TRADITIONAL USES

forests showed best results for scarification method traditional system of medicine combating various diseases have its history way back from a hundred years. The utilization of roots, and stem barks for different remedies is also in practice. High tannin content on woody tissues provides the longevity to the timber, commercial value of chemicals. The utilization of leaves and fruits, of the tree as medicine is a highly sustainable source of natural medicines. The utilization of roots, seeds at the time of its maturity to define seed maturity indicators pertaining to this tree, a study has been done for the collection of data on the gap between traditional claims and modern therapy on Myrica nagi.
Bark

The bark contains gallic acid, myrican, myricanol, epigallocatechin-3-O-gallate, epigallocatechin-3′-O-gallate, and dimethelphindin [epigallocatechin (4′→8) epigallocatechin 3-O-gallate and 3′-O-gallloyl epigallocatechin (4′→8) epigallocatechin 3′-O-galate].

Hydrolysable tannin castalagin. Prodelphinidin units with 2,3-cis configuration having average of 5000 mean molecular weight (Mr) were found in the higher mean molecular weight (Mr) fractions. The terminal unit of the polymer has epigallocatechin 3-O-galloyl, the terminal unit of the polymer has epigallocatechin 3′-O-galloyl, the terminal units were also known to have galloyl group at C-3′. Proanthocyanidins with water were extracted by ultrasound-assisted technique. The terminal unit of the polymer has epigallocatechin 3-O-gallate, the extender units were also known to have galloyl group at C-3′.

Root bark

Acidic, lycopelonic acid and stigmastanol were evaluated by HPTLC in bark extract. Gallic acid at 0.56 with toluene-ethanol acetate formic acid (5:5:1) as mobile phase, while oleoic acid, stigmasterol, and laevoae at 0.38, 0.49, 0.62 with toluene-ethyl acetate (8:2) as mobile phase were established.

The stem bark contains flavonoids myricetin-3-O-(3′-galloyl)-α-L-rhamnoside, myricitrin-3-O-(2′-O-galloyl)-α-L-rhamnoside, myricitin-3-O-(2′-O-galloyl). The stem bark contains flavonoids myricetin-3-O-(3′-galloyl)-α-L-rhamnoside, myricitrin-3-O-(2′-O-galloyl), α-L-rhamnoside, myricin, 3-O-(2′-O-galloyl), α-L-rhamnoside, myricitin, 3-O-(2′-O-galloyl).

Leaves

Leaves are reported to constitute 4-hydroxy-1,8-cineole 4-O-β-Dapiosifuranosyl-(1→6)-β-D-glucopyranosyl, (1,3,4,5-R)-2-hydroxy-1,8-cineole 1,8-cineole, β-D-glucopyranosyl, corchoinoside C, (6S,9R)-hydroxyroseide, myricinal, 5-O-β-D-glucopyranosyl myricanol, arjunolic acid, arjunglucoside, 3-epi-arsonic acid, 3-O(E)-caffeoyluronic acid, myricetin, myricitrin. On the spectroscopic evidences flavone 4′-hydroxy-3′,5′,3′-trimethoxy-7-O-β-D-glucopyranosyl, 1,4′-a-L-rhamnosyrophosphate, 4-5′-di-hydroxy-6-methoxy-7-O-α-L-rhamnosyrophosphate, β-Sitosterol, β-Sitosterol-β-glucopyranoside and quercetin were elucidated. The volatile oil was extracted by distillation and analyzed by gas chromatography-mass spectrometry. The major constituents were Nerolidol (13.4%), α-pinen (13.4%), α-Selinene (12.28), β-Caryophyllene (11.66%), β-Selinene (9.7%), α-Caryophyllene (8.94%), α-cadinol (5.32%), Linalool (4.06%).

In a study done on the chemical constituents thirteen compounds myricitin, myricanol, myricanolic acid, ethyl 3-O-gluopyranoside, 3-hydroxybenzaldehyde, isovanillin, 4-methoxybenzoic acid, 4-(hydroxymethyl) phenol, β-sitosterol, daucosterol were isolated by silica gel column chromatography and recrystallization. In this study conformation of Myricanol was done by X-ray diffraction for the first time.

PHARMACOLOGY

Medicinal plants possess pharmacological actions on animals due to the presence of secondary metabolites. The pharmacological aspect of this tree with immense medicinal applications has been well studied for its efficacy and wide utility. A number of animal models have been used for finding the pharmacological effects. These pharmacological activities prove the traditional utilization of the tree scientifically.

Anti-allergic activity

The stem bark of Myrica esculenta has been studied for anti-allergic activity and it was concluded that it can be used in the allergic disorders. The ethanolic extract of the stem bark possess potential anti-allergic activity when studied on mice. In the experiment Allergic pleurisy and vascular permeability were induced by acetic acid in mice.

Anti-inflammatory activity

An experimental study was carried out to find the anti-inflammatory activity in an animal model as rat paw edema. While in another study carried out by group of scientists on the bark, the essential oils were found to possess significant topical anti-inflammatory activity, in comparison to standard drug in Swiss albino mice ear.

Antioxidant activity

The fruits of the tree were studied for the antioxidant activities and it was found that they can be utilized as natural antioxidants. The study also revealed that Phenolics and Flavonoid contents were higher in Myrica esculenta fruits than Myrica rubra, another species of the same genus found in China. The same study proved that Myrica esculenta fruits possess strong antioxidant activity than Myrica rubra.

Antihelminthic activity

Aqueous ethanolic extract of bark showed anti-helminthic activity on Indian earthworm. The effects were found more than reference. The extract caused paralysis followed by the death of the worms at all tested dose levels. It was proved through this study that extract effects were dose dependent.

Anti-microbial activity

The ethanolic extract of the stem bark was found to be a potent antimicrobial agent against the various bacteria with average zone of inhibition as 17.9mm with 17.6mm, 19.5mm, 26.9mm, 9.5mm and 15.9mm. The aqueous extract of the stem possess strong activity against food poisoning bacteria against Escherichia coli, Streptococcus pyogenes against food poisoning bacteria.

Anxiolytic effect

Myrica esculenta against food poisoning bacteria Myrica esculenta against food poisoning bacteria for the antioxidant activities and it was found that they can be utilized as natural antioxidants. The study also revealed that Phenolics and Flavonoid contents were higher in Myrica esculenta fruits than Myrica rubra, another species of the same genus found in China. The same study proved that Myrica esculenta fruits possess strong antioxidant activity than Myrica rubra.

Chemopreventive effect

Myrica nagi is an effective chemopreventive agent in skin and capable of ameliorating cumene hydroperoxide induced cutaneous disorders. The ethanolic extract possesses potential anti-allergic activity when studied on mice. When plates were spray ed with 5%

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oxidative stress and toxicity. It was found that the protective effect was dose-dependent.

Hypertension
A study focused on the megastigmanses of Myrica esculenta for the management of hypertension revealed that the compound corchoroside C and (659R)-roseoside isolated from the leaves of the tree were potent ACE inhibitors with rates of 25.63% at the concentration of 100μM, while myricanol, 5-0-β-D-glucopyranosyl myricanol and myricetin show weak activity with inhibitory rates of 0.07-1.41% at concentration of 100μM.

Mast cell stabilizing effect
Ethyl acetate and water extracts of the bark at the dose of 100mg/kg, 200mg/kg were analyzed for Mast cell stabilizing activity. The studies with egg albumin model showed better protection of mast cell degeneration (45-62%) in comparison to that of the standard drug prednisolone (65%). When the peritoneal mast cells treated with compound, extracts showed better mast cell stabilizing activity. For the extracts the percentage of advanced results was in the range of 70-78% while for the standard drug it was found 65%.

Myrica nagi as a herb tar
Myrica nagi as a herb tar a poly herbal formulation against CC14 induced hepatotoxicity in rats using albino Wistar rats as animal model. It was found that Myricetin nagi as a herb tar reverses the alterations in lipid peroxidation and antioxidants status during CC14 induced hepatotoxicity in rats.

APPLICATION IN NANOSCIENCES FIELD
From Bark Tanin (BT)
The homogenous Palladium (Pd) nanoparticles were prepared from the bark of Myrica esculenta tanbin (BT) and later on were immobilized onto γ-Al2O3 for the preparation of heterogeneous γ-Al2O3-BT-Pd catalysts. Fourier Transformation Infrared Spectrum and X-ray Photoelectron Spectroscopy were employed to find out the stability of phenolic hydroxyl groups, it was found that Pd NPs were stabilized by the phenolic hydroxyl groups of Myrica esculenta. Even after using γ-Al2O3-BT-Pd for five times for the hydration of olefins no significant loss of the catalytic activity were recorded. This proves its superior usability over conventionally prepared γ-Al2O3-Pd catalysts.

From Leaf Extract
Silver (Ag) nanoparticles were prepared from the plant extract of Myrica esculenta. The spherical silver nanoparticles with 5nm average size were prepared by the extract of Myrica esculenta after the bio-reduction of aqueous Ag+ ion in six hours. The characterization was done with UV-Vis spectroscopy, X-ray diffractometer and transmission electron microscope.

MYRICETIN: AN IMPORTANT PHYTOCONSTITUENT
Myricetin24, yellow-beige powder crystalline powder, a flavonol, consisting of 3-hydroxyflavone backbone and 6 hydroxyl groups has been extracted from the leaves and fruits of the species. Through literature survey, it is found that there are a lot of benefits of Myricetin to health as it possess wide variety of biological effects, as antioxidant and free radical scavenging activities. Myricetin has anti-cancer, antimutagenic and anti-inflammatory properties. Myricetin application in diabetes, heart problems, and in brain health are well known21, in an in-vitro study on epidermal growth factor-activated mouse epidermal cells found that myricetin might directly target Janus kinase 1 (JAK1) and thereby inhibiting cell transformation. Anti-inflammatory properties were proved as it inhibit the expression of tumor necrosis factor-alpha, which is a cytokine responsible for promoting the inflammatory response. Myricetin is also involved in inflammatory diseases. Leaves of Myrica rubra22 another species of the genus found in China were examined with different in vivo models, for both acute and chronic inflammations. The study also proved that Myricetin inhibited the increase in capillary permeability induced by the production of acetic acid in the human body. While on the other hand, Myricetin significantly decreased the serum levels of Malondialdehyde (MDA) and, in turn, increased the serum levels of increased superoxide dismutase (SOD) in the carrageenan-induced paw edema model. The significant decreased leukocyte count was also recorded. The granuloma tissue was inhibited during chronic inflammation by Myricetin. The study proves that Myricetin possesses a potent anti-inflammatory function on acute and chronic inflammation. Its anti-inflammatory mechanisms are associated with the inhibition of antioxidant activity. No such study has been done on Myrica nagi.

Role of Myricetin In Various Health Issues
Myricetin can improve heart health25 by preventing Low-density lipoprotein (LDL) oxidation and reducing the uptake of oxidized LDL by macrophages. It is known that Myricetin along with preventing LDL from oxidation block oxLDL uptake by macrophages also that is too at least in part through reducing CD36 gene expression on macrophages. Scientists have a strong opinion that atherosclerosis can be ameliorated by Myricetin use. Diabetic rats26 were taken for a study and it was found that Myricetin inhibits the uptake of methylglyoxal by adipocytes and reduces oxidative injury in diabetes related bone diseases, it also reduces glucose plasma level in diabetic rats. It inhibits ROS production caused by glutamate and reduces glutamate-induced activation of caspase-3. Myricetin restored dopamine level in the animals induced with Parkinsonism models27. Myricetin also inhibit beta-amyloid fibril formation in Alzheimer patients.

FUTURE PROSPECTS
Through literature survey, it was found that the nano particles were already prepared from the leaf extract and bark tannin of the tree but the other parts (roots, fruits) of the tree are yet to be explored in the nanoparticle field. The fruits of the tree have already been quoted for the antioxidant activity. But the most important compound Myricetin found in the fruit of the species has been studied only for effective matrix metalloproteinase Inhibition activity for cancer. This naturally occurring compound can be further studied for diabetes, brain diseases, etc. The compound and its derivatives can be synthesized in the laboratory. The need of hour is to utilize this compound by working on other pharmacological studies because medicinal herbs as the potential source of therapeutics aids has attained a significant role in health system all over the world for both humans and animals not only in the diseased condition but also as a potential material for maintaining proper health. As Myricetta nagi is endangered, a prompt attention needs to be given to protect the tree from extinction.

CONCLUSION
Myrica nagi is an important medicinal tree, which is safely and effectively used to treat various disorders in Ayurvedic system of medicines since ancient times. Bioactive compounds of the tree have several pharmacological activities such as; anti-inflammatory, antioxidant, antihelminthic, anti-microbial, anti-oxidant, chemopreventive, mast cell stabilizing, hypertension which itself speaks about the wide scope for the utilization of this species. There are strong prospects for the commercial utilization of the species. Most pharmacological work has been done on bark, fruits, flowers but the pharmacological potential of the other part of the trees constitute a potential area for research in future. Efforts should be made to standardize a technique for its utilization of all the parts which will lead to wider commercial applicability.

REFERENCES

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