6.0
Co 7217	S	S	HS	5.3	CoJ 76	MS	MS	MS	4.0
Co 7218	MS	S	S	5.3	CoLK 7701	HS	HS	HS	5.3
Co 7228	MS	MS	MS	5.0	CoLK 7702	MR	MR	MR	3.0
Co 7303	HS	HS	HS	6.0	CoLK 7707	MS	MS	MS	4.0
Co 7304	MR	MR	MR	3.0	CoLK 7708	S	HS	S	5.3
Co 7305	MS	MS	MS	4.0	CoLK 7710	R	R	R	2.0
Co 7313	HS	HS	HS	6.0	CoLK 7712	MS	MS	MR	3.7
Co 7316	MR	MR	MR	3.0	CoLK 7716	MS	MS	MS	4.0
Co 7317	HS	HS	HS	6.0	CoLK 7901	MS	MS	MS	4.0
Co 7321	MS	MS	MS	4.0	CoLK 7902	MS	MS	MS	4.0
Co 7336	HS	HS	HS	6.0	CoLK 8001	MR	MR	MR	3.0
Co 7404	HS	HS	HS	6.0	CoLK 8002	R	R	R	2.0
Co 7405	HS	S	S	5.3	CoLK 8003	MS	S	S	4.7
Co 7411	MR	MR	R	2.7	CoM 7126	MS	MS	MS	4.7
Co 7505	HS	HS	HS	6.0	CoM 7129	S	S	S	5.3
Co 7508	HS	HS	HS	6.0	CoM 7204	MS	S	HS	5.0
Co 7536	HS	HS	HS	6.0	CoM 7211	S	HS	S	5.3
Co 7537	HS	HS	S	5.7	Cos 767	MS	MS	MR	3.7
Co 7541	HS	HS	HS	6.0	CoS 770	MS	S	MS	4.3
Co 7604	HS	HS	HS	6.0	CoS 771	S	S	S	5.0
Co 7634	MS	MS	MS	4.0	CoS 802	MR	MR	MR	3.0
Co 7704	MR	MR	MR	3.0	CoH 7801	MS	S	MS	4.3
Co 7717	HS	HS	HS	6.0	CoH 7802	HS	HS	HS	6.0
Co 1148	S	S	HS	5.3	CoH 7803	S	MS	MS	4.3
Co 1158	MS	MS	MS	4.0	BO 90	S	MS	S	4.7
Co 62399	S	MS	MS	4.3	BO 91	MR	MR	MR	3.0
Co 312	HS	HS	HS	6.0	BO 99	MS	MS	MR	3.7
Co 997	HS	HS	HS	6.0	BO 104	MR	MR	MR	3.0
Baragua	HS	HS	HS	6.0	BO 106	MS	MS	MR	3.7
Katha	MR	MR	MR	3.0	BO 108	MS	S	MS	4.3
CoL 9	S	MS	MS	4.3					

R—resistant, MR—moderately resistant, MS—moderately susceptible, S—susceptible, and HS—highly susceptible.

RESULTS AND DISCUSSION

The reaction of various genotypes during three seasons is given in Table 1. Among 81 genotypes tested against red rot, none was found highly resistant. Reaction of 46 genotypes was consistant over the years, whereas in the remaining genotypes the reaction varied slightly over the years. Two plausible explanations can be given for this: first, the variation may be attributed to a change in the race itself. It is now fully documented [10, 11] that when facultative parasites are cultured on nutrient media for a long time (3 years in this case), the virulence is either reduced or lost, and second, the variation in reaction may possibly be due to difference in the environmental conditions that prevailed during a particular year. The average score over 3 years was calculated for grading different sugarcane varieties. Twelve varieties, namely, Co 7304, Co 7316, Co 7411, Co 7704, CoLK 7702, CoLK 7710, CoLK 8001, CoLK 8002, CoS 802, BO 91, BO 104, and Katha (*S. barberi*) had disease rating score of 3 or less. These varieties were resistant (R) or moderately resistant (MR) to red rot for 3 years under certified inoculation tests. The above mentioned R and MR varieties/genotypes can be successfully employed as a source of resistance in the breeding programme to evolve resistant cultivars. Twenty seven clones displayed intermediate reaction (>3.0 to <4.5 score). Out of these 39 clones having score less than 4.5, some possessed good agronomic attributes and can be directly used as cultivars. Some of these are being cultivated and others are under trial at different locations. The varieties Co 7321, Co 7304, Co 7305, Co 7411, CoA 7602, CoC 772, CoJ 76, CoLK 7702, CoLK 7707, CoLK 7716, CoLK 7901, CoLK 7901, CoLK 8001, CoS 767, CoS 802, BO 99 and BO 106 having many desirable characters along with above average cane yield (Table 2). The varieties having R/MR reaction can be released in the red rot prone area of Bihar, Bengal and Tarai region of U.P., whereas moderately susceptible varieties may be released only under clean cultivation.

The remaining 42 varieties /genotypes (Baragua, Co 312, Co 997, Co 1148, Co 6618, Co 6806, Co 6812, Co 6907, Co 7205, Co 7208, Co 7217 to Co 7218, Co 7228, Co 7303, Co 8313, Co 7317, Co 7336, Co 7404, Co 7405, Co 7505, Co 7508, Co 7536, Co 7537, Co 7541, Co 7604, Co 7717, CoA 7601, CoA 8001, CoC 671,

Table 2. Average cane yield (tonnes/ha) of some promising resistant/moderately resistant varieties of sugarcane [12]

Variety	Yield	Variety	Yield	Variety	Yield	Variety	Yield
Co 7304	68.7	CoLK 7702	50.7	CoLK 8001	115.4	CoA 7602	81.7
Co 7305	77.2	CoLK 7707	52.9	CoLK 8002	102.6	CoC 772	92.0
Co 7316	62.1	CoLK 7710	61.0	BO 91	79.6	CoJ 76	72.8
Co 7321	95.3	CoLK 7716	84.5	BO 99	85.0	Co 419	72.9
Co 7411	80.5	CoLK 7901	100.2	BO 104	62.6	CoS 802	61.6
Co 7704	86.0	CoLK 7902	89.2	BO 106	63.9	CoS 767	71.3

CoJ 64, CoJ 67, CoJ 75, CoLK 7701, CoLK 7708, CoLK 8003, CoM 7125, CoM 7129, CoM 7204, CoM 7211, CoS 771, CoH 7802 and BO 90) recorded susceptible to highly susceptible reaction. Such varieties should be recommended only for upland areas and red rot free zones (M.P., Rajasthan, Punjab and parts of Haryana, except Jamnagar area and uplands in the Western U.P.) if found superior in other varietal characters to prevalent varieties. When such varieties are cultivated, constant supervision for red rot disease incidence should be made to check possible disease spread. These "superior genotypes" may also be used in crossing programme as female parents in order to have resistant selections high sugar content and more cane yield.

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