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EFFICACY OF FUNGICIDES AND BOTANICALS AGAINST BLACK LEAF SPOT DISEASE OF BER (*ZIZYPHUS MAURITIANA* LAMK.) UNDER FIELD CONDITIONS

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ABSTRACT

To study the effect of different fungicides and botanicals against black leaf spot disease of ber, a field experiment was conducted during 2018 and 2019 at Chaudhary Charan Singh Haryana Agricultural University, Regional Research Station, Bawal (Rewari), Haryana. Different Fungicides and botanicals were taken as treatments and sprayed as foliar at two times (first spray at 1st week of September and second spray on 3rd week of September at the time of initiation of disease) on cultivar Gola for reducing the black leaf spot disease of ber during both the years. Minimum disease intensity *i.e* 14.00% was observed in treatment T₈, where Propiconazole 25 EC was sprayed with concentration 0.1% and followed by T₆ (Carbendazim@0.1%) and T₇ (Copper oxychloride @0.3%) *i.e* 18.00% and 26.00%, respectively. The maximum ber fruit yield was recorded (64.6kg/plant) in treatment T₈, where the plants were sprayed with Propiconazole25EC @ 0.1% as compared to all other treatments.

Key words : Ber, Black leaf spot, Fungicides, Botanicals, Treatment.

Introduction

Ber (*Zizyphus mauritiana* Lamk.) belonging to family Ahmaceae is considered as “King of arid fruits” due to its xerophytic nature and ability to survive during drought. 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. It can be successfully grown in saline and alkali soils too. The area occupied by ber in India is over more than 50,000 ha of land with of 513,000 MT (Anonymous, 2018; Kaur *et al.*, 2020). At present, ber is commercial fruit in the states of Rajasthan, Haryana, Punjab, Madhya Pradesh, Bihar, Uttar Pradesh, Maharashtra, Assam and Gujrat, which provides economic as well as nutritional and ecological security (Pareek and Vashishtha, 1999). The fruit are widely acknowledged as rich and cheap source of minerals such as iron, calcium, phosphorus, ascorbic acid and essential minerals (Pareek, 1983; Abba *et al.*,

1988; Pareek *et al.*, 2002). It is hardy crop that tolerates extremes temperature and thrives under rather dry condition with annual rainfall of 15-225 cm. The ber 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*) and leaf spot (*Tandonella zizyphi*, *Alternaria* sp.), *Cercospora zizyphi*, *Cladosporium zizyphi* and *Phoma* sp. and black or mouldy leaf spot (*Isariopsis indica* var. *zizyphi*). However, black or mouldy leaf spot is a hurdle in ber fruit production. This disease appears in the form of brown to blackish brown necrotic spots on leaves and fruit. Under severe conditions, the black sooty growth covers the lower side of the affected leaves which is responsible

for large reduction in photosynthetic area and leads to premature defoliation (Kumar, 1987).

Therefore, an attempt was made to manage the disease by foliar application of fungicides and botanicals in present study.

Materials and Methods

The experiment was conducted during 2018 and 2019 at Chaudhary Charan Singh Haryana Agricultural University, Regional Research Station, Bawal (Haryana), India; on cultivar 'Gola' to assess the efficacy of fungicides and botanicals for management of black leaf spot of ber. There were 4 replications for each treatment with randomized block design (RBD). The foliar spray of different fungicides and botanicals was scheduled *i.e* first spray, before onset of the disease on 1st week of September and second spray on 3rd week of September at the time of initiation of disease under field condition. The fungicides and botanicals used as treatment *viz.*, neem leaf extracts 5%(w/v), neem leaf extracts 10%(w/v), neem seed kernel extracts 5%(w/v) and neem seed kernel extracts 10%(w/v), Mancozeb @ 0.2%, Carbendazim @ 0.1 %, Copper oxychloride @ 0.3%, Propiconazole 25EC @ 0.1%, Nimbecidene@ 0.4% (Table 2).

Observations were recorded on percent disease intensity (PDI) and yield (kg/ha). The observations in

Table 1 : Scale of disease intensity (0-5).

Rating	Average disease Intensity (%)	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

Table 2 : List of fungicides and botanicals used as foliar spray against black leaf spot disease of ber.

S. no.	Treatments
T ₁	Neem leaf extracts
T ₂	Neem leaf extracts
T ₃	Neem seed kernel extracts
T ₄	Neem seed kernel extracts
T ₅	Mancozeb
T ₆	Carbendazim
T ₇	Copper oxychloride
T ₈	Propiconazole 25EC
T ₉	Nimbecidene
T ₁₀	Control (No spray)

respect of disease intensity on leaves were recorded after 20 days after last spray. Two hundred leaves (50 from each side of the tree) were observed by using following 0-5 grade scale of Mckinney (1923) as given in Table 1.

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

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

All the treatments were arranged in randomized block design and data were statistically analyzed.

Results and Discussion

The different treatments *viz.*, fungicides and botanicals were sprayed as foliar at two times *i.e* first spray, before onset of the disease on 1st week of September and second spray on 3rd week of September at the time of initiation of disease on cultivar, Gola for reducing the black leaf spot disease of ber. Among the various treatments, during both the years, 2018 and 2019, treatment T₈ (Propiconazole 25EC @ 0.1%) was found effective significantly in management of the disease as compared to all treatment, and it was followed by T₆ (Carbendazim @ 0.1%) and T₇ (Copper oxychloride @ 0.3%) in reducing the black leaf spot disease of ber. Minimum disease intensity *i.e* 15.00% was observed in treatment T₈ and followed by T₆ (19.00%) and T₇ (27.00%), whereas maximum disease intensity was recorded in treatment T₁₀ (Control) *i.e.*, 37.00% during, 2018. And during in the year 2019 the disease intensity in T₈ were recorded (13.00%) followed by T₆ (19.00%) and T₇ (25.00%). The results showed that similar trends of reducing the disease intensity in both the years in the same treatments, respectively. Although, the reduction in disease intensity was higher in the year 2019 as compared to 2018. Maximum disease intensity was observed in the control T₁₀, where no foliar spray was done during both the year. *i.e* 38.00% and 37.00%.

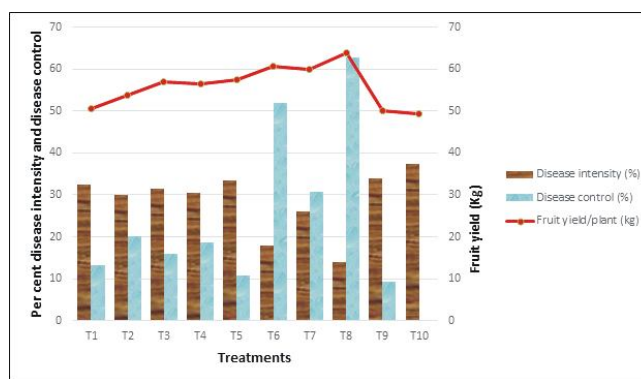


Fig. 1 : Graphical representation of pooled data (2018 and 2019) of effect of fungicides and botanicals on black leaf spot disease of ber.

Table 3 : Effect of fungicides and botanicals on black leaf spot disease of ber.

Treatments	Concentrations	2018			2019		
		Disease intensity (%)	Disease control (%)	Fruit yield/plant (kg)	Disease intensity (%)	Disease control (%)	Fruit yield/plant (kg)
T ₁	5% (w/v)	32.00	13.51	51.09	33.00	13.15	50.08
T ₂	10% (w/v)	29.00	21.62	54.12	31.00	18.42	53.62
T ₃	5% (w/v)	31.00	16.21	56.00	32.00	15.78	58.12
T ₄	10% (w/v)	30.00	18.91	56.09	31.00	18.42	57.09
T ₅	0.2%	33.00	10.81	57.56	34.00	10.52	57.56
T ₆	0.1%	17.00	54.05	60.14	19.00	50.00	61.15
T ₇	0.3%	25.00	32.43	59.46	27.00	28.94	60.58
T ₈	0.1%	13.00	64.86	63.32	15.00	60.52	64.34
T ₉	0.4%	34.00	8.10	50.05	34.00	10.52	50.08
T ₁₀	-	37.00	00.00	49.15	38.00	00.00	49.66
CD (P=0.05%)	-	6.25	-	3.34	6.60	-	2.38

Maximum ber fruit yield were recorded (64.34 kg/plant) and (63.32 kg/plant) in treatment T₈, where the plants were sprayed with Propiconazole 25EC @ 0.1% during both season, respectively as compared to all other treatments.

However, foliar spray with botanicals found least effective in minimizing the disease as compared to fungicides during both the years (Table 3). These findings suggest that spraying of Propiconazole 25EC @ 0.1% should be done before onset of the disease on 1st week of September and second spray on 3rd week of September at the time of initiation of disease is very useful in managing of black leaf spot disease in ber orchards for achieving the higher yield as clearly shown in Fig.1 (Pooled data of 2018 and 2019). These findings are in conformity with Pradeep Kumar *et al.* (2003). Use of systemic fungicides as foliar spray helps in managing the black leaf spot disease of ber (Pradeep Kumar *et al.*, 2003 and Anonymous, 1998, 2000).

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