

Incidence of Sugarcane Mosaic Virus (SCMV) in Different Germplasms at BSRI Farm

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ABSTRACT

A study was conducted to assess the incidence of sugarcane mosaic virus (SCMV) and the differential resistant behavior of 150 germplasms at Bangladesh Sugarcane Research Institute (BSRI), Ishurdi, Pabna in three consecutive cropping seasons 2000-2001, 2001-2002 and 2002-2003. There were 150 number of germplasms tested every year and observed mosaic incidence from 0 to 100 percent; Twenty five clones were classified as resistant ranging from 0.1-3 percent. A group of 19 clones were classified as moderately resistant ranging from 3.1 to 25 percent. In another group 56 clones were classified as moderately susceptible to SCMV ranging from 25.1 to 50 percent. Fifty number of clones were grouped as highly susceptible ranging from 50.1 to 100 percent infections. The percentage of mosaic disease infection recorded in the table 1 and 2 are based on maximum infection observed during the series of tests.

Key words: Sugarcane genetic diversity, mosaic resistant clone.

INTRODUCTION

Sugarcane mosaic virus disease is considered to be a great potential hazard at present in Bangladesh. In Bangladesh no report was available when the disease was first recorded. Ahmed *et al.* (1976) first reported the disease in the year 1974. Mosaic virus was noticed in all cane growing areas of the country and almost all sugarcane varieties were found to be affected by the disease. Ahmed *et al.* (1979) reported two types of mosaic infection on the basis of symptomology. The more common and wide spread one is "mild" or "green" type and the other one is "severe" or "yellow" type. The weather condition prevailing in this country is favorable for its wide spread during the grand period of growth of sugarcane. Mosaic disease is carried mainly through infected setts. However, secondary spread in the field of sugarcane is influenced by the resistance of the variety; strains of the virus presence; activity of the insect vectors and other condition (Martin *et al.* 1961). Summers (1943) measured the yield reduction from 2.5 to 33.4 percent. Yield reduction in Isd 2-54, BO 70 and Co1158 due to mosaic disease was assessed up to 34.30% compared to healthy crops by Rahman *et al.* (1990). Rahman and Khan (1981) also reported decrease in cane weight of various sugarcane clones due to infection of SCMV.

Although the disease was reported earlier and is widely distributed in the country, no report is available on the extent of disease resistant or susceptibility to sugarcane germplasms. A survey was conducted to assess the mosaic incidence in commercial sugarcane varieties and germplasms. This paper presented the results of differential behavior of 150 germplasms to mosaic virus observed during 2000 to 2003 at Bangladesh Sugarcane Research Institute (BSRI), Ishurdi, Pabna.

MATERIALS METHODS

One hundred and fifty sugarcane varieties/clones were used for testing resistance during 2000-2003 planting season at BSRI, Ishurdi, Pabna. The clones were collected from different parts of the world by the Breeding division from time to time. Three budded five setts were planted in the line of 150 cm length. The distance between line to line was 90 cm. Four Commercial sugarcane varieties with different resistance against SCMV were used as control. The control varieties were Isd 20 resistant, Isd 2-54 moderately resistant, moderately susceptible Isd 5-55 and Isd 16 as highly susceptible. Every two months of intervals the observation on sugarcane mosaic virus incidence were recorded. The number of plants showing symptoms were counted and the total number of plants were also taken into account. The final reading were taken before harvesting of the plot. The rating of mosaic resistance/susceptibility were made according to Breaux

and Dunkelman (1969) with slight modification in this assessment. According to the rating scale of resistance and susceptibility percentage of mosaic infection, of 150 germplasms were classified into five groups as follows:

% infection	: Class
0%	: Immune
0.1-3%	: Resistant
3.1 - 25%	: Moderately resistant
25.1 - 50%	: Moderately susceptible
50.1 - 100%	: <i>Highly susceptible</i>

RESULTS AND DISCUSSIONS

Wild collection, which was the primary source of mosaic resistance, showed variable percentage of mosaic infections. At initial stage mosaic infections were very low. Commercial control varieties Isd 20 were used as resistant, Isd 2-54 moderately resistant; Isd 5-55 moderately susceptible and Isd 16 as highly susceptible. Out of 150 flowering varieties/clones, only 25 number of clones showed 0.1-3% mosaic infection and categorized as resistant. 19 clones were found moderately resistant having 3.1-25% infection, 56 clones/varieties were found moderately susceptible having 25.1-50% infection and 50 number of clones were categorized as highly susceptible having 50.1 to 100% infection (Table 1).

Table 1. Year wise rating scale of resistance and percentage of mosaic infection of 150 germplasms.

Genotypes	2000-01	2001-02	2002-03	Resistant (R)
				Range (0.1-3%)
1. CP-50-70	1-2	1.50-2	2-3	1.50-2.33
2. F-1	2-3	1-2	1.5-2	1.50-2.33
3. I 143-67	1.5-2	2.5-3	2-3	2.0-2.66
4. I 143-86	2.5-3	2-3	2.5-3	2.33-3.0
5. I 325-86	2-3	2.25-3	2-3	2.08-3.0
6. I 251-85	2-3	1-2	1.5-2.5	1.5-2.50
7. I 523-85	1-2	1.5-2	2-3	1.5-2.33
8. Isd 25	2-3	1-2	2-2.5	1.66-2.5
9. Kaluzuri	2.5-3	2-3	1.5-2	2.0-2.66
10. BC-3	2.25-3	2-2.5	2-3	2.16-2.83
11. B 34-231	1.5-2	1.5-2	1.5-2	1.5-2.00
12. BO-43	2-3	1-2	2-3	1.66-2.66
13. I 228-80	1.5-2	2-3	2.5-3	2.00-2.66
14. Co-530	1-2	1-2	2-3	1.33-2.33
15. Co 47-193	2-3	2-3	2-2.5	2.0-2.83
16. I 114-91	2.5-3	2.5-3	1-2	2.0-2.66
17. H 37-1933	0.5-1	1-2	1-2	0.83-1.66
18. I 36-91	1-2	2-3	2-2.5	1.66-2.50

Genotypes	2000-01	2001-02	2002-03	Moderately Resistant (MR)
				Range (0.1-3%)
19. Isd 20	2-2.5	2-3	1.5-2.5	1.83-2.66
20. I 96-80	2-2.5	2-3	1.5-2.5	1.83-2.66
21. I 6-56	2-3	1-2	2-3	1.66-2.66
22. I 290-82	1.25-2	2-3	1-2	1.41-2.33
23. I 418-85	1.5-2	2.2.5	2-3	1.83-2.5
24. I 308-85	2-3	1.5-2.5	2.5-3	2.00-2.83
25. Misrimala (red)	2-3	1-2	2-3	1.66-2.66
26. B 60-31	5-8	5-7	5-8	5.0-7.66
27. CI 85-80	8-11	6-9	5-8	6.33-9.33
28. CI 228-80	4-8	4-8	5-7	4.33-7.66
29. Co 1158	6-9	6-8	7-9	6.33-8.66
30. Cok 31	10-12	8-10	10-15	9.33-12.33

Table 1 continued

Genotypes	2000-01	2001-02	2002-03	Moderately Resistant (MR)
				Range (0.1-3%)
31. CP 36-105	8-12	10-15	10-12	9.33-13.00
32. CP 48-110	10-15	15-18	12-15	12.33-16.0
33. CP 50-20	12-15	10-12	15-20	12.33-16.0
34. CP 70-1136	7-10	10-15	10-12	9.0-12.33
35. CP 73-361	15-20	15-18	15-20	15.0-19.33
36. I 25-90	20-25	20-22	18-20	19.33-22.33
37. I 68-78	10-15	10-15	12-18	10.66-16.00
38. I 19-86	20-22	15-20	20-24	18.33-22.00
39. I 192-86	15-25	20-24	20-22	18.33-23.66
40. I 322-86	18-20	20-22	15-20	17.66-20.66
41. I 291-87	15-20	20-22	15-18	16.66-20.00
42. BC 2	8-10	12-15	15-16	11.66-13.66
43. BC 5	22-25	20-25	20-24	20.66-24.66
44. I 231-85	15-20	20-25	20-25	18.33-23.33

Genotypes	2000-01	2001-02	2002-03	Moderately Resistant (MR)
				Range (25.1-50%)
45. BO 65	28-35	30-41	30-40	29.33-38.66
46. BO 25	30-38	30-45	32-45	30.66-42.66
47. CI 46-80	35-45	40-45	40-45	38.33-45.00
48. CP 377-80	31-38	35-38	35-42	33.66-39.33
49. CL 41-229	34-42	40-45	40-46	38.00-44.33
50. Co 604	35-45	38-42	31-40	34.66-42.33
51. Co 630	40-45	35-40	40-42	38.33-42.33
52. Co 633	38-47	35-42	40-45	37.66-44.66
53. Co 635	30-35	40-45	35-40	35.00-38.33
54. Co 640	38-45	42-48	40-46	40.00-46.33
55. Co 642	32-40	40-45	38-44	36.66-43.00
56. Co 775	25-35	32-40	34-38	30.33-37.66
57. Co 1148	30-38	35-40	32-38	32.33-38.66
58. Co 6502	26-35	30-40	32-38	29.33-37.66
59. CoL 29	28-30	35-45	40-45	34.33-40.66
60. CoL 33	40-45	40-45	35-38	38.33-42.66
61. CoL 66	40-45	28-35	35-40	34.33-40.00
62. CoL 73	27-32	30-35	35-38	30.66-35.00
63. CP 36-13	35-40	38-40	35-40	36.00-40.00
64. CP 40-101	40-45	34-38	35-38	36.33-40.33
65. Saipan	30-35	32-37	30-40	30.66-37.33
66. CP 44-154	35-40	30-36	32-35	32.33-37.00
67. CP 44-155	30-32	35-38	40-46	35.00-38.66
68. CP 50-5	40-48	30-40	42-45	37.33-44.33
69. CP 50-6	40-45	35-42	40-44	38.33-43.66
70. CP 50-72	35-40	38-44	40-50	37.66-44.66
71. CP 50-68	40-50	35-40	40-45	38.33-45.00
72. CP 53-33	30-35	32-38	31-35	31.00-36.00
73. CP 63-37	28-32	30-34	34-36	30.66-34.00
74. I 100-91	35-40	30-35	40-42	35.00-39.00
75. I 60-91	35-40	38-40	40-42	37.66-40.66
76. CP 66-31	40-45	35-38	30-40	35.00-41.00
77. CP 9-1052	45-48	40-45	45-50	43.33-47.66
78. CP 70-330	30-38	40-42	38-45	36.00-41.66
79. I 293-91	35-37	35-40	40-45	36.66-40.66
80. CP 72-1218	32-35	30-35	40-42	34.00-37.33

Table 1 continued

Genotypes	2000-01	2001-02	2002-03	Moderately Resistant (MR)
				Range (25.1-50%)
81. I 46-63	30-38	35-40	35-37	33.33-38.33
82. CP 130-65	38-40	35-38	40-42	37.66-40.00
83. I 139-66	30-35	35-40	35-38	33.33-37.66
84. I 101-66	40-48	40-50	45-48	41.66-48.66
85. I 156-66	45-48	45-50	35-40	41.66-46.00
86. I 170-67	40-45	30-40	38-45	36.00-41.66
87. I 134-70	26-30	30-35	30-40	28.66-35.00
88. I 4-71	30-34	30-38	38-40	32.66-37.33
89. I 5-71	35-40	35-40	40-45	36.66-41.66
90. I 11-71	40-44	40-45	35-40	38.33-43.00
91. I 38-72	28-30	30-35	40-44	32.66-36.33
92. I 106-74	36-40	40-45	35-38	37.00-41.00
93. Isd -21	30-35	30-38	33-36	31.00-36.33
94. I 24-76	38-40	40-45	30-35	36.00-40.00
95. I 119-76	45-50	40-48	40-45	41.66-47.66
96. I 14-78	40-48	45-50	40-45	41.66-47.66
97. I 27-78	30-35	40-45	30-40	33.33-40.00
98. I 30-78	35-38	30-35	28-40	31.00-37.66
99. I 33-75	26-30	32-38	40-44	32.66-37.33
100. I 5-78	30-35	40-45	35-40	35.00-40.00

Genotypes	2000-01	2001-02	2002-03	Highly Susceptible (HS)
				Range (50.1-100 %)
101. I 75-78	55-60	65-70	52-58	57.33-62.66
102. I 9-79	58-65	60-70	65-70	61.00-68.33
103. I 25-80	70-85	70-80	80-90	73.33-85.00
104. I 28-80	65-70	55-60	65-70	61.66-66.66
105. I 29-80	60-65	58-65	70-75	62.66-68.33
106. Isd 5-55	75-80	60-65	70-80	68.33-75.00
107. Isd 16	55-60	65-68	52-55	57.33-61.00
108. L 5	80-85	70-75	65-70	71.66-76.66
109. L 7	62-65	75-80	55-65	64.00-70.00
110. L 65-69	60-70	55-60	60-65	58.33-65.00
111. Misimala (white)	70-75	60-70	60-65	63.33-70.00
112. MY 54-129	65-70	70-75	60-70	65.00-71.66
113. NSM	52-60	65-70	65-75	60.66-68.33
114. Phill 48-15	65-60	60-65	60-70	61.66-65.00
115. Poj 28-75	58-60	65-70	60-65	61.00-65.00
116. ZH 110-65	70-75	65-70	80-85	71.66-76.66
117. ZH 238-65	60-70	70-75	60-70	63.33-71.66
118. ZH 179-66	80-85	70-80	70-75	73.33-80.00
119. I 144-86	70-75	65-70	70-80	68.33-75.00
120. I 323-86	60-65	70-75	65-70	65.00-70.00
121. I 328-86	55-60	60-65	60-65	58.33-63.33
122. I 326-86	60-70	80-85	60-75	66.66-76.66
123. I 327-86	60-70	65-70	70-80	65.00-77.33
124. I 507-55	55-60	52-58	60-65	55.66-61.00
125. I 507-85	65-70	60-70	60-75	61.66-71.66

Table 1 continued

Genotypes	2000-01	2001-02	2002-03	Highly Susceptible (HS)
				Range (50.1-100% infection)
126. Isd -28	80-85	75-80	70-80	75.00-81.66
127. I 562-85	60-65	65-70	60-70	63.00-68.33
128. Isd -24	55-60	60-65	55-65	56.66-63.33
129. Isd 14-60	70-75	65-70	60-70	65.00-71.66
130. I 226-83	55-60	70-75	65-70	63.33-68.33
131. I 49-84	60-65	60-70	70-75	63.33-70.00
132. BC - 4	70-75	60-70	65-75	65.33-71.66
133. BC-1	65-70	55-60	60-65	60.00-65.00
134. I 281-85	80-85	70-80	75-80	75.00-81.66
135. I 233-87	75-80	65-70	60-70	66.66-73.33
136. I 294-87	60-70	70-75	65-70	65.00-71.66
137. I 457-85	75-85	80-85	80-90	78.33-86.66
138. I 379-85	55-65	60-65	60-65	58.33-65.00
139. Isd -27	55-60	65-70	60-70	60.00-66.66
140. Beluchi	60-65	60-70	65-70	61.66-68.33
141. CP 38-80	65-70	60-65	70-80	65.00-66.66
142. I 52-88	70-75	55-65	60-70	61.66-70.00
143. I 101-66	65-70	55-60	70-75	63.33-68.33
144. I 220-92	68-70	65-70	60-70	64.33-70.00
145. I 175-93	55-60	70-75	55-60	60.00-65.00
146. I 227-87	70-75	60-65	70-70	66.66-71.66
147. CO 208	65-70	55-60	60-65	60.00-65.00
148. I 8092	60-65	70-75	55-60	61.66-66.66
149. I 80-93	65-70	60-70	80-85	68.33-75.00
150. I 131-94	70-75	65-70	70-75	68.33-73.33

Table 2: Categories of tested 150 germplasms with respect to SMCV infection from 2000-2003

Resistant clones (0.1-3% infection)	Moderately resistant clones (3.1-25%)	Moderately Susceptible clones (25.1-50%)		Highly susceptible clones (50.1-100% infection)	
1. CP-50-70	1. B 60-31	1. BO 65	29. CP 63-37	1. I 75-78	29. Isd 14-60
2. F-1	2. CI 85-80	2. BO 25	30. I 100-91	2. I 9-79	30. I 226-83
3. I 143-67	3. CI 228-80	3. CI 46-80	31. I 60-91	3. I 25-80	31. I 49-84
4. I 143-86	4. Co 1158	4. CP 377-80	32. CP 66-31	4. I 28-80	32. BC - 4
5. I 325-86	5. Cok 31	5. CL 41-229	33. CP 9-1052	5. I 29-80	33. BC-1
6. I 251-85	6. CP 36-105	6. Co 604	34. CP 70-330	6. Isd 5-55	34. I 281-85
7. I 523-85	7. CP 48-110	7. Co 630	35. I 293-91	7. Isd 16	35. I 233-87
8. Isd 25	8. CP 50-20	8. Co 633	36. CP 72-1218	8. L 5	36. I 294-87
9. Kaluzuri	9. CP 70-1136	9. Co 635	37. I 46-63	9. L 7	37. I 457-85
10. BC-3	10. CP 73-361	10. Co 640	38. CP 130-65	10. L 65-69	38. I 379-85
11. B 34-231	11. I 25-90	11. Co 642	39. I 139-66	11. Msrimala (white)	39. Isd -27
12. BO-43	12. I 68-78	12. Co 775	40. I 101-66	12. MY 54-129	40. Beluchi
13. I 228-80	13. I 19-86	13. Co 1148	41. I 156-66	13. NSM	41. CP 38-80
14. Co-530	14. I 192-86	14. Co 6502	42. I 170-67	14. Phill 48-15	42. I 52-88
15. Co 47-193	15. I 322-86	15. CoL 29	43. I 134-70	15. Poj 28-75	43. I 101-66
16. I 114-91	16. I 291-87	16. CoL 33	44. I 4-71	16. ZH 110-65	44. I 220-92
17. H 37-1933	17. BC 2	17. CoL 66	45. I 5-71	17. ZH 238-65	45. I 175-93
18. I 36-91	18. BC 5	18. CoL 73	46. I 11-71	18. ZH 179-66	46. I 227-87
19. Isd 20	19. I 231-85	19. CP 36-13	47. I 38-72	19. I 144-86	47. CO 208
20. I 96-80		20. CP 40-101	48. I 106-74	20. I 323-86	48. I 8092
21. I 6-56		21. Saipan	49. Isd -21	21. I 328-86	49. I 80-93
22. I 290-82		22. CP 44-154	50. I 24-76	22. I 326-86	50. I 131-94
23. I 418-85		23. CP 44-155	51. I 119-76	23. I 327-86	
24. I 308-85		24. CP 50-5	52. I 14-78	24. I 507-55	
25. Msrimala (red)		25. CP 50-6	53. I 27-78	25. I 507-85	
		26. CP 50-72	54. I 30-78	26. Isd -28	
		27. CP 50-68	55. I 33-75	27. I 562-85	
		28. CP 53-33	56. I 5-78	28. Isd -24	

Among the 150 tested germplasms none was found to be immune to sugarcane mosaic virus. Only 25 number of clones were found resistant, 19 clones were found moderately resistant, 56 were moderately susceptible and the rest 50 number of clones were highly susceptible to mosaic virus (Table 2). This revealed that germplasm lines varies greatly for their response to virus infection and this may be attributed to their diversity of genetic makeup. Moreover, the resistance of different germplasm are not uncommon, as prevalence of resistance have been recorded by many workers, Gurha, et al. (1982), Iqbal, et al.; Ahmed (1975). The reaction of urdbean cultivars to YMV under condition of high natural infection have reported in the varietal screening studies in Pakistan by Ahmed (1975). These results indicated higher level of resistance against mosaic virus disease in the germplasm. This result had the conformity with the results reported by Iqbal *et al.* (1991). This observation revealed that there are varieties/clones exists at BSRI germplasm, which had wide range of mosaic infection from resistant, moderately resistant, moderately susceptible and highly susceptible. The observation and the breeding behavior of different clones support wide genetic diversity to mosaic resistant exist within the varieties/clones. Careful evaluation of potential parent clones should be done in a breeding programme against SCMV. It is noted that the same variety were classified differently in different years in respect of incidence of SCMV due to variation of climatic condition.

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