

RESEARCH ARTICLE

Evaluation of elephant foot yam germplasm against leaf blight caused by *Phytophthora colocasiae* Racib

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ABSTRACT

The wide spread cultivation of acidity free and high yielding cultivars of elephant foot yam (*Amorphophallus paeoniifolius* Dennst.) has led to severe problem of leaf blight disease, throughout the country. The difficulty to control with chemical means after its outbreak, particularly in rainy season, leaves us with the only option to use resistant cultivars. Therefore, in order to find resistant sources in the available germplasm, an experiment was conducted at the Main Experiment Station of the Department of Vegetable Science, Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad, UP, during 2005-06 and 2006-07. Altogether, 49 genotypes of elephant foot yam, collected from different parts of the country, were screened against *Phytophthora* leaf blight, caused by *Phytophthora colocasiae* Racib., under artificial epiphytotic conditions. The per cent disease intensity (PDI) was recorded following the 0-5 scale, as suggested by Chester (1950), and the Area Under Disease Progress Curve (AUDPC) was also calculated. The results thus obtained indicated that none of the genotypes was found in resistant category. Out of the 49 genotypes tested, 9 genotypes namely, NDA-3, NDA-12, NDA-13, NDA-21, NDA-25, NDA-26, NDA-29, NDA-30, and NDA-45, showed moderate susceptibility.

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INTRODUCTION

Elephant foot yam (*Amorphophallus paeoniifolius* Dennst.), known as *Suran* in Hindi, is a popular vegetable in Uttar Pradesh, Bihar, Madhya Pradesh, Maharashtra, Orissa, Andhra Pradesh, Tamil Nadu, Karnataka and Kerala. Introduction of acidity free new varieties with high yield potential has led to significant increase in elephant foot yam acreage across the country. This has also led to severe problem of leaf blight disease, caused by *Phytophthora colocasiae* Racib., which is the causative organism of leaf blight of taro also (Mishra, 1999). This disease appears in severe form

wherever elephant foot yam is grown with specific perspective to Northern and Eastern parts of the country. Symptoms of *Phytophthora* leaf blight of elephant foot yam are generally observed in the older leaves during August to September. Small water-soaked lesions develop on the leaflets. These spots enlarge and coalesce and give a blighted appearance in later stages.

Studies have shown the usefulness of fungicides against *P. colocasiae* (Aggarwal and Mehrotra 1987; Mishra, 1999). But, in rainy season, once the disease appears in the field, practically it becomes next to impossible to control it with any means. This leaves the use of resistant varieties as the only

Table 1 : Reaction of elephant foot yam genotypes against Phytophthora leaf blight

Sr. No	Genotypes	2005-06			2006-07			Highest disease score
		PDI Pooled mean	AUDPC	Reaction	PDI Pooled mean	AUDPC	Reaction	
1.	NDA-1	56.48	1160.58	HS	57.32	1214.32	HS	HS
2.	NDA-2	34.48	905.81	S	38.35	1087.57	S	S
3.	NDA-3	22.47	449.98	MS	24.85	471.30	MS	MS
4.	NDA-4	58.75	1301.32	HS	56.24	1150.72	HS	HS
5.	NDA-5	53.88	1082.01	HS	58.75	1246.76	HS	HS
6.	NDA-6	37.34	809.58	S	48.15	1039.62	S	S
7.	NDA-7	55.30	1093.70	HS	54.30	1187.33	HS	HS
8.	NDA-8	63.47	1388.51	HS	60.57	1320.82	HS	HS
9.	NDA-9	30.84	709.74	S	36.69	844.66	S	S
10.	NDA-10	52.46	1185.72	HS	63.75	1412.86	HS	HS
11.	NDA-11	59.47	1360.57	HS	62.29	1339.20	HS	HS
12.	NDA-12	21.76	448.23	MS	24.05	551.64	MS	MS
13.	NDA-13	23.20	531.39	MS	24.89	589.96	MS	MS
14.	NDA-14	37.75	897.45	S	43.77	1005.06	S	S
15.	NDA-15	64.66	1477.63	HS	62.39	1315.75	HS	HS
16.	NDA-16	28.89	622.75	S	32.37	691.70	S	S
17.	NDA-17	51.11	1066.57	HS	54.25	1209.94	HS	HS
18.	NDA-18	30.81	654.19	S	37.38	859.43	S	S
19.	NDA-19	47.15	1013.56	S	48.72	1060.53	S	S
20.	NDA-20	23.84	489.67	MS	27.88	506.31	S	S
21.	NDA-21	20.05	390.01	MS	20.39	395.57	MS	MS
22.	NDA-22	63.57	1305.70	HS	60.25	1280.18	HS	HS
23.	NDA-23	57.47	1300.20	HS	58.78	1305.05	HS	HS
24.	NDA-24	59.57	1360.30	HS	61.65	1380.96	HS	HS
25.	NDA-25	23.43	490.31	MS	24.28	559.76	MS	MS
26.	NDA-26	18.21	319.12	MS	19.57	323.15	MS	MS
27.	NDA-27	51.32	1185.66	HS	47.23	1099.32	S	HS
28.	NDA-28	24.05	531.39	MS	30.75	634.83	S	S
29.	NDA-29	22.39	370.12	MS	24.01	387.81	MS	MS
30.	NDA-30	21.19	365.45	MS	22.09	372.83	MS	MS
31.	NDA-31	40.59	947.15	S	43.75	1015.13	S	S
32.	NDA-32	33.99	665.57	S	38.67	839.88	S	S
33.	NDA-33	52.30	1165.28	HS	58.23	1310.97	S	HS
34.	NDA-34	21.45	454.60	MS	23.77	769.66	S	S
35.	NDA-35	57.89	1114.32	HS	58.34	1367.12	HS	HS
36.	NDA-36	65.44	1507.13	HS	67.71	1586.92	HS	HS
37.	NDA-37	70.31	1705.00	HS	69.25	1660.50	HS	HS
38.	NDA-38	55.69	1370.32	HS	58.18	1448.35	HS	HS
39.	NDA-39	58.47	1273.57	HS	60.23	1292.59	HS	HS
40.	NDA-40	64.30	1509.32	HS	68.72	1630.11	HS	HS
41.	NDA-41	41.40	858.58	S	47.45	943.51	S	S
42.	NDA-42	55.23	1366.32	HS	60.33	1386.22	HS	HS
43.	NDA-43	40.57	900.56	S	47.97	1018.32	S	S
44.	NDA-44	55.31	1190.06	HS	59.84	1219.76	HS	HS
45.	NDA-45	20.46	400.48	MS	20.88	398.93	MS	MS
46.	NDA-46	53.45	1045.13	HS	60.32	1287.32	HS	HS
47.	Gajendra	66.32	1544.22	HS	67.81	1504.12	HS	HS
48.	Bidhan Kusum	45.45	897.77	S	57.31	1113.87	HS	HS
49.	Sree Padma	51.52	1206.12	HS	56.89	1377.13	HS	HS

S : Susceptible

MS : Moderately Susceptible

HS : Highly Susceptible

Sr. No	Scale grade	Percent plant / area affected	Reaction
1.	0	Leaves free from infection	Highly resistant (HR)
2.	1	Traces of infection, less than 1 % leaf area infected	Resistant (R)
3.	2	Light infection, lesions visible upto 5 % leaf area	Moderately resistant (MR)
4.	3	Moderate infection, lesions visible upto 6-25 % leaf area	Moderately susceptible (MS)
5.	4	Heavy infection, lesions visible upto 25-50 % leaf area	Susceptible (S)
6.	5	Severe infection, profuse coalescing lesions with more than 50 % leaf area	Highly susceptible (HS)

practical option for *Phytophthora* leaf blight management in farmer's fields. Moreover, the use of resistant varieties is considered to be the cheapest and best, and the safest method of plant disease control; particularly air borne leaf diseases. Therefore, the present study was carried out to identify the resistant sources in the available genetic stock of elephant foot yam against this disease.

MATERIAL AND METHODS

The experiment was conducted at the Main Experiment Station of the Department of Vegetable Science, Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad, UP, during 2005-06 and 2006-07, for screening against leaf blight disease. Planting material of 49 genotypes collected from different parts of the country were planted in a well prepared and fertilized field during *Kharif* 2005-06 and repeated in *Kharif* 2006-07. The experiment was laid out following Randomized Block Design using 2.40 x 2.40 m plot size and maintaining a spacing of 60 x 45 cm. Two rows of susceptible line (NDA-38) were planted as infector row all around the experimental plot. All the treatments were inoculated with pure culture of *Phytophthora colocasiae*. Spore suspension of the pathogen was prepared in distilled water having a spore load of 50 to 75 per microscopic field (10x). The inoculum was sprayed using an atomizer in the evening hours, after 55 days of planting. To create epiphytotic conditions, the crop was again inoculated after four days of the first inoculation. The per cent disease intensity (PDI) was recorded following 0-5 scale, four times at 10 days intervals on randomly selected ten plants from each genotype. The 0-5 scale, as suggested by Chester (1950), is given below:

On the basis of per cent disease intensity (PDI), the Area Under Disease Progress Curve (AUDPC) was also calculated by the following formula (Singh *et al.*, 2004).

$$\text{AUDPC} = \sum_{i=1}^{n-1} \frac{Y_i + Y_{i+1}}{2} (T_{i+1} - T_i)$$

where :

Y_i : *Phytophthora* leaf blight intensity (%) at the i^{th} observation,

T_i : Time (days) of the i^{th} observation, and

n : Total number of observations.

RESULTS AND DISCUSSION

The results presented in Table 1, indicated that the Per cent Disease Intensity (PDI) and Area Under Disease Progress Curve (AUDPC) varied for different genotypes during both the years of experiment. It was observed that higher the PDI more was the AUDPC. On overall basis, the disease severity was higher in the second year experiment.

The minimum PDI and AUDPC were observed for the genotype NDA-26 (18.21, 319.12 and 19.57, 323.15), followed by NDA-21 (20.05, 390.01 and 20.39, 395.57), NDA-30 (21.19, 365.45 and 22.09, 37.83) and NDA-34 (21.45, 454.60 and 23.77, 769.66). On the other hand, maximum per cent disease intensity (PDI) and Area Under Disease Progress Curve (AUDPC) was note for NDA-37 (70.31, 1705.00 and 69.25, 1660.50) during 2005-06 and 2006-07, respectively. Similar variations have also been reported by Singh *et al.* (2004).

On the basis of PDI, the susceptibility of each genotype was recorded. A perusal of Table 1 indicated that none of the genotypes was found in resistant category. Out of the 49 genotypes tested, 9 genotypes namely, NDA-3, NDA-12, NDA-13, NDA-21, NDA-25, NDA-26, NDA-29, NDA-30, and NDA-45, showed moderate susceptibility. These findings are in conformity with the observation made by Singh *et al.* (2001).

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