



MANAGEMENT OF ISARIOPSIS LEAF SPOT OF BER (*ZIZYPHUS MAURITIANA* LAMK.) THROUGH FUNGICIDES

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Introduction

Ber [*Zizyphus mauritiana* Lamk. (Syn. *Z. jujuba* L.)], the Indian jujube is a tropical fruit tree species belonging to the family *Rhamnaceae*. It is also known as Narkelikul, Boroi, Bor, Beri and Indian plum. Indian jujube is one of the two *Zizyphus* species that have considerable horticultural importance. The other one is Chinese jujube. Being native to India, it is now widely naturalized in Africa, Afghanistan, China, Malaysia, Australia and in some Pacific regions. In India it is commonly grown in Rajasthan, Haryana, Punjab, Madhya Pradesh, Bihar, Uttar Pradesh, Maharashtra, Assam and Gujrat. It is a hardy crop that tolerates extreme temperature and thrives under rather dry condition with annual rainfall of 15-225cm. Ber fruit is very nutritious having rich in minerals and vitamins. The fruit is eaten raw or as pickles or used in beverages. In India, the ripe fruits are mostly consumed raw but are sometimes stewed.

Ber crop suffers from a number of fungal diseases. Among them, some important fungal diseases are powdery mildew (*Oidium erysiphoides* f. sp. *zizyphi*), rust (*Phakospora zizyphus vulgaris*), leaf spot (*Tandonella zizyphi*, *Alternaria* sp.) *Cercospora zizyphi*, *Cladosporium zizyphi* and *Phoma* sp.) and mouldy leaf spot (*Isariopsis indica* var. *zizyphi*). However mouldy leaf spot or Isariopsis leaf spot appears in severe form on various ber cultivars and causes maximum yield loss. Gupta *et al.* (1977) reported Isariopsis leaf spots disease for the first time from Haryana. Verma and Kumar (1992) reported that Cloudy weather with moderate temperature during October-November is favourable for the disease development. Black spots, which are sooty, tuft like circular to irregular black spots develop on leaf surface. During advanced stage, the lower surface of leaves also covered in longer

area and corresponding upper surfaces show brown discolouration. Thus, the present research was done to find out effective fungicides for management of Isariopsis leaf spot of ber.

Materials and Methods

The experiment was conducted during 2010-2013 at Main Experimental Station, Horticulture, N.D.U.A. & T., Kumarganj Faizabad (U.P.), India; on Cultivar 'Gola' to assess the efficacy of fungicides for management of Isariopsis leaf spot of ber. There were 4 replications for each treatment. The spray of fungicides/botanicals @ 10 liter/plant was scheduled just after initiation of the disease under field condition. The fungicides/botanical used for treatment were Mancozeb 0.2%, Carbendazim 0.1%, Copper oxychloride 0.2%, Propiconazole 25EC 0.1%, Difenconazole 10WP 0.1% and Neem oil 3.0%.

Observations were recorded on disease incidence/intensity and yield (kg/ha). The observations in respect of disease intensity on leaves were recorded after 20 days after last spray. Hundred leaves (25 from each side of tree) were observed following 0-5 grade scale of Mckinney (1923) as given in table 1.

Yield data were recorded at the time of harvesting of fruits. The per cent disease index (PDI) and per cent disease control (PDC) were calculated by using following formula.

$$PDI = \frac{\text{Sum of all numerical rating}}{\text{Total no. of leaves examined} \times \text{highest rating}} \times 100$$

$$PDC = \frac{\% \text{ disease control} - \% \text{ disease in treatment}}{\% \text{ disease in control}} \times 100$$

All the treatments were arranged in randomized block design and data were statistically analyzed. Percentage data of disease index and disease control were

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Table 1 : Scale for disease intensity.

Rating	Average disease intensity in (%)	Per cent area covered with disease infection
0	0%	No infection
1	0.1-5 %	0.1-5% area covered
2	5.1-20 %	5.1-20% area covered
3	20.1-50 %	20.1-50% area covered
4	50.1-75%	50.1-75% area covered
5	75.1-100%	75.1% or above

transformed to archsine before calculation.

Results and Discussion

It is well known that by using resistant variety is the best measure for management of disease. However, due to development of new strains against resistant varieties, it becomes difficult for farmers to manage disease. Then chemicals become the last option to manage the disease and reduce losses caused by the pathogen. Therefore, the present study was carried out to find out effective fungicides against *Isariopsis* leaf spot of ber and results were given in table 2.

All the fungicides/botanical were found significantly superior over control in reducing the disease intensity. Results given in table 2 indicated that minimum disease intensity (10.60%) was recorded with spray of Propiconazole 0.1% followed by Difenconazole 0.1% (11.70%) and Carbendazim 0.1% (12.81%). Maximum disease intensity (40.0%) was recorded in untreated plant. Maximum disease control (73.52%) was recorded with Propiconazole 0.1% treatment followed by Difenconazole 0.1% (70.77%) and Carbendazim 0.1% (68.0%). Verma and Cheema (1983) also reported that disease was successfully managed by 4 sprays of carbendazim, Copper oxychloride applied fortnightly from the first week of November. The yield of fruit was higher in plant treated with fungicides which influence the weight of by reducing disease incidence. Maximum yield (88.88 kg/tree) was recorded with Propiconazole 0.1% treatment followed by Difenconazole 0.1% (87.63 kg/tree) and Carbendazim 0.1% (69.20 kg/tree), while minimum yield (31.13 kg/tree) was recorded in untreated plant. Recently, Kumar *et al.* (2015) recorded that ber plant treated with Propiconazole (0.1%) showed minimum intensity of black leaf spot disease caused by *Isariopsis indica* var. *zizyphi* and maximum disease control (70.18). Rawal and Saxena (1989) conducted 2 years field trials with 8 different fungicides against *Isariopsis indica* var. *Zizyphi* on

Table 2 : Effect of chemicals on *Isariopsis* leaf spot of ber (Pooled data 2010-2013).

Treatments	PDI	PDC	Yield kg/tree
Mancozeb 0.2%	17.65	55.91	46.75
Carbendazim 0.1%	12.81	68.0	69.20
Copper oxychloride 0.2%	19.25	51.92	46.63
Propiconazole 25EC 0.1%	10.60	73.52	88.88
Difenconazole 10WP 0.1%	11.70	70.77	87.63
Neem oil 3.0%	20.48	48.85	42.88
Control	40.4		31.13
CD at 5%	1.15		0.66

Zizyphus mauritiana and reported that most effective fungicide against the disease was Bavistin (Carbendazim) @ 0.1% followed by Daconil (chorothalonil) @ 0.2%.

The fungicides Propiconazole (Tilt) @ 0.1% and Difenconazole (Score) @ 0.1% found effective and gave yield 88.88 kg/tree and 87.63 kg/tree, respectively. Therefore, it is recommended that Spraying of Propiconazole (Tilt) @ 0.1% or Difenconazole (Score) @ 0.1% should be done at an interval of 15 days, starting from the initiation of the disease *i.e.* first week of September to manage the *Isariopsis* leaf spot of ber for achieving the higher yield.

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