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Review Article

A Comprehensive Review of *Tamarix gallica* Linn.: A Herbal Haemostat with special reference in Unani Medicine

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Abstract

Background and aim: *Tamarix gallica* L. is commonly known as "Jhau". These deciduous, herbaceous, twiggy shrub or small tree reaching up to about 5 meters high and mainly found in the salty regions and is found between interdunal areas of the desert. It has enormous potential and having a broad spectrum of activity on a variety of illnesses such as leukoderma, eye diseases, teeth disorder, any type of hemorrhage, spleen disorders etc. This review aims to compile maximum information available, regarding its various traditional uses, pharmacognosy, phytochemical constituents and pharmacological activities to enrich our knowledge about this plant.

Materials and methods: A manual literature survey of classical Unani texts such as *Khazā'in al-Adwiya*, *Tanqih-al-Mufradāt*, *Bustān-al-Mufradāt*, *Muḥīt-i-A'zam* and online literature survey from Pubmed, Google scholar, Cochrane library, science direct was conducted to collect the information available on the plant *Tamarix gallica*.

Result and discussion: The findings of the literature survey on the basis of previous phytochemical analyses of this plant revealed the presence of a number of components, some of which are tannin, tannic acid, tamarixin, significant amount of phenolic and flavonoid content, antioxidants like carotenoids and essential oils which are extracted from various parts of the plants. Its reported pharmacological activities include anti-inflammatory, antinociceptive, anti-proliferative, antibacterial, antioxidant, anti-hyperlipidemic, anti-diarrheal, cytotoxic activity and hepatoprotective activities.

Keywords: *Tamarix gallica*, phytochemical analyses, tannin, antioxidant, pharmacological activities, anti-inflammatory, antinociceptive, antiproliferative, antibacterial.

Introduction:

Tamarix gallica is known as *Jhāu* in hindi.¹ The *Tamarisk* are trees that are commonly growing² to 4m by 6m at a medium rate from June to August in salty soils.¹ They are distinguished by having small, scaly leaves that are often nested, giving their twigs the appearance of some junipers.² There are about 50-60 species of *Tamarix*.¹ There are several phytochemical investigations on different *Tamarix* species which have introduced a series of phytochemicals amongst which the most important ones are polyphenolic compounds; e.g. phenolic acids, flavonoids, and tannins. Also, in different countries of Asia and Africa, such as Pakistan, India, Iran, and Algeria in which tamarisk is naturally grown, local people use this plant for medicinal purposes.³ Traditionally, *Tamarix gallica* has been used as an expectorant, laxative, astringent, anti-diarrheal, and anti-dysentery.¹ This review aims to compile maximum information available, regarding its various traditional uses, pharmacognosy, phytochemical constituents and pharmacological activities to enrich our knowledge about this plant.

Material and Methods:

In the present review a manual literature survey of classical

Unani texts such as *Khazā'in al-Adwiya*, *Tanqih-al-Mufradāt*, *Bustān-al-Mufradāt*, *Muḥīt-i-A'zam* were searched for the terms *Kazmāzaj*, *Mā'in*, *Jhāu* for its complete description viz. Temperament, color, taste, expected side effects, corrective, substitute, dosage, its functions and actions, and Unani formulations. Some other books such as The Unani pharmacopoeia of India, Indian medicinal plants, Indian materia medica were also searched for its botanical name, synonyms, taxonomy, vernaculars, and other medicinal uses. For quality standards and other aspects to prove the importance of *Kazmāzaj* computerized databases such as Medline, Pubmed, Ovid SP, Google Scholar and Science-direct were searched for its ethnobotanical description, habitat, phytochemistry and pharmacological actions etc.

BOTANICAL NAME: *Tamarix gallica* Linn.^{4, 5}

SYNONYMS: *Tamarix indica* Roxb. *T. troupii* Hole.⁶

TAXONOMY⁷

- **Kingdom:** Plantae
- **Division:** Magnoliophyta
- **Class:** Dicotyledonae

- **Order:** Tamaricales
- **Family:** Tamaricaceae
- **Genus:** Tamarix
- **Species:** Gallica

VERNACULARS:

Arabic: *Samratur-Turfā, Jooz-i-Turfā*.⁴

Ayurvedic/ Sanskrit: Jhāvuk, Bahugranthikaa, Shaavaka.^{1, 4, 6}

Bengali: Jhaoghacch.⁴

English: Tamarix, Saltcedar,¹ Takut galls,⁶ Manna.⁵

Gujarati: Jhav-nu-Jhad.^{4, 5}

Hindi: Jhāu', Jhuvā.^{1, 4, 5}

Persian: *Kazmāzaj, Gazmāzaj, Gazangābin*.⁵

Siddha/Tamil: Sirusavakku,^{4, 6} Atru-sha-vukku, Kota-shavukku.⁵

Telugu: Erusarumanu.⁴

Unani: *Mā'in Kalān* (large galls), *Mā'in Khurd* (small galls).⁶

Ethnobotanical Description:

The *Tamarisk* are trees that commonly grows in salty soils. They are distinguished by their small, scaly leaves that are often nested, giving the twigs of these plants a juniper-like appearance. The leaves frequently have tiny holes that resemble funnels at the bottom of which the stomata are located and from which a mucus containing salt and limestone exudes. In general, the roots are very advanced and their wood contains vessels of large gauge. Some species of the genus *Tamarisk* have cylindrical kittens where the flowers are grouped.^{3, 7}



Figure 1: Tamarix Gallica Linn. Plant

Description in Unani medicine

Kazmāzaj is of two types. One is known as *Jhāu'* or *Farāsh* or *Asal*. The leaves of which are small, flowers are red in color, on its branches small round galls are present, these galls are of the size of gram⁸ and are known as *Mā'in Khurd*. Other type of shrub is known as *Jhāu'* or *Ghaz*. On its branches comparatively larger galls are formed. These are globular, irregular and of the size of *Māzū* and are known as *Mā'in Kalān*. Together these small and large galls are known as *Kazmāzaj*.⁹

Temperament: Cold 1⁰ and dry 2⁰ 4, 8-11

Habitat:

Tamarix naturally occurs from North Africa through the Mediterranean and Western Europe. It is distributed in coastal forests in Bangladesh, Pakistan, Ceylon, Burma, Malaysia & the Andaman Islands.¹² It is found throughout India near rivers and seacoast.¹⁵

Parts used: Galls^{4, 9} Fruit¹⁰



Figure 2: Tamarix Gallica galls

Macroscopic Characterization:

Colour:

- Grey^{4, 8, 9}
- Greyish red¹⁰

Taste:

- Astringent⁹⁻¹¹
- Bitter astringent¹¹

Microscopic Characterization:

Transverse sections of galls of *Kazmāzaj* are made up of vascular, ground and epidermal tissue. The epidermis has multiple layers, tangentially elongated cells with thick walls, and an external cuticle that is 5–6 microns thick. The cells in the ground tissue are parenchymatous, irregular and have thin walls and intercellular spaces.

Brown pigment can be found in some of the cells. In the ground tissue, prismatic calcium oxalate crystals are also present. Xylem and phloem are the components of vascular tissue. Vessels with spiral & scalariform thickenings, xylem fibers and xylemparenchyma are all components of xylem. Sieve tubes, phloem fibers and phloem parenchyma are all components of phloem.⁴

Phytochemistry:

The major chemical constituents are tannin (50%),⁴ tannic acid (80%),⁹ tamarixin, trouoin, 4-methylcoumarin and 3,3-dio-O-methylellagic acid⁷ and saponins.⁴ The extract contains a significant amount of phenolic and flavonoid content, which suggests that it is a rich source of these chemicals. Additionally, five phenolic compounds in *Tamarix*

gallica that can be used as an antiradical drug are identified and quantified using a potent analytical HPLC technique. Acid compounds that are abundant in plant extracts are used to inhibit nephrolithiasis. Currently known polyphenols include resveratrol, ellagic acid, anthocyanins, tannins, flavonones and isoflavones.^{12, 13} It also constituted antioxidants like carotenoids and essential oils.¹ Additionally, previous phytochemical studies have revealed that aerial parts of *Tamarix* species contain lipophilic methylated flavonoids like tamarixetin, 7,3',4'-trihydroxy-5-methoxyflavone, 3,7,4'-trihydroxy-5-methoxyflavone, 3,5,7-trihydroxy-3',4'-dimethoxyflavone and 7-O-sinapoyl Kaempferol-7,4.¹⁴

Uses:

1. *Kazmāzaj* galls are used as powder or decoction or pessaries on account of their bitter taste, tonic and astringent effect in chronic discharges and watery fluxes.
2. A strong infusion of galls is a good astringent gargle and is useful in stomatitis and sore-throat and local application on foul sloughing ulcers and phagedenic buboes.
3. An infusion of the bark or the galls in the dose of 4 to 5 ounces in a pint of water is used in dysentery, diarrhea, preferably combined with infusion of *Chirā'tā*.
4. Powdered galls with Vaseline or any non-irritating oil forms an efficacious ointment and is useful in ulcerating piles and anal fissures.
5. *Tamarix* is a mild aperient, expectorant and detergent. It is used in cough.
6. As a mild laxative it causes soft motions without irritation of bowels.⁵
7. An external compress of leaves of *Kazmāzaj* helps to stop bleeding from wound.
8. It is used in leukoderma, eye diseases, rheumatism. It can be used as prophylactic and therapeutic remedies to cure malaria as folk medicine.^{1, 15}
9. Its leaves have been used as traditional remedies for the treatment of various diseases such as diabetes, piles and gingivitis. It is used as the stimulus of perspiration, as a diuretic, to kill worms.^{1, 14, 16, 17}
10. It is used as laxative and expectorant. It is also used for the prevention and treatment of nephrolithiasis.¹
11. *Kazmāzaj* in the form of decoction, powder, mouth wash or toothpaste is used for inflamed gums, bleeding gums, toothache, stomatitis, and tonsillitis.^{4, 8-11}
12. Orally in the form of powder, it is beneficial in respiratory tract infection, hemoptysis, to strengthen gums and diarrhea.
13. It is also useful in heavy menstrual bleeding, any type of haemorrhage,⁸ nocturnal emission, spermatorrhea & premature ejaculation.^{4, 9, 11}
14. *Kazmāzaj* is used in the form of suppository⁸ or sitz bath in leucorrhoea.^{8, 11}
15. Sitz bath of its decoction is used for prolapse of uterus and rectum and also useful in piles.
16. As an anti-inflammatory, powder of leaves in the form of paste or decoction or hot fomentation with vinegar is useful in cirrhosis and inflammation of spleen.^{8, 9, 11}
17. Nasal spray of fine powder of *Kazmāzaj* is useful for epistaxis.

18. Roasted *Mā'īn* mixed with *Gerū* or 70.5gm *Mā'īn Khurd* with 10.5gm *Gulnār* used 2-3 times in a day to stop chronic diarrhoea.⁸
19. Steam inhalation of leaves or branches are used in cold & throat irritation.
20. Sprinkling of *Kazmāzaj* powder is beneficial to stop bleeding from wounds.
21. Decoction of *Kazmāzaj* root with *Ravghan-i-Zaytūn* is helpful in leprosy.¹¹
22. *Kazmāzaj* is used as a cleansing agent in various skin disorders and is also used as a stimulant for the functions of stomach, liver & spleen.

Expected side effects:

It is harmful for intestines^{8, 11} and stomach^{9, 10}

Corrective:

Pure honey^{5, 8-11}

Substitute:

One type to other⁹⁻¹¹

Gulnār,⁸ *Asl*¹¹

Māzū, *Jauz ul Sarū*⁸

Dosage:

3-5gm⁹

4-6gm¹⁰

7gm^{4, 8, 11}

Pharmacological Studies:

1. **Anti-inflammatory and antinociceptive effects:** Methanolic extract of aerial parts of *Tamarix gallica* showed anti-inflammatory and analgesic activities in rats at doses of 100, 200, and 300mg/kg p.o. body wt. The extract produced dose dependent inhibition of paw oedema due to carrageenan and histamine, 10mg/kg diclofenac used as a standard in the study. Methanolic extract of *Tamarix gallica* barks showed antinociceptive activity in acetic acid induced writhing model in Swiss Albino mice at doses of 250 and 500mg/kg body weight, compared to standard drug diclofenac sodium at dose 25mg/kg body weight.^{1, 18}
2. **Anti-proliferative activities:** In vivo animal study on rats, at various concentrations, *T. gallica* ethyl acetate extract showed good antiproliferative effects. It appears that the extracts of *T. gallica* from humid and arid areas exhibit a strong activity by reducing the number of cancer cells. Other studies also stated that the anticancer effect of *T. gallica* on human colon cancer cells and the potential primary mechanisms & demonstrated that shoot, leaf and flower extracts significantly inhibited Caco-2 cell growth at concentrations of 50 and 100gm/ml.^{15, 19}
3. **Antibacterial activity:** The antibacterial activity of *T. gallica* extract was studied against staphylococcus saprophyticus, shigella sonnie, salmonella typhi, vibrio cholera, s. epidermidis, shigella flexneri and s. aureus clinical isolates. The antibacterial property was studied by disc diffusion method using extract 200mg/disc. Control discs contained solvents only (50% aqueous methanol). Gentamycin was used as positive control. Minimum inhibitory concentration was evaluated by micro dilution method using 5ml of liquid broth with different concentrations of extract.^{12, 20}
4. **Antioxidant activities:** In a pharmacological study, using

the phosphor-molybdenum assay, total antioxidant activity of the extracts was calculated. 0.6M sulfuric acid, 4mM ammonium molybdate (NH₄)₆Mo₇O₂₄, & 28mM Na₃PO₄ were present in 1ml of the reagent solution. 4mM was added to the extracts. The aforementioned reaction mixture was heated to 95°C in a water bath for 90minutes and the number of flavonoids was determined at 695nm in comparison to a blank solution. The measure of total antioxidant capacity (TAA) was mg GAE/gm plant extract.¹⁷

5. **Anti-hyperlipidemic:** In a study, at doses of 400 and 500mg/kg bodyweight, methanolic and phenolic extract of *T. gallica* reduced cholesterol, triglyceride, LDL cholesterol and VLDL cholesterol levels in triton X-100-induced hyperlipidemic rats while increasing HDL cholesterol. Phenolic extract has definite antihyperlipidemic activity at 500mg/kg body weight.¹
6. **Effect on renal calculi:** Nephrolithiasis (calcium oxalate) was inhibited by extract of *T. gallica*. The formation of calcium oxalate brought on by addition of sodium and calcium chloride oxalate solutions. The *T. gallica* extract acts at the stage of growth, this efficacy was due to presence of acid.¹
7. **Antidiarrheal activity:** Methanolic extract of leaves of *T. gallica* revealed anti-diarrheal action on castor oil induced diarrhea in mice at dose of 500mg/kg body weight p.o., in comparison to loperamide at dose of 50mg/kg body weight.^{1, 21}
8. **Cytotoxic activity:** In a pharmacological study, shrimps in brine were used for the cytotoxicity test on *T. gallica*, which demonstrates cytotoxic activity. After being incubated at around 29°C for 48hours, 5mg of Artemia salina eggs hatched in fresh seawater. To ensure survival and maturity before use, the larvae were given an additional 48hours in seawater. 5 plant extract doses (1, 2, 4, 6, 8 and 10gm/ml) tested in 5% dimethyl sulfoxide (DMSO) and/or sea water. Each concentration's percentage of mortality was calculated and it was found that extract was lethal to brine shrimp larvae. *T. gallica* displayed variable mortality rates depending on the concentration.^{1, 21}
9. **Hepatoprotective:** Methanolic extracts of *T. gallica* exhibited protective effect against hepatic oxidative stress and hyperproliferative response caused by thioacetamide in Wistar rats. Orally pre-treatment of rats with *Tamarix* extract at doses 25 & 50mg/kg B.W., prohibited thioacetamide promoted oxidative stress and toxicity, reduced susceptibility of hepatic microsomal membrane significantly for iron-ascorbate induced lipid peroxidation, H₂O₂ content, glutathione S-transferase and xanthine oxidase activities.^{1, 21}

Compound (UNANI) FORMULATIONS:

- *Ḥabb-i-Pechish*
- *Safūf-i-Tha'lab*
- *Safūf-i-Sailān-ur-Raḥim*⁴
- *Safūf-i-Ḥābis*
- *Ḥabb-i-Qābid*
- *Sinūn-i-Supār*⁹

Conclusion:

The present review reveals that the plant *Kazmāzaj* (*Tamarix gallica*) is used in treating various ailments. All parts of *Kazmāzaj* have different uses. Various chemical constituents

like tannin, tannic acid, tamarixin, significant amount of phenolic and flavonoid content, which are responsible for many pharmacological activities like anti-inflammatory, antinociceptive, anti-proliferative, antibacterial, antioxidant, anti-hyperlipidemic, antidiarrheal, cytotoxic activity and hepatoprotective activities. There is currently a big gap regarding the clinical data supporting the therapeutic activities of *Tamarix spp.* and thus, well-designed clinical trials are needed to confirm the safety and efficacy of these plants in human. Future studies on the phytochemical, pharmacological, and toxicological aspects of *Tamarix spp.* is needed to provide better knowledge of these valuable plants.

Conflict of Interest: None.

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