

A review on plant *Cordia obliqua* Willd. (Clammy cherry)

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ABSTRACT

Cordia obliqua Willd. plant (Common name-Clammy Cherry) belongs to family Boraginaceae. It is a medium-sized deciduous tree and very vigorous in growth. According to traditional system, it possesses anthelmintic, purgative, diuretic, expectorant, antipyretic, hepatoprotective and analgesic action. The fruits are edible and used as pickle. The gum obtained from mucilage is used for pasting sheets of paper and as matrix forming material in tablet formulations. Phytochemical investigations show the presence of alkaloids, flavonoids, phenolics, tannins and reducing sugar. Evaluation of pharmacological activities confirmed *C. obliqua* plant as antimicrobial, hypotensive, respiratory stimulant, diuretic and anti-inflammatory drug. A number of traditional activities of this plant still need scientific approval which will increase its medicinal potential. This review presents the Pharmacognostic properties, phytochemical constituents, traditional uses and biological activities reported for the plant and it will be helpful to explore the knowledge about *Cordia obliqua* Willd. for the researchers.

Key words: Anti-inflammatory, Boraginaceae, Clammy cherry, *Cordia obliqua*, pharmacological activities, phytoconstituents

INTRODUCTION

The Boraginaceae family consists of about 2,700 species, which are distributed in tropical, sub-tropical and warmer regions around the world. It is composed of about 130 genera and six sub families, in which *Cordioideae* is one. It contains the genus *Cordia*, which is comprised of evergreen trees and shrubs. About 300 species of genus *Cordia* have been identified worldwide. There are 13 species of this genus found in India.^[1] One of them is *Cordia obliqua* Willd.

It is a medium-sized deciduous tree, found scattered throughout the mid-Himalyas up to elevations of 1,470 meters. It shows vigorous growth. There are two forms of *Cordia obliqua* Willd., which are found in Himachal Pradesh and the major difference in between these two forms is the size of their fruits, one have smaller fruit than other. The plant having small fruits is commonly found.^[2]

Its fruit is sweet and possess diuretic, anthelmintic, purgative, expectorant, maturant, useful in dry cough, in the diseases of chest and urethra, in biliousness and chronic fever and pains in the joints. As per Yunani system, it is good in diseases of spleen. According to ayurveda, it is valuable in all diseases of lungs and used as a substitute for *Cordia wallichii*.^[3]

Phytochemical investigation shows the presence of Phenolics, Flavonoids, Pyrrolizidine Alkaloids, Tannins, Triterpenes and Phenylpropanoid derivatives.^[1]

The raw fruits are used as vegetable and a very good pickle. The mucilaginous substance of the fruit can be used as a gum for pasting sheets of paper and cardboard.^[2]

A study carried out at Tamilnadu described that fruits of *Cordia obliqua* Willd. var. *obliqua* and var. *tomentosa* (known as local name Virusu and Kal virusu respectively) family Boraginaceae, are used as edible by palliyars.^[4]

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Common name-	Clammy cherry
English name-	Sebesten plum
Hindi name-	Lasura, Lessora, Lasora, Bhirala, Bhokar, Chhota laslasa, Chhota lasora, Gondi, Guslasah and Rasalla.

Vernacular names

Bengal-	Bahubara, Bohari
Gujrati-	Gundomoto, Lepistan

Madras-	Perunaruvuli
Malyalam-	Celu, Cheruviri
Marathi-	Bargund, Bhokar
Punjab-	Laswara
Sanskrit-	Bahuvaraka, Laghupichhila
Tamil-	Naruvili, Virisu
Telugu-	Bankanakkera, Chinnabotuku
Urdu-	Lasora
Uriya-	Amobhoto, Gondi ^[3]
Botanical name-	<i>Cordia obliqua</i> Willd.
Family-	Boraginaceae (Forget-me-not family)
Synonyms-	<i>Cordia wallichii</i> G. Don., <i>Cordia myxa</i> Linn. and <i>Cordia latifolia</i> Roxb. ^[2]

TAXONOMY

Kingdom *Plantae*

Subkingdom *Tracheobionta*

Superdivision *Spermatophyta*

Division *Magnoliophyta*

Class *Magnoliopsida*

Subclass *Asteridae*

Order *Lamiales*

Family *Boraginaceae*

Subfamily *Cordioideae*

Genus *Cordia*

Species *obliqua* Willd.^[2]

DISTRIBUTION

It is widely distributed nearly the whole of the warmer parts of India and Ceylon. Also found in other parts of the world like Philippines, New Guinea, Hainan, Formosa, Java and Tropical Australia.^[3]

DESCRIPTION

Clammy cherry is a medium sized deciduous tree, 10.5 meters high, the girth of trunk of a full bearing tree being 75.5 cm, branchlets glabrous, wood soft, light grey, no heartwood.^[3]

Macroscopy

Leaves are alternate, entire to slightly dentate and glabrous, but may be more or less rough when full grown, variable in shape, from elliptic-lanceolate to broad ovate, often with a rounded or cordate base, basal nerves 3, rarely 5, blade 3-6, petioles 2.5-5 cm long.

Flowers are bisexual, complete, short-stalked, actinomorphic, white and glabrous. A fully open flower is 6 mm in average diameter. The inflorescence is terminal or an axillary cyme, which almost resembling to a biparous cyme. It has 14 flowers per cluster. The calyx is cup-shaped. Sepals are about 4mm in length, slightly dentate from top, light green in color and gamoseplous. The corolla has four creamish white color petals which are 6mm in length and polypetalous. The androecium contains two stamens, each having a very small filament and epipetalous. The gynoecium is bifurcated, 4 mm in length and having a globose shaped ovary at the base.^[2]

Fruit is drupe, 1.3-2.5 cm long, when ripe yellowish brown, pink or nearly black, shining but minutely rugose, endocarp rugose, very hard, in a sweetish viscid, almost transparent pulp.^[3] Epicarp is thick while mesocarp is mucilaginous and endocarp is hard and stony.^[2]

Stone is found in fruit and it is of 8.5 × 7 mm in size, 298 microlitres in volume, 375 mg in weight and each stone contains two seeds, which are separated by a stony septum. The seeds are mildly sweet in taste.

The flowering starts during the last week of April and continues till the end of May. The fruiting season lasts from the beginning of July to the end of August.^[2] Figures 1 and 2 are showing *Cordia obliqua* Willd. tree, bark, leaves and fruits.

Microscopy

Leaf

The transverse section of leaf shows that mesophyll is differentiated into palisade and spongy parenchyma cells.

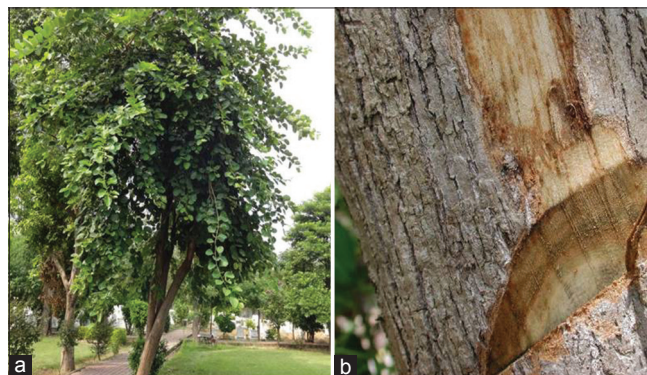


Figure 1: (a) *Cordia obliqua* Willd. tree (b) *Cordia obliqua* Willd. tree bark

Epidermis is of single layer, covered externally with prominent cuticle in upper and lower surface. Palisade tissue is consists of one layer of columnar cells, which occupies a little less than half of the width of mesophyll and the spongy mesophyll is covered with cells of irregular size. The midrib is almost circular in out line. Following the epidermis, there is a zone of cortex composed of 1 or 2 layers of collenchyma surrounding the central portion. The vascular bundle is ovoid in shape and circularly arranged, centrally forming pith. Sclerenchyma sheath is found lignified with thick walled cells that cover the vascular bundles and xylem consists of small tracheids and vessels with large lumen^[5,6] [Figure 3].

Table 1 describes different types of stomata number per mm square in lower and upper epidermis and average dimensions of guard cells in micrometer found in *Cordia obliqua* leaf.^[7] A histological study was carried out on three distinct types of galls which are found on the *Cordia obliqua* leaves. These leaves were collected from various parts of India. It described that Fusiform galls are caused due to *Baris cordiae* Mshl., found on the petiole and mid rib, green to dark green coloured epiphyllous filzgalls are caused due to *Eriophyes* mites on the lamina and the third marginal galls are caused due to *Aneurothrips* sp. The occurrence

Table 1: Study of type and size of various stomata in *Cordia obliqua* Willd. leaf^[7]

Type of stomata	Number of stomata per mm square	
	Lower epidermis	Upper epidermis
Anomocytic	65	56
Heliocytic	20	22
Diacytic	-	-
Paracytic	02	-
Hemiparacytic	01	05
Cyclocytic	07	06
Stomatal index	20.42	3.87
Average dimensions given for guard cells and pore size in micro meter are-		
Length of guard cell	26.0	28.2
Width of guard cell	8.6	10.2
Length of pore	11.8	11.4
Width of pore	2.0	2.0

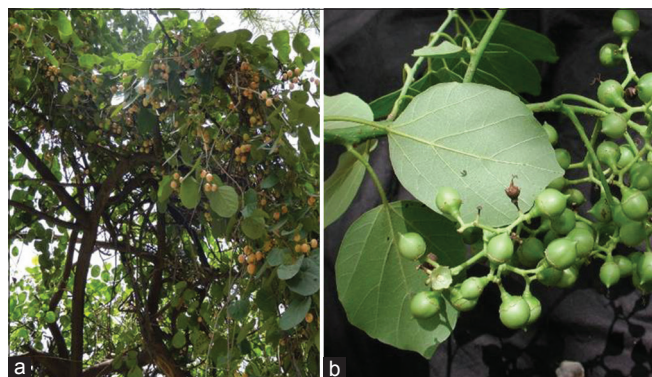


Figure 2: (a) *Cordia obliqua* Willd. branches (b) *Cordia obliqua* Willd. leaves and fruits

of these three types of galls on the same leaf and the tissue responses of the leaf to the different insects and mites were also analysed in this study.^[8]

Stem

The transverse section of stem shows single layer epidermis with barrel shaped cells. Cortex is made up of 2-4 layers of collenchyma hypodermis and 8-9 layers of parenchymatous cells. Distinct endodermis and pericycle (2-3 layers) was also observed. The secondary phloem is made up of sieve elements and parenchyma. The xylem is consists of tracheids, vessels of large lumen and parenchyma. In between the xylem cells 1-3 layered medullary rays are also found with many starch grains. The pith is consists of scattered several conspicuous sclerenchyma aggregates. In the pith parenchyma, Starch grains are abounded.^[5]

Root

The outermost part is the cork consists of 10-12 layers of brown cells with thick walled. The phellogen consists of some layers of thin walled colourless cells. The phelloderm having thick walled rectangular cells consists of rhomboidal calcium oxalate crystals and starch grains. This part is followed by a zone consisting of cortical cells having polygonal shape and many starch grains. There were a number of large stone cells scattered in this region. The vascular part consists of prominent medullary rays which are biseriate. Xylem consists of large tracheids and vessels.^[5]

Chemical composition

The fruit contains moisture 75 g, pectin 4.5 g, total sugars 3.55 g, reducing sugars 3.41 g, non-reducing sugars 0.08 g, protein 2.06 g, ash 2.132 g, phosphorus 0.091 g, potassium 1.066 g, magnesium 0.067 g, calcium 0.062 g and iron 0.005 g (all data is per 100 g of the edible portion). The total soluble solids of the fruit pulp constitute 10.2%.^[2]

The leaf, stem and root powders with various extracts showed the presence of phenols, alkaloids, tannins and reducing sugar.^[5]

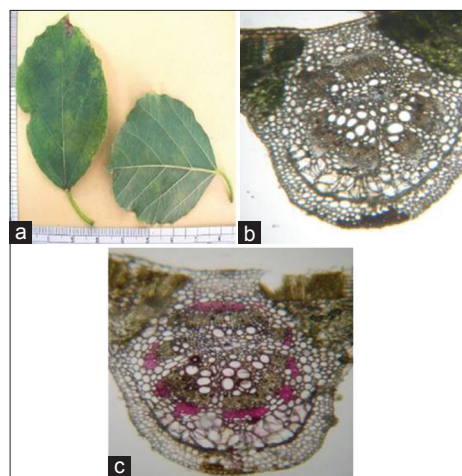


Figure 3: (a) *Cordia obliqua* Willd. leaf (b) Leaf T.S. through midrib (c) Leaf T.S. through midrib stained^[6]

In a phytochemistry study of *Cordia obliqua* leaf aqueous extract, a number of chemical tests were performed to find out various chemical constituents and this study confirmed that only steroids are present in leaf aqueous extract and other constituents like saponins, flavonoids, terpenoids, cardiac glycosides and tannins were absent.^[9]

Chemical examination of *Cordia obliqua* seeds, resulted in isolation and characterization of various constituents like alpha-amyrin, betulin, octacosanol, lupeol-3-rhamnoside, beta-sitosterol, beta-sitosterol-3-glucoside, hentricontanol, hentricontane, taxifolin-3,5-dirhamnoside and hesperitin-7-rhamnoside.^[10]

Other isolated chemical compounds from various parts of *Cordia obliqua* plant are Hesperetin-7-rhamnoside from roots,^[11] Lupa-20,29-ene-3-o-β-D-maltoside from roots^[12] [Figure 4], Lupa-20 (29)-ene-3-O-alpha-L-rhamnopyranoside from roots,^[13] natural gums and mucilage from fruits.^[14] Constituents like Allantoin-β-sitosterol and some flavonoids were also isolated from stem bark of *Cordia obliqua*.^[15]

Medicinal properties

The fruit is sweet and have effects like slightly cooling, anthelmintic, purgative, diuretic, expectorant, and useful in diseases of the chest, urethra, dry cough, biliousness and chronic fever. It lessens thirst and the scalding of urine, removes pains in the joints, bad humours, burning of the throat and also good in diseases of the spleen (As per Yunani system).

The juice of the bark is given in gripes, along with coconut oil. The bark and unripe fruit are used as a mild tonic.

The kernels are a good remedy in treatment of ringworm. The leaves are useful as an external application to treat ulcers and headache.

The Santals use a powder of the bark for external application in prurigo. The Javanese use the bark in treatment of fevers.^[3]

Utilization

A good pickle is prepared from its raw fruits and these are also used as vegetable. The fruit mucilage is used as a gum for pasting cardboard and paper sheets.^[2]

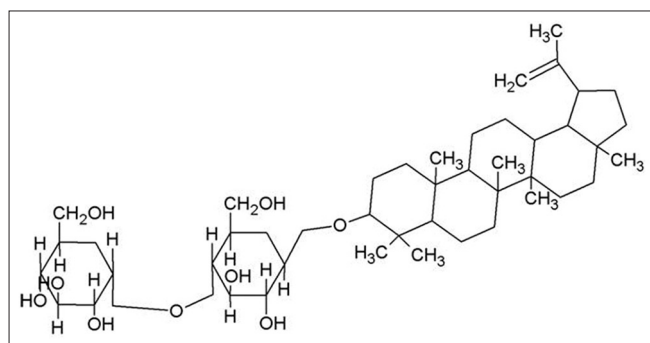


Figure 4: Lupa-20, 29-ene-3-o-β-D-maltoside^[1]

Biological activities

Traditionally a number of activities are reported from various parts of this plant. A few of them are scientifically proven. Some of the reported studies are following:

Anti-inflammatory activity

Cordia genus is well known in herbal medicine for its anti-inflammatory activity. It is taken internally and as well as applied topically for various types of inflammatory conditions.

A study was carried out on various isolated constituents from *Cordia obliqua* seeds to find out anti-inflammatory effect and it showed potent anti-inflammatory action of these seed constituents.^[9]

Hypotensive and respiratory stimulation activity

A comparative study was carried out to find hypotensive and respiratory stimulant effects of both ripe and unripe fruit mucilage of *Cordia obliqua* and *Cordia myxa*. The experimental animals were used guinea pigs and rabbits. The *Cordia obliqua* fruit mucilage both ripe and unripe, decreased rabbit blood pressure and also showed stimulation of respiratory rate. But hypotensive effect of *Cordia myxa* fruit mucilage was 12.37 times more potent than the effect of *Cordia obliqua* fruit mucilage. Although the respiratory stimulant effect of *Cordia obliqua* fruit mucilage is 7 times more than its own hypotensive effect and *Cordia myxa* fruit mucilage showed no effect on respiratory stimulation.^[16]

Antimicrobial activity

The *Cordia obliqua* seeds and leaves extracts were evaluated for antimicrobial activity using zone inhibition assay against some oral pathogenic strains of Gram-positive bacteria (*Streptococcus mitis*, *S. mutans* and *S. sanguis*), Gram-negative bacteria (*Pseudomonas gingivalis*, *Bacillus forsythus* and *Aggregatibacter actinomycetemcomitans*) and fungal strain (*Candida albicans*). The activity of methanol extract was compared with standard antibiotics Gentamycin, Chloramphenicol, Ciprofloxacin, Erythromycin and Fluconazole. The activity of methanol extract was found comparable with standards and it's use was suggested as potent antimicrobial agent.^[17]

Diuretic activity

A study was carried out on 266 identified plants from 222 plant families for various biological activities. In this study, *Cordia obliqua* var. wallichii plant of family Boraginaceae, was also studied. It was collected from Calcutta, West Bengal in the month of April. The fruits were used to study various activities like antiprotozoal, antiviral, CNS effects, antifertility, effects on respiration, diuretic activity and other. They reported diuretic activity with LD₅₀ > 1000mg/kg body weight of mice.^[18]

Other activity

As sustained release matrix forming material

A study was carried out to evaluate the efficacy of gum obtained from *Cordia obliqua* Willd. plant as a novel sustained release matrix forming material in tablet formulations using Diclofenac. The drug Diclofenac was selected because of its short half life

which needs multiple dosing regimens of immediate release formulations and so requires sustained release formulation for patient compliance. The *Cordia* gum was obtained from fresh and raw fruits mucilage, which was expressed from fruits by tincture press. Matrix tablets were prepared by wet granulation technique using non aqueous solvents. The effect of gum in various concentrations (1, 2, 5 and 10% w/w with respect to total tablet weight) on *in-vitro* drug release profile was examined and it was compared with commercial sustained release Diclofenac formulation (Voveran SR-100). The results showed that the formulation containing 2% w/w gum, gave a similar dissolution profile as to the marketed product and it obeys first order kinetics. So this study concludes the efficacy of *Cordia obliqua* gum as sustained release matrix forming material.^[19]

CONCLUSION

Cordia obliqua Willd. is a well known and commonly found tree. Traditionally it has a number of medicinal activities and its fruits are utilized in form of pickle and vegetable all over India. Although its distribution is very common, yet very less research has been done on this plant parts as compared to other *Cordia* species. Many of its traditional uses are still scientifically unproved. Beside this, very less data is available showing the morphology and histology of this plant. So it is required to explore the knowledge about its identification, investigation of its phytochemicals and biological evaluation of various traditionally mentioned activities. This review is an effort to compile all available information and research data on this plant.

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