Available online www.jocpr.com

Journal of Chemical and Pharmaceutical Research, 2016, 8(1): 809-814

Review Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Tamarix gallica: For traditional uses, phytochemical and pharmacological potentials

Mirza KalamUrfi, Md. Mujahid*, Badruddeen, JuberAkhtar, Mohammad Khalid, Mohammad Irfan Khan and AfreenUsmani

Faculty of Pharmacy, Integral University, Lucknow, UP(India)

ABSTRACT

Tamarixgallica belongs to family Tamaricaceae, traditionally used in leucoderma, spleen trouble, eye diseases, rheumatis, gingivitis etc. The plant material constituted phytochemical constituents as tamarixin, tamarixetin, troupin, 4- methylcoumarin, 3, 3'-di-0-methylellagic acid and quercetol (methyllic ester)and pharmacological activities reported that the plant material(s) may be used as anti-malarial, laxative, expectorant, antidiarrheal, anthelmintic, antihaemorrhoid, astringent, inhibitor of nephrolithiasis, diuretic, hepatoprotective, antioxidant, anti-hyperlipidemic, antinociceptive, antidiarrhoeal, anticancer, antimicrobial, liver carcinogenesis etc.

Keywords: Gingivitis,hepatoprotective,*Tamarixgallica*,antioxidant.

INTRODUCTION

Traditional herbal medicines form an important part of the healthcare system of India. Ayurveda, supposed to be the oldest medical system in the world, provides potential leads to find active and therapeutically useful compounds from plants. Plants have always played a key role in the treatment of different ailment human and animals all over the world. In developing country more researchers are working on plant and plant product so recognition of natural product is growing. Herbal medicine is an important part of both traditional and modern system of medicine [1].

Fig: 1-*Tamarix gallica* flowers and leaves

Tamarixgallica known as Jhau in hindi. There are about 50-60 species of flowering plant in the familyTamaricaceae. It is deciduous shrub growing to 4m by 6m at a medium rate and is in flower from june to august. The flowers are hermaphrodite and pollinated by bees [2].The branchlets and the leaves of the plant are astringent and diuretic, an external compress is applied to wounds to stop bleeding [3,4]. *Tamarixgallica* is traditionally used as expectorant,

laxative, astringent, antidiarrheal and antidysentery [5]. Galls produced by the plant as a result of insect damage contain up to 50 % tannin, which is used as dyestuff for fabric [6]

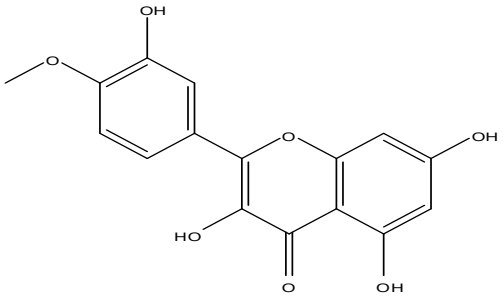
Vernacular name [7]**:Hindi:**Jhau, Jhuva, **English:**Tamarix, Saltcedar, **Sanskrit:**Jhavuk, **Oriya:**Jaula.
Taxonomy [8]:
Kingdom : Plantae
Phylum: Spermatophyta
Class: Dicotyledonae
Order: Tamaricales
Family: Tamaricaceae
Genus: Tamarix
Species:gallica

Distribution: *Tamarixgallica* is distributed in the coast forests of Bengal, Pakistan, Ceylon, Burma, Malay and Andamans. It is mainly found in the salty regions, between interdunal areas of the desert [4].

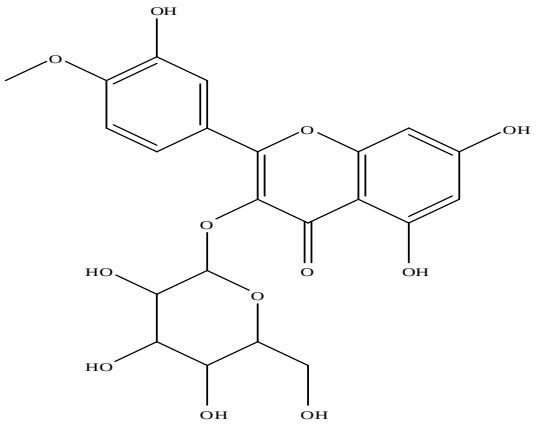
Marketed Formulations– Many formulations (Liv 52 DS, Liv 52 Vet, Geriforte Aqua, Geriforte Vet, Digyton, Bonnisan, Geriforte) constituted *Tamarixgallica* [9].

TRADITINAL USES
- *Tamarixgallica* used as prophylactic and therapeutic remedies to malaria [10],
- It used as laxative and expectorant [6],
- Rheumatism [11],
- *Tamarixgallica* used as antidiarrheal, anthelmintic, gingivitis andantihaemorrhoid [5],
- Astringent [4],
- Dromedary galls [5],
- It used in leucoderma, spleen trouble and eye diseases [12],
- Diuretic [13],
- Tamaxicgallica used as an inhibitor of nephrolithiasis [14],
- Used as hepatoprotective [15].

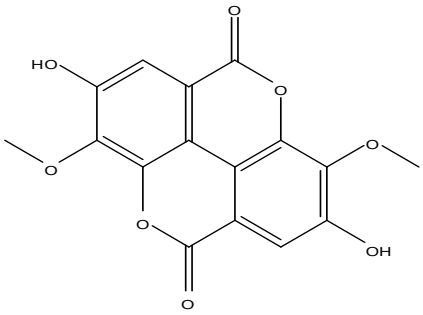
CHEMICAL CONSTITUENTS
Tamarixgallica consists of tannin (50%) eg. ellagic acid and gallic acid [15, 16]. Major chemical constituents of tamarix were tamarixin, tamarixetin, troupin, 4- methylcoumarin, 3, 3'-di-0-methylellagic acid and quercetol (methyllic ester) [17]. The numerous polyphenols were also present in tamarix like anthocyanins, tannins, flavonones, isoflavonones, resveratrol and ellagic acid [18, 19]. It also constituted antioxidants like carotenoids and essential oils [15, 16, 27].



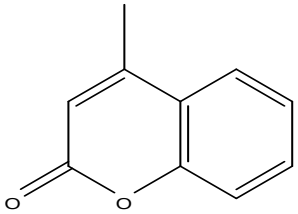
Tamarixetin
(3,5,7-trihydroxy-2-(3-hydroxy-4-methoxyphenyl)-4H-chromen-4-one)



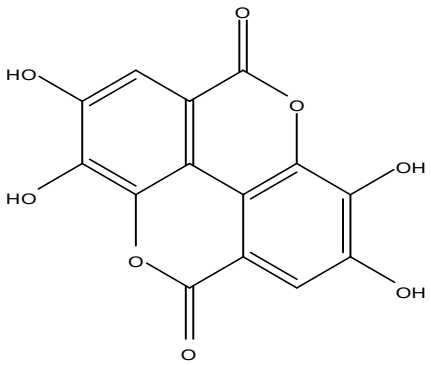
Tamarixin
(5,7-dihydroxy-2-(3-hydroxy-4-methoxyphenyl)-3-(3,4,5-trihydroxy-6-(hydroxymethyl) tetrahydro-2H-pyran-2-yloxy)-4H-chromen-4-one)



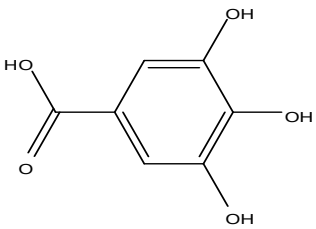
3, 3'-di-o-methylellagic acid
(2,7-dihydroxy-3,8-dimethoxychromenochromene-5,10-dione)



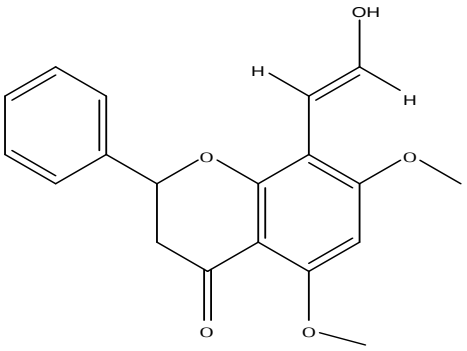
4 methylcoumarin
(4-methyl-chromen-2-one)



Ellagic acid
(2,3,7,8-tetrahydroxychromeno-chromene-5,10-dione)



Gallic acid
(3,4,5-trihydroxybenzoic acid)



Quercetol
(8-(2-hydroxyvinyl)-5,7-dimethoxy-2-phenylchroman-4-one)

TOXICITY STUDIES

Methanolic and ethyl acetate extracts of *Tamarixgallica*showed no mortality after acute oral toxicity studies upto the dose of 3000 mg/kg body weight in albino rats [20, 21].

PHARMACOLOGICAL ACTIVITIES

ANTIOXIDANT

Leaves and flowers of *Tamarixgallica* showed antioxidant activity, however flowers showed higher antioxidant activity as compared to leaves. The inhibitory concentration for fifty percent animals (IC 50) values of the flower extracts were 1.3 (β-carotene bleaching) to 19 times (lipid peroxidation inhibition), lower than those for leaves. Flowers extract demonstrated the highest total phenolic content (135.36 mg GAE/g DW). RP-HPLC analysis showed syringic acid, isoquercitin and catechin as the major phenolics [16].

Methanolic and ethyl acetate extracts of *Tamarixgallica* showed antioxidant activity, both extracts led to the isolation of three known phenolic compounds: 3', 3, 5-tri hydroxy 4', 7- diméthoxy flavone , 5-hydroxy 4' ,3,7-trimethoxyflavone and isorhamnetine respectively. The structures of these above compounds were elucidated by mass specroscopy and a series of 1D and 2D NMR analyses. Some extracts and the pure isolated compounds have also been evaluated for their antioxidant activities through different methods: 1,1-diphenyl-2-picrylhydrazyl (DPPH) and cupric-reducing antioxidant capacity (CUPRAC) methods demonstrated important radical scavenging activity with the antiradical power (ARP) of 5 (in DPPH method), and trolox equivalent antioxidant capacity (TEAC) = 1 [22].

ANTI-HYPERLIPIDEMIC

Methanolic and phenolic extract of *Tamarixgallica* showed dose dependent decrease in the levels of cholesterol, triglyceride, LDL-C and VLDL-C level and increase HDL-C at the doses of 400 and 500 mg/kg body weight in triton X-100 induced hyperlipidemic rats. Atorvastatin used as a standard drug. Phenolic extract 500 mg/kg body weight has definite antihyperlipidemic activity [20].

ANTINOCICEPTIVE

Methanolic extract of aerial parts of *Tamarixgallica* showed anti-inflammatory and analgesic activities in rats at doses of 100, 200, and 300 mg/kg p.o. body wt. The extract produced dose dependent inhibition of paw edema due to carragenan and histamine, 10 mg/kg diclofenac used as a standard in the study. Central and peripheral activities of tamarix was also evaluated by tail flick, hot plate and acetic acid induced writhing method on swiss albino mice, *Tamarixgallica* increased in the reaction time and reduction in number of writhes [21].

Methanolic extract of *Tamarixgallica* showed antinociceptive and anti-inflammatory activities. It produced significant inhibition induced by acetic acid and also produced significant inhibitory effect on paw edema induced by carragenan in mice at the doses of 200 and 400 mg/kg body weight [23].

Methanolic extract of *Tamarixgallica* leaves showed antinociceptive, cytotoxic and antidiarrhoel activities in mice. It produced significant writhing inhibition in acetic acid induced writhing in mice at oral dose 500 mg/kg body weight compared to diclofenac sodium 25 mg/kg body weight [24].

Methanolic extract of *Tamarixgallica* barks showed antinociceptive activity in acetic acid induced writhing model in swiss albino mice at doses of 250 and 500 mg/kg body weight, compared to standard drug diclofenac sodium at dose 25 mg/kg body weight [25].

EFFECT ON RENAL CALCULI

The extract of *Tamarixgallica* acted as inhibitor of nephrolithiasis (calcium oxalate). The calcium oxalate formation induced by the addition of oxalate solutions of sodium and calcium chloride. The extract of *Tamarixgallica* acts at the stage of growth, this effectiveness was due to presence of acid [14].

ANTIDIARRHOEAL

Methanolic extract of *Tamarixgallica* leaves showed antidiarrhoeal activity on castor oil induced diarrhoea in mice at dose of 500 mg/kg p.o. body weight, compared to standard drug loperamide at the dose of 50 mg/kg body weight [24].

CYTOTOXIC ACTIVITY

*Tamarixgallica*methanolic show scytotoxic activity, brine shrimps used for cytotoxicity test. 5 mg eggs of *Artemiasalina*were hatched in natural seawater after incubation at about 29°C for 48h. The larvae were allowed another 48 h in seawater to ensure survival and maturity before use. Five doses of plant extract (1, 2, 4, 6, 8 and 10 µg/ml) in 5% DMSO and/or sea water were tested. Each extract preparation was dispensed into clean test tubes in 10 ml volumes and tested in duplicates. The concentration of DMSO in the vials was less than 10 µl/ml. For control, same procedure was followed except test samples. After marking the test tubes properly, 10 living shrimps were added to each of the 20 vials with the help of a Pasteur pipette13 .The test tube containing the sample and control were then incubated at 29°C for 24 h in a water bath, after which each tube was examined and the surviving nauplii were counted. The percentage of mortality was calculated at each concentration and it was reported that the extract showed lethality against the brine shrimp larvae. *Tamarixgallica* showed dissimilar mortality rate at different concentrations [24].

ANTIMICROBIAL

Tamarixgallica leaves and flower shows antimicrobial activity, however flowers extract showed highest antibacterial activity especially against Micrococcus luteus (zi = 25 mm). It also have antifungal activities especially against Candida glabrata (zi = 14.67 mm) and Candida albicans (zi = 14.33). The phytochemical tests demonstrated the presence of five flavonoids in flower extracts including quercetin and kaempferol, leaves showed 6 compounds including quercetin, 3-0-glucuronide [26].

Tamarixgallica extracts showed antibacterial properties against human pathogen strains, mean inhibition zone was from 0 to 6.5 mm when concentration increased from 2 to 100 mg/l. The strongest activity was showed against Micrococcus luteus and lowest activity against Escherichia coli [16].

HEPATOPROTECTIVE

*Tamarixgallica*metahnolic extracts showed protective effect against thioacetamide induced hepatic oxidative stress and hyperproliferative response in wistar rats. Orally pretreatment of rats with tamarix extract at doses 25 and 50 mg/kg body wt., prevented thioacetamide promoted oxidative stress and toxicity, significantly reduced the susceptibility of the hepatic microsomal membrane for iron-ascorbate induced lipid peroxidation, H_20_2 content, glutathione S-transferase and xanthine oxidase activities [15].

EFFECT ON LIVER CARCINOGENESIS

Methanolic extract of *Tamarixgallica* showed inhibitory effects on diethylnitrosamine (DEN) initiated and 2-acetyl aminofluorene (2-AAF) promoted liver carcinogenesis in male wistar rats. Pretreatment of *Tamarixgallica* extract at doses of 25 and 50 mg/kg body weight prevented oxidative stress by restoring the levels of antioxidant enzymes and also prevented toxicity at both doses. Protective effect against liver carcinogenesis of *Tamarixgallica* might be mediated by multiple action,incude restoration of cellular antioxidant enzymes, detoxifying enzymes, ODC activity and DNA synthesis [27].

CONCLUSION

Tamarixgallica constituted a number of phytochemicals, which divulge its uses for various therapeutic purposes. Tamarix can be used for the treatment of various health problems for instance anti-hyperlipidemic, antinociceptive, antidiarrhoeal, antioxidant, anticancer, antimicrobial, inhibitor of nephrolithiasis, liver carcinogenesis, and hepatoprotective. However attempts are required to evaluate the mechanism of actions with therapeutic activity for *Tamarixgallica.*

Acknowledgement

The authors express their sincere thanks to Faculty of Pharmacy, Integral University, Lucknow to encourage them by its research atmosphere and its all valuable supports.

REFERENCES

[1] SoniP;Siddiqui AA; Dwivedi J; Soni V, *Asian Pacific Journal of Tropical Biomedicine*.,**2012**, 2(12), 1002-1008.
[2] Baum, Bernard R. "The Genus Tamarix", The Israel Academy of Science and Humanities, **1978**.
[3] Chiej R. Encyclopaedia of medicinal plants. Covers plants growing in Europe. Also gives other interesting information on the plants, **2002**.
[4] Panwar AQ;Abro H. *Pakistan Journal of Botany*.,**2007**, 39(7), 2301-15.
[5] Sultanova N, Makhmoor T, Yasin A, Abilov ZA, Omurkamzinova VB, Rahman A, Choudhary MI. *PlantaMedica*.,**2004**, 70(1), 65-67.
[6] Chopra RN, Nayar SL, Chopra IC. Glossary of Indian Medicinal plants, **2000**.
[7] Srivastava S;Choudhary GP. *Scholars Academic Journal of Pharmacy*.,**2014**,3(5), 363-365.
[8] Gaskin JF, Schall BA. *Systematic Botany*.,**2003**,28(1), 86-95.
[9] Drabu S;Chaturvedi S; Sharma M. *Asian Journal of Pharmaceutical and Clinical Pharmacy*.,**2012**,5(3), 45-48.
[10] Tagarelli G;Tagarelli A and Piro A. *Journal of Ethnobiology and Ethnomedicine*.,**2010**, 6, 27-27.
[11] Rakholiya K. *Journal of Medicinal Plants Research*.,**2011**,5(1), 63-71.
[12] Sharma SK;Parmar VS. *Journal of Scientific and Industrial Research*.,**1998**, 57, 873-890.
[13] Gaston B. La grandeflore en couleurs. France, Suisse, Belgiqueet pays voisins, tome 1st Editions, Berlin Paris, **1998**, 373.
[14] Bensatal A;Ouahrani MR. *Urological Research*.,**2008**, 36(6), 283-287.
[15] Sehrawat A and Sultana S. *Journal of Enzyme Inhibition and Medicinal Chemistry*.,**2006**, 21, 215-223.
[16] Ksouri R;Falleh H; Megdiche W;Trabelsi N and Mhamdi B. *Food and Chemical Toxicology*., **2009**, 47, 2083-2091.
[17] Kirtikar KR and Basu BD. Indian Medicinal Plants. Indian Press, Allahabad, **1996**, 2: 61-62.
[18] Mahmoud AM, Nawwar, Sahar A, Hussein M. *Phytochemistry*, **1994**, 36(4), 1035-1037.
[19] Djurdjevic L;Mitrovic M;Avlovic P;Gajic G;Ostic O. *Archives of Environmental Contamination and Toxicology*.,**2006**, 50(4), 488-495.
[20] Naveed SA; Reddy MS; Kumar CHP;Suhasini B;Dontamalla SK. *International Journal of Pharmacy*.,**2015**,6(4), 7880-7895.
[21] Chaturvedi S;Drabu S; Sharma M.*International Journal of Pharmacy and Pharmaceutical Sciences*.,**2012**, 4(3), 88-91.
[22] Akkal S, Lefaha M, Zaabat N, Franca MGD. Studies on flavonoids and their antioxidant activities of *Tamarixgallica.OMICS Group* Conferences Biotechnology, **2014**.
[23] Rehman M;Haque E;Hasanuzzaman M;Shahid IZ. *International Journal of Pharmacology*.,**2011**; 7(4), 527-531.
[24] Habiba U; Bose U;Rahman AA. *Pharmacologyonline*.,**2010**, 1, 275-283.
[25] Sarker M;Sarker A. *BangladeshJournal of Pharmacology*.,**2009**, 25(2), 1-3.
[26] Boulaaba M, Snoussi M, Saada M, Mkadmini K, Smaoui A, Abdelly C, Ksouri R. *Industrial crops and products*, **2015**, 76, 1114-1122.
[27] Sehrawat A; Sultana S. *Life Sciences*.,**2006**, 79(15), 1456-1465.