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Quercus leucotrichophora: Pharmacological Review

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ABSTRACT: *Quercus leucotrichophora* A. Camus is a member of the family Fagaceae. There are numerous therapeutic applications for the medicinal plants of the Quercus genus. The production of fuel and feed in the Himalayan region is heavily reliant on banj oak. In both human and animal health care systems, QL leaves, seeds, and bark are utilized. The tree's gum has long been used to treat stomach issues, particularly in children, and gonorrhea. The seeds are used to cure asthma, diarrhea, and indigestion because of their astringent and diuretic properties. The DPPH test demonstrated the strong dose-dependent antioxidant activity of methanol and aquoes leaf extracts. In Wistar rats, Quercus leucotrichophora was shown to have anti-inflammatory and anti-arthritic effects. Strong antibacterial activity against both Gram-positive and Gram-negative bacteria was demonstrated by the *Q. leucotrichophora* extract in ethyl acetate. Urine output increased significantly 24 hours after a single oral dosage of *Quercus leucotrichophora* A. Camus seed methenolic extract. The extract had strong diuretic effects and promoted diuresis in a dose-dependent manner.A DOCA-induced rat model of hypertension suggests that *Quercus leucotrichophora* (QL) may have therapeutic benefits.

KEYWORDS: Anti-oxidant, Anti- bacterial, Fagaceae, Pharmacological action, *Quercus leucotrichophora*.

INTRODUCTION

The Himalayan region boasts a diverse flora, including over 10,000 medicinal plant species. Banj oak (*Quercus leucotrichophora* A. Camus) belongs to the family Fagaceae. The Quercus genus contains medicinal plants with numerous therapeutic purposes. The Himalayan region relies heavily on banj oak for both fuel and fodder production. QL leaves, seeds, and bark are used in both human and livestock health care systems. The gum of the tree has long been used to cure gonorrhea and digestive issues, particularly in youngsters. The seeds have astringent and diuretic properties, and are used to treat indigestion, diarrhea, and asthma.[1]

is a moderate-sized to big evergreen tree with a height of up to 25 m and a girth of 3.0m. It is found in Kashmir and Western Himalayan regions up to Nepal, at elevations ranging from 1000-2400 m, and occasionally in damp areas like Kangra and Kulu in India. Seeds are produced in abundance. Birds and creatures take the seeds before they ripen, making survival difficult unless the ground is thoroughly plowed to cover and hide falling acorns. Acorns are used in Ayurvedic medicine as a diuretic, gonorrhea treatment, and astringent for indigestion and diarrhea, particularly in youngsters.[2] Recent research has focused on phytochemicals found in herbal and crude plants to prevent oxidative stress, which causes cardiovascular breakdown, tissue injury, DNA damage, and tumor development. Antioxidants may prevent the development of reactive oxygen species and aid in disease treatment, as suggested by multiple studies. Antioxidants prevent ROS-induced cell damage by neutralizing free radicals. Plants include bioactive compounds such as phenolics, flavonoids, and essential oils, which offer antioxidant properties.[3]

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Seed of *Quercus leucotrichophora*

Leaf of *Quercus leucotrichophora*

Antioxidant activity:

The DPPH the test showed that methanol and aquoes leaf extracts have significant dose-dependent antioxidant activity. The QLME 1600 µg/mL solution had the highest scavenging rate compared to the QLAQ 1600 µg/mL solution. At 1,600 µg/mL, QLME (67.64% ± 0.43%) and QLAQ (63.09% ± 0.65%) had considerably higher antioxidant activity ($p < 0.0001$) than ascorbic acid (72.75% ± 0.21%). QLME shown substantial antioxidant activity ($p < 0.05$) at all tested concentrations (50, 100, 200, 400, 800, and 1,600 µg/mL) compared to QLAQ. [4] The ethyl acetate fraction of *Quercus leucotrichophora* seed extract showed the highest DPPH and NO radical scavenger antioxidant activity, with IC50 values of 49.019 ± 0.15 µg/ml and 51.39 ± 0.19 µg/ml, respectively. The aqueous fraction had the lowest antioxidant potential.[5]

Anti-inflammatory activity:

Quercus leucotrichophora was found to have anti-arthritic and anti-inflammatory properties in Wistar rats. This could be attributed to the presence of ferulic acid, sinapic acid, gallic acid, catechin, and quercetin, as measured by HPLC. QL methanolic extract showed anti-arthritic effects by restoring blood parameters, pro-, anti-inflammatory, and oxidative stress indicators in treated rats.To determine the most active fraction, *Quercus leucotricophora* should be fractionated according to activity. Activity-guided fractionation is crucial for isolating anti-arthritic components from QL methanolic extract. Perform HPLTC fingerprinting on plant extracts. [4]

Anti-bacterial activity:

Q. leucotrichophora extract in ethyl acetate shown strong antibacterial activity against both Gram-positive and Gram-negative bacteria. This new research adds credibility to the theory that the plant's historical use as a therapeutic agent stems from its free radical scavenging qualities. Consuming Q. leucotrichophora extracts is recommended due to its antioxidant and antibacterial properties, which have been linked to many conditions such as cancer, cardiovascular disease, and aging. Further study is needed to separate and characterize bioactive chemicals at a molecular level.[4]

QL methanolic extracts were tested for antibacterial activity against five bacterial species using the agar disk diffusion method.the antibacterial activity of QL extracts as measured by the inhibition zone diameter in millimeters. QL Bark and QL Leaf extracts exhibited zones of inhibition (ZOI) ranging from 9.37 ± 0.65 to 19.07 ± 0.31 mm and 8.53 ± 0.50 to 17.03 ± 0.55 mm, respectively. Both extracts demonstrated maximum and minimal zone of inhibition (ZOI) against B. subtilis and E. coli, respectively. Ampicillin inhibited all bacterial strains with a zone of inhibition (ZOI) ranging from 21.2 ± 0.46 to 23.3 ± 0.70 mm. A negative control, DMSO, did not exhibit any zone of inhibition. Previously, the volatile extract of QLB showed antibacterial activity against three microbiological cultures: Streptococcus pyogenes, Streptococcus aureus, and Escherichia coli. QLB's volatile extract showed promising antibacterial action against Streptococcus pyogenes, but not Streptococcus aureus or Escherichia coli.The fatty acid methyl ester (FAME) extract of QL fruits demonstrated antibacterial effectiveness against four bacterial stains: Bacillus subtilis, Staphylococcus aureus, Pseudomonas aeruginosa, and Escherichia coli, with a range of 7.8 to 15.9 mm.[6]

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Anti-diuretic activity:

A single dosage of the methenolic extract of *Quercus leucotrichophora* A. Camus seed taken orally resulted in a considerable rise in urine output 24 hours later. The extract increased diuresis in a dose-dependent manner, with significant diuretic effects ($p < 0.001$) at 500 mg/kg compared to furosemide, the reference drug. Treatment with a methenolic extract of *Quercus leucotrichophora* A. Camus seed reduced urine osmolarity by increasing Na+, K+, and Cl− excretion in a dose-dependent manner. The stability of aldosterone, the lack of connection with plasma sodium levels, and the higher clearance of free water in the animals given the methenolic extract indicate that increased diuresis and moderate natriuresis are tubular in origin.[7]

Anti-hypertension activity:

Quercus leucotrichophora (QL) has potential therapeutic effects in a DOCA-induced hypertension rat model. QL's methanolic seed extract reduced blood pressure by increasing nitric oxide (NO) levels, corrected electrolyte balance, and revealed antioxidant characteristics by increasing GSH, GSHPx, and SOD activities while decreasing TBARS levels, which associated with eNOS activation. The DOCA-induced hypertension model verified several aspects of human hypertension. QL reduced hypertension, cardiac, and renal hypertrophy, possibly by eNOS activation and reduced oxidative stress, resulting in higher blood NO levels. QL's antihypertensive impact was linked to improved serum electrolyte balance. The study emphasizes QL's potential as a multifaceted therapeutic agent for hypertension, with NO modulation, antioxidant defense, and electrolyte balance being essential pathways.[8]

DISCUSSION

Quercus leucotrichophora A. Camus belongs to the Fagaceae family. The Quercus genus contains medicinal plants with a variety of therapeutic use. The Himalayan region depends significantly on banj oak for fuel and feed production. QL leaves, seeds, and bark are used in both human and animal health care systems. The gum from the tree has traditionally been used to treat gonorrhea and digestive problems, especially in children. The seeds contain diuretic and astringent qualities, and are used to treat indigestion, diarrhea, and asthma. The DPPH test revealed that methanol and aquoes leaf extracts exhibit substantial dose-dependent antioxidant activity. *Quercus leucotrichophora* was discovered to have anti-arthritic and anti-inflammatory effects in Wistar rats. Q. leucotrichophora extract in ethyl acetate shown significant antibacterial activity against both Gram-positive and Gram-negative bacteria .A single dose of the methenolic extract of *Quercus leucotrichophora* A. Camus seed administered orally caused a significant increase in urine output 24 hours later. The extract promoted diuresis in a dose-dependent manner, indicating substantial diuretic effects. *Quercus leucotrichophora* (QL) may have therapeutic effects in a rat model of DOCA-induced hypertension.

Conflict of interest

The author declares no conflict of interest.

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