BER

Ber or Indian jujube (*Ziziphus mauritiana*) is indigenous to India. The fruits are rich in vitamin C, A and B complex. The composition varies in different varieties. Its leaves contain 5.6% digestible crude protein and 49.7% total digestible nutrients, making it a nutritive fodder for animals. Haryana, Punjab, Uttar Pradesh, Rajasthan, Gujarat, Madhya Pradesh, Bihar, Maharashtra, Andhra Pradesh and Tamil Nadu are major ber-growing states.

Climate and Soil

Ber grows under varying conditions of climate all over India even at elevations up to 1,000 m above mean sea-level. It can withstand extremely hot conditions but is susceptible to frost. The trees shed leaves and enter into dormancy during summer. Under moderate climate of south India, however, the trees continue to grow throughout the year. It is extremely drought hardy owing to its deep root system and other xerophytic characters. The tree prefers atmospheric dryness for development of good quality fruits. High atmospheric humidity is distinctly disadvantageous.

Ber is not particularly exacting in its soil requirement. It can grow on a wide variety of soils—sandy, clayey, saline and alkali soils.

Varieties

More than 300 varieties have been listed but only a few are commercially important such as Umran, Banarasi Kadaka, Mundia, Seb, Gola and Kaithali.

Ber Gola, Seb and Mundia are suitable for extremely dry areas, whereas Banarasi Kadaka, Umran and Meharun for the dry regions and Sanaur 2, Meharun and Umran for comparatively humid regions. In northern India, Gola is earliest to ripen, Kaithali and Mundia are mid-season and Umran late cultivar. An early-maturing selection from Umran, known as Early Umran or Gohma Kirti has been identified at Godhra (Gujarat). Gola ber is tolerant to saline soils.

Propagation and Rootstocks

Most common method of propagation of ber is by I or T (shield) budding. Rootstock seedlings are raised by sowing seed kernels extracted by breaking the stone (endocarp). These germinate in about one week. The seed stones can also be sown as such but take nearly one month to germinate. Germination of seed stones can be improved by soaking them for 48hr in water or for 6hr in concentrated sulphuric acid or in 200ppm Gibberellic acid. Seeds of any locally adapted and vigorous ber trees can be used for raising rootstocks.

Seeds should be sown in a well-prepared nursery bed at 30cm × 30cm spacing and at 2cm depth during March–April. These seedlings could either be transplanted in the field during July–August for *in-situ* budding or can be budded in the nursery beds. The budlings can be
transplanted in bare rooted condition during January–March after treatment with 12 % Waxol or after defoliation. This is, however, possible only in irrigated areas.

In rainfed areas, seeds should be sown in 300 gauge polythene tubes of 25cm length and 10cm diameter, filled with a 1:1:1 mixture of farmyard manure, sand and clay. Sowing is done during April in north India so that the seedlings become buddable during July. The budlings become ready for transplanting 1–2 months after budding. The budlings raised by this technique retain their deep rooting tendency and prove the most suitable under the low rainfall drylands. In drylands, ber orchard can also be raised by transplanting tube-raised ber seedlings with the onset of monsoon, leaving them to grow in the field until the forthcoming summer for budding in situ.

**Planting**

Beginning of monsoon is best time for planting. Planting is done at a spacing of 6m in low rainfall areas and 8m in the irrigated regions or in those receiving higher rainfall. In rainfed areas, shaping the interspaces between tree rows to provide 5% slope towards the plant helps accumulate run-off water during monsoon and thereby results in higher establishment success. In irrigated areas, ber plants can be transplanted during January–March also. In sandy soils, placing sub-surface barriers of bentonite clay reduce infiltration of water and thus increases success.

**Training and pruning**

During the first 2–3 years after planting, ber trees should be trained to develop a strong framework. After that old growth is beheaded during March keeping 1–2 nodes above the graft union to induce vigorous new growth. One upright growing vigorous shoot is retained to develop into main trunk which is kept clean of secondary branches up to 30cm height from the ground level. On the main trunk, 3 or 4 well-spaced and favourably located main branches are allowed above when it is headed back. During the second year, these main branches are also clipped retaining 3–4 secondary branches on each of them. This process is continued to develop tertiary branches. Upward growing shoots are retained at each stage to develop an upright tree stature. Not more than one upright growing shoot is retained at a node so that narrow crotches are avoided. This basic frame of the tree is maintained by removing of water sprouts as and when they emerge. Correction in the framework is done at the time of annual pruning.

Annual pruning in ber is essential to induce maximum number of new healthy shoots which would bear good quality fruits. It is also essential to remove the undesirable, weak, intercrossing, diseased and broken branches to avoid crowding and to encourage healthy growth for maximum fruit bearing. Pruning is done during the hot and dry season when the tree sheds leaves and enters into dormancy. In Tamil Nadu, the trees are pruned during January–April, in Maharashtra pruning must be completed by the April-end and in Haryana by the May-end. Severity of pruning also differs at different locations. In general, light pruning, at about 25 buds, is the best. However, pruning could be done at 15–20 buds under more moderate climatic conditions. All the secondary shoots should be completely removed. To avoid the occurrence of long unfruitful basal portions of branches as a result of light pruning for several years, half the past season’s shoots are pruned to 20 buds and the remaining half to the basal 1 or 2 nodes.
Spraying of 3% thiourea or potassium nitrate once in 2 days before pruning induces bud sprouting from maximum number of nodes.

**Manuring and fertilization**

Ber orchards are seldom manured. However, productivity of trees can be improved if manuring is done every year. The dose depends on fertility status of different locations. A dose of 750g N/tree gives highest yield, whereas 250g N and 250g P₂O₅ increase fruit yield. Application of K does not give any response.

**Interculture**

Leguminous intercrops such as mungbean, mothbean and cowpea can be grown under rainfed conditions. Gram, chilli and other vegetables can be grown between tree rows until the trees occupy full space. Interculture should be done to remove weeds which cause losses of nutrients and water and act as alternate host for the diseases. Cover cropping with moth bean improves fertility and moisture status of the soil.

**Irrigation**

In rainfed areas, arrangement for in-situ water harvesting should be done by giving 5% slope to the inter-row spaces towards the trees. Black polythene mulch helps conserve soil moisture and improves growth of the trees.

Irrigation during November—February at 3–4 week interval should be done in Punjab and Haryana, but irrigation during October causes flower shedding and that during March-April causes fruit spoilage and delays ripening.

**Harvesting and Postharvest management**

Ber matures 150–175 days after flowering. A pre-harvest spray of 750ppm 2-chloroethyl phosphoric acid (Ethephon) at colour turning stage induces early maturity. Fully mature fruits are harvested by picking. Picking should be done in the forenoon.

The time of harvesting depends on agro-climatic conditions of the location and cultivars. In south India, the fruits are harvested during October–November, in Gujarat during December–March, in Rajasthan during January–March and in north India during February–April. The average yield during the prime bearing period (10–20 years) ranges 80–200kg/tree. In dry areas, under rainfed conditions, 50–80kg fruits /tree can be obtained. Fruits do not ripen after picking. Over-ripe fruits lose their eating quality and storage life. Therefore, fruits which are just mature and have shining yellow colour should be harvested. At this stage, the fruits contain the desired sugar:acid ratio and ascorbic acid content.

The harvested ber should be sorted to discard the damaged, over-ripe, unripe and misshapen fruits. Then the fruits should be graded into large, medium and small-sized groups. For local markets, fruits are generally packed in cloth sheets or in gunny bags but for long distant
transport and packing should be done according to grades. While A grade fruits can be packed in perforated cardboard cartons of 6 kg capacity with paper cuttings as cushioning material, the lower grades can be packed in baskets or gunny bags. Ber fruits can be stored for 10–12 days after packing in perforated polythene bags at room temperature. The storage life can be prolonged to 30–40 days by storage at 3°C and 85–90% humidity. Pre-cooling of fruits at 10°C immediately after harvest increases shelf life by about 3 days when subsequently stored at room temperature. Preharvest spraying of 1% calcium nitrate and dipping of the fruits before storage in 500ppm Captaf also improve their shelf-life.