

Ziziphus jujube Miller – A fast vanishing minor fruit plant of Kashmir, India

IN the Indian union territory of Jammu and Kashmir, *Ziziphus jujube* is found growing at different places in Kashmir province with temperate climate mainly in wild form and at very few places is cultivated for fruits while *Ziziphus mauritiana* is cultivated in Jammu province with tropical or sub tropical climate. Of the two subspecies of *Ziziphus jujube* occurring in Kashmir, *Ziziphus jujuba* ssp. *spinosa* grows wild at many places with thorny, often shrubby plants bearing smaller fruits; the other one viz., *Ziziphus jujuba* ssp. *jujube* with thorn less trees bearing larger and tastier fruits is cultivated at few places. The fruits especially of later subspecies are consumed by locals and are of medicinal importance. During our recent exploration and germplasm collection programme, we have collected eight accessions of *Ziziphus jujuba* ssp. *spinosa* and only two of *Ziziphus jujuba* ssp. *jujube* from various parts of Kashmir. Variability in fruit size, shape, color and taste was recorded in these collections. A unique accession of *Ziziphus jujuba* ssp. *spinosa* has been collected from Ganderbal area having moderately thorny plants bearing bigger, brown, shining and tasty fruits almost equivalent to the fruits of *Ziziphus jujuba* ssp. *jujube*. Such accessions can be suggested to be possible progenitor of later subspecies. Earlier both these subspecies of *Ziziphus jujube* were more common in Kashmir and unfortunately are now fast vanishing from the region. Therefore, more concerted efforts should be made for their conservation both *ex situ* and *in situ* for our future generations. We firmly believe that under the prevailing uncertain climatic conditions, these wonderful and multipurpose minor fruit plants being highly drought tolerant and capable of growing on dry wastelands hold a great promise in the region.

Ziziphus Mill. is a very important genus of buckthorn family Rhamnaceae native to South Asia and comprising about 100 species of trees, shrubs, climbers, and a herb distributed mostly in the tropical and sub-tropical regions of the world, mainly Asia and America, although few of these extend in the Pacific Islands and Australia. Some of these occur in the temperate regions as well. About 17 species have been reported in India, 12 in China, 13 in Pakistan, 7 in Bhutan, 8 in Nepal and 6 in Bangladesh. *Ziziphus* trees and shrubs inhabit arid environments on every continent due to their versatility in being able to adapt to drought stress. The fleshy drupes of some species are rich in sugars and vitamins, and this fact has made *Ziziphus* species important fruit trees for many centuries. The highly nutritious fruits provide a valuable source

of energy, vitamins and also income when sold in local markets. The leaves provide fodder for livestock; the hard wood is used for turning, making agricultural implements, fuel and high quality charcoal. More importantly, extract from fruits, seeds, leaves, roots and bark of this plant is used in many traditional medicines to alleviate the effects of insomnia, skin diseases, inflammatory conditions and fever. In many regions, *Ziziphus* is grown as a hedge; with its spines creating effective live-fencing besides their strong root system stabilizes the soil preventing soil erosion. Some species, like *Ziziphus mauritiana* and *Ziziphus jujuba* are found on nearly every continent, whereas other species are restricted in their distribution. These two are major domesticated *Ziziphus* species for fruit production. In India as well as in China, *Ziziphus* trees have a long tradition of selection and cultivation, as result a these two species occurring in these countries are better known and more widely researched than those in other regions. *Ziziphus mauritiana* is commonly cultivated in India, while *Ziziphus jujube* is predominantly cultivated in China.

Ziziphus mauritiana Lamk. (Ber, Indian Jujube, Chinese date, Indian cherry, Indian plum) is highly drought resistant plant, thus considered as an ideal fruit tree for arid and semi-arid regions in tropical and subtropical climates where most of the fruit crops cannot be grown either due to lack of irrigation facilities or adverse climatic and soil conditions. It is found growing wild as well as in cultivated forms throughout the warmer regions up to an altitude of 1500 m above mean sea level. In India, the major ber growing states are Rajasthan, Haryana, Uttar Pradesh, Gujarat, Madhya Pradesh, Bihar, Maharashtra, Andhra Pradesh and Tamil Nadu. Its plants are large shrubs or trees, may be evergreen and up to 15 meter tall. Drupe fruits are eaten fresh and also processed to prepare delicious murraba and candies. Fruits can also be used for preparation of jam and wine. These contain high amount of vitamin C (85 - 95 mg per 100 g), more vitamin C has been found in the fruit flesh near the seed rather than near the skin of the fruit. Drupes are 1.0 - 1.2 × 1.0 cm. in size, globose, oblong or ovoid, orange yellow, turning deep red, pulpy, with persistent tube at base; stones irregularly furrowed with a hard, thick, boney shell enclosing 1 - 2 red-brown shiny seeds 6 - 7 × 5 - 6 mm. in size. Fruits are produced from September to January.

Ziziphus jujuba Mill. (Jujube, Chinese ber, Red date and Chinese date) is small deciduous tree, rarely shrub up to 10 m tall, spinose or unarmed. Drupe red at maturity, turning red-purple, oblong or narrowly ovoid, 2.0 - 3.5



Fruiting shrub (a), heavy bearing late maturing plant with bigger green fruits (b) and a small tree of *Ziziphus jujube* subsp. *spinosa* (c), a huge tree (d), fruiting branch (e) of *Ziziphus jujube* subsp. *jujube*, and local community initiative for protection of trees in Shopian area (f).

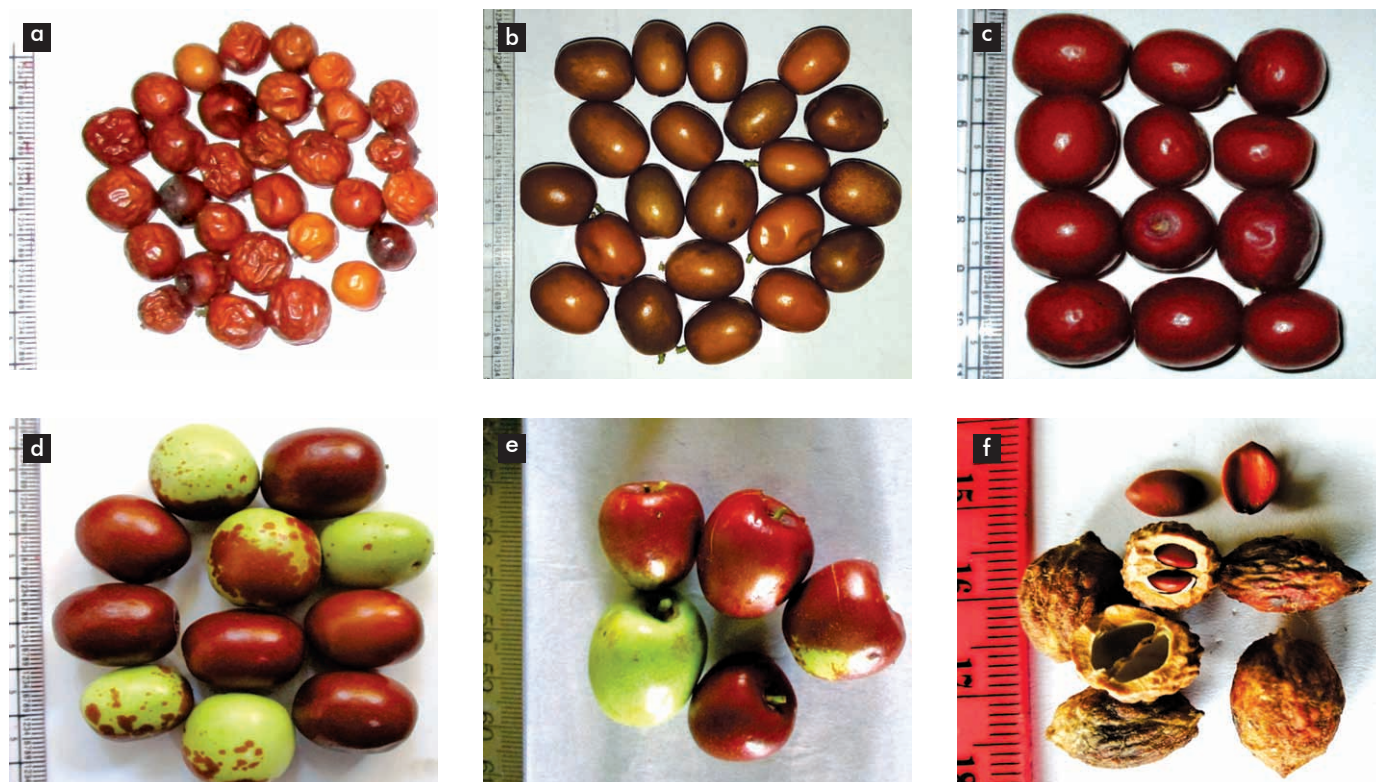
cm. long, 1.5 - 2 cm in diameter; mesocarp fleshy, thick, sweet or sour-tasting; stone acute or obtuse at both ends, 2-loculed, 1 - 2-seeded; fruiting pedicel 2 - 5 mm or longer. Seeds compressed to orbicular, 1×0.8 cm in size. Flowering from May to July and fruiting from August to October. Three accessions of Chinese ber namely Ta-Yan-Jhao (EC27715-A), Ta-Yan-Tszov (EC36768) and Moodeung (EC280769) were introduced from Russia and Korea, they are established in the field gene bank of ICAR-NBPGR Regional Station, Shimla and have been distributed to several places in north eastern India. The plants are thorn less bushy, spreading, or upright, 5-10 m tall. Leaf shape is ovate, broad elliptic and elliptic with serrate margin. Chinese ber requires a small amount of chilling during winter to set the fruits however, it can withstand wide range of temperature (below freezing to 34°C). Fruits are borne solitary or in clusters, with smooth surface, obtuse fruit apex and base. Pulp color greenish-white, less sweet in taste with moderate pulp aroma. Fruit length varies from 1.8 - 4.3 cm and diameter 1.2 - 3.3 cm. Stone shape oval to spindle. Average fruit varies 8 - 18 g in weight with 16 - 21% total soluble solids and pulp to stone ratio varying from 1.2 - 1.9.

In the Indian Union Territory of Jammu and Kashmir, *Ziziphus mauritiana* has been reported to be grown on 7.90 thousand hectares with a production of 13.20 thousand metric tonnes in Jammu province with tropical to subtropical climate while in temperate Kashmir province, *Ziziphus jujube* is the species found growing at different places mainly in wild form and at very few places it is being cultivated rather maintained for fruits. While revising genus *Ziziphus* in the Kashmir Himalaya

have collected many plant specimens growing in the wild which were identified as *Ziziphus jujuba* Mill. subsp. *spinosa* (Bunge) Peng, Li & Li, a new addition to the flora of the Indian subcontinent from the Kashmir Himalayas. This wild subspecies of *Ziziphus jujube* was earlier known as *Ziziphus acidojujuba* Cheng & Liu and is widely distributed and considered an important honey plant in North China for its fragrant flowers rich in nectar. In Kashmir, *Ziziphus jujuba* ssp. *spinosa* occurs as thorny shrub often bearing less tasty smaller fruits which upon maturity form a cavum, completely hollow mesocarp. Another subspecies found growing in Kashmir is *Ziziphus jujuba* ssp. *jujube* which is cultivated for its bigger and tastier fruits and is characterized by taller thorn less trees not forming a cavum upon drying. This species could have been introduced in Kashmir through the famous Silk Route.

Characteristics and germplasm collection

Ziziphus jujuba ssp. *spinosa* occurs wild in Kashmir and locally called as 'Bar-e-Kund' grows on dry areas like *Karewa* lands, slopes near foot hills, fencing of orchards at some places at an altitude of 1600 - 2300 m. We have observed small populations of this plant growing in Tral area of Pulwama district and at various places in Ganderbal district during our recent exploration and germplasm collection programme of wild fruits from various areas of Kashmir. It is a thorny deciduous shrub 1 - 3 m tall mostly with spreading habit. However, at few places we have seen small upright trees of this species with solid branched trunk more than 5 m in height. We have also observed some plants moderately and some heavily armed with spines but we have not been so far able to



Variation in fruit shape, size and color (a - d), stone/seed shape and size (f) in *Ziziphus jujube* subsp. *spinosa*. Fruits of unique accession of *Ziziphus jujube* subsp. *spinosa* collected by authors (d) comparable to the fruits of *Ziziphus jujube* subsp. *jujube* (e).

locate spineless plants of this species. The fruits mature from September to October. During our exploration programme we have collected eight diverse accessions of this species varying in fruit shape, size, color and taste from an altitudinal range of 1671 - 1779 m. Fruits shape may be globose, oblong or ellipsoid. Color varies from light brown, dark brown to tan. We have recorded fruit length of 0.9 - 2.1 cm, breadth of 0.8 - 1.9 cm, fruit weight of 0.775 - 4.057 g and stone weight of 0.071 - 0.408 g in this species. Stone globose to ellipsoid, obtuse or sometimes acute as well, superficially tuberculate, often with two locules each with single smooth surfaced, brown, compressed, orbicular seed. One heavy bearing late maturing bush type accession with fruit size of 1.8 x 1.6 cm, fruit weight of 2.923 g and stone weight of 0.343 g has been collected from Tral area. However, fruits of this accession form a cavum upon maturity and drying; besides its fresh fruits are almost tasteless. On the other hand one unique accession with shrubby plants has been collected from Lar Ganderbal area with fruit size of 2.1 x 1.9 cm, fruit weight of 4.057 g and stone weight of 0.371 g. The accession is unique in being moderately thorny, bearing very tasty, brown shining crispy fruits with thin epicarp, and comparatively thicker mesocarp, besides not forming cavum upon maturity. These characteristics bring it closer to *Ziziphus jujuba* ssp. *jujube* and thus can be suggested to be its possible progenitor. This accession has a potential to be exploited as a minor fruit crop in the region.

Ziziphus jujuba ssp. *jujube* is thorn less cultivated subspecies locally called as 'Bre' resembling 'Ber' referring to *Ziziphus mauritiana* in other parts of the country.

Ziziphus jujuba ssp. *jujube* is now rare in Kashmir and we have collected its two accessions only, one from Pampore area at an elevation of 1630 m and another from Shopian area at an elevation of 1930 m. Three very huge plants believed to be around a century old were observed in Pampore area with fruits maturing in the month of September while in Raqhama village of Shopian almost a dozen comparatively smaller trees were found to be growing. The fruits here mature late in October. Mature fresh fruits of *Ziziphus jujuba* ssp. *jujube* are brownish, tasty, and narrowly ovoid, on an average 2.7 in length, 2.4 in breadth, fruit weight 6.473 g and stone weight of 0.238 g, stone acute at both ends, 2-loculed, 1 or 2-seeded, seeds orbicular and compressed.

Utilization

The fruits are eaten fresh or in dried form. Various functional compounds such as vitamin C, amino acids, triterpene acids, polysaccharides, and polyphenols have been reported in the *Ziziphus*. In Unani system of medicine, it is known as 'Unnab' and its *sherbet* is believed to have a sort of 'cooling effect' on the body. Traditionally, species belonging to the genus *Ziziphus* have been largely used as medicine to treat many diseases and body disorders, such as chest and respiratory problems, scabies, pimples and the inflammation of mouth and gums. It is reported to be a good blood purifier and stomachic. The fruits are useful in the treatment of asthma, bronchitis, diabetes, eye diseases, inflammatory skin conditions, liver disorders, ulcers and wounds. In Uri areas of Kashmir, *Ziziphus jujuba* ssp. *jujube* is locally called as 'Singli' and

a decoction prepared by grinding its seeds in salty water is taken orally two spoons thrice a day for two months as a cure for jaundice. In Kashmir, the leaves especially of *Ziziphus jujuba* ssp. *jujube* are added to boiling water used for taking bath to cure various skin ailments. The foliage is used as fodder for livestock at many places.

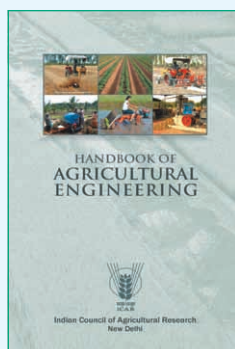
Need for conservation

Four or five decades back *Ziziphus jujuba* ssp. *jujube* was more commonly grown in Kashmir and its trees were seen in countless number of villages and people fondly consumed its fruits especially for medicinal purposes. However, unfortunately over these years this potential minor fruit has fast vanished and now-a-days is growing at very limited places across Kashmir. Even *Ziziphus jujuba* ssp. *spinosa* growing wild at various places throughout Kashmir is greatly threatened due to merciless cutting and habitat loss. Therefore, efforts should be made for their conservation both *ex situ* and *in situ*. During the exploration programme, the authors while interacting with local people at village Raqham of Shopian, lauded their efforts in protecting about a dozen *Ziziphus jujuba*

ssp. *jujube* trees by wire fencings as a local community initiative. Root suckers of these protected plants are being carefully maintained and groomed for propagation purpose. The village community is eager to distribute these juvenile plants among interested people for revival of this valuable plant genetic resource. The village is interestingly and correctly known as 'Bre Baag' meaning a 'Ber Orchard'. As mentioned earlier we have collected a total of 10 accessions of both these subspecies for conservation. The authors firmly believe that under the prevailing uncertain climatic conditions, *Ziziphus jujuba* holds a great promise as a multipurpose minor fruit crop in the region being highly drought tolerant and capable of growing on dry wastelands. Therefore, more concerted efforts should be made for their conservation both *ex situ* and *in situ* for our future generations.

For further interaction, please write to:

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