

## Ber Cultivation for Increasing the Productivity, Profitability and Sustainability

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### INTRODUCTION

Ber (*Ziziphus mauritiana* Lamk.) is a major fruit crop of arid and semi-arid regions. It is also referred to as a poor man's fruit because of its high nutritional value and low market rate. In addition to being consumed raw ber fruits, these can process into canned, candies, pulp, jam and juices. Ber fruit is high in antioxidants and anti-cancer agents and it helps to keep the liver healthy. It has also a calming effect on endurance and weight gain. Its fruits are nutrient-rich, high in ascorbic acid (Vit -C) and vitamins (A and B) as well as minerals like calcium, phosphorus and iron.

In India ber is cultivated in an area of 50000 hectares with an annual production of 539000 metric tonnes (MT). After China, India ranks second in the world in its production. Haryana, Punjab, Madhya Pradesh, Uttar Pradesh, Bihar, Maharashtra, Gujarat, Andhra Pradesh, Rajasthan and Tamil Nadu are the commercial ber-growing states in India. It covers 4399 ha in Haryana and produced 44738 MT during 2020-21. Haryana's major ber-growing districts include Sonipat, Rohtak, Gurugram, Hisar, Jhajjar, Sirsa, Mewat, Bhiwani, Fatehabad and Jind.

It is a hardy plant that can withstand temperature as high as 50°C and is drought resistant. However, it is vulnerable to frost and high levels of humidity. The plant has a strong tap root system that adapts to various soil types and can thrive in pH levels as high as 9.2. However, deep sandy loam to loamy soils is best for better growth and development.

### Varieties

Various horticultural varieties of ber are grown all over India. Umran, Karaka, Gola, Seb, Chuhara, Sanaur - 2, Ilaichi, and Mehrun are the most popular varieties.

**Gola:** Gola is an early cultivar which is very popular in Delhi, Haryana, Rajasthan and in arid-semiarid regions. The fruit is medium in size and ovate to round in shape. It develops greenish to golden yellow colour at maturity. The quality of fruit is excellent. The average fruit weight varies from 15-18g, yields upto 90 kg/tree.

**Seb:** Growth habit is spreading, ovate to ovate oblong shape leaves. Fruits are round in shape, resembling crab-apple. Fruit light pinkish yellow with occasional specks at maturity, skin slightly rough with yield upto 85 kg/tree.

**Kaithali** It is mid-season and popularly grown cultivar in Punjab & Haryana. The fruit shape is oval to oblong and medium in size. The fruit on its maturity develops greenish yellow to golden yellow colour. The weight of the fruit varies from 19-21g, good to taste and thin skinned. Yields upto 130 kg/tree.

**Sannaur:** This mid-season variety is popular in Punjab and Haryana. The fruit shape is oval to ovate and medium in size. This variety is resistant to powdery mildew. The average weight of the fruit varies from 16-20g, yields upto 95-100 kg/tree.

**Umran:** This is a late season and famous cultivar among the farmers. The fruit shape is oval to elliptical and large in size. The weight of the fruit varies from 22-28g. The fruits gain

golden yellow colour on its maturity or ripening stage. The yield of this variety is high and keeping quality is appreciable. The fruits are good for distant transport and is also resistant to fruit flies. Yields up to 150-190 kg/tree.

### Propagation

Earlier the Ber was propagated by seeds, but main disadvantage of this method is heterozygosity and variability in seedling progeny. Therefore, propagation of superior cultivars by budding (T, ring, patch) is recommended. For timely germination of ber seeds, breaking of endocarp (hard seed coat) gives quick germination.

### Planting

Square system of planting is preferred in India. The spacing recommended is 6x6m for rainfed areas and 7x7m and 8x8m for irrigated orchards for larger canopy. The best time of planting ber is Feb-March or in the monsoon during July to September in Punjab and Haryana. The selected plant should be free from virus, pest and disease. This will facilitate operating tillage machinery and taking up plant protection measures. Pits of 1 meter cube are dug and filled with mixture of tank silt, red earth and farm yard manure in equal proportions. Apply 2-3 kg bone meal or super phosphate per pit.

### Manuring and fertilization

Bearing tree/yr

	FYM (Kg)	N <sub>2</sub> (g)	P <sub>2</sub> O <sub>5</sub> (g)	K <sub>2</sub> O (g)
<b>Rainfed</b>	30	100	50	50
<b>Irrigated</b>	60	500	400	400

For rainfed, full dose given in July & for Irrigated crop FYM, P, K & ½ N given in July. Remaining ½ N in Sept.

### Training and pruning

Ber tree training is necessary over the first 2-3 years to establish a strong frame-work from the nursery stage. To avoid damage to the bud union and to support the main stem, young plants transplanted in the field should be supported with bamboo stakes. If the ber is not properly trained, it will develop a bushy and spreading shape with long thin branches. More than one shoot emerges from the base of the

stem, resulting overcrowding of branches and creating an environment favourable to the breeding of pests and diseases. Such trees have a short duration and low yield. Ber flowering and fruiting occur on current season growth. Pruning is usually done between the middle and end of May (before the beginning of the growth season). Pruning severity in irrigated orchards increased fruit quality. Early pruning advanced the flowering date. Ber trees are

deciduous and enter dormancy in May and June, when the concentration of reserve metabolites such as carbs, starch, and sugars is highest. Pruning at this time period might result in increased growth, more fruit set, and a higher yield. Any deviation from the pruning period and dormancy phase results in decreased yield and poor quality fruits. Severely pruned trees yielded substantially less fruit than lightly pruned ones.

### **Intercropping**

It takes 4 to 5 years after planting ber plants to cover the interspace between the plants. The interspace between plant rows can be used to grow intercrops. Leguminous crops are often selected as intercrops since they nourish the soil while also providing some income. For up to 5 years, intercropping in a newly planted ber orchard exhibited no negative effects on plants growth.

### **Weed control**

Spray with Diuron @ 1.2 kg/acre as pre-emergence herbicide in first fortnight of August. The weeds can be controlled as post emergence by Glyphosate @ 1.2 ltr/acre or Paraquat @ 1.2 Ltr/acre in 200 Ltr of water when weeds are 15-20 cm in height.

### **Irrigation**

Water conservation is a significant element of fruit cultivation in arid areas under rainfed conditions. A double-walled pot called as Jaltripti has been shown to save 75 percent of irrigation water while establishing young seedlings in the field. Ber plants have a deep tap root system and a Xerophytic nature, thus they require little maintenance and irrigation once planted. Fruit harvesting is completed by April and plants become dormant and shed their leaves in May and June. They do not require irrigation during the fruit maturity. Ber trees require irrigation from November to February for better fruit development.

### **Pests**

**Fruit fly:** Fruit fly is the most significant pest of Ber. Fruit fly infestation starts in September just when fruit set begins. Adult females deposit eggs by inserting their oviposition into

growing fruits. Larvae emerge after 2 to 5 days and feed on the pulp. Infested fruits become deformed, rotting may take place and a large number of affected fruits drop down.

**Bark eating catter pillars:** The caterpillar eats away at the bark of the tree, reducing the yield significantly. To control the pest, paint the exposed holes with 10 ml monocrotophos. A combination of one litre kerosene oil and 100 g soap in 19 litres of water has also been found to be effective.

**Hairy caterpillar:** In the early stages, the caterpillars feed on leaves. The old caterpillars can feed on fruits and tender shoots, causing tree damage. 0.05 percent methyl parathion can be used to control the caterpillars.

### **Diseases**

**Powdery mildew (Oidium sp.):** Powdery mildew is the most severe disease of ber and results in significant losses. The disease appears between October and November when the temperature drops and the air is humid (cloudy). Fungus first appears as white patches on foliage, fruits etc. When there is a serious infestation, the white mass covers the surface of the leaves and fruits. Premature fruit drop or sunken fruit are also problems. This results in yield reduction.

**Sooty mould or black spot (Isariopsis sp.):** The disease's symptoms include the development of black spots on the lower surface of the leaves and in more advanced stages, the earlier bottom surface may be curled by sooty mould and the leaves may drop down.

### **Harvesting and yield:**

Ber plants starts fruiting the first year of planting in budded plants, however seedling plants take 3-4 years to fruit. However, commercial production starts in the third year, thus fruiting in the first year should be avoided. Ber fruits do not mature after harvesting. It is therefore essential to harvest the fruits at their peak of maturity. Typically, the exterior colour of the fruits, specific gravity, environmental circumstances, and

management techniques are used to assess maturity. Though harvesting in ber is difficult owing to the spiny nature of the plants, the fruits are harvested manually. Fruit harvesting by shaking branches is also practised. Harvesting must be done repeatedly. Agroclimatic conditions affects the yield potentials of ber plant.

**Ripening and storage:**

The ber fruits can be stored about one week at room temperature and about three weeks in perforated poly bags under cold storage. Bhasker et al. (2006) found that in a 20 days storage period the combinations of 1% and 2% Ca with polyethylene bag under zero energy cool chamber were found effective in maintaining better quality of the fruit throughout the storage period in term of retention of acidity, ascorbic acid and total

sugar. Calcium nitrate (1.5%) + PPE bag also recorded least spoilage loss in both cultivars. The cultivars had 5 and 9 days, while the untreated control had 3 and 5 days economic life for Gola and Goma Kirti, respectively, under ambient conditions. Physiological loss in weight increased and fruit firmness decreased during storage. The sensory rating increased up to 10 days in all the treatments, except control but subsequently it decreased during storage. The rate of increase in PME activity was faster up to 10 days in untreated fruits while treated fruits showed slower rise in PME activity up to 20 days and declined afterwards. Fruits can be stored up to 20 days by pre-harvest spray of CaCl<sub>2</sub> (2%) and GA<sub>3</sub> (60ppm) treatment, with minimum loss in quality.