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SHORT COMMUNICATION

Response of ber (*Ziziphus mauritiana* Lamk.)cultivars against black leaf spot (*Isariopsis indica* var. *ziziphi*) disease and its correlation with weather parameters

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Ber [*Ziziphus mauritiana* Lamk. (Syn. *Z. jujuba* L.)] Indian jujube also known as Narkelikul, Boroi, Bor, Beri, Indian plum is a tropical fruit tree species belonging to the family *Rhamnaceae*. Indian jujube is one of the two *Zizyphus* species that have considerable horticultural importance. The other one is Chinese jujube. It is commonly found in the tropical and subtropical regions. Originally native to India, it is now widely naturalized in tropical region from Africa, Afghanistan and China and in some Pacific regions. *Ziziphus* spp. can be grown even on marginal land in the hot arid regions of Rajasthan. Its cultivation has received a great impetus in recent years in the northern part of India; especially in the states of Punjab, Haryana, Rajasthan, Uttar Pradesh and Gujarat from 1984 to 1995 with improved cultivars.

The fruits are eaten raw or as pickles or used in beverages. It is quite nutritious and rich in vitamin C. In India, the ripe fruits are mostly consumed raw, but are some times stewed. Ripe fruits are preserved by sun drying and a powder is prepared for out-of-season purposes. Production of ber is affected by a large number of biotic stresses. A number of fungi belonging to different taxonomic families attack the crop. Among the fungal diseases, rust (*Phakospora zizyphus vulgaris*), powdery mildew (*Oidium erysiphoides* f. sp. *zizyphi*), leaf spot (*Tandonella zizyphi*, *Alternaria* sp.) *Cercospora zizyphi*, *Cladosporium zizyphi* and *Phoma* sp.) and mouldy leaf spot (*Isariopsis indica* var. *zizyphi*) are very important. This disease was first reported from Haryana by Gupta and Madan, 1977. However, mouldy (black) leaf spot of ber caused by *I. indica* causes the maximum yield less and appears in severe form on various cultivars of ber (Verma and Kumar, 1992).

The experiment was carried out at Main Experiment Station, Department of Horticulture, Narendra Deva University of Agriculture & Technology, Kumarganj, Faizabad (Uttar Pradesh) during 2008-09. Three cvs viz., Tikadi (with maximum resistance) cv. Gola (with moderately resistance) and Chhuhara (with minimum resistance) were selected for the experiment. Three plants for each cvs. were selected for the same. Four branches in 4 diagonally opposite directions of each of the three plants were selected and 5 healthy leaves from each of the branch were selected for observations. Thus, total 60 leaves for each of the three groups of the cvs. were selected for the observations.

Date of first appearance of the spot on each leaf were recorded as well as area covered in each leaf at weekly intervals till the maximum/ whole leaf covered were also observed.

The temperature and relative humidity under the tree canopy and sunshine hrs/day

The temperature and relative humidity of the canopy were recorded with hygro-thermometer while sunshine hrs/day at weekly intervals recorded from meteorological department of this university from the start of the experiment till the end.

Disease intensity

Natural incidence of the black leaf spot disease of ber was recorded at weekly intervals and average disease incidence was calculated. The disease severity were observed on all three cvs. Disease severity was calculated by using 0-5 scale as given below:

Table 1. Scale for varietal screening

Disease intensity	Rating	Reaction
0	0	Immune
0.1-5	1	Resistant
5.1-20	2	Moderately susceptible
20.1-50	3	Susceptible
50.1 and above	4	Highly susceptible

A comparative observations regarding symptoms were noted at three stages viz. initial stage, middle stage and peak stage of disease development of all the three cvs. Gola, Chhuhara and Tikadi described as under:

1. Initial stage- Black spot disease symptoms are on lower side of leaves in the cvs. Gola (0.10 per cent) and Chhuhara (1.10 per cent). While in cv. Tikadi, there is no any symptoms appeared.
2. Middle stage- Sooty black spots observed on lower side of leaves in cvs. Gola (16-17 per cent) and Chhuhara (22-23 per cent) leaf area covered. While in cv. Tikadi, tiny globose, corky, brown coloured spots covering 1.0 per cent area.
3. Peak stage- Sooty black spots observed on lower side of leaves in both the cvs. in Gola (40-41 per cent) and Chhuhara (52-53 per cent) of leaf area covered, whereas in cv. Tikadi tiny, globose, corky, brown colour spots seen on lower side of leaves up to 2.9-3.0 per cent area covered. Bakshi and Singh (1974) recorded sooty black spots on the leaves resulting into yellowing of leaves and premature defoliation.

First appearance of disease was recorded during 3rd week of September (38th meteorological week) on cvs. Gola and Chhuhara when weather factor viz. temperature maximum (30.88) and minimum (25.00), relative humidity morning (87.00) and evening (80.75), sunshine hrs/day (2.4). Disease appeared on Tikadi during 3rd week of October (19.10.2008) 42nd meteorological week. It was also observed that, disease increases fast during last November to last December (47th - 52th meteorological week). During 52nd meteorological week temperature maximum (19.88) and minimum (7.5). Relative humidity (morning), 90.50 and evening (62.25), sunshine hrs (4.7) The PDI of all the three cvs. Gola (37.90), Chhuhara (47.00) and Tikadi (2.26).

Maximum PDI of cvs. Gola (40.18%), Chhuhara (52.95%) and Tikadi (2.92%) was found during 3rd week of January, 2009 at maximum temperature 23.75 C and minimum temperature of 6C, RH (morning 90.50%) and evening (38%), sunshine hours (5.8).

Table 1. Response of ber cultivars against black leaf spot disease and its correlation with weather parameters.

Date of observation	Met. Week	PDI of Tikadi	PDI of Gola	PDI of Chhuhara	Temperature		R.H.		Sunshine (hrs/day)
					Max.	Min.	Morning	Evening	
15.9.08	37	0.00	0.00	0.00	33.5	27.00	87.00	64.00	7.7
21.9.08	38	0.00	0.81	4.65	30.88	25.00	87.00	80.75	2.4
28.9.08	39	0.00	3.19	6.32	31.00	23.00	90.67	71.00	6.3
5.10.08	40	0.00	6.59	9.33	31.00	23.25	89.00	70.50	5.6
12.10.08	41	0.00	8.26	11.66	32.00	21.83	90.67	66.33	7.7
19.10.08	42	0.11	10.37	14.18	31.13	19.50	89.00	59.75	7.5
26.10.08	43	0.28	11.94	16.97	30.67	16.17	83.33	48.00	7.0
2.11.08	44	0.50	14.07	18.46	30.00	15.38	86.00	44.75	6.6
9.11.08	45	0.66	15.41	22.09	30.67	13.83	86.33	52.33	5.9
16.11.08	46	0.89	18.15	24.97	16.75	12.13	86.75	43.50	6.1
23.11.08	47	1.15	20.39	26.43	21.50	10.67	79.67	45.67	5.5
30.11.08	48	1.33	23.44	30.00	25.63	9.63	88.25	42.25	4.1
7.12.08	49	1.51	27.49	35.00	25.17	9.23	91.00	45.00	2.4
14.12.08	50	1.78	32.33	39.50	25.38	9.38	90.75	60.75	2.1
21.12.08	51	1.97	35.40	44.95	19.00	10.23	93.67	69.33	1.6
28.12.08	52	2.26	37.90	47.00	19.88	7.50	90.50	62.25	4.7
4.1.09	1	2.47	38.75	49.25	21.60	6.02	85.67	66.00	2.4
11.1.09	2	2.77	39.95	51.00	21.88	6.88	79.75	66.50	3.9
18.1.09	3	2.92	40.18	52.95	23.75	6.00	90.50	38.00	5.8

Correlation matrix studies

Correlation matrix studies indicated that, temperature (maximum and minimum) showed highly significant negative correlation with PDI of all three ber cvs. Gola, Chhuhara and Tikadi. Sunshine hrs/day showed significant negative correlation while relative humidity (evening) showed negative correlation against PDI of all three cvs. Relative humidity (morning) showed negative correlation against PDI of Tikadi whereas positive correlation against cvs. Gola and Chhuhara as shown in Table-2. Similar results were also recorded by Singh *et al* (1996).

Table 2. Correlation coefficient of PDI of black leaf spot of ber cvs. with weather parameters.

Cultivars	Weather parameters				
	Temperature		Relative humidity		Sunshine (hrs/day)
	Max.	Min.	Morning	Evening	
Tikadi	-0.768**	-0.911**	-0.024	-0.233	-0.565*
Gola	-0.786**	-0.946**	0.031	-0.258	-0.569*
Chhuhara	-0.789*	-0.948**	0.021	-0.264	-0.568*

* Significant

** Highly significant

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