

## Original Research Article

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## Screening of Ber (*Zizyphus mauritiana* Lamk) Cultivars / Germplasm against *Alternaria alternata* (Fr.) Keissler Causing Alternaria Leaf Spot

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### ABSTRACT

Ber (*Zizyphus mauritiana* Lamk) is one of the important fruit crops of arid and semi arid zones of the world. In India though it is a minor fruit but recently the ber become an important cash crop in some areas and its acreage and production are increased. Due to rapid spread of commercial cultivation, the crop is also affected by different biotic and abiotic factors including commercial pathogens causing many serious diseases. Among the diseases, *Alternaria alternata* is one of the most important, widespread and easily recognized disease. The disease is characterized by the formation of small, irregular brown spots on upper surface of leaves. Corresponding lower side appears with dark brown to black spot 3 to 6 mm in diameter with a gray to tan centre and distinct brownish yellow margins. Under humid conditions, black patches comprising plenty of conidia can be seen and which severe as air borne inoculation. As in case of ber plants, under severe conditions many spots coalesce to form big patches and later such leaves defoliated from branches. In varietal screening, forty varieties/germplasm was screened against *Alternaria alternata* (Fr.) Keissler. It was recorded that none of the variety was found free from disease and only 3 germplasm, Narendra ber Selection-1 (3.50%) Seo (4.0%) and Narendra ber Selection-2 (4.60% area covered with the pathogen) were found resistant and 20 genotypes having disease intensity 5.01 to 20% area covered with the pathogen were moderately susceptible, 13 genotypes having disease intensity to 20.01 to 50% area covered with the pathogen were susceptible and 4 genotypes namely genotypes having disease intensity > 50% area covered with the pathogen were found highly susceptible.

#### Keywords

Ber,  
*Zizyphus*  
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### Introduction

Indian jujube or ber (*Zizyphus mauritiana* Lamk.) is one of the most common fruit; indigenous to an area joined from India to China belongs to family Rhamnaceae. It is also known as Chinese date or Chinese fig or plum and commonly considered as poor

man's fruit. It is popularly called the king of arid zone fruit (Yamadagni, 1985; Shoba and Bharathi, 2007; Mishra *et al.*, 2013). This fruit probably originated in India. It is reported to be grown in other countries like Iran, Syria, Australia, USA, France, and certain part of Italy, Spain, Africa, etc. Precisely, it is seen to grow under tropical and

sub-tropical as well as Mediterranean region of the world. In view of the gaining popularity, area under this fruit is being increased gradually day by day. Ber orchards are generally found in Varanasi, Mirzapur, Sonbhadra, Jaunpur, Aligarh, Ayodhya, Agra and Raebareli districts of Uttar Pradesh (Singh *et al.*, 1973)

The ber fruit has high sugar content (sucrose, glucose, fructose and starch). It is therefore high in carbohydrates, which provide energy. The levels of sugars vary according to cultivar. The fruits also contain protein with many essential amino acids (asparagine, arginine, glutamic acid, aspartic acid, glycine, serine and threonine). General nutritive composition of ber fruits is reported by Morton, 1987; Pareek and Dhaka, 2008 and Pareek *et al.*, 2009.

The ber is a heat and drought tolerant fruit crop with high productivity under arid and semi-arid condition (Pareek 1983). Several species of *Zizyphus* can endure extreme stress caused by drought, salinity and in some cases water logging. The ber cultivar Gola is one of the most important cultivar and requires less degree days of maturity (Singh *et al.*, 1983). Production of ber is affected by a large number of biotic and abiotic stresses (Gupta and Madaan, 1977).

Among the biotic diseases, *Alternaria alternata* is one of the most important, widespread and easily recognized disease. In

Uttar Pradesh, *Alternaria* leaf spot of ber disease was minor but due to climatic changes, it was recorded moderate to severe form among the commercial cultivars during recent years. The present investigation aims ultimately to find out to management strategy for leaf spot of ber disease that suits agro-climatic conditions of the country. In the absence of stable management strategy, use of resistant varieties, against *Alternaria* leaf spot of ber is the only recommendation for the management of leaf spot of ber.

### Materials and Methods

Twenty five years old of 40 cultivars/germplasm/variety grown at Main Experimental Station, Horticulture, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj (26°47' N, 82°12' E, 113 msl), Ayodhya (U.P.), India. The symptoms were recorded from initial stage to final stage. Per cent disease severity was also recorded at initial stage to peak of disease under Randomized Block Design with three replications (one tree per replication) 50 leaves of a tree were picked up randomly when the disease severity was high and per cent disease intensity was calculated as per 0-5 disease rating scale for assessing host reaction against *Alternaria* leaf spot of ber is as follows scale given by McKinney (1923). The symptoms were recorded from initial stage to final stage.

Rating scale	Average per cent disease intensity
0	0% area covered with the pathogen
1	0.1-5 % area covered with the pathogen
2	5.1-20 % area covered with the pathogen
3	20.1-50 % area covered with the pathogen
4	50.1- 75% area covered with the pathogen
5	75.1-100% area covered with the pathogen

Disease severity of leaf spot of ber on varieties/genotypes, was recorded using 0-5 point scale as mentioned above and genotypes

were classified based on their categorization on the basis of per cent disease intensity are as follows:

Rating scale	Description	Host reaction
0	0 No infection	<b>Immune</b>
1	0.1-5 area covered with the pathogen	<b>Resistant</b>
2	5.1-20 area covered with the pathogen	<b>Moderately susceptible</b>
3	20.1-50 area covered with the pathogen	<b>Susceptible</b>
4	<b>&gt;50.1% area covered with the pathogen</b>	<b>Highly susceptible</b>

The per cent disease intensity (PDI) was calculated by by employing formula mentioned below:

$$PDI = \frac{\text{Sum of all numerical ratings}}{\text{Total number of leaves examined} \times \text{Highest rating}} \times 100$$

none of the variety/genotypes was found free from disease the observation on leaf spot incidence was recorded on the basis of 0-5 disease rating scale. Out of forty genotypes/varieties screened under natural conditions.

## Results and Discussion

### Symptomatology

The disease is characterized by the formation of small, irregular brown spots on upper surface of leaves. Corresponding lower side appears with dark brown to black spot 3 to 6 mm in diameter with a gray to tan center and distinct brownish yellow margins. Under humid conditions, black patches comprising plenty of conidia can be seen and which severe as air borne inoculation. As in case of ber plants, under severe conditions many spots coalesce to form big patches and later such leaves defoliated from branches (Fig. 1A to D). Similar symptoms were also recorded by Pareek (1983); Mehmood *et al.*, (2018), Kaur *et al.*, (2020) and reported *Alternaria* leaf spot of ber symptoms.

### Varietal screening

Forty genotypes/varieties were selected for screening against leaf spot disease under natural field conditions. It was recorded that,

Minimum per cent disease intensity was recorded in 3 genotypes namely Narendra Ber sel.-1 (3.50) followed by Seo (4.00), Narendra Ber Sel. -2 (4.60) proved resistant; 20 genotypes namely Goli (6.00), Narendra Ber Sel.- 3 (7.00), Banarasi Karaka (9.00), Tikdi (9.00), Seedless (9.00), Mirchia (10.00), Kala Gola (10.00), Kaithali (11.00), Darakhi No.1 (11.00), Backwadi (12.00), Godhan (14.00), Kali (15.00), Safeda Rohtak (15.00), Katha Rajasthani (17.00), Z-G-3 (18.00), Pathan (19.00), Akhrot (19.00), Narendra Ber Sel. 4 (19.00), Villaiti (20.00) and Banarasi Peondi (20.00) were found moderately susceptible.

Narenra Ber Sel. 5 (21.00), Sunaur-5 (21.00), Narma (26.00), Gola (29.00), Kakrola Gola (30.00), Peondi (33.00), Mudia Murhara (33.00), Jalandhar (35.00), Chhuhara (35.00), Safeda Seremon (40.00), Illaichi (45.00), Katha (45.00) and Umran (45.00) were found susceptible and 4 genotypes namely Reshmi (52.00), Sanaur-3 (55.00), Sindura Narnaul (60.00), Ponda (62.00) were found highly susceptible (Table 1).

**Table.1** Screening of ber cultivars against *Alternaria alternata* causing Alternaria leaf spot of ber under natural conditions

S. No.	Germplasm/Varieties	Per cent Disease Intensity (PDI) *	Host reaction
1.	Kali	15.00 (22.78)	MS
2.	Kakrola Gola	30.00 (33.19)	S
3.	Mirchia	10.00 (18.43)	MS
4.	Reshmi	52.00 (46.15)	HS
5.	Katha	45.00 (42.13)	S
6.	Safeda Rohtak	15.00 (22.78)	MS
7.	Umran	45.00 (42.13)	S
8.	Banarasi Karaka	9.00 (17.43)	MS
9.	Villaiti	20.00 (26.56)	MS
10.	Tikdi	9.00 (17.45)	MS
11.	Kala Gola	10.00 (18.43)	MS
12.	Pathan	19.00 (25.84)	MS
13.	Ponda	62.00 (51.94)	HS
14.	Jaladhar	35.00 (36.23)	S
15.	Godhan	14.00 (21.95)	MS
16.	Illaichi	45.00 (42.12)	S
17.	Seo	4.00 (11.53)	R
18.	Banarasi Peondi	20.00 (26.56)	MS
19.	Backwadi	12.00 (20.23)	MS
20.	Katha Rajsthani	17.00 (24.35)	MS
21.	Z-G-3	18.00 (25.10)	MS
22.	Narma	26.00 (30.65)	S
23.	Sanaur-3	55.00 (47.87)	HS
24.	Gola	29.00 (32.54)	S
25.	Mudia Murhara	33.00 (35.05)	S
26.	Safeda Seremon	40.00 (39.23)	S
27.	Kaithali	11.00 (19.37)	MS
28.	Sindura Narnaul	60.00 (50.77)	HS
29.	Sunaur-5	21.00 (27.27)	S
30.	Chhuhara	35.00 (36.26)	S
31.	Akhrot	19.00 (25.82)	MS
32.	Peondi	33.00 (35.04)	S
33.	Seedless	9.00 (17.45)	MS
34.	Goli	6.00 (14.18)	MS
35.	Darakhi No. 1	11.00 (19.37)	MS
36.	Narendra Ber Selection -1	3.50 (10.76)	R
37.	Narendra Ber Selection- 2	4.60 (12.38)	R
38.	Narendra Ber Selection -3	7.00 (15.34)	MS
39.	Narendra Ber Selection- 4	19.00 (25.84)	MS
40.	Narendra Ber Selection- 5	21.00 (27.23)	S
	<b>SEm±</b>	<b>0.82</b>	--
	<b>CD (P=0.05%)</b>	<b>2.31</b>	--

\* Average of three replications

Figures given in parenthesis are angular transformed values.

R= Resistant, MS = moderately susceptible, S= Susceptible, HS =highly susceptible

**Fig.1 A-D:** The disease symptoms at different stages of disease development on leaves



**Experimental field view of ber plant and healthy Leaves**



**Symptoms of *Alternaria* leaf spot**

Kaur *et al.*, (2020) tested 21 cultivated varieties, Sanuar-2 showed maximum (20.7%) while Kaithali showed minimum (4.7%) disease incidence. Out of twenty one ber cultivars, Sanuar-2 was susceptible whereas Thornless, Sanuar-4, Pathani, Safeda, Selected Safeda, Seo and Nalagarh were

resistant to the disease. Chaudhary *et al.*, (2017) also screened 21 ber cultivars against *Oidium erysiphoides* f. sp. *zizphi* causing powdery mildew and found Darakhi-2 and Nazuk cultivars were categorized as resistant as these showed 2.60 and 4.67 per cent disease intensity respectively.

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