

TAXONOMIC STATE OF ZIZYPHUS: A COMPARATIVE STUDY FOR IDENTIFICATION OF COMMON INDIAN JUJUBE.

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Abstract: The wild edible *Indian jujube* is one of the diffused species wild resources in India. The Indian species described under the name *Zizyphus mauritiana* Lamk., is native from the province of Yunnan in Southern China to Afghanistan, Malaysia and Queensland. *Zizyphus jujuba* has been distinguished into two main groups, *Chinese jujube* and *Indian jujube*. Actual Taxonomy of *Zizyphus* as found in the literature as well as in various herbaria is all chaos and confusion. Till now several attempts has been made in Indian flora to study Taxonomy of *Zizyphus species*, but the nomenclature of entire genus is unclear as also the taxonomic identity of the varieties. In most of the Indian flora, Indian jujube has been described under the name of *Zizyphus jujuba*. but several botanists distinguish Indian jujube as *Zizyphus mauritiana* Lam. The present paper discusses the comparative study of *Zizyphus jujuba* Mill. and *Zizyphus mauritiana* Lamk. and also study actual taxonomic state of *Zizyphus mauritiana* Lamk. and *Zizyphus jujuba* Mill. on the basis of leaf and fruit morphology, which helps us to identify the species present in India.

Key words: *Zizyphus jujuba* Mill., Taxonomic state, Flora, *Zizyphus Mauritia Lamk.*, Leaf Morphology, Fruit Morphology.

INTRODUCTION

Zizyphus is a genus of about 40 species of spiny shrubs and small trees in the buckthorn family Rhamnaceae, distributed in the warm-temperate and subtropical regions throughout the world (Bhatt *et al.*, 2007). The leaves are alternate, entire, with three prominent basal veins, and 2-7 cm long; some species are deciduous, others evergreen. The flowers are small, inconspicuous yellow-green. The fruit is an edible drupe, yellow-brown, red, or black, globose or oblong, 1-5 cm long, often very sweet and sugary. The best known species is *Zizyphus jujuba* Mill. Other species include *Z. spina-christi* from southwestern Asia, *Z. lotus* from the Mediterranean region, and *Ber* (*Zizyphus mauritiana* Lamk.), which is found from western Africa to India. *Zizyphus joazeiro* grows in the Caatinga of Brazil.

There are about 40 species of *Zizyphus* out of which *Zizyphus mauritiana* Lamk. is grown mostly in India. (Bhattacharjee, 1998).

These includes:

<i>Zizyphus pubinervis</i>	<i>Zizyphus rugosa</i>
<i>Zizyphus reticulata</i>	<i>Zizyphus saeri</i>
<i>Zizyphus rignonii</i>	<i>Zizyphus spinachristi</i>
<i>Zizyphus robertsoniana</i>	<i>Zizyphus spinosa</i>
<i>Zizyphus rugosa</i>	<i>Zizyphus talanai</i>
<i>Zizyphus saeri</i>	<i>Zizyphus taylorii</i>
<i>Zizyphus spinachristi</i>	<i>Zizyphus trinervia</i>
<i>Zizyphus spinosa</i>	<i>Zizyphus guaranitica</i>
<i>Zizyphus talanai</i>	<i>Zizyphus horrida</i>
<i>Zizyphus taylorii</i>	<i>Zizyphus hutchinsonii</i>
<i>Zizyphus trinervia</i>	<i>Zizyphus incurva</i>
<i>Zizyphus pubinervis</i>	<i>Zizyphus zizyphus</i> (syn. <i>Z. jujuba</i>)
<i>Zizyphus reticulata</i>	<i>Zizyphus lotus</i>

<i>Zizyphus rignonii</i>	<i>Zizyphus mairei</i>
<i>Zizyphus robertsoniana</i>	<i>Zizyphus mauritiana</i>
<i>Zizyphus rugosa</i>	<i>Zizyphus melastomoides</i>
<i>Zizyphus saeri</i>	<i>Zizyphus mexicana</i>
<i>Zizyphus spinachristi</i>	<i>Zizyphus mistol</i>
<i>Zizyphus spinosa</i>	<i>Zizyphus montana</i>
<i>Zizyphus talanai</i>	<i>Zizyphus mucronata</i>
<i>Zizyphus taylorii</i>	<i>Zizyphus nummularia</i>
<i>Zizyphus trinervia</i>	<i>Zizyphus obtusifolia</i>
<i>Zizyphus pubinervis</i>	<i>Zizyphus oenoplia</i>
<i>Zizyphus reticulata</i>	<i>Zizyphus oxyphylla</i>
<i>Zizyphus rignonii</i>	<i>Zizyphus parryi</i>
<i>Zizyphus robertsoniana</i>	

Of these, only few species such as *Z. jujuba* Mill., *Z. sativa* Gaertn., and *Z. lotus* Lamk., yield edible fruits. Cultivated species referred as *Z. jujuba* Mill. are supposed to be of Chinese origin while *Z. vulgaris* Lam. represents those of Indian origin. (Watt, 1908), (Chatterjee and Randhawa, 1952) distinguished between these two main groups of jujube, i.e. *Chinese jujube* (*Z. jujuba* Mill.) and the ber or *Indian jujube* (*Z. mauritiana* Lamk.). In most of the Indian flora, *Indian jujube* is named *Z. jujuba* Lamk. (Vasista, 2001). In his book 'Indian Trees' (Brandis, 1997) mentioned only *Z. jujuba* in 'Tropical Horticulture' (Bose, 1999) and Ber varieties (Bal, 1992). mentioned *Z. mauritiana* is commercially cultivated in India. (Bhandari, 1978). described that *Z. mauritiana* Lamk. found throughout India in "Flora of the Indian Desert". Ber grown in Pakistan is *Zizyphus mauritiana* Lamk. often misidentified as *Zizyphus jujuba* (Malik, 2000).

How ever, the nomenclature of the entire genus *Zizyphus* is unclear as also the taxonomic identity of the varieties.

A- Description of *Zizyphus mauritiana* Lam.

Zizyphus mauritiana is widely cultivated in dry areas throughout the tropics. The use of *Zizyphus mauritiana* in India can be traced back to as early as 1,000 BC. This species which is also known as ber, Indian jujube, Indian plum, or desert apple, is an ever-green, medium-sized, thorny tree, whose greatest quality is its ability to thrive and produce fruits in arid or semi-arid regions. One idealist describes this species as "a gift of mother nature which symbolizes the productive capacity of the seemingly infertile ecosystem". An apt description of its value is that ber produces the three vital "f's" that desert dwellers require—fruit, fodder, and fuel (Vashishtha 1978).

It tolerates extremely dry habitats and is an extremely valuable tree for people that live in such climates. *Zizyphus mauritiana* has a multitude of uses, including culinary and medicinal. It can form dense stands and become invasive in some areas, including Fiji and Australia. In Australia *Zizyphus mauritiana* has the capacity to greatly expand its current range in northern and northeastern Australia. The main industry affected is the cattle industry but *Zizyphus mauritiana* also has environmental impacts in woodland and savanna ecosystems.

Similar species: *Zizyphus* sp.

Occurs in: agricultural areas, natural forests, riparian zones, ruderal/disturbed.

Habitat description:

Roadsides and former agricultural land, to 600m in Fiji, (Smith, 1985. In PIER, 2002). In India, the tree grows best on sandy loam, neutral or slightly alkaline. It also grows well on laterite, medium black soils with good drainage, or sandy, gravelly, alluvial soil of dry river-beds where it is vigorously spontaneous, (Morton, 1987). Even moderately saline soils are tolerated. The tree is remarkable in its ability to tolerate water-logging as well as drought. In China and India, wild trees are found up to an elevation of 5,400 ft (1,650 m). In India, the minimum shade temperature for survival is 44.6° to 55.4° F (7°-13° C); the maximum, 98.6° to 118° F (37°-48° C), (Morton, 1987).

In Australia, this species grows on a wide variety of soil types, including cracking clays, solodic soils and deep alluvials, in the tropics and sub-tropics where the average annual rainfall is in the range 470-1200 mm. In the drier parts of this range, it grows best in riparian zones. (Grice, pers. comm. 2002).

Taxonomic name: *Zizyphus mauritiana* Lamk.

Systematic position of *Zizyphus mauritiana* Lamk.

Symbol : ZIMA

Group	:	Dicot
Family	:	Rhamnaceae
Duration	:	Perennial
Growth Habit	:	Tree, Shrub

Classification:

Zizyphus mauritiana Lam.

Kingdom	<i>Plantae</i> – Plants
Subkingdom	<i>Tracheobionta</i> – Vascular plants
Superdivision	<i>Spermatophyta</i> – Seed plants
Division	<i>Magnoliophyta</i> – Flowering plants
Class	<i>Magnoliopsida</i> – Dicotyledons
Subclass	<i>Rosidae</i>
Order	<i>Rhamnales</i>
Family	<i>Rhamnaceae</i> – Buckthorn family
Genus	<i>Zizyphus</i>
Species	<i>Zizyphus mauritiana</i> Lamk.– <i>Indian jujube</i>

Synonyms (alternative names) for *Zizyphus mauritiana* Lamk.

Rhamnus jujuba L., *Rhamnus mauritiana* Soyer-Willemet, *Zizyphus jujuba* (L.) Lam., non P. Mill., *Zizyphus aucheri* Boiss., *Zizyphus jujuba* (L.) Gaertn., *Zizyphus jujuba* (L.) Gaertn. var. *fruticosa* Haines, *Zizyphus jujuba* (L.) Gaertn. var. *stenocarpa* Kuntze, *Zizyphus mauritiana* Lam. var. *deserticola* A. Chev., *Zizyphus mauritiana* Lam. var. *orthacantha* (DC.) A. Chev., *Zizyphus orthacantha* DC, *Zizyphus poiretii* G. Don, *Zizyphus rotundata* DC.

Common names for *Zizyphus mauritiana* Lamk.

aprin (Puerto Rico), baer (Fiji), baher (Fiji), bahir (Fiji), bedara (Malaya), ber (India), bor (India), Chinee apple (Queensland, Australia), Chinese apple (English), Chinese date (English), coolie plum (Jamaica), crabapple (Jamaica), dindoulier (French-West Indies), dunk (Barbados), dunks (Trinidad), dunks (Tropical Africa), gingeolier (French-West Indies), Indian cherry (English), Indian jujube (English), Indian plum (English), jujube (Guam), jujube (French), jujube du pays (French-Reunion (La Réunion)), jujubier (French), jujubier (French-Reunion (La Réunion)), jujubier indien (French-Reunion (La Réunion)), liane croc chien (French-West Indies), Malay jujube (English), mangostine (Barbados), manzana (apple) (Philippines), manzanas (Guam), manzanita (Guam), manzanita (little apple) (Philippines), masson (French-Reunion (La Réunion)), ma-tan (Thailand), perita haitiana (Dominican Republic), petit pomme (French-West Indies), phutsa (Thailand), pomme malcadi (French-West Indies), pomme surette (French-West Indies), ponsigne (Venezuela), prune Saint Paul (French-Reunion (La Réunion)), putrea (Cambodia), tao (Vietnam), tao

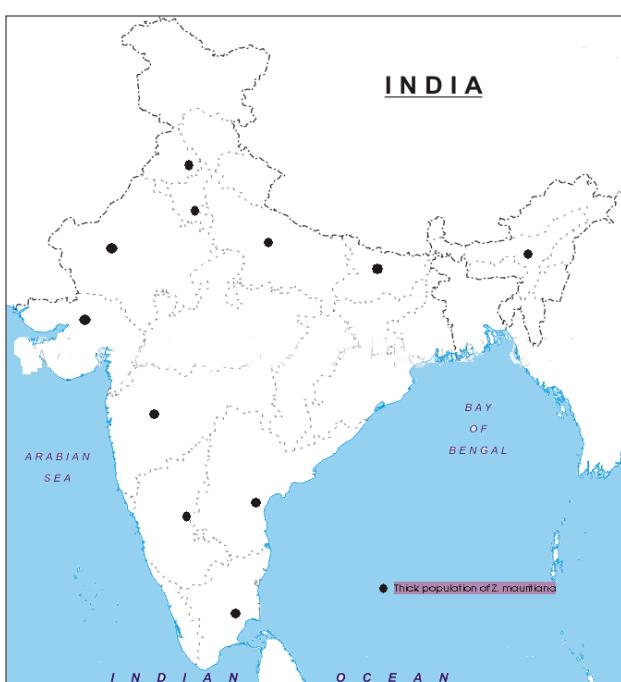
nhuc (Vietnam), widara (Indonesia), widara (Surinam), yuyubi (Puerto Rico), yuyubo (Venezuela).

PLANTS Profile: Distribution of *Zizyphus mauritiana* Lamk.

Organism type: Tree, shrub.



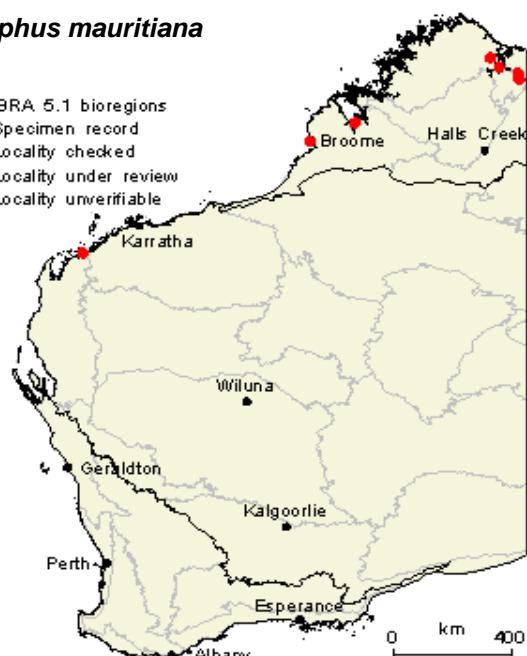
World Map



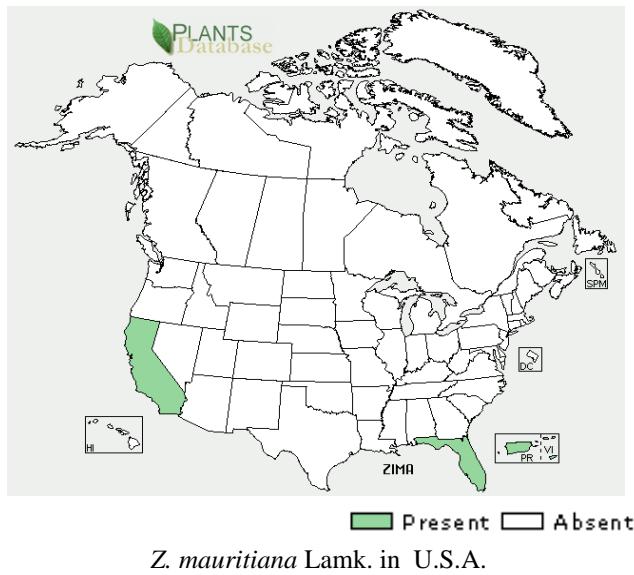
Z.mauritiana Lamk. in India

Zizyphus mauritiana

- ~ IBRA 5.1 bioregions
- Specimen record
- Locality checked
- Locality under review
- ✗ Locality unverifiable



Z. mauritiana Lamk. in Western Australia



Tree characters

Zizyphus mauritiana Lamk. (Indian Jujube or Cottony Jujube) is a type of fruit tree. It is most often found in south-east Asia, usually India (Bal, 1992). It is a medium sized tree that grows vigorously and has a rapidly developing taproot, a necessary adaptation to drought conditions. The species varies widely in height, from a shrub 1.5 to 2 m tall, to a tree 10 to 12 m tall with a trunk diameter of about 30 cm. Ber tree may be erect or wide-spreading, with gracefully drooping thorny branches and downy, zigzag branchlets, with short, sharp straight or hooked spines (Bhatt et al., 2007). It may be evergreen or leafless for several weeks in hot summers.

Picture showing *Zizyphus mauritiana* Lamk. Tree.



Zizyphus mauritiana Lamk. Tree.



Zizyphus mauritiana Lamk. Bark

Leaf characters:

Leaves- The leaves are alternate, ovate- or oblong-elliptic, 1 to 2 1/2 in (2.5-6.25cm) long, 3/4 to 1 1/2 in (2-4cm) wide; distinguished from those of the Chinese jujube by the dense, silky, whitish or brownish hairs on the underside and the short, downy petioles. On the upper surface, they are very glossy, dark-green, with 3 conspicuous, depressed, longitudinal veins, and there are very fine teeth on the margins." (Morton, 1987). Depending on the climate, the foliage of the Chinese apple may be evergreen or deciduous. (Especially in areas with dry season).

Pictures showing *Zizyphus mauritiana* Lamk. Leaves.





Flower characters:

Flowers. In cymes (axillary); predominantly green or white or yellow, regular, pedicellate, pedicel 5–6 mm long, perianth 2 -whorled. Calyx 1–1.5 mm long, 5 sepals (triangular), all sepals free. Corolla to 1 mm long, 5 petals (membranous, spatulate), all petals free. Stamens 5, adnate to the perianth (to the base of the sepals), all opposite the corolla parts, free of each other. Anthers dehiscing via longitudinal slits. Ovary syncarpous, inferior, 2–4 -celled (usually 3). Ovules 1 per cell. Styles 1, simple (stigma 2–4 lobed).

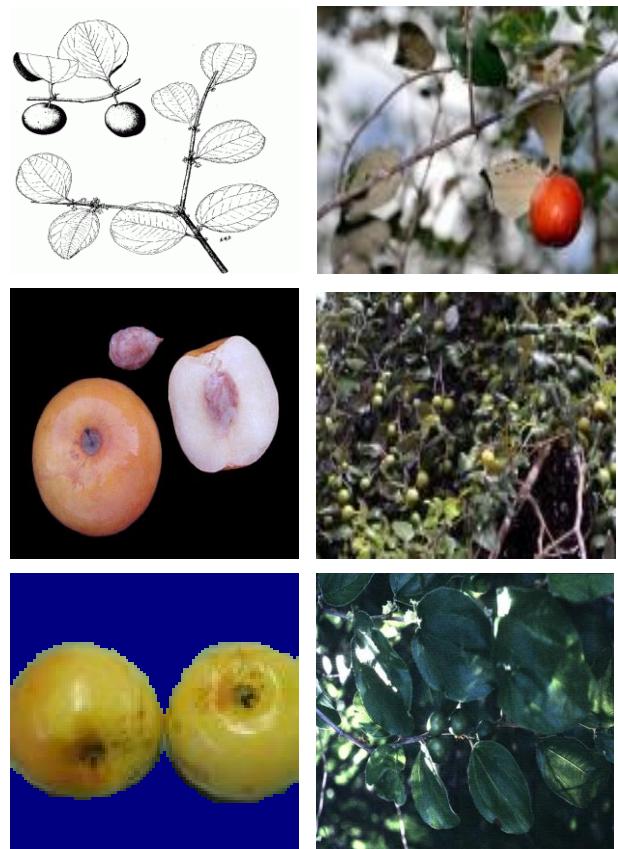


Ziziphus mauritiana Lamk. flower.

Fruit Morphology of *Ziziphus mauritiana* Lamk.

Indehiscent, a drupe (sub globular, with succulent white flesh and a pleasant apple flavour, surrounding a large stone), fleshy, yellow or red or brown, to 25 mm long, to 25(–50) mm wide (diameter).fruits are orange to brown, 2-3 cm long, with edible white pulp surrounding a 2-locular

pyrene. (Smith, 1985). Fruits vary in shape and size. They can be rounding, oval or oblong; large, medium or small. Most are round to oval. Size can be as small as 1.8 to 2.5 cm for fruit from wild trees or as large as 5 cm (plum sized) from improved cultivars. Ber fruits are first green, turning yellow as they ripen. The ripe fruit is sweet and sour in taste. Both flesh texture and taste are reminiscent of apples. (Stone, 1970).



Ziziphus mauritiana Lamk. fruits

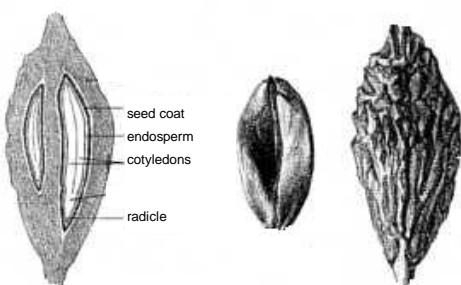
Seed structure and Morphology of *Ziziphus mauritiana* Lamk.

There is a single, hard, oval or oblate, rough central stone which contains 1-2 elliptic brown kernels each 6 mm long elliptic, brown seeds, 1/4 in (6mm) long." Seed a tuberculate and irregularly furrowed stone, (Morton, 1987).

Pictures showing *Ziziphus mauritiana* Lamk. Seed.



Morphology of Z. mauritiana Lamk.



Seed Anatomy of *Z. mauritiana* Lamk.

Description of *Zizyphus jujuba* Mill.

The jujube originated in China where they have been cultivated for more than 4,000 years and where there are over 400 cultivars. About 50 genera and more than 900 species: almost cosmopolitan, mainly in subtropical to tropical areas; 13 genera and 137 species (82 endemic, one introduced) in China. The plants traveled beyond Asia centuries ago and today are grown to some extent in Russia, northern Africa, southern Europe, the Middle East and the southwestern United States. Jujube seedlings, inferior to the Chinese cultivars, were introduced into Europe at the beginning of the Christian era and carried to the U. S. in 1837. It wasn't until 1908 that improved Chinese selections were introduced by the USDA. The Jujube, Chinese Date, or Tsao () or Chinese Jujube is an interesting deciduous tree with spiny, gnarled branches and an open, irregular form. The tree can reach a height of 5 to 12 m, is ornamental, with shiny-green leaves, and sometimes thorns. The jujube can withstand a wide range of temperatures; virtually no temperature seems to be too high in summertime. Winter dormancy allows it to withstand temperatures to about -28° F, yet it requires only a small amount of winter chill in order for it to set fruit. The plant revels in summer sun and heat, with the lack of either limiting fruit production more than winter cold. Yet jujubes have fruited in the Puget Sound and low Cascade regions of Washington State as well as in Pennsylvania. Fruiting of some cultivars has also been reported in northern Florida. The Indian jujube, which is more sensitive to frost, is grown in Florida, but the fruit is considered inferior. Dutta (1954). described the 5 cultivars of *Z. mauritiana* and one of *Z. jujube* grown in Assam.

Similar species: Indian Jujube (*Zizyphus mauritiana* Lamk.).

Occurs in: Agricultural areas, natural forests, riparian zones, ruderal/disturbed.

Habitat description: Succeeds in most soils so long as they are well drained. Prefers an open loam and a hot dry

position. Succeeds in an alkaline soil. Plants are fast growing, even in poor soils. Plants are hardy to about -20°c. Another report says that they are hardy to about -30°c when fully dormant. The jujube is often cultivated in warm temperate zones for its edible fruit, there are many named varieties. The trees need a hot dry summer if they are to fruit well, which rather restricts their potential in a country like Britain. The tree spreads by root suckers and self-sowing, often forming dense thickets. Where the climate suits it, the plant can escape from cultivation and become an invasive and problematic weed. Trees are resistant to most pests and diseases. Responds well to coppicing. Trees form a deep taproot and should be planted into their permanent positions as soon as possible. Fast growing and quick to mature, it can fruit in 3 - 4 years from seed.

considered to be affiliated with the genus. One hundred fifty five recorded taxa of *Rhizopus* have been listed in the Index fungorum (www.indexfungorum.org). Out of these, fifty eight taxa have been redesignated as *R. arrhizus* var. *arrhizus* A. Fisch., three taxa as *R. arrhizus* var. *delemer* (Wehmer & Hanzawa) J.J. Ellis, five taxa as *R. microsporus* var. *rhizopodiformis* (Cohn) Schipper & Stalpers, six taxa as *R. microsporus* var. *chinensis* (Saito) Schipper & Stalpers, two taxa as *R. microsporus* var. *oligosporus* (Saito) Schipper & Stalpers and seven taxa as *R. stolonifer* (Ehrenb. ex Fr.) Vuill. Two taxa, *R. azygosporus* Yuan & Jong and *R. microsporus* Tieghhave been redesignated as *R. microsporus* var. *azygosporus* (Yuan & Jong) Zheng and *R. microsporus* var. *microsporus* Tiegh. Thus a lot of merger, rearrangement, derecognition of many species and erection of new taxa has taken effect within the genus *Rhizopus* over a period of time.

Systematic position of *Zizyphus mauritiana* Lamk.

Symbol	: ZIZY
Group	: 3. Dicot
Family	: Rhamnaceae
Duration	: Perennial
Growth Habit	: Mostly Trees Rarely Shrub

Classification:

Zizyphus mauritiana Lamk.

Kingdom	<i>Plantae</i> – Plants
Subkingdom	<i>Tracheobionta</i> – Vascular plants
Superdivision	<i>Spermatophyta</i> – Seed plants
Division	<i>Magnoliophyta</i> – Flowering plants
Class	<i>Magnoliopsida</i> – Dicotyledons
Subclass	<i>Rosidae</i>
Order	<i>Rhamnales</i>
Family	<i>Rhamnaceae</i> – Buckthorn family

Genus *Zizyphus* - Jujube
Species *Zizyphus mauritiana* (L.)- Karst.

Vernacular names for *Zizyphus jujuba* Mill.

English: Jujube • **Català:** Ginjoler • **Deutsch:** Jujube • •
Español: Azufaifo • **Français:** Jujubier commun •
Hrvatski: žižula • **Italiano:** dattero cinese •
Nederlands: Jujube • **Português:** Jujuba •
Русский: Зизифус настоящий • **Svenska:** Jujubär •
Tiếng Việt: Táo tàu • **Türkçe:** Hünnap • **Local name:** Ber.

Common names for *Zizyphus jujuba* Mill.

Common jujube (EN) , Chinese jujube (EN) , Indian jujube, Chinese date, French jujube, Tsao, Kankole, Beri, Bedara, Ber, Bidara, Ilantai, Ma-tan, Masan , Jujube, *Zizyphus jujuba* Mill. jujubeboom (NL) , jujubier (FR) , głoźyna pospolita , daktyl chiński (PL) jujuba (PT) , kiinanjujuba (FI) , Brustbeerbaum , chinesische Dattel (DE) , harilik kreektürn (ET) , cicimek , jujuba , čínská datle (CZ) , Jinjolero , azufaifo (ES) , kínai datolya , zsidótövis (HU) , τζίτζιφα (EL) , almindelig jujube (DK) , navadni čičimak (SL) , jujuber (SE) , Azufaifo, Chinesische Dattel, Da zao sssssssss , Indian Plum, Jujube, Satunab, Suan zao ren. [B,P], Dara [E], Hong Zao [E], Indian Jujube [B,P], Jujube [H,E], Jujubier [E], Kan Tsao [E], Kola [E], Liane Crocs Chien [E], Liang Tsao [E], Mei Tsao [E], Nabug [E], Nan Tsao [E], Pei Tsao [E], Perita Haitiana [E], Petite Pomme [E], Pomme Malcadie [E], Ponsere [E], Suan Tsao [E], Ta Tsao [E], Unnab [E], Unnap Agaci [E], Widara [E],

Latin names for *Zizyphus jujuba* Mill.

Zizyphus spina-christi [syn. *Z. spinosa*, *Rhamnus spina Christi*, *Paliurus spina-christi*, *Paliurus virgatus*, *Paliurus australis* (Gaertn.), *Paliurus aculeatus* (Lam.)]. The literature is quite confused on other possible synonyms *Rhamnus paliurus*, *Zizyphus spinosa*.

Synonyms (alternative names) for *Zizyphus jujuba* Mill.

Spinosa, *Zizyphus zizyphus*, *Rhamnus jujuba*[G] *Rhamnus zizyphus* [G,H] *Z. jujube* [HORTIPLEX] *Z. mauritiana*[B,E,G,P] *Z. spinosa*[G] *Z. vulgaris* var. *Zizyphus jujuba* [H,] *Zizyphus lotos* [H] *Zizyphus sativa* [H] *Zizyphus vulgaris* [E,H]

Zizyphus zizyphus[H]. jujube; jujube bush; Christ's-thorn; Jerusalem thorn.

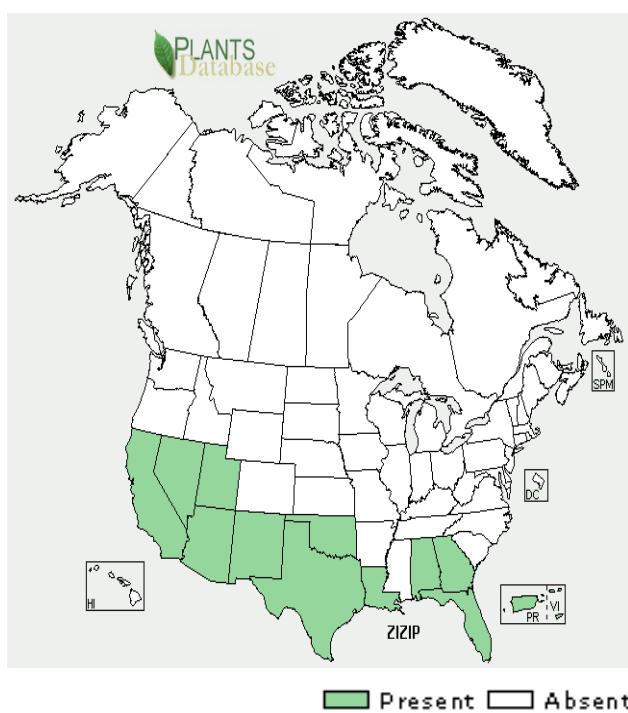
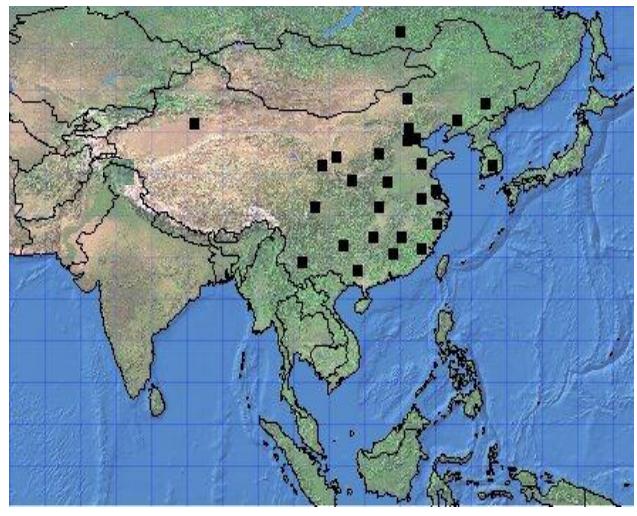
Names in other languages

Catalan: - ginjoler

Chinese - zǎo (simplified: traditional: Wade-Giles: tsao; also hóng zǎo , dà zǎo , hēi zǎo , or zǎozi

Croatian: žižula, čičindra
Dhivehi: kunnaaru
Gujarati: bor
Hindi: ber
Italian: giuggiolo
Japanese: natsume
Korean: daechu
Maltese: zinzel
Marathi: bor
Persian - annab (عناب)
Sindhi - beir
Tagalog - manzanitas
Tamil - elanthai-
Telugu - regu pandu
Thai Language - Bhud-Saar (ບຸດສາ)

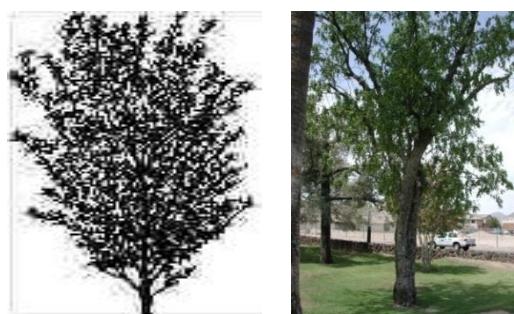
Tulu: - bogori
Turkish - hünnap
Urdu - ber (بِر)
Vietnamese - táo tàu
Organism type: Mostly Tree and Rarely Shrub.



Tree characters:

The jujube is a Deciduous or evergreen, often thorny trees, shrubs, woody climbers, or lianas, rarely herbs, tree, growing to 40 feet tall in Florida, but smaller in size in California. The naturally drooping tree is graceful, ornamental and often thorny with branches growing in a zig-zag pattern. The mottled gray/black bark is rough and shaggy. The wood is very hard and strong. Jujube cultivars vary in size and conformation, with some being very narrow in habit and others being more widespread. One cultivar, the so, seems to be fairly dwarfing in habit. After 30 years of growth in an average site, trees can be 30 feet tall with a crown diameter of up to 15 feet. Plants send up suckers (often with intimidating spines) from their roots, and these suckers can appear many feet from the mother plant. Currently, these root suckers must be controlled by mowing or hoeing.

Picture showing *Zizyphus jujube*. Mill. Tree.



Young Tree.

Mature Tree.



Spreading Tree.



Bark and hard stem.



Hard Branches.



Branches with fruits.

Leaf characters:

Leaves- The leaves are shiny-green, ovate-acute, 2-7 cm long and 1-3 cm broad, with three conspicuous veins at the base, and a finely toothed margin. Leaves simple, petiolate, alternate or opposite, pinnately veined or 3-5-veined, entire to serrate, sometimes much reduced; stipules small, caducous or persistent, sometimes transformed into spines. In the autumn, the leaves turn bright yellow before falling. There are usually two spines at the base of each leaf. Some spines may be hooked while others are long daggers. Virtually thornless cultivars are known. As the growing season commences, each node of a woody branch produces one to ten branchlets. Most of these are deciduous, falling from the plant in autumn.

Picture showing *Zizyphus jujuba* Mill. Leaves.



Flower characters:

Flowers yellowish to greenish, rarely brightly colored, small, bisexual or unisexual, rarely polygamous, (4 or) 5-merous, hypogynous to epigynous, in mostly axillary, sessile or pedunculate cymes, or reduced to few in fascicles. Calyx tube patelliform or hemispherical to tubular, sometimes absent, at rim with calyx, corolla, and stamens; sepals 4 or 5, valvate in bud, triangular, erect or \pm recurved during anthesis, adaxially often distinctly keeled, alternate with petals. Petals 4 or 5, rarely absent, usually smaller than sepals, concave or hooded, rarely nearly flat, often shortly clawed. Stamens 4 or 5, antepetalous and often \pm enclosed by petals; filaments thin, adnate to bases of petals; anthers minute, versatile or not, 2(or 4)-celled, dehiscing by longitudinal slits, usually introrse. Disk intrastaminal, nectariferous, thin to \pm fleshy, entire or lobed, glabrous or rarely pubescent, free from ovary or tightly surrounding it, or adnate to calyx tube. Ovary superior to inferior, (1 or) 2-4-loculed, with 1(or 2) ovules per locule; ovules anatropous, basal and erect; styles simple or \pm deeply 3-lobed or 3-cleft. Fruit either an indehiscent, rarely explosively dehiscent, sometimes winged, schizocarpic capsule, or a \pm fleshy drupe with 1-4 indehiscent, rarely dehiscent, pyrenes (stones).

Picture showing *Zizyphus jujuba* Mill. Flowers.

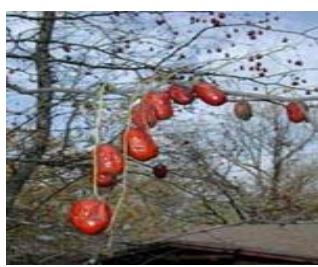




Fruit characters.

The fruit is a drupe, varying from round to elongate and from cherry-size to plum-size depending on cultivar. It has a thin, edible skin surrounding whitish flesh of sweet, agreeable flavor. The single hard stone contains two seeds. The immature fruit is green in color, but as it ripens it goes through a yellow-green stage with mahogany-colored spots appearing on the skin as the fruit ripens further. The fully mature fruit is entirely red. Shortly after becoming fully red, the fruit begins to soften and wrinkle. The fruit can be eaten after it becomes wrinkled, but most people prefer them during the interval between the yellow-green stage and the full red stage. At this stage the flesh is crisp and sweet, reminiscent of an apple. Under dry conditions jujubes lose moisture, shrivel and become spongy inside. Tests in Russia indicate a very high vitamin C content. The fruit has been used medicinally for millennia by many cultures. One of its most popular uses is as a tea for sore throat.

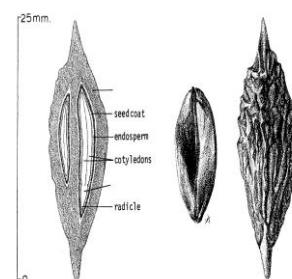
Picture showing *Zizyphus jujuba* Mill. Fruits.



Seed characters:

They have pointed oblong stones and there is a single hard stone similar to an olive stone. Seeds with thin, oily albumen, sometimes exalbinous; embryo large, oily, straight or rarely bent.

Picture showing Seed of *Zizyphus jujuba* Mill.



Conclusion:

Zizyphus mauritiana Lamk. is widely cultivated in India and neighboring countries. However, the actual Taxonomy of *Zizyphus mauritiana* Lamk. as found in the literature as well as in various herbaria is all chaos and confusion.

On the basis of available resources and studied literature, an attempt has been made to distinguish *Zizyphus mauritiana* Lamk. and *Zizyphus jujuba* Mill. We have concluded that the most common Ber plant cultivated in India is *Zizyphus mauritiana* Lamk., not *Zizyphus jujuba* Mill.

REFERENCES

- Bal, J.S. and Uppal, D.K. (1992). Ber Varieties. Associated Publishing Company, New Delhi.
- Bhatt, D.K.; Raj, A. and Bhatt, K. (2007). Herbal and Medicinal Plants of India. Shri Publishers and Distributors. New Delhi, pp. 3007-3015.
- Bhattacharjee, S.K. (1998). Hand Book of Medicinal Plants. Pointer Publishers, Jaipur, pp.302-304.
- Bose, T.K.; Mitra, S.K.; Farooqi, A.A. and Sadhu, M.K. (1999). Tropical Horticulture Naya Prakash Culcutta India. 1: pp- 344-350.

Bhandari, M.M. (1978). Flora of the Indian Desert. Scientific Publication Jodhpur. pp. 98-100.

Brandis, D. (1971). Indian Trees. New Delhi.

Chatterjee, D. and Randhawa, G.S. (1952). Standardized names of cultivated plants in India. 1. Fruits. *Indian. J. Hort.*, **9**(2): 24-36.

Dutta, S. (1954). Jujubes of Assam. *Indian. J Hort.*, **10**: 53-6.

Grice, A.C. (2002) The Biology of Australian Weeds 39. *Zizyphus mauritiana* Lamk. *Plant Protection Quarterly* **17**, 2-11.

Malik, M.N. (2000). Horticulture. Delhi. pp. 464.

Morton, J.; Morton, F. and Miami, (1987). Indian Jujube. In: Fruits of Warm climates. Center for New Crops and Plant Products, Purdue University. pp. 272-275.

Smith, Albert, C. (1985). Flora Vitiensis nova: a new flora of Fiji. National Tropical Botanical Garden, Lawai, Kauai, Hawaii. Volume 3 pp. 696-697.

Stone, Benjamin C. (1970). The flora of Guam. *Micronesica* **6**:1-659.

Vashishtha, B.B. (2001). Ber Varieties: A Monograph. Agrobios (India).

Vashishtha, B.B. and Pareek, O.P. (1978). Flower morphology fruit set and fruit droop in some ber (*Zizyphus mauritiana* Lamk.) I. Floral biology. *Punjab. Hort. J.*, **3**: 60-70.

Watt, G. (1908). Commercial Products on India, pp. 1143-74.

