Review Article

A REVIEW ON PHARMACOLOGICAL ACTIVITIES OF *BETULA UTILIS*

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ABSTRACT

Betula utilis common name bhojpatra used in traditional medicine and is known for its beneficial and medicinal value. In this article an attempt has been made to review highlighting different pharmacological activities of bark. From ancient time different cultures around the world have used herbs and plants as a remedy in different diseased condition to maintain health. Many drugs prescribed today in modern medicinal system are derived from plants. Researchers carried out investigations on various active constituents of *Betula utilis* obtained from the plant proved to have various therapuetical actions which promised its use in mangament of Anticancer, Anti-inflammatory, Anti-HIV, Antioxidant, Mild Antihyperglycaemic and Antibacterial activity. Scientific data available on medicinal plants indicate that phytochemicals present in the bark can be used to treat many health problems, more over some of the pathological condition where allopathic drugs become ineffective but traditional herbal therapy had satisfying option which demands research in this area. Here an attempt has made to present an overview of pharmacological activities of the bark of *Betula utilis*.

Key Words: *Betula utilis*, Anti-inflammatory, Anti oxidant, Anti bacterial, Antioxidant, Mild Antihyperglycaemic.

INTRODUCTION

World health organization has listed over 21,000 plant species used around the world for medicinal purposes. In India, about 2500 plant species belonging to more than 1000 genera are being used in indigenous system of medicine which symbolizes the rich tradition for herb and herbal remedies.[1] Synthetic drug is known for its toxicity which sometimes needs serious medical attention. So in the recent days the practice of herbalism has got popularity around the globe including the developed countries due to its potency and apparent safety profile.

Herbal medicines represent one of the most important fields of traditional medicine all over the world. In the late 90's, WHO stated that a big percentage of the world population depend on herbal medicinal therapy to cover the needs of the primary health care.[2]

Medicinal plants play a key role in human health care. About 80% of the world population relies on the use of traditional medicine, which is predominantly based on plant material. *Betula utilis* generally called as Himalayan birch. It known with different names in different languages. *Himalayan birch* (English), bhuya patra (Kannada),*bujjamaram*(Malayalam).

AVAILABILITY

Betula utilis is available in India (Arunachal Pradesh, Darjiling, Himachal Pradesh, Jammu-Kashmir, Sikkim, Uttaranchal), Afghanistan, Bhutan, China, Tibet, Kazakhstan,Nepal, Pakistan, Tajikistan, Uzbekistan.[3]

TREE

It is a moderate size tree that can grow up to 20 m in height. The bark is shining, smooth, reddish white or white with horizontal lenticels. The outer bark is having numerous thin papery layers, exfoliating in widehorizontal rolls. The inner cortex is soft and red in color.[4]

BARK

Colour: reddish white or white with horizontal lenticels.

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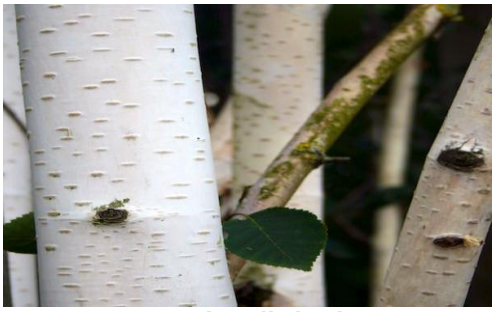

***Betula utiis* bark**

CHEMICAL CONSTITUENTS

The bark contains several chemical compounds like betulin, lupeol,oleanolic acid, acetyloleanolic acid, betulinic acid, lupenone,sitosterol, methyle betulonate,methyl betulate, karachic acid etc.

Essential oil of *Betula utilis* bark shows presence of geranic acid, seleneol, Linalool, Ses-quiphellendrene, Champacol, 1,8-cineol. Fatty acid constituents present in the Betula utilis bark are linoleic (17.66%), myristic (15.9%), palmitic (9.09%), Oleic(11.30%). Essential oil of *Betula utilis* bark shows presence of geranic acid, seleneol, Linalool, Sesquiphellendrene, Champacol, 1,8-cineol.[5]

THERAPEUTIC USES

Betula utilis is one of the most important tree species used in various indigenous systems of medicine in India. It is used in tridosa- 'vata' (air), 'pitta' (phlegm) and 'kaph' (cough). Its herbal medicine is prepared in the form of infusion, powder, paste and decoction.Its bark contains betulin and other essential oils those possess medicinal properties. The stem bark is used as styptic, cleaning of wounds and leprosy as it has astringent properties.[6]

Its resin is used as contraceptive and treatment of burns and external wounds. The resin is also applied to boils. The bark is used in earache, and also to treat kidney and bladder disorders. It is considered to contain a good therapeutic agent for treatment of psychological disorders and so that it is used in insanity, epilepsy and hysteria. The bark is also used to treat jaundice.And also used in constipation, cough and as a tonic.[7] The bark is also used for treatment of domestic animals. Ashes prepared by burning the bark and its paste is applied on the deep cuts and wounds of animals.

PHARMACOLOGICAL ACTIVITIES

1. Anticancer activity

Betula utilis Bark (BUB) was screened for its anticancer activity, in the study methanol extract was prepared and fractionated with hexane, ethyl acetate, chloroform, n-butanol and water. All six fractions were evaluated for their *in-vitro* anticancer activity in nine different cancer cell lines and ethyl acetate fraction was found to be one of the most potent fractions in terms of inducing cytotoxic activity against various cancer cell lines. Isolation of various active constituents were done by utilizing column chromatography, six triterpenes namely betulin, betulinic acid, lupeol, ursolic acid (UA), oleanolic acid and β-amyrin were isolated from the ethyl acetate extract of BUB and structures of these compounds were unraveled by spectroscopic methods. β-amyrin and UA were isolated for the first time from *Betula utilis*. Isolated triterpenes were tested for in-vitro cytotoxic activity against six different cancer cell lines where UA was found to be selective for breast cancer cells over non-tumorigenic breast epithelial cells (MCF 10A).[5]

2. Anti-inflammatory Activity

Woodfordia fructicosa and *Betula utilis* were extracted with solvents of different polarities. Antioxidant activities and anti-inflammatory activity of the extracts were evaluated by a 1,1-diphenyl-2- picrylhydrazyl free radical (DPPH), 2,2'-Azinobis (3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) and lipoxygenase inhibition assay. Ascorbic acid, gallic acid and indomethacin were used as reference standards for DPPH, ABTS and lipoxygenase assays. It has been reported the ability of methanolic and water extract of *Betula utilis* reduce free radicals which may stop the free radical initiation or retard free radical chain reaction in the propagation of the oxidation mechanism. This indicates that the plants are more useful in the treatment of inflammation. During inhibition the activity of *Betula utilis* was found to be less in lipoxygenase enzyme. It may act on free radical to reduce the inflammation.[8]

3. Anti HIV activity

A novel series of omega-aminoalkanoic acid derivatives of betulinic acid were synthesized and evaluated for their activity against human immunodeficiency virus (HIV). The anti-HIV-1 activity of several members of this new series was found to be in the nanomolar range in CEM 4 and MT-4 cell cultures. The optimization of the omega-aminoalkanoic acid side chain is described. The presence of an amide function within the side chain was found important for optimal activity. RPR 103611 (14g), a statine derivative, was found to be inactive against HIV-1 protease, reverse transcriptase, and integrase as well as on gp120/CD4 binding. "Time of addition" experiments suggested interaction with an early step of HIV-1 replication. As syncytium formation, but not virus-cell binding, seems to be affected, betulinic acid derivatives are assumed to interact with the postbinding virus-cell fusion process. . Since a number of betulinic acid derivatives have been shown to inhibit HIV-1 at a very early stage of the viral life cycle, these compounds have the potential to become useful additions to current anti-HIV therapy, which relies primarily on combination of reverse transcriptase and protease inhibitors.[9]

4. Antioxidant activity

Woodfordia fructicosa and Betula utilis were extracted with solvents of different polarities. Antioxidant activities and anti-inflammatory activity of the extracts were evaluated by a 1,1-diphenyl-2- picrylhydrazyl free radical (DPPH), 2,2'-Azinobis (3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) and lipoxygenase inhibition assay. The methanol and water extract of *Betula utilis* was showed DPPH and ABTS scavenging activity (8.4, 35.08 g/ml IC50 for DPPH, and 83.18, 37.14 g/ml IC50 for ABTS assay) but very mild activity against lipoxygenase inhibition activity (18.74 and 28.78% inhibition at 1.0 mg/ml). The results obtained in this study indicate that *Betula utilis* can be a potential source of antiinflammatory and antioxidant agents. Though Betula *utilis* has free radical scavenging activity, it reduces free radicals which may stop the free radical initiation or retard free radical chain reaction in the propagation of the oxidation mechanism.[8]

5. Antimicrobial Activity

Successive solvent extract viz., petroleum ether, chloroform, methanol, ethanol and water extracts of bark of *Betula utilis* D. The extract was evaluated for antibacterial activity, against fourteen important bacterial strains by agar-well diffusion method. Comparison of the inhibitory activity of the extracts with the antibiotics gentamicin revealed that methanol extracts of *Betula utilis* was significantly higher than that of the antibiotics tested. The results suggest that *Betula utilis* is scientifically validate the use of this plant in the traditional medicine for isolation and characterization of the active principle for further exploitation in medical microbiology.[10]

6. Mild Antihyperglycaemic Activity

The ethanolic extracts of different parts of the following plants viz. *Eclipta alba Hassk* (Asteraceae) whole plant, roots of *Berberis aristata DC* (Berbidaceae), stem wood of *Betula utilis D*. *Betula utilis D* (Betulaceae), stem wood of *Cedrus deodara* (Pinaceae), and fruits of Myristica fragrans Houtt. (Myristcaceae) exhibited 7.5, 8.3, 9.2, 6.0, and 8.7% significant fall in blood glucose profile in a single dose experiment on Streptozotocin-induced diabetic rats. In single dose experiment nearly 8.0% decline in blood glucose profile of Streptozotocin induced diabetic rats was observed with ethanolic extract of the fruits of *Terminalia chebula* (Combretaceae).[11]

CONCLUSION

The present review reveals the description, active constituents, therapeutic uses and pharmacological activities of *Betula utilis*. Historically, *Betula utilis* has been used for number of ethnobotanical purposes, which include religious and medicinal. Being an important source of medicine, various useful plant parts of *Betula utilis* should be screened properly for making standardized herbal drugs. At the same time, collection of this tree species needs to be regulated for its sustained availability and conservation of fragile Himalayan ecosystem. Further studies and investigations can be performed on the plant for its various pharmacological activities.

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