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Evaluation Of Ethnobotanical Profile Of Azadirachta Indica With Special Reference To Gondia District, Maharashtra

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Abstract:

Azadirachta indica is frequently utilized in rural regions as a part of ethnomedicine for the treatment of many diseases such as antioxidant activity, anticancer activity, anti-inflammatory activity, hepatoprotective activity, wound healing effect, anti-diabetic activity, anti-malarial activity, anti-viral activity etc. In this article, ethnobotanical profile of Azadirachta indica with special reference to Gondia district, Maharashtra has been discussed.

Keywords: Azadirachta indica, Ethnobotany, Gondia.

INTRODUCTION:

Neem trees have appealing rounded tops, thick furrowed bark, and a height range of 15 to 30 meters (49 to 98 feet). The complex leaves are normally evergreen and feature serrated leaflets, but they can drop off during extremely dry spells. The male or staminate (bisexual) little, fragrant white blooms are borne in bunches in the axils of the leaves. [1] The fruit's pulp has a sweet flavor and is a smooth yellow-green drupe. Although cuttings or root suckers can be used to multiply neem, seeds are typically the preferred method. The plant thrives in rocky, poor soil because it is tough and tenacious. Neem can withstand a wide range of climatic conditions, although it cannot endure waterlogging or subfreezing temperatures. [2] The plant has been found Gondia district, Maharashtra with ethnobotanical importance based on rural and tribal peoples.

ETHNOBOTANICAL PROFILE [3-10]:

Antioxidant Activity:

One of the primary causes of the onset of many diseases is the free radical or reactive oxygen species. However, one of the crucial measures in the prevention of illnesses is the neutralization of free radical activity. Antioxidants also have a function in the activation of antioxidant enzymes that play a part in the regulation of damage produced by free radicals and reactive oxygen species. Antioxidants stabilize or deactivate free radicals, frequently before they assault targets in biological cells. Antioxidant activity has reportedly been found in medicinal herbs. Due to their abundance in antioxidants, plant components such fruits, seeds, oil, leaves, bark, and roots play a significant role in the prevention of disease. The antioxidant activity of leaf and bark extracts of A. indica has been investigated, and the study's findings unmistakably showed that all the examined leaf and bark extracts and fractions of neem growing in the foothills have considerable antioxidant characteristics. Another significant study was conducted to evaluate the antioxidant activity of Siamese neem tree leaves, fruits, flowers, and stem bark extracts. The findings indicate that extracts from leaves, flowers, and stem bark have significant antioxidant potential. The following are the results of a useful study that was conducted to assess the in vitro antioxidant activity in various crude extracts of Azadirachta indica (neem) leaves and the antioxidant capacity of various crude extracts: ethyl acetate extract in chloroform, butanol, hexane, and methanol. The current findings indicate that neem crude extracts in chloroform might be employed as a natural antioxidant. According to other findings, ascorbate was followed by nimbolide, azadirachtin, and nimbolide in order of concentration-dependent antiradical scavenging activity and reductive potential. By preventing procarcinogen activation, oxidative DNA damage, and upregulating antioxidant and carcinogen detoxification enzymes, azadirachtin and nimbolide treatment also prevented the growth of DMBA-induced HBP carcinomas. The Azadirachta indica Juss. neem plant's flowers and seed oil were tested for their antioxidant activity, and the results showed that an ethanolic extract of the flowers and seed oil at a concentration of 200 g/mL produced the highest levels of free radical scavenging activity—64.17 0.02% and 66.34 0.06%, respectively.

The study's findings showed that root bark extract had a greater level of free radical scavenging activity, with 50% scavenging activity at 27.3 g/mL, and that this extract's total antioxidant activity was 0.58 mM of standard ascorbic acid. Other study findings indicated that neem cultivated in the foothills (a sub-tropical location) has high antioxidant capabilities in the examined leaf and bark extracts or fractions. The Siamese neem tree's leaves, fruits, flowers, and stem bark extracts were tested for antioxidant capacity. The study's findings revealed that leaf aqueous extract and flower and stem bark ethanol extracts had higher levels of free radical scavenging activity, with 50% scavenging activity at 26.5, 27.9, and 30.6 microg/mL, respectively. Additionally, it was discovered that the total antioxidant activity of the extracts was 0.959, 0.988, and 1.064 mM of standard trolox, respectively.

Anti-cancerous Activity:

The multifaceted disease of cancer is a significant global health issue. Changes in molecular and genetic processes contribute to the emergence and spread of cancer. The allopathic treatment plan works well on one side but has negative effects on healthy cells as well. According to earlier research, plants and their constituents have the ability to prevent the formation of cancerous cells by altering cellular proliferation, apoptosis, the tumour suppressor gene, and a number of other biochemical pathways. Flavanoids and other compounds found in neem are crucial in the prevention of the growth of cancer. Numerous epidemiological studies have suggested a link between increased flavonoid intake and a lower risk of cancer. Neem oil contains several neem limonoids that stop 7,12-dimethylbenz(a)anthracene's ability to cause mutations. Study results showed that treatment with nimbolide resulted in dose- and time-dependent suppression of proliferation of human choriocarcinoma (BeWo) cells with IC50 values of 2.01 and 1.19 M for 7 and 24 h, respectively. The compound nimbolide is found in leaves and flowers. An investigation was conducted to determine the chemopreventive potential of limonoids, azadirachtin, and nimbolide. The findings revealed that azadirachtin and nimbolide prevented the activation of procarcinogens and oxidative DNA damage, upregulated antioxidant and carcinogen detoxification enzymes, and inhibited tumour invasion and angiogenesis. Azadirachta indica and its active ingredients are essential in halting the growth and spread of cancer. It is unclear exactly how the molecules in this view function. Various cell signalling pathways were thought to be modulated by neem and its components, according to research. Azadirachta indica contains a variety of components, and these elements function as tumour suppressors and inhibit the activity of several genes associated with the initiation and progression of cancer, including VEGF, NF-B, and PI3K/Akt. According to reports, neem works well to activate tumour suppressor genes and to block the VEGF and phosphoinositide PI3K/Akt pathways. Additionally, it stimulates apoptosis, inhibits NF-B signalling, and activates the cyclooxygenase pathway.

Anti-inflammatory Activity:

It is common to use plants or isolated products of them to treat or serve as anti-inflammatory agents. According to a study finding, extract of A. indica leaves at a dose of 200 mg/kg, p.o., significantly reduced inflammation in rats when tested using cotton pellet granuloma assays. Other study findings showed that neem leaf extract significantly reduced inflammation, but it was less effective than dexamethasone. These findings also point to nimbidin's potential role in suppressing neutrophil and macrophage activity that is related to inflammation. An earlier discovery demonstrated the anti-inflammatory and immunomodulatory effects of bark and leaf extracts, as well as the antipyretic and immunomodulatory effects of oil seeds. Neem seed oil's analgesic action was tested in experiments on albino rats, and the findings revealed that the oil has dose-dependent analgesic activity and significantly reduced pain at

doses of 1 and 2 mL/kg. Using carrageenan to cause hind paw edoema, a second study was conducted to examine the anti-inflammatory effects of neem seed oil (NSO) on albino rats. The results showed that NSO demonstrated enhanced suppression of paw edoema with the gradual increase in dose from 0.25 mL to 2 mL/kg body weight. At the 4th hour after carrageenan injection, NSO demonstrated the greatest (53.14%) edoema inhibition at the dose of 2 mL/kg body weight. The study's findings indicated that the isolated component azadiradione and a dose of 100 mg/kg of Azadirachta indica fruit skin carbon tetrachloride extract (CTCE) significantly reduced pain and inflammation in the treated animals.

Hepatoprotective Effect:

Medical plants and their constituent parts are essential for hepatoprotection without any negative side effects. In a study to determine the hepatoprotective effects of azadirachtin-A in rats with rat hepatotoxicity caused by carbon tetrachloride (CCl4), histology and ultrastructure data showed that pretreatment with azadirachtin-A dose-dependently reduced hepatocellular necrosis. According to additional study findings, pretreatment with azadirachtin-A at higher dose levels only partially returns the rat liver to normal.

Another study was conducted to determine the protective effect of neem's active ingredient, nimbolide, against carbon tetrachloride (CCl4)-induced liver toxicity in rats, and the findings indicate that nimbolide has hepatoprotective effects against CCl4-induced liver damage with efficacy comparable to that of silymarin standard. Additionally, another study found that leaf extract has protection against paracetamol-induced liver necrosis in rats.

The results of a study evaluating the hepatoprotective activity of Azadirachta indica (AI) leaf extract on antitubercular drug-induced hepatotoxicity showed that the aqueous leaf extract significantly reduced changes in the serum levels of bilirubin, protein, alanine aminotransferase, aspartate aminotransferase, and alkaline phosphatase, as well as significantly reduced changes in the group's histological changes A. indica leaf extracts in both ethanolic and aqueous forms demonstrated moderate effectiveness against mice treated with carbon tetrachloride, according to additional findings. Rats were used to test the hepatoprotective effects of methanolic and aqueous extracts of Azadirachta indica leaves, and the results of the study showed that the plant had a strong chance of acting as a hepatoprotective agent.

A neem extract pretreatment protected against ethanol-induced gastric mucosal damage, according to an experiment conducted to test its preventive effect on lesions of the gastric mucosa in rats.

Wound Healing Effect:

The effects of several plants and their compounds on wound healing are significant. Excision and incision wound models were used in a study to assess the wound healing activity of extracts from the leaves of A. indica and T. cordifolia in Sprague-Dawley rats. The results showed that extracts from both plants significantly promoted the wound healing activity in both excision and incision wound models. Additionally, it was discovered that both plant-treated groups' healing tissue tensile strength was much higher than that of the control group in incision wounds. Other findings demonstrated that Azadirachta indica leaf extracts stimulate wound healing activities by enhancing the inflammatory response and neovascularization.

Antidiabetic Activity:

When used at a level of 800 mg/kg, neem root bark extract demonstrated statistically significant outcomes in a study that evaluated the effects of 70% alcoholic neem root bark extract (NRE) on diabetes. Another experiment was conducted to investigate the pharmacological hypoglycemic action of Azadirachta indica in diabetic rats. The results showed that in a glucose tolerance test, neem extract at a dose of 250 mg/kg demonstrated significantly lower glucose levels than the control group, and Azadirachta indica significantly lower glucose levels at the 15th day in diabetic rats. A. indica chloroform extract and B. spectabilis aqueous and methanolic extracts demonstrated good oral glucose tolerance and markedly decreased intestinal glucosidase activity, according to studies using an in vivo diabetic mouse model and chloroform, methanol, and aqueous extracts of the two plants. Another noteworthy study revealed that Azadirachta indica and Andrographis paniculata leaf extracts may be useful in the treatment of diabetes mellitus due to their strong antidiabetic properties.

Antibacterial Activity:

When compared to sodium hypochlorite, the standard endodontic irrigant, a study was conducted to determine the antimicrobial efficacy of herbal alternatives. The results confirmed that leaf extracts and grape seed extracts showed zones of inhibition, indicating that they had antimicrobial properties. Furthermore, compared to 3% sodium hypochlorite, leaf extracts displayed noticeably larger zones of inhibition. The antibacterial activity of guava and neem extracts was assessed against 21 strains of foodborne pathogens, and the study's findings indicated that both extracts may include chemicals with antibacterial capabilities that may be effective in controlling foodborne pathogens and spoilage organisms. Another test was conducted to determine the antibacterial effects of Azadirachta indica (neem) bark, leaf, seed, and fruit extracts on bacteria isolated from adult mouths. The results showed that only the bark and leaf extracts had any effect on the test bacteria. Furthermore, only at higher doses did fruit and seed extracts exhibit antibacterial action.

Antiviral Activity:

The findings demonstrated that neem bark (NBE) extract, at concentrations ranging from 50 to 100 g/mL, effectively inhibited HSV-1 entrance into cells. Additionally, when the extract was pre-incubated with the virus but not with the target cells, the inhibiting action of NBE was seen, pointing to a direct anti-HSV-1 property of the neem bark. The coxsackievirus virus B-4 has been shown to be susceptible to the virucidal effects of neem (Azadirachta indica Juss.) leaf extract, as demonstrated by virus inactivation and yield reduction assays in addition to interference at an early stage of the virus' replication cycle (NCL-11).

Antifungal Activity:

An experiment was conducted to test the effectiveness of several neem leaf extracts against the seed-borne fungi Aspergillus and Rhizopus, and the results showed that both alcoholic and water extracts significantly inhibited and controlled the growth of both fungal species. Further, alcoholic neem leaf extract outperformed aqueous extract in terms of slowing the growth of both fungal species. Another discovery demonstrated the antimicrobial function of aqueous neem cake extracts in the inhibition of spore germination against three sporulating fungi, such as C. lunata, H. pennisetti, and C. gloeosporioides f. sp. mangiferae. Additionally, the study's findings demonstrated that methanol and ethanol extract of Azadirachta indica showed growth inhibition against Aspergill Previous researchers have noted the antifungal properties of aqueous extracts of many neem sections, including neem oil and its main constituents. An investigation into the antifungal activity of Azadirachta indica L. against Alternaria solani Sorauer was conducted, and the results showed that the fraction of ethyl acetate, with a MIC of 0.19 mg, was most effective in slowing fungal growth and was also more effective than the fungicide (metalaxyl + mancozeb), which has a MIC of 0.78 mg.

Antimalarial Activity:

Neem leaf and stem bark extracts significantly decreased the level of parasitemia in infected mice by about 51–80% and 56–87%, respectively, according to an experiment done to test the antimalarial activity of extracts using Plasmodium berghei-infected albino mice. Other studies also revealed that azadirachtin and other limonoids present in neem extracts are active against malaria vectors. In a separate 72-hour culture of mature gametocytes and asexual parasites treated with IRAB (0.5 microg/mL), parasite numbers were less than 50% of those in control cultures, which had parasitemia levels of 8.0% and 8.5%, respectively. This finding was based on a crude acetone/water (50/50) extract of leaves (IRAB), which was used to evaluate the activity against the asexual and sexual forms of the malaria parasite, Plasmodium falciparum.

Role of Neem in Dentistry:

A study was conducted to evaluate the effectiveness of neem-based mouthwash in terms of its antigingivitis impact, and the results showed that chlorhexidine and A. indica mouthwash are both equally efficient in decreasing periodontal indices. Another investigation was conducted to assess the antibacterial capabilities of neem organic extracts against three bacterial strains responsible for dental caries. The findings revealed that petroleum ether and chloroform extracts had potent antimicrobial activity against S. mutans. Streptococcus salivarius was strongly inhibited by chloroform extract, while the third strain, Fusobacterium nucleatum, was extremely sensitive to both ethanol and water extract. An earlier discovery confirmed that, when compared to S. salivarius, S. mitis, and S. sanguis, dried neem chewing sticks had the strongest antibacterial effects against S. mutans.

Anti-nephrotoxicity Effect:

Rats were used in an experiment to test the effects of Azadirachta indica methanolic leaf extract (MLEN) on cisplatin-induced nephrotoxicity and oxidative stress, and the results showed that the extract is beneficial in protecting the kidney from CP-mediated oxidative damage. Additionally, downregulation of the caspase-3, caspase-9, and Bax genes was observed in the MLEN-treated groups according to PCR data.

Neuroprotective Effects:

Results of a study on the neuroprotective properties of Azadirachta indica leaves against cisplatin-induced neurotoxicity revealed that the morphological differences between neem before and after CP injection suggested that the brain tissue was well preserved. Biochemical parameters did not change in the neem-treated groups.

Immunomodulatory and GrowthPromoting Effect:

Neem infusion successfully increased antibody titre, growth performance, and gross return at the level of 50 mL/liter of fresh drinking water in an experiment to evaluate the growth-promoting and immunomodulatory effects on broiler chicks. Another study looked into how feeding broilers powdered dry leaves of A. indica (AI) affected humoral and cell-mediated immune responses. The findings revealed that AI (2 g/kg) treatment significantly increased antibody titres against the NCDV antigen.

CONCLUSION:

Neem (Azadirachta indica), a plant typically found in India, Pakistan, Bangladesh, and Nepal and a member of the Meliaceae family, is discussed here in terms of its therapeutic implications for the treatment of numerous ailments. Azadirachta indica contains a variety of different elements, including nimbin, nimbidin, nimbolide, and limonoids. [11] These kinds of substances are useful for managing disease through altering various genetic pathways and other processes. The first polyphenolic flavonoids to be isolated from neem

leaves were quercetin and ß-sitosterol, which were also recognized to have antifungal and antibacterial properties. There have been reports of numerous biological and pharmaceutical effects, including antibacterial, antifungal, and anti-inflammatory ones. [12] The anti-inflammatory, antiarthritic, antipyretic, hypoglycemic, anti-gastric ulcer, antifungal, antibacterial, and anticancer actions of neem have been established by earlier researchers, and a review outlined the many therapeutic roles of neem.

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