

A CASE STUDY

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Evaluation of banana germplasm against sigatoka leaf spot disease under natural conditions

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ABSTRACT

Study on screening of germplasm of banana was under taken during 2008-09 and 2009-10 under natural epiphytotic conditions. The observations were recorded on to sigatoka leaf spot index of banana. All cultivars under study from four genomic groups have recorded susceptible to highly susceptible reactions to the sigatoka leaf spot disease (*Mycosphaerella musicola*) of banana. During both the years of study, all cultivars were recorded susceptible category, of disease reaction. Among the nine cultivars from AAA group, the respective range of PDI were 11.43 to 31.33 and 22.35 to 38.52 for 2008-09 to 2009-10. During both years of study, the highest PDI was recorded with cv. MAHALAXMI. The least PDI was recorded with cv. SHRIMANTHI. The cv. SAFED VELCHI (AB) recorded PDI above 20 and also recorded susceptible reaction. The four cultivars from AAB group recorded PDI in the range of 8.35 to 21.53 and 20.14 to 28.32, respectively for 2008-09 and 2009-10.

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INTRODUCTION

Banana is the most important tropical fruit crop. The incidence of sigatoka since last two decades in Maharashtra was increased, Now-a-days it has become one of the major constraints in banana production. Sigatoka leaf spot disease is caused by *Mycosphaerella musicola*. Economic losses due to the leaf spot disease have been so heavy in some areas that the banana production has been ceased altogether especially where susceptible varieties were grown. A severe incidence of sigatoka was recorded in banana orchards of south Gujarat during 1976 to 1982 causing drying and defoliation of leaves and premature ripening of fruits (Vala, 1996). In Maharashtra state, north Maharashtra region is the major producer of banana followed by Nanded, Parbhani, Basmat area of Marathwada. Now-a-days Pune, Ahmednager,

Solapur and Kolhapur districts and rest of western Maharashtra, have emerged as new banana growing regions. There is appearance of sigatoka leaf spot disease from June to February, with varying incidence and intensity. It disappears during summer months. The grand naine, the major cultivar under cultivation in Maharashtra is from dwarf Cavendish group (AAA). The present investigation was undertaken to find out the resistant source from the different cultivars maintained in germplasm at the Banana Research Station, Jalgaon (M.S.).

MATERIAL AND METHODS

The experiment was conducted during 2008-09 and 2009-2010 at The Banana Research Station, Mahatma Phule Krishi Vidyapeeth, Jalgaon. Seventeen cultivars including various

genome and ploidy levels were evaluated for their reaction to sigatoka leaf spot under natural field conditions. The observations were recorded with respect to sigatoka leaf spot index. For scoring 0 to 6 scale was used as suggested by (Gauhl *et al.*, 1993) where 0 = no symptoms, 1 = less than 1 per cent of lamina with symptoms (only streaks and 1 or up to 10 spots), 2 = up to 5 per cent of lamina with symptoms, 3 = 6 to 15 per cent of lamina with symptoms, 4 = 16 to 33 per cent of lamina with symptoms, 5 = 34 to 50 per cent of lamina with symptoms, 6 = 51 to 100 per cent of lamina with symptoms.

From these observations, the infection index (PDI) has been calculated by applying the following formula :

$$\text{Infection index (PDI)} = \frac{\sum nb}{(N-1)T} \times 100$$

where, n = number of leaves in each grade. b = Grade N = Number of grades used in the scale (7) T = Total number of leaves scored.

After calculation, the cultivars were classified under different categories is given in Table A.

Disease score	Disease reaction
0.	Immune
1.	Highly resistant
2.	Resistant
3.	Moderately resistant
4.	Susceptible
5 and 6.	Highly susceptible

RESULTS AND DISCUSSION

From Table 1, it was observed that, 16 cultivars were classified under susceptible, disease reaction and one under highly susceptible reaction. During the 2008-09 the range of PDI was in between 7.69 to 31.33 and disease score from 3 to 4.0. The nine cultivars from AAA genomic group, recorded PDI in the range of 11.43 to 31.33. The highest (31.33) PDI was recorded with cv. MAHALAXMI, followed by cv. GRAND NAINI (28.43). The rest of cultivars were in the range of 11.43 to 25.34. The commonly grown cultivars like cv. SHRIMANTI and cv. HANUMAN of northern Maharashtra recorded PDI in the range of 11.43 to 13.33 which was comparatively least than others Somu *et al.* (2013) and Totagi *et al.* (2014a).

Among AAB group of cultivars, the PDI ranged from 8.35 to 21.53 cv. ALPAN recorded least (8.35) PDI, and was grouped under susceptible. Another two cultivars from ABB group recorded PDI below 18 with disease score of 3.0. The cv. NENDRAN recorded 21.53 PDI and grouped as susceptible cultivars. Only one seedless diploid cultivar cv. SAFED VELCHI recorded 20.45 PDI with disease score of 4.0 and also grouped as susceptible cultivars (Totagi *et al.*, 2014b).

Table 1 also indicated that in 2009-10 study the PDI was in the range of 9.62 to 40.25 and disease score of 3 to 5.0. Among the cultivars from AAA group, cv. MAHALAXMI recorded 38.52 PDI with disease score of 4.0 and grouped as susceptible, and the cv. SHRIMANTI exhibited least PDI 22.55 with score of 4.0. The rest of cultivars from AAA group recorded PDI in the range of 23.8 to 29.30 and with susceptible reaction to the sigatoka leaf spot (Mondal *et al.*, 2012).

Sr. No.	Cultivars	Genome group	PDI		Disease score	Disease reaction
			2008-09	2009-10		
1.	Grand Naine	AAA	28.43	25.45	4.0	Susceptible
2.	Shrimanti	AAA	11.43	22.55	3.0	Susceptible
3.	Harsal	AAA	24.64	26.00	4.0	Susceptible
4.	Ardhपुरी	AAA	25.34	29.30	4.0	Susceptible
5.	Ambiamohor	AAA	16.36	28.79	4.0	Susceptible
6.	Mahalaxmi	AAA	31.33	38.52	4.0	Susceptible
7.	Red banana	AAA	16.30	25.81	4.0	Susceptible
8.	Basrai	AAA	12.84	23.80	3.0	Susceptible
9.	Hanuman	AAA	13.33	27.63	3.0	Susceptible
10.	Safed velchi	AB	20.45	20.33	4.0	Susceptible
11.	Nendran	AAB	21.53	26.40	4.0	Susceptible
12.	Lalkel	AAB	15.17	28.32	3.0	Highly susceptible
13.	Mutheli	AAB	13.93	20.56	3.0	Susceptible
14.	Rajeli	AAB	18.33	24.50	4.0	Susceptible
15.	Alpan	AAB	8.35	20.14	3.0	Susceptible
16.	NRCB-01	ABB	7.69	9.62	3.0	Susceptible
17.	NRCB-03	ABB	7.14	11.30	3.0	Susceptible

Table 2 : Per cent disease intensity of sigatoka leaf spot on banana cultivars					
Sr. No.	Cultivars	Genome group	PDI	Disease score	Disease reaction
1.	Basrai	AAA	23.8	4.0	Susceptible
2.	Shrimanti	AAA	22.55	4.0	Susceptible
3.	Ambia mohar	AAA	28.79	4.0	Susceptible
4.	Harsaal	AAA	26.00	4.0	Susceptible
5.	Hanumaan	AAA	27.63	4.0	Susceptible
6.	Red Banana	AAA	25.81	4.0	Susceptible
7.	Ardhapuri	AAA	29.30	4.0	Susceptible
8.	Manoranjitham	AAA	26.53	4.0	Susceptible
9.	Straight Finger	AAA	26.33	4.0	Susceptible
10.	Gandevi selection	AAA	28.55	4.0	Susceptible
11.	Grand Naine	AAA	25.45	4.0	Susceptible
12.	Mahalaxmi	AAA	38.52	5.0	Highly susceptible
13.	Mutheli	AAB	20.56	4.0	Susceptible
14.	Rajeli	AAB	24.15	4.0	Susceptible
15.	Alpan	AAB	20.14	4.0	Susceptible
16.	Nendran	AAB	26.40	4.0	Susceptible
17.	Karpurachackerakeli	AAB	33.70	5.0	Highly susceptible
18.	Lalkel	AAB	28.32	4.0	Susceptible
19.	Rasthali	AAB	27.40	4.0	Susceptible
20.	Jawari Bale	AAB	29.55	4.0	Susceptible
21.	Ladies Finger	AAB	26.35	4.0	Susceptible
22.	Mas	AAB	40.25	5.0	Highly susceptible
23.	Sarkar Chonya	AAB	35.60	5.0	Highly susceptible
24.	Hybrid Sawani	AAB	31.20	4.0	Susceptible
25.	Sughandhi	AAB	20.54	4.0	Susceptible
26.	Chera Padathi	AAB	26.75	4.0	Susceptible
27.	Champa	AAB	17.20	4.0	Susceptible
28.	Vannan	AAB	31.33	4.0	Susceptible
29.	NRCB-01	ABB	09.62	3.0	Susceptible
30.	NRCB-03	ABB	11.30	3.0	Susceptible
31.	Ankur-II	ABB	18.43	4.0	Susceptible
32.	Bangrier	ABB	20.55	4.0	Susceptible
33.	SABA	ABB	15.66	3.0	Susceptible
34.	Udhayam	ABB	19.25	4.0	Susceptible
35.	Bankel	ABB	23.05	4.0	Susceptible
36.	Agnimalbhog	ABB	21.17	4.0	Susceptible
37.	Sahalil Kela	ABB	25.28	4.0	Susceptible
38.	Bhurkel	ABB	24.15	4.0	Susceptible
39.	Jamulapalem	ABB	18.25	4.0	Susceptible
40.	Boddida Bukkissa	ABB	21.30	4.0	Susceptible
41.	Pey Kunnan	ABB	22.55	4.0	Susceptible
42.	Chirapunji	ABB	19.20	4.0	Susceptible
43.	Kallu Monthan	ABB	18.85	4.0	Susceptible
44.	Kait Sheijing	ABB	24.65	4.0	Susceptible
45.	Singalaji	ABB	22.33	4.0	Susceptible

Table 2 : Contd...

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46.	Goukar	ABB	18.25	4.0	Susceptible
47.	Anaikomban	AA	26.25	4.0	Susceptible
48.	Pisang lilin	AA	29.70	4.0	Susceptible
49.	Matti	AA	23.55	4.0	Susceptible
50.	Cv. ROSE	AA	27.43	4.0	Susceptible
51.	Calcutta-04	AA	10.63	4.0	Susceptible
52.	Namarai	AA	25.15	4.0	Susceptible
53.	Sanna chenkadali	AA	35.20	5.0	Highly susceptible
54.	Kunnan	AB	20.35	4.0	Susceptible
55.	Ney poovan	AB	22.72	4.0	Susceptible
56.	Ney poovan	AB	24.35	4.0	Susceptible
57.	Nattu poovan	AB	26.36	4.0	Susceptible
58.	Poovila chundan	AB	30.35	4.0	Susceptible
59.	Safed velchi	AB	20.33	4.0	Susceptible
60.	Valia kunnan	AB	27.85	4.0	Susceptible
61.	Adakka kunnan	AB	25.38	4.0	Susceptible

All the the cultivars from AAB group recorded PDI more than 20 and with susceptible disease reaction. cv. LALKEL recorded highest PDI of 28.32 with disease score of 3.0. The rest of cultivars were grouprd as susceptible cultivars with PDI in the range of 20.14 to 26.40. The result obtained in two experiments are in agreement with the results obtained by Babylatha *et al.* (1990) and Daniells and Bryde (1999). Table 2 indicates the per cent disease intensity (PDI) and disease reaction of 61 cultiors of banana against sigatoka leaf spot disease.

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