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Screening of Colocasia Germplasm In Sodic Soil Against Phytopthora Leaf Blight

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ABSTRACT
Root and tuber crops are the third most important food crops the world after cereals and legumes. Colocasia (Colocasia esculenta var.antiquorum(L.) Schott) is an important vegetable crop and a cheap source of carbohydrate for middle class family throughout the country. The crop suffers from a number of devastating diseases in which leaf blight caused by PhytohpthoracolocasiaeRacib. is the most damaging. Because of the hydrophobic nature of Colocasia leaves, there is a tendency of no retention of water droplets on the leaves surface, which leads to failure of any fungicidal spray for managing this disease. Under such circumstances, cultivation of resistant varieties may be only the option for disease management. In order to develop disease resistant varieties, information regarding the nature and magnitude of resistance of Colocasia germplasm against leaf blight is of utmost importance. Keeping in view, 63 indigenous germplasm of Colocasia were evaluated under natural epiphytotic conditions at the MES of Vegetable Science Department, NDUAT, Kumarganj, during the cropping season of 2008 for resistance screening against leaf blight disease. Out of these 63 germplasm lines evaluated, only two lines namely NDC-30 and NDC-59 were found to be moderately resistant, 35 germplasm were found to be moderately susceptible, 24 germplasm were found to be under susceptible category and remaining two germplasm namely NDC-31 and NDC-62 were found to be highly susceptible. It is noteworthy that none of the germplasm was found to be highly resistant or even resistant during the course of investigation.

I. INTRODUCTION

*Colocasia esculenta*var.*antiquorum*(L.)Schott commonly known asTaro or *Arvi* is an important tuber crop used as vegetable in tropical and subtropical parts of India (Mishra *et al*., 2008 and Thankappan 1985). However, theproduction is limited heavily due to various diseases prevailing in tropical and subtropical parts. Among these diseases, leaf blight caused by *Phytophthoracolocasiae*Racib. is of serious nature. The disease affects the leaves and petioles of taro plants, resulting in extensive damage of the foliage, typical symptoms are large often coalescing to destroy large areas of leaf (Sarkar*et al*., 2017). The leaf blight diseases is widely spread and have been reported to have destroyed Colocasia planting in several countries like Indonesia, Thailand, Myanmar, India,Srilanka, Taiwan, Philippines, Malaysia, Hawai, Papua New Guinea,and Caribbean (Thankappan 1985). The climatic conditions in north and eastern parts of India are highly suitable for spread of this disease and it is observed in devastating forms after the onset of monsoon. Normally it appears during middle of July and continues till September. In India this diseases is serious in many states like Andhra Pradesh, Tamil Nadu, Arunachal Pradesh, Assam, Bihar, Odisha, Punjab, Jharkhand, Uttar Pradesh and West Bengal. The disease causes considerable yield loss especially in wet conditions throughout the country (Mishra*et al*.,2008). There is a waxycoating on Colocasia leaves, hence water droplet does not retain on leaf surface, which leads to failure in disease management through fungicidal application (Sugha and Gurung, 2007). The most effective and economical method of disease management thus, lies in the cultivation of resistant varieties. The present investigations was therefore undertaken to screen different indigenous genotypes of Colocasia against leaf blight in natural epiphytotic conditions.

II. MATERIALS AND METHODS

Sixty-three indigenous germplasm of *Colocasia* were collected from different parts of northern and eastern India. These germplasm were evaluated for resistance against *Phytophthoracolocasiae*Racib. causing leaf blight, at the MES of Vegetable Science Department during the cropping season of 2008. The trial was laidout in augmented plot design with three replications in a field where the crop was continuously grown for the last five years. A susceptible check was grown all around the experimental plot to create sufficient inoculum pressure. The recommended package of practices were followed except

fungicidal spray to raise a good crop.The germplasm were evaluated under natural epiphytotic conditions. Disease severity was recorded by taking visual observations following the rating scale described by Prasad (1982). For scoring, 50 leaves of 10 randomly selected plants within each plot were used for rating disease severity on 0-5 rating scale. The highest values of disease severity were recorded for analysis. Tuber yield were also recorded.

III. RESULTS AND DISCUSSION

The results pertaining to disease reaction against Phytophthora leaf blight and corm yield of individual germplasm lines is presented in Table 1. A perusal of data in Table 1 revealed that there was considerable variation among thegermplasm lines for disease resistance against leaf blight.Nag et al., (2020), Sarkar*et al*., (2017), Shakyawar*et al*., (2012) and Mishra (1993) also reported that disease reaction among various *Colocasia* linesagainst Phytophthora leaf blight varied significantly.

Table 1: Disease reaction of Colocasia germplasm lines against Phytophthoraleaf blight

Sl. No.	Germplasm	Total No. of plants	Diseased plants	Disease intensity (%)	Grade (out of 5)	Disease reaction	Yield (t/ha)
1	NDC-1	17	7	41.45	4	S	14.20
2	NDC-2	18	5	27.77	4	S	29.94
3	NDC-3	20	4	20.00	3	MS	28.70
4	NDC-4	18	4	22.22	3	MS	20.06
5	NDC-5	19	7	26.84	4	S	14.35
6	NDC-6	12	5	41.66	4	S	13.27
7	NDC-7	4	1	25.00	3	S	12.96
8	NDC-8	18	7	38.88	4	MS	14.07
9	NDC-9	18	7	38.88	4	S	13.33
10	NDC-10	18	8	44.44	4	S	22.22
11	NDC-11	18	5	27.77	4	S	20.37
12	NDC-12	18	4	22.22	3	S	18.19
13	NDC-13	4	1	25.00	3	MS	35.50
14	NDC-14	14	2	14.28	3	MS	9.56
15	NDC-15	17	5	29.41	4	MS	22.84
16	NDC-16	20	4	20.00	3	S	20.04
17	NDC-17	17	5	29.41	4	MS	25.00
18	NDC-18	18	4	22.22	3	S	24.07
19	NDC-19	16	5	31.25	4	MS	21.60
20	NDC-20	17	3	17.64	3	MS	20.99
21	NDC-21	18	5	27.77	4	S	25.31
22	NDC-22	18	5	27.77	4	S	13.88
23	NDC-23	18	7	38.88	4	S	20.37
24	NDC-24	20	4	20.00	3	MS	17.28
25	NDC-25	19	3	15.78	3	MS	17.28
26	NDC-26	18	7	38.88	4	S	13.58
27	NDC-27	19	5	26.31	4	S	9.88
28	NDC-28	18	2	11.11	3	MS	14.20
29	NDC-29	17	2	11.76	3	MS	16.67
30	NDC-30	18	1	5.55	2	MR	12.35
31	NDC-31	18	11	61.11	5	HS	11.42
32	NDC-32	17	5	29.41	4	S	19.14
33	NDC-33	12	2	16.66	3	MS	111.11
34	NDC-34	20	3	15.00	3	MS	20.68
35	NDC-35	18	4	22.22	3	MS	19.14
36	NDC-36	18	3	16.66	3	MS	19.44
37	NDC-37	18	7	38.88	4	S	19.14
38	NDC-38	19	8	42.10	4	S	21.91
39	NDC-39	17	3	17.66	3	MS	14.20
40	NDC-40	18	2	11.11	3	MS	16.67
41	NDC-41	18	2	11.11	3	MS	14.19
42	NDC-42	18	4	22.22	3	MS	15.74
43	NDC-43	17	3	17.64	3	MS	16.36
44	NDC-44	17	3	17.65	3	MS	16.36
45	NDC-45	19	3	15.98	3	MS	13.89
46	NDC-46	19	4	21.05	3	MS	20.06
47	NDC-47	10	4	40.00	4	S	29.94
48	NDC-48	18	3	16.66	3	MS	24.07
49	NDC-49	8	3	37.50	4	S	25.00
50	NDC-50	18	3	16.66	3	MS	18.84
51	NDC-51	17	2	11.76	3	MS	17.59
52	NDC-52	17	3	17.64	3	MS	17.72

53	NDC-53	16	5	31.25	4	S	14.20
54	NDC-54	17	4	23.52	3	MS	13.57
55	NDC-55	18	3	16.66	3	MS	20.06
56	NDC-56	17	2	11.76	3	MS	30.86
57	NDC-57	17	3	17.64	3	MS	12.96
58	NDC-58	19	3	15.78	3	MS	16.36
59	NDC-59	18	1	5.55	2	MR	16.34
60	NDC-60	12	4	33.33	4	S	14.20
61	NDC-61	17	3	17.64	3	MS	14.20
62	NDC-62	18	10	53.55	4	HS	16.36
63	NDC-63	18	5	27.77	4	S	12.65

S : Susceptible, MS : Moderately Susceptible, HS : Highly Susceptible, R : Resistant, MR : Moderately Resistant

Among these 63 genotypes of *Colocasia* tested for resistance against *Phytophthoracolocasiae,*only two lines *viz.*,NDC-30 and NDC-59 were found to be moderately resistant, as they exhibited the disease severity of 5.55 %. A total of 35 germplasm were rated as moderately susceptible,as these germplasm lines exhibited disease severity between the range of 10 to 24.9 %. Some 24 germplasm were found to be susceptible and remaining two germplasm namely NDC-31 and NDC-62 were found to be highly susceptible,for they exhibited highest disease severity i.e. 61.11 % and 55.55 %, respectively.Nag et al., (2020), Sarkar*et al*., (2017), Kumar and Dubey (1996) Mishra (1993 and 1991) have also reported similar range of prevalence of Phytophthora leaf blight in Colocasia germplasm lines.

Depending upon disease severity and disease rating scale the germplasm lines were grouped in different categories as given below.

Disease Reaction	Germplasm Lines
Highly Resistant	None
Resistant	None
Moderately Resistant	NDC-30 and NDC-59
Moderately Susceptible	NDC-3, NDC-4, NDC-7, NDC-12, NDC-13, NDC-14, NDC-16, NDC-18, NDC-20, NDC-24, NDC-25, NDC-28, NDC-29, NDC-33, NDC-34, NDC-35, NDC-36, NDC-39, NDC-40, NDC-41, NDC-42, NDC-43, NDC-44, NDC-45, NDC-46, NDC-48, NDC-50, NDC-51, NDC-52, NDC-54, NDC-55, NDC-56, NDC-57, NDC-58 and NDC-61,
Susceptible	NDC-1, NDC-2, NDC-5, NDC-6, NDC-8, NDC-9, NDC-10, NDC-11, NDC-15, NDC-17, NDC-19, NDC-21, NDC-22, NDC-23, NDC-26, NDC-27, NDC-32, NDC-37, NDC-38, NDC-47, NDC-49, NDC-53, NDC-60 and NDC-63
Highly Susceptible	NDC-31 and NDC-62

The highest yield was recorded in the germplasm NDC-13 (35.50t/ha) which was rated as moderately susceptible variety. The second highest yield was recorded in the varieties NDC-56 (30.86 t/ha), NDC-2 and NDC-47 (29.94 t/ha). These three varieties were stated as moderately susceptible, susceptible and susceptible, respectively, similarly the lowest yield (9.56 and 9.88t/ha) were recorded in the varieties NDC-14 and NDC-27 which were rated as moderately susceptible and susceptible respectively. It was found that there was no correlation either positive or negative between the susceptibility/resistance to crop yield.Sarkar*et al*., (2017), Shakyawar*et al*., (2012), Sugha and Gurung (2007) and Kumar and Dubey (1996) have also reported similar kind of yield patterns in naturally infected Colocasia crop with leaf blight.

IV. CONCLUSION

On the basis of the results of the present experiment the germplasm lines NDC-30 and NDC-59 may be utilized in resistance breeding programmes in Colocasia.

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