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Neem Plant Review: A Comprehensive Guide to Its Benefits and Care

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Abstract: *Neem, also known as azadirachta indica, has gained international attention recently due to its many therapeutic uses. Neem has become a contemporary medical cynosure and has been widely employed in ayurvedic, unani, and homeopathic medicine. Neem is a beautiful evergreen tree with wide leaves that may reach heights of 30 m and girths of 2.5 m. Its straight stem is between 30 and 80 centimeters in diameter. Its spreading branches grow up to 20 meters across, forming a rounded crown of deep-green foliage and honey-scented blossoms. Although azadirachtin is frequently utilized as a raw material to make biopesticides, it has been shown to have other qualities, most notably antimalarial and anticancer effects. Azadirachtin may be extracted using a variety of techniques, such as solid-liquidextraction as well as solvent extraction at either high or low temperatures. Alcohol-based solvents are recommended for the separation of azadirachtin from plant components since they are linked to greater extraction yields. In most cases, extracts must be cleaned in order to undergo further purification. Neem seeds have the greatest amounts of azadirachtin, however concentration values vary greatly across batches. As a result, regular techniques for azadirachtin identification and quantification must be established in addition to extraction processes. For the identification and measurement of azadirachtin in plant matrices, chromatography-based methods are preferred. All things considered, this procedure will ensure a future consistent, secure, and efficient usage of the extracts in commercial formulations.*

Keywords: taxonomy, morphology, pharmacological use, and macroscopical characteristics

I. INTRODUCTION

The neem tree, azadirachta indica a., is a tropical evergreen that is related to mahogany and a member of the meliaceae family. It is indigenous to east india and burma and is found throughout most of southeast asia and west africa. More recently, a few trees have been planted in the caribbean and a number of central american nations, including mexico. Indians have long held the neem tree in high regard; for centuries, millions have used its twigs to clean their teeth, its leaf juice to treat skin conditions, its tea as a tonic, and its leaves to ward off pests in their beds, books, grain bins, cupboards, and closets. Trees may grow to a height of 30 meters, with limbs that are half as broad. The pinnately complex, glossy, dark green leaves can reach up to 30 cm long. There are 10–12 serrated leaflets, each about 7 cm in length and 2.5 cm in width, on each leaf. It may flourish in regions with intense temperatures of up to 48°c and will grow when there is little moisture. Neem deserves to be referred to as a “wonder plant,” according to even some of the most skeptical specialists. In 1989, a group of private growers in san josé del cabo who were committed to organic gardening brought the neem tree to baja california sur, mexico. In 1992, this species was imported to yaqui valley, sonora, mexico [3], after the first trees were transferred from the philippines [1, 2].

TAXANOMICAL CLASSIFICATION

- Kingdom: Plantae
- Division: Magnoliophyta
- Family: Meliaceae
- Order: Rutales
- Suborder: Rutinae.
- Species: Indica
- Genus: Azadirachta

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II. MORPHOLOGY

Neem is a medium-sized tree that may grow to a height of 15 to 30 meters. Its wide, rounded crown can reach a diameter of 10 to 20 meters. Though mostly evergreen, it occasionally loses its leaves in the dry season. Neem is a mycorrhizal-dependent plant with a deep taproot.[3] in older trees, the bark becomes gray, cracks, and flakes. In humid areas, aged trees exude a sticky foetid sap. There are several branches that are growing. The leaves are glabrous, dark glossy green, alternating, petiolated, grouped at the tips of the branches, and unevenly pinnate.mature, with 10–20 leaflets and a length of 20–40 cm.[4] the leaflets are somewhat denticulate, sickle-shaped, and 5–10 cm long by 1.2-4 cm wide.[5] the white, fragrant, and abundant blooms are produced in big clusters that can reach a length of 30 cm. When unripe, neem fruits are smooth, green drupes that are 1-2 cm long and have a white, milky juice; when ripe, they change yellow to brown. Their endocarp is firm, their mesocarp is mucilagenous and fleshy, and their epicarp is thin. A varied quantity of ovoid (1-2 cm) oil seeds are present in them.[6]

RESOURCES

Biological Sources:-The fresh or dried leaves and seed oil of Azadirachta indica J. Juss (also known as Melia Indica or M. azadirachta Linn.)[6]

Geographical Sources:- India, Pakistan, Sri Lanka, Malaya, Indonesia, Japan, and the tropical regions of Australia and Africa are among its locations. It may be found in Tamil Nadu, Rajasthan, Maharashtra, Uttar Pradesh, and M.P. [7]

III. MEDICINAL USES OF AZADIRACHTA INDICA (NEEM)

1. Antimicrobial

The study was conducted to determine the antimicrobial activity of leaf extract of neem. The alcoholic extract of neem leaves which shows antimicrobial activity when compared with standard of gentamycin.[8,9,10] The alcoholic extract of neem shows the maximum inhibition on bacillus pumillus, pseudomonas aeruginosa, and staphylococcus aureus. Activity of the neem extract also found useful in inhibiting the growth of carcinogenic bacterium s. Sobrinus. (md. Mohashinebhuiyanetal. 1997). [11]Another study conducted to evaluate the bioactive compound which is used to get new antimicrobial agent. The cultured bacteria used for the study are staphylococcus aureus and enterococcus faecalis in which result shows the leaf extract of a neem shows potent antibacterial activity and bark extract of neem shows good antimicrobial activity on pseudomonas aeruginosa, proteus mirabilis and enterococcus faecalis at all the concentration. The seed extract shows the antifungal activity which is seen at 1000 and 2000µg/ml against candida albicans but the seed not show any antibacterial activity. [12] The study conducts to observe the antimicrobial activity of a acetone extract of neem leaf exhibit stronger inhibition against gram negative bacteria (e. coli and p. Aeruginosa). When compared to the chloroform extract for the similar bacteria the c.e shows stronger antimicrobial activity against b

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subtilis, 8 cereus, s. Pneumonia and s. Aureus which are gram positive bacteria the result proves that to contain many bioactive constituent which have effective antimicrobial activities and also found that it have a good cytotoxicity activities for cancer therapy.[13]

2. Antibacterial

The study conducted by gayathri menon et al, 2016 to evaluate the antibacterial activity of neem oil by using the bacterial pathogen after the result it is observed that the maximum zone of inhibition was seen with streptococcus mutans which is found to be 27mm in diameter. The zone of inhibition for enterococcus teacalis and lactobacillus acidophilus was observe to be 24mm and 18mm respectively. [14]

Various study conducts on azadirachta indica (neem) in which uwiba bazi francin et al,.2015 are one of them on the antibacterial activity of neem plant against straptophylococcus aureus and escherichia coli. The aqueous extract and methanol extract of leaf shows different result on straptophylococcus aureus strains. The used on the straptophylococcus aureus strain and the comparison are done based on the inhibition zones which is obtained after incubation. The result shows that the neem effect on these bacteria with ethanol extract were more efficient whether for dried and fresh neem bark and leaves. [15] the aqueous extract of leaves of azadirachta indica shows that the antibacterial activity against the microbial isolates. The detail study is carried out in 2019 with the aqueous extract of azadirachta indica for evaluate the antibacterial and antifungal activity against the microbial isolates.. After the comparision it is observe that the azadirachta indica shows good antibacterial activity.

3. Anti-Cancer

Azadirachta indica have been widely used as an anticancer. In the study conducted by the researchers on aqueous neem leaf extract which is used to study on in vivo murine system against 3H-B- -Pand the initiation phase of cancer is suppress by using the azadirachita indica extract. In the other study conducted by chaimuan graj et al. on the rats observe that the extract of neem leaf at the dose of (20,100,250mg/kg body weighty) inhibit the ACF (Azoxymethane induced aberrant cryptfoci) and also decrease the proliferating cell nuclear antigen IPCNA). In the recent year it is found that 06- alkyl guanines are carcinogenic so, the enzyme which detoxifies 06-alkylguanines are (MGMT) 0-6-methyl guanine DNA methyl transferase which try to maintain the integrity of cell.[16] So, in the recent study it is found that aqueous and ethanolic extract of neem enhance the activity of enzyme MGMT. There is also a chemical constituent in neem which posseses the anticancer property ex Azadirachtin A, Nimbolide, and Nimbidin. [17]

In a recent year wide study has been conducted on neem which contains several therapeutic compounds which is used for several disease and suppress the tumor by interfering with the carcinogens in process. The study also conducted by Muhammad et.al to prove the cytotoxicity of the chemical constituent of neemnimbolide in vitro by using different cancer cells and normal cells. The cells are seeded with nimbolide in different concentration for 24 and 48 hours and found that the cytotoxic effect of the neem compound is depend on time and dose which shows a good effect on cancer cell. Other Chemical constituent gedunin is a tetranorterpenoid isolated from the seed oil which is demonstrated its anticancer activity and used in breast cancer.[18]

4. Anti-inflammatory

The study conducted to investigate anti-Inflammatory activity in vitro of azadirachta indica and lawsonia inner mis (Henna) individual extract and in the combination of using the same solvent. The ethanolic extract of azadirachta indica shows anti-inflammatory activity with reference to diclofenac sodium.[19] The inhibition of protein denaturation in percentage and percentage of membrane stabilizing ethanolic extract, diclofenac sodium at 50,100 and 200 µg/ml. It shows 46.62% membrane stabilizing and inhibits 57.3% protein denaturation. The ethanolic extract of Henna at the concentration of 200 µg/ml shows inhibition of protein denaturation 53.75% and 39.89% protection membrane stabilization if the concentration is above 200 µg/ml protein denaturation is decrease and membrane stabilization is increase. The ethanolic extract of henna and neem when combine for study of anti-inflammatory activity it shows at the concentration of 200 ag/ml it shows increase in the anti-inflammatory activity.

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5. Wound Healing

The study of plant azadirachta indica is conducted to evaluate wound healing activity on excision wound model. The ethanolic extract of stem bark of neem is used, and it is compared with standard drug povidone iodine ointment (0.01% w/w). This test is performed on adult rat of both strains (Albino and Wistar). As comparison to the standard drug povidone iodine the ethanolic extract of azadirachta indica stem bark shows faster wound closure and wound contraction.[20]The neem extract has high wound healing property in the excision wound model. Wound healing percentage is increased ($P<0.05$) from day 0 till day 12 which was 99% and 100% in the case of neem ointment and gel. In the study conducted by Nakaoetal. 2009 shows that after application of neem ointment and neem gel to the wound of the diabetic rat (group 2, 3) it increases the rate of wound contraction ($P<0.05$) when compared to diabetic contraction (group c) By day 12 diabetic animal wound are treated with neem gel and ointment which close the wound 92.83% and 92% respectively while standard formulation of tetracycline which also closed wound by 94% in which is found that the topical formulation of tetracycline have increased percentage of wound healing in diabetic rats.[20]

IV. CONCLUSION

Azadirachtaindica, or neem, is very significant. Name's benefits have previously been noted in a number of publications. Its use in several medical ailments has been indicated by Ayurveda. The demand for neem products has been seen to be rising daily as a result of the current high level of public knowledge regarding herbal items. Every portion of the neem plant has a variety of uses. Numerous medical advantages of neem have been identified by researchers. Neem is well-known for its anti-inflammatory, anti-cancer, and anti-diabetic properties. Numerous Hindu ceremonies employ neem. This review work illustrates several applications of neem that will educate readers and introduce them to its wonders.

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