



## Studies on Azotobacter and Organic Manure Treatments on Ber Seedling (Khushi Khandelwal, \*Saket Mishra and Shashi Kant Ekka)

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The Ber (*Ziziphus mauritiana*) belongs to the family Rhamnaceae. It is an important indigenous dry land fruit of India and China but more associated with the Indian culture since ancient times. Indian jujube or Ber also known as poor man fruit is a hardy fruit crop suitable for arid regions. Ber is a rich source of protein, Vitamin C and minerals. It is cultivated throughout the country. Madhya Pradesh, Bihar, Uttar Pradesh, Punjab, Haryana, Rajasthan, Gujarat, Maharashtra, Tamil Nadu and Andhra Pradesh are major Ber growing states. It is a common and fourth important fruit crop (after kinnow, mango, guava) of Punjab state. The Indian arid zone is spread over about 31.7 million ha area in the states of Rajasthan, Gujarat, Andhra Pradesh, Maharashtra and Haryana since the major potential area for growing traditional fruit crops have already been exploited the emphasis is now shifted for utilization of vast land resources spread in arid areas, where several indigenous fruit crops like Ber can successfully be grown.

Among the fruit trees, Ber cultivation requires perhaps the least inputs and care. It gives good production even without irrigation and can be grown as a rainfed crop in semi-arid and arid regions. The tree can, therefore, give assured income even under marginal growing conditions and provides nutritious food at very low cost. The fruit is dried and is used as a dessert fruit. It can also be preserved as a candied fruit.

The Ber is one of the most common fruit trees and cultivated practically all over the country. Its fruits are eaten fresh as well as dried and processed into delicious candy. Besides nutritive value, fruits are a rich source of ascorbic acid (Vitamin 'C'), protein and mineral nutrients (Fe, Ca and Mg). The seed kernels are aphrodisiac (having substances arousing sexual desire) and root and bark are good for dysentery and diarrhoea. The leaves are used as fodder for sheep, goats, cattle, feed for silk worms and host (plant that supports parasite) for lac insects. Besides nutritive value of Ber, many other aspects make the Ber cultivation a good venture. Its fruits come in market from January and continue till mid-April. In this peak season, citrus fruits are practically over and grapes, mango are not ready yet. Ber fruits are available at a cheaper rate and are therefore in great demand. The Ber plant is quick growing, early bearing and yields a heavy crop every year. A well-maintained Ber orchard is very remunerative.

A part from that, in marginal lands, Ber is only fruit tree among many fruits which can give better income.



## Botanical Description of Ber

Ber (*Ziziphus mauritiana*) which commonly known as Indian Jujube, Indian Plum. Regional name Marathi - Bor, Hindi - Ber, Sanskrit - Badri, Tamil - Elandhai, Manipuri - Boro. Indian Jujube, Indian Plum comes in category Fruit Plants, Trees. Which belongs to family Rhamnaceae. Which require high sun light and normal water for growth. Ber was primarily grown for fruit and seed. Flowering season of ber was April, May, June, July, August, September, October. with Flower colour of Green and Yellow and Foliage colour was Green. Normally Plant Height of ber plant is 8 to 12 meters long and Plant Spread or Width is 6 to 8 meters plant spreading upright or erect. Special Character of ber plant is it is a Indigenous (native to India) Fragrant flowers or leaves. Ber plants are Good for screening and also good for hedges and borders.

## Origin

According to DeCandole (1886) the centre of origin of ber is **central Asia**. This includes north West India, Afghanistan, areas of Todijakistan, Uzbekistan and China. It is found growing wild, semi-wild and in cultivated forms in almost all parts of India.

## Economic Significance

Fruits are rich in Vitamin C, A and B complex. About 5.6% digestible crude protein and 49.7% total digestible nutrients are present in the leaves making it a nutritive fodder for animals. Ber can be processed to prepare murabba, candy, dehydrated ber, pulp, jam and beverage.

## Effect of Azetobacter on Seedling Growth

Azotobacter is one of the bio-fertilizer which contains living organisms which when applied on soil surface or seeds help in colonizing the rhizosphere or the interior parts of the plants parts and also help in promoting growth through the increase of the availability of primary nutrients of plants.

## Effect of Organic Manure on Seedling Growth

From organic manure Growth of seedlings, soil properties, and nutrient concentrations were measured to compare the treatments. Organic manure significantly increased the soil pH and the concentrations of nitrogen, available phosphorus, exchangeable potassium, calcium, and magnesium.

## Control of Disease

**Powdery Mildew:** This is one of the most prominent diseases and caused significant losses due to its infection on fruits (4). The disease appears by the end of October and prevails up to April. The disease first appears on young leaves in the form of white floury patches and later spreads to the young shoots and developing fruits. With the passage of time, the infected area becomes slightly raised and rough. The infected fruit often becomes malformed and may shed from the tree. The disease caused by the fungus *Oidium erysiphoides* f. sp. *zizyphi* Yen and Wang and air-borne in nature. The fungal mycelium become external on the host while conidiophore are



upright single, measuring  $75.8-139.4 \times 12.6$  mm. Conidia are cylindrical, hyaline, measuring about  $25.2 - 37.8 \times 16.8 - 21.0$  mm. Conidia of this fungus germinates and form appressoria after 2-4 hours at  $20 \pm 2^\circ$  C in most saturated atmosphere, where sporulation starts 96 hours after inoculation on susceptible ber leaves. Temperature ranges from  $10-30^\circ$  C and relative humidity of 32 percent and above, favour the diseases development.



**Downy mildew infection**

**Black leaf spot** It was first reported from Haryana (1). Sooty tuft like circular to irregular black spot develop on leaf surface. When infection advances, it covers a large area on the lower surface of the leaves and corresponding upper surface shows brownish discoloration. The disease is caused by *Isariopsis indica* var. *zizyphi*. The pathogen produces multi-septate, long, dark brown conidiophore having prominent scars. Conidia were light brown, multicellular (3-4 celled) broader at middle while tapering towards the both ends, straight or sometimes bent, measuring  $17-42 \times 8.5-10.2 \mu\text{m}$  in size. The conidia germinating from the tip cell were also recorded. The same observation was also described by Gupta and Madan (1). The fungus survives in plant debris and soil which serve as primary source of infection. Secondary infection occurs through spores present in the air. Climatic factors like temperature and humidity largely influenced the disease development. Black leaf spot disease of ber was recorded during post rainy 66 The Journal of Plant Protection Sciences, 5(1) : 65-69, June, 2013 season in the month of November to May. Severity of the disease was found to be 32.5% during November and increases during the month of March (47.0 %) and then decreased in the month of May (20%) indicated that low to moderate temperature and low atmospheric humidity favours the disease development .



## References

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