An appraisal of medicinal properties of Katira
(Chochlospermum religiosum (Linn.) Alston.): A review

Shah Alam, Nighat Anjum, Jamal Akhtar and Fouzia Bashir

Abstract
The use of medicinal plants for the prevention and treatment of various ailments has been in practice from the time immemorial. Chochlospermum religiosum (Linn.) Alston belonging to family Cochlospermaceae has been mentioned by the name of katira in ancient Unani literature. Different parts of the plant viz., Gum, Bark, Leaves, Flowers and Seeds are used as medicine among various ethnic and rural societies. Indian gum katira is the dried gummy exudate which is popularly known as Gond e katira in traditional Unani medicine. The parts of the plant are considered as demulcent, emollient, haemostatic, bulk laxative with good nutritional value in Unani medicine. This communication is an attempt to compile and document information on different aspects of C. religiosum mentioned in classical Unani as well as modern literature. The plant has been suggested to be taken up for further scientific investigations so as to validate the medicinal claims presented herein and to utilize its maximum therapeutic potential.

Keywords: Katira, Chochlospermum religiosum (Linn.), unani medicine

Introduction
Indian gum katira is the dried gummy exudate of the tree Cochlospermum religiosum (Linn.) of the family Cochlospermaceae. It occurs in India, Pakistan and to some extent in Africa. It is widely distributed throughout India in the states of Gujarat, Konkan, Deccan, dry forests of Madras Presidency, Rajputana and central India. Katira is a derivative from Cochlospermum religiosum, but Karaya gum which is also used as Katira in Indian medicine is a derivative of Sterculia urens. The height of plant Sterculia urens is about 15 meter, while of Cochlospermum religiosum is only 4-5 meters. Unani scholar Kabiruddin states that originally gum Katira is obtained from the plant known as Qataad which is Astragalus gummifer grown in the highlands of Asia minor while in India gum Katira is obtained from both i.e. C. religiosum and S. urens. Therefore, it can be inferred that presently used Katira is not the authentic drug but a substitute because original Katira is not available in India. Currently used gum may be a latest introduction in Unani materia-medica, because the real Tragacanth is not available in Asian market [1, 2].

Botanical description
It is a small deciduous tree, young parts more or less pubescent, trunk erect, straight, bark white, smooth, papery, the outer surface thin, peeling off, the inner coat fibrous and netted. Leaves 20-25 cm diameter, crowded at the end of the branches, shallowly palmately 5 lobed, flowers greenish yellow, small in terminal panicles, follicles 4 to 6 ovoid-oblong 2.5 cm diameter, coriaceous, red, covered with tinging hairs, seeds 3 to 6 oblong, black. The gum exudates naturally from the bark throughout the year, but most of the time it is generally produced by tapping or blazing by stripping off the bark. Tapping is done from April to June, before the rains and then from October to January, after the rains. The gum is better in quality if collected before the rain and yield also increased as weather becomes warmer. Gum occurs in irregular, translucent often veriform pieces which vary in colour from almost white to pinkish-brown, with water it swells and gives viscous mucilage. It has a distinct odour of acetic acid. It is largely used as a substitute for tragacanth. Various other parts viz., fruits, roots, bark and leaves of the plant are used for medicinal and commercial purposes [3, 4, 5].

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**Scientific Classification**

Kingdom: Plantae  
Phylum : Tracheophyta  
Class : Magnoliopsida  
Order : Violales  
Family : Cochlospermaceae  
Genus : Cochlospermum  
Species : *C. religiosum* (Linn.) Alston

**Synonym:** Cochlospermum gossypium DC.  
**Vernaculars** [4,5]  
Arabic: Shayjartul-quds, Katira  
Assam: Hatchanda  
Bombay: Gular, Gulu, Gwira, Kadai, Kandai, Kando, Kandol, Kulu, Pandruka  
Gujrati: Kada, Kagdol, Karai  
Hindi: Bali, Gular, Gulu, Karrai, Kulu, Tabsi, Tanuku  
English: Gum Karaya, Indian tragacanth, Sterculia gum  
Malayalam: Tonti  
Marathi: Gwira, Kandol, Kandula  
Tamil: Kavalam, Puttali, Sendalai, Tanakkku, Vellaipputtali, Sendanakku  
Telugu: Ettaponaku, Kavili, Ponaku, Tanuku, Tapasi  
Uriya: Kavili  
Urdu: Katira, Qataad, Nawaras

**Phytochemical constituents**

A glycoside compound named as 5,7,3',4'-tetrahydroxy-3-methoxy-flavone-7-O-β-D-glucopyranosyl(1→4)-O-β-D-galactopyranoside was isolated from the seeds. [6] A bioactive flavonoid designated as Isohamnetin-3-glucoside was isolated from the leaves. [7] Phytochemicals viz., phenols, tannins, flavonoids and alkaloids have been detected in the leaves and stem bark. [8] Gum consists of an acetylated, branched heteropolysaccharide with a high composition of D-galacturonic acid and D-glucuronic acid moieties. Hydrolysis of the gum affords D-galactose (13-26%), L-rhamnose (15-50%), D-galacturonic acid, aldobionic acid, 6-β-D-glucopyranosyl uronic acid, 3-β-D-galactopyranosyl-D-galactose, acetic acid and an acid trisaccharide. Uronic acid residues are present in the gum. Starch is absent and it does not contain methoxyl groups. Due to presence of acetyl group (8%) gum is insoluble and only swells in water [5, 9, 10].

**Mizaj (Temperament)**

Cold  
Dry  
Moderately cold and hot  
Moderate and Moist

**Afa’al (Pharmacological actions in Unani Medicine)**

As per Unani medicine Gond-e-Katira manifest following actions:

- **Mulattif (Demulcent)** [2, 5, 12, 14, 15, 16]  
- **Man-e-Surfa (Anti-tussive)** [2, 12, 13, 14, 15]  
- **Habis-ad-dam (Haemostatic)** [5, 12, 13, 14, 15]  
- **Mulayvin-o-Mumallis (Bulk Laxative and Emollient)** [3, 12, 14, 15, 16]  
- **Mubarrid (Cooling agent)** [12, 13]  
- **Musakkin-e-Hrarat (Antipyretic)** [12, 13]  
- **Musakkin Hiddat-e-Akhlaat** [12, 13, 15]  
- **Mugharri (Musclagenous)** [2, 5, 14, 15, 16]  
- **Musakkin (Sedative/Relaxant)** [2]

- **Dafē Is’haal (Anti-diarrhoeal)** [12, 13]  
- **Mugavawi ama (Intestinal tonic)** [12]  
- **Musleh Advia (Drug Corrective)** [12, 13]  
- **Musammin-e-Badān (Nutritivel/Anabolic)** [5, 12, 13]  
- **Mus ‘hil-e-Balghum wa Sauda (Purging of black bile & phlegm)** [12]  
- **Badiqa (Medium/Vehicle)** [12, 16]

**Mawaq-e-Istemaal (Therapeutic uses in Unani Medicine)**

As per the classical Unani literature Gond-e-Katira is indicated in the following disorders:

- **Saual-e-Muzmin Yabis (Chronic dry cough)** [2, 11, 12, 13, 14, 15]  
- **Nafs-ad-dam (Haemoptysis)** [2, 5, 12, 13, 14, 15]  
- **Jiryan-ad-dam (Haemorrhage)** [5, 12, 13, 15]  
- **Khushunat-e-halaq (Sore throat)** [2, 4, 5, 11, 12, 13, 15]  
- **Bahat-as-Saut (Hoarseness of voice)** [2, 4, 11, 13]  
- **Qarha-e-Riya (Lung abscess)** [2, 12, 15]  
- **Zat-ar-riya (Pneumonia)** [6, 13]  
- **Qarha-e-Ama (Intestinal ulcer)** [3]  
- **Sozish-e-Aksha (Bowel inflammation)** [5]  
- **Qurhu-e-Mujra-e-Boi (Urinary tract ulcers)** [2, 12]  
- **Waja-ul-Kuliya (Renal colic)** [11, 12]  
- **Hirqat-e-Boi (Burning micturition)** [11, 12, 13]  
- **Bars (Vitiligo)** [12]  
- **Behaq (Pityriasis)** [12]  
- **Hirq (Burns)** [16]  
- **Tazeeniyat (Cosmetics)** [12]  
- **Ashob-e-Chashm (Conjunctivitis)** [5, 12]  
- **Conreal Ulcer** [5]  
- **Used for weight gain** [5]

**Miqdar-e-Kurakh (Therapeutic dose)**

1. 2.25gm to 3gm & can be increased up to 7-17 gm [5, 12]  
2. 0.5 – 5gm [2, 13, 15]

**Muzirat (Adverse Effects)**

Prolonged and excessive use of Gond-e-katira may have adverse effects on lower alimentary tract or anal canal and may cause Sudda i.e. obstruction [12],[14],[15]

**Musleh (Corrective)**

Following drugs have been recommended by Unani scholars which may be used along with Gond katira so as to avoid its adverse effects:

<table>
<thead>
<tr>
<th>Musleh</th>
<th>Condition</th>
</tr>
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<tbody>
<tr>
<td>i) Anisoon and Magnhz tukhm-e-kaddoo</td>
<td>i) Lower alimentary tract /anal canal disorders [12, 14, 15]</td>
</tr>
<tr>
<td>ii) Tukhm-e-karfas</td>
<td>ii) Obstruction (Sudda) [12]</td>
</tr>
</tbody>
</table>

**Badal (Substitute)**

Certain drugs viz. Gond-e-Babul (Gum Acacia) or , Magnhz Tukhm-e-Kaddoo or , Roghan-e-Badadam have been mentioned in classical Unani literature as its substitutes. [5],[12],[15]

**Murakkabat (Compound Unani formulations)**

Evidence based pharmacological activities

Antibacterial activity
Methanolic extract of leaves of C. religiosum was effective against Staphylococcus aureus while other bacteria were not affected [18]. Ethanol extract obtained from the leaves of C. religiosum displayed concentration dependent inhibition of Staphylococcus aureus and Escherichia coli. S. aureus was more susceptible than E. coli [19]. The acetone and ethanolic extract obtained from the stem of C. religiosum were effective against gram positive and gram-negative bacteria. Chloroform extract was not effective. [20] Bai et al. showed antibacterial activity of methanol extract of C. religiosum leaves against human and plant pathogenic gram positive and gram-negative bacteria [21]. The study carried out by Ponnamma et al. revealed concentration dependent antibacterial activity of solvent extracts of C. religiosum leaves. Among extracts, marked antibacterial activity was shown by ethyl acetate extract. Marked inhibitory activity was observed against E. coli. At concentration 25 and 50µg, chloroform extract did not cause inhibition of any of the test bacteria. [22] Kawde et al. evaluated antibacterial potential of various solvent extracts of stem bark of C. religiosum. Solvent extracts displayed concentration dependent inhibition of test bacteria with marked activity against gram positive bacteria. [23] Recent study showed the efficacy of methanolic extract of flower of C. religiosum to inhibit gram positive and gram negative bacteria [24].

Antifungal activity
Methanolic and aqueous extracts of leaves of C. religiosum were screened for three phytopathogenic fungi of Gossypium herbaceum against Alternaria alternata, Chaetomium globosum and Fusarium oxysporum. The extracts caused concentration dependent inhibitory activity against fungi. Overall, methanol extracts were more inhibitory than aqueous extracts [25]. Antifungal efficacy of methanolic extract of flower to inhibit mycelial growth of two mold namely Curvularia sp. and Rhizopus sp. was reported. [24]

Antioxidant activity
A bioactive flavonoid compound Isorhamnetin-3-glucoside isolated from the leaves of C. religiosum was shown to exhibit concentration dependent scavenging of superoxide radicals. [25] Katira gum was shown to exhibit weaker inhibitory activity against DPPH radicals with a scavenging activity of 11.6% at 1% w/v concentration. [26] Kawde et al. revealed scavenging of DPPH radicals by methanolic extract of stem bark with an IC50 value of 50µg/ml. [27] Ponnamma et al. screened antiradical activity of various solvent extracts of C. religiosum leaves by DPPH assay. The extracts were shown to inhibit DPPH radicals in a dose dependent manner. [22] In a recent study, Swathi et al. reported the antioxidant activity of flower extract of C. religiosum as evaluated by DPPH and ABTS radical scavenging assays and ferric reducing assay. The extract was effective in scavenging DPPH radicals, dose dependently with EC50 values 2.72 and 1.50µg/ml, respectively. [24]

Insecticidal activity
Flower extract of C. religiosum was shown to possess insecticidal activity (in terms of larvicidal activity) in a recent study by Swathi et al. methanolic extract of flower was effective in causing 100% mortality of I, II and III instar larvae of Aedes sp. and Anopheles sp. at 1mg/ml concentration [24].

Bioactivities of gum katira
The gum katira is obtained from C. religiosum and is one of the economically valuable non-timber forest products obtained from the stem bark of the plant. It is shown to exhibit following biological activities.

Wound healing activity
Girotra and Singh evaluated wound healing activity of katira gum (an exudate) in terms of period of epithelialization and percent wound contraction in Wistar rats. Gels formulated with katira gum alone and combination of katira gum and silver sulphadiazine were tested for wound healing potential. The animals treated with the combination of gum and silver sulphadiazine showed marked wound contraction and the period for epithelialization taken was also significantly lesser [27].

Effect on α-glucosidase activity
The study carried out by Hongising et al. revealed no inhibitory effect of katira gum against the activity of the enzyme α-glucosidase [26].

Effect on tyrosinase activity
Katira gum was screened for its effects on tyrosinase enzyme. The gum, at 1% w/v concentration, had a slight inhibitory activity against tyrosinase. At lower concentrations, the gum was shown to exhibit activation of tyrosinase enzyme [26].

Effect on lipase activity
At concentration 0.25%, the Katira gum was shown to exert lipase inhibitory activity with an inhibition of 16.2%, [26]

Effect on glucose diffusion
Hongising et al. studied the effect of Katira gum on the glucose diffusion by using dialysis tubing method, which is an in-vitro method mimicking the conditions in the lumen of jejunum. At 2% polysaccharide gel concentration, Katira gum revealed 60±4.2% of glucose releasing indicating the ability of the gum to retard glucose absorption across the intestinal lumen [26].

Effect on cholesterol solubility
Hongising et al. determined the effect of Katira gum on cholesterol inhibition through its solubility. Katira gum showed a slightly inhibitory effect (16±0.04%) [26].

Immunological evaluation of gum Katira
Puskuri et al. carried out immunological evaluation of three grades of gum Katira (KG-I, KG-II and KG-III) in terms of its ability to elicit delayed type of hypersensitivity. Interestingly, the KG-III grade elicited immunological response in the animals and was related to the presence of impurities. However, grades viz. KG-I and KG-2 were not able to cause delayed type of hypersensitivity [28].

Bioremediation of toxic metals by C. religiosum gum
Sashidhar et al. evaluated the efficacy of gum katira to remove uranium (VI) from aqueous, simulated nuclear effluents and studied the adsorption characteristic of the gum towards uranium (VI). The result obtained was
promising and maximum adsorption was found at 0.1% concentration of gum and pH 4.0 with the contact time of 60 minutes. [29] Vinod and Sashidhar determined the bioremediation potential of gum katira in terms of its adsorptive removal of toxic metal ions. The gum was able to competitively biosorb toxic metal ions namely cadmium, copper, iron, lead, mercury, nickel and zinc. [30] The study of Vinod et al. also revealed the efficacy of gum katira in the bioremediation of nickel and chromium. [31] Vinod et al. reported competitive adsorption of heavy metals by gum katira. It was inferred that the amorphous nature of the gum facilitate metal biosorption. [32]

**Conclusion**

*Cochlospermum religiosum* has been in use since ancient times in Unani system of medicine. Various parts of the plants have edible, aesthetic as well as medicinal applications. In the present review, we referred primary and secondary data to compile the information based on taxonomy, distribution, morphological description, phytochemical constituents, and pharmacological claims. The plant is reported to display antibacterial, antioxidant, antifungal, insecticidal, wound healing and other pharmacological properties. Though traditionally the plant is being listed as threatened species due to overexploitation for the gum and medicinal uses. It is very much necessary more scientific studies must be conducted to investigate the unexploited potent compounds. Molecules 2016;21:293.

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~ 150 ~


