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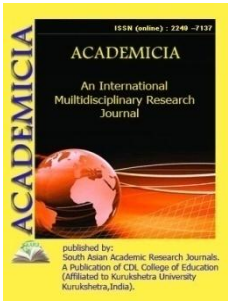

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A BRIEF STUDY ON AZADIRACHTAINDICA (NEEM)

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ABSTRACT

Neem (Azadirachtaindica) belongs to the Meliaceae family and is known for its health-promoting properties due to its high antioxidant content. It has long been utilized in Chinese, Ayurvedic, and Unani medicine, particularly in the Indian Subcontinent, to cure and prevent a variety of illnesses. An earlier discovery showed that neem and its components have a function in free radical scavenging and disease etiology prevention. According to animal research, neem and its main components have a key role in anticancer control by modulating a number of molecular pathways, including p53, pTEN, NF-B, PI3K/Akt, Bcl-2, and VEGF. It is regarded as a safe therapeutic herb that regulates a variety of biological processes without causing harm. I outline the function of Azadirachtaindica in illness prevention and therapy through the control of different biochemical and physiological processes in this paper. This paper can be used for future work for further study on Neem.

KEYWORDS: *Azadirachtaindica, Botanical Description, Effects, Healing, Neem.*

1. INTRODUCTION

Through the increase of antioxidant activity, suppression of bacterial growth, and regulation of genetic pathways, plant products or natural products play a significant role in disease prevention and therapy. Because of their low side effects and low cost, the medicinal function of a variety of plants in disease management is currently being vigorously studied. It is well acknowledged that allopathic medicines are costly and have a harmful impact on normal tissues and biological processes[1]. Many pharmacologically active medicines are produced from natural resources, including medicinal plants, as is widely recognized.

The Bible and the Quran, for example, both advocate the use of herbs in health treatment and prevention. The importance of herbs in illness management is also confirmed from an Islamic

viewpoint, with Prophet Mohammed (PBUH) recommending different plants and fruits for disease treatment. Many infectious, metabolic, and malignant illnesses are treated using neem components in Ayurveda, Unani, Homeopathy, and contemporary medicine. In many countries, several kinds of preparations based on plants or their components are extremely popular in illness treatment. Based on the fact that neem (Azadirachtaindica), a member of the Meliaceae family widely found in India, Pakistan, Bangladesh, and Nepal, has therapeutic implications in disease treatment and formulation[2].

Azadirachtaindica has a complex of components including as nimbin, nimbidin, nimbolide, and limonoids, which have a role in illness management by modulating different genetic pathways and other activities[3]. The first polyphenolic flavonoids, quercetin and ß-sitosterol, were isolated from fresh neem leaves and were recognized to have antifungal and antibacterial properties. Biological and pharmacological properties such as antibacterial, antifungal, and anti-inflammatory have been documented[4]. Researchers have previously verified their anti-inflammatory, antiarthritic, antipyretic, hypoglycemic, antigastric ulcer, antifungal, antibacterial, and antitumor properties, and a review highlighted neem's numerous therapeutic roles. The function of neem and its active components in disease prevention and therapy through regulation of different biological pathways is summarized in this study.

1.1 Botanical account of Neem:

The Meliaceae family includes the neem tree, which is abundant in tropical and semitropical areas such as India, Bangladesh, Pakistan, and Nepal. It is a fast-growing tree that reaches a height of 20–23 meters and has a straight trunk with a diameter of 4-5 feet. The leaves are complex, imparipinnate, and have 5–15 leaflets apiece[5]. It has green drupes that mature to a golden yellow color between June and August. Table 1 shows the taxonomic classification of Azadirachtaindica (neem).

TABLE 1: ILLUSTRATES THE TAXONOMIC CLASSIFICATION OF AZADIRACHTAINDICA (NEEM)

Order	Rutales
Suborder	Rutinae
Family	Meliaceae
Subfamily	Melioideae
Tribe	Melieae
Genus	Azadirachta
Species	Indica

1.2 Active Compounds of Azadirachtaindica L. (Neem):

Because of its abundant supply of different kinds of components, Azadirachtaindica L. (neem) has a therapeutic function in health management. Azadirachtin is the most active component, followed by nimbolinin, nimbin, nimbidin, nimbidol, sodium nimbinate, gedunin, salannin, and quercetin. Nimbin, nimbanene, 6-desacetylnimbinene, nimbandiol, nimbolide, ascorbic acid, n-hexacosanol and amino acid, 7-desacetyl-7-benzoylgedunin, 17-hydroxy-azadiradione, and nimbiol are among the compounds found in the leaves. Quercetin and ß-sitosterol, polyphenolic

flavonoids isolated from neem fresh leaves, have antibacterial and antifungal effects, while seeds include important components such as gedunin and azadirachtin.

1.3 Effect of Neem as Anti-Inflammatory:

Plants or isolated products of plants are used to treat or function as anti-inflammatory agents. In a cotton pellet granuloma test in rats, extract of A. indica leaves at a dosage of 200 mg/kg, p.o. exhibited substantial anti-inflammatory action, according to the results of a research. Other research found that neem leaf extract has a substantial anti-inflammatory impact, albeit it is less effective than dexamethasone, and that nimbidin inhibits macrophage and neutrophil activities that are related to inflammation. Earlier research revealed that bark and leaf extracts had immunomodulatory and anti-inflammatory properties, whereas oil seeds have antipyretic and anti-inflammatory properties. The analgesic efficacy of neem seed oil was tested on albino rats, and the findings indicated that neem seed oil had a substantial analgesic impact at doses of 1 and 2 mL/kg, and that the oil had dose-dependent analgesic action[6].

Another research looked at the anti-inflammatory effects of neem seed oil (NSO) on albino rats with carrageenan-induced hind paw edema, and the findings indicated that NSO exhibited increasing suppression of paw edema when the dosage was raised from 0.25 mL to 2 mL/kg body weight. During the dosage of 2 mL/kg body weight, NSO inhibited edema to the greatest extent (53.14 percent) at the 4th hour after carrageenan injection.The research found that rats given a 100 mg kg1 dosage of Azadirachtaindica fruit skin carbon tetrachloride extract (CTCE) and the isolated component azadiradione had substantial antinociceptive and anti-inflammatory effects.

1.4 Wound Healing Effect:

The wound healing effect is influenced by a variety of plants and their components. Excision and incision wound models in Sprague Dawley rats were used to evaluate the wound healing activity of extracts of leaves of A. indica and T. cordifolia, and the results revealed that extracts of both plants significantly promoted wound healing activity in both excision and incision wound models. Furthermore, the tensile strength of the healing tissue of both plants treated groups was shown to be substantially greater than the control group in incision wounds. Other findings revealed that Azadirachtaindica leaf extracts enhance wound healing activities by increasing inflammatory response and neovascularization[7].

1.5 Hepatoprotective Effect:

Medicinal herbs and their constituents serve an important function in hepatoprotection without causing any side effects. The hepatoprotective effect of azadirachtin-A in carbon tetrachloride (CCl_4) caused hepatotoxicity in rats was investigated, and histology and ultrastructure findings showed that pretreatment with azadirachtin-A decreased hepatocellular necrosis dose-dependently. Furthermore, the study's findings indicate that pretreatment with azadirachtin-A at higher dosage levels returns the rat liver to a modest degree of normalcy.

1.6 Antidiabetic Activity:

A research was conducted to assess the 70 percent alcoholic neem root bark extract (NRE) in diabetes, and the findings revealed that the neem root bark extract exhibited statistically significant outcomes in the 800 mg/kg dosage. Another experiment was carried out to investigate

the pharmacological hypoglycemic action of Azadirachtaindica in diabetic rats, and the results revealed that in a glucose tolerance test with neem extract 250 mg/kg, glucose levels were significantly lower than in the control group, and Azadirachtaindica significantly reduced glucose levels at the 15th day in diabetic rats.

1.7 Role of Neem in Dentistry:

A research was conducted to determine the effectiveness of neem mouth rinse in terms of its antigingivitis impact, and the results revealed that A. indica mouth rinse is just as efficient as chlorhexidine in lowering periodontal indices.Another research looked at the antibacterial capabilities of organic neem extracts against three bacterial strains that cause dental caries, with the findings revealing that petroleum ether and chloroform extracts had significant antimicrobial activity against S. mutans. Streptococcus salivarius was extremely sensitive to chloroform extract, while Fusobacterium nucleatum was highly sensitive to both ethanol and water extract. In comparison to S. salivarius, S. mitis, and S. sangui, dried chewing sticks of neem exhibited the highest antibacterial activity against S. mutans.

1.8 Antinephrotoxicity Effect:

The effects of a methanolic leaves extract of Azadirachtaindica (MLEN) on cisplatin-(CP-) caused nephrotoxicity and oxidative stress in rats were investigated, and the findings showed that the extract efficiently protects the kidney from CP-mediated oxidative damage. PCR findings for caspase-3, caspase-9, and Bax genes also revealed downregulation in the MLEN-treated groups.

1.9 Neuroprotective Effects:

The neuroprotective properties of Azadirachtaindica leaves against cisplatin-induced neurotoxicity were investigated in a research, and the results revealed that morphological findings of neem before and after CP injection indicated well-preserved brain tissue. There were no changes in biochemical indicators in the neem-treated groups.

1.10 Antimicrobial Effect:

Neem and its constituents prevent the development of a variety of microorganisms, including viruses, bacteria, and dangerous fungus. Individually, the function of neem in preventing microbial development is explained as follows.

1.10.1 Antibacterial Activity:

The antibacterial effectiveness of herbal alternatives as endodontic irrigants was evaluated and compared to the conventional irrigant sodium hypochlorite, with the findings confirming that leaf extracts and grape seed extracts exhibited zones of inhibition, indicating that they possessed antimicrobial characteristics. Leaf extracts also revealed considerably more inhibitory zones than 3 percent sodium hypochlorite.

1.10.2 Antifungal Activity:

The effectiveness of different neem leaf extracts on seed-borne fungus Aspergillus and Rhizopus was tested, and the findings showed that both alcoholic and water extracts substantially inhibited and regulated the growth of both fungal species. Furthermore, as compared to aqueous extract, the alcoholic extract of neem leaf was most effective in inhibiting the development of both

fungal species. Another finding revealed that aqueous extracts of neem cake inhibited spore germination against three sporulating fungi, including C. lunata, H. pennisetti, and C. gloeosporioides f. sp. mangiferae, and that methanol and ethanol extracts of Azadirachtaindica inhibited growth against Aspergillus flavus, Alternariasolani.

2. LITERATURE REVIEW

Rajkumar Paul et al. discussed a review on anticancer biology on Neem[8].A member of the Meliaceae family, neem (Azadirachtaindica) is a fast-growing tropical evergreen tree with a strong, robust stem. Neem has been dubbed "the wonder tree" and "nature's medicine store" because of its enormous therapeutic, domestic, agricultural, and ethnomedicinal value, as well as its closeness to human culture and civilization. All components of this tree, including the leaves, bark, seed oil, and refined products, are extensively utilized in cancer therapy. This plant has purified about 60 distinct kinds of biochemicals, including terpenoids and steroids. The anticancer activities of the crude and purified compounds from this plant have been fine-tuned through pre-clinical research work done over the past decade. The plant's anticancer qualities have mostly been investigated in terms of its preventative, protective, tumor-suppressive, immunomodulatory, and apoptotic actions against different cancers and their molecular processes. The goal of this study is to comb through the dispersed material on "the anticancer biology of A. indica," as well as associated toxicity issues and future prospects. The compelling evidence on the anticancer biology of A. indica compounds demands multi-institutional clinical studies as soon as feasible. The chances for comparatively inexpensive cancer medicines may potentially be better, especially for the world's poorest cancer sufferers.

AlokMaithani et al. discussed a review on Neem[9].Traditional medicine and medicinal plants are extensively used as a normative foundation for the preservation of good health in most underdeveloped nations. Based on knowledge acquired from traditional healers, about 121 medicinal items were developed in the past century. Natural chemical principles have grown simpler, which has aided in the creation of novel medicines derived from medicinal plants. And as a result of these facts, the global market for plant-derived chemicals – medicines, perfumes, flavors, and colorants – is worth several billion dollars each year. Because of numerous phytoconstituents found in it, as well as a variety of pharmacological properties connected with it, Azadirachtaindica is one of the most revenue-generating plants cultivated in India. The current study focuses on the literature on Azadirachtaindica leaves from a taxonomic, botanical, phytoconstituents, and pharmacological standpoint.Jose Francisco Islas et al. discussed a review on Neem and its impact on health[10].For a better knowledge of the metabolic process and its consequences in the human body, global health and medical practice strive to combine traditional medicine with evidence-based medicine. Complementary medicine, such as phytotherapy, is one example. Because of its many health benefits, Azadirachtaindica (Neem), a tree native to India and Myanmar, has been dubbed "The Village Pharmacy" or "Divine Tree" by many. Neem-derived extracts have recently been proven to be effective in a variety of applications, including insect repellant, anti-inflammatory supplements, diabetic management, and even cancer prevention. We describe the health benefits of various compounds and extracts derived from Neem, as well as the mechanisms and pathways by which Neem compounds produce their effects. We also warn that extracts produced under unsanitary and unstandardized conditions can

cause health problems, with certain compounds having potentially harmful effects on the liver and kidneys.

3. DISCUSSION

Natural products or their derivatives are becoming more popular in the treatment and prevention of illnesses owing to their lack of adverse effects. Neem and its constituents have medicinal properties and have been utilized in traditional medicine throughout the globe, particularly in the Indian Subcontinent, since ancient times. Clinical investigations have shown that neem is effective in preventing a variety of illnesses. Active components have been shown to have a chemo preventive impact in a variety of tumors by modulating several cell signaling pathways. To understand the precise mechanism of action in illness management, a thorough research based on animals should be conducted for future work.

4. CONCLUSION

Neem (Azadirachtaindica) has long been used as a herbal remedy for a range of human ailments. Researchers have been attempting to isolate the active compounds in this plant in order to determine its mechanistic, pharmacological, and clinical features using trustworthy methods. The refined version of neem is accessible in over 60 different formulations. These compounds are being evaluated on appropriate in vitro and in vivo systems to determine their anticancer and immunomodulation effects in comparison to crude neem extracts. There is strong experimental evidence that neem compounds, such as Azadirachtin A, Nimbolide, Nimbidin, and others, have anticancer effects. Their action has been studied at the molecular level. For these reasons, it is critical to perform appropriate clinical studies in order to pave the way for these medicines to be approved as anticancer medications on the market. The scientific evidence suggests that the use of appropriate medication combinations in conjunction with radiation and bioimmunotherapy may hold tremendous promise in finding a cure for cancer patients.Neem products may have certain unpleasant side effects, especially when used in large amounts. As a result, these items should only be used under the guidance and prescription of experienced medical practitioners and doctors.

REFERENCES

1. J. Jerobin, P. Makwana, R. S. Suresh Kumar, R. Sundaramoorthy, A. Mukherjee, and N. Chandrasekaran, “Antibacterial activity of neem nanoemulsion and its toxicity assessment on human lymphocytes in vitro,” *Int. J. Nanomedicine*, 2015, doi: 10.2147/IJN.S79983.
2. R. Subapriya and S. Nagini, “Medicinal properties of neem leaves: A review,” *Current Medicinal Chemistry - Anti-Cancer Agents*. 2005, doi: 10.2174/1568011053174828.
3. M. A. Alzohairy, “Therapeutics role of azadirachta indica (Neem) and their active constituents in diseases prevention and treatment,” *Evidence-based Complementary and Alternative Medicine*. 2016, doi: 10.1155/2016/7382506.
4. P. V. Quelemes *et al.*, “Effect of neem (Azadirachta indica A. Juss) leaf extract on resistant Staphylococcus aureus biofilm formation and Schistosoma mansoni worms,” *J. Ethnopharmacol.*, 2015, doi: 10.1016/j.jep.2015.09.026.
5. S. S. Bhat, “Neem – A Green Treasure,” *Electron. J. Biol.*, 2008.

6. H. K. Shannag, J. L. Capinera, and N. M. Freihat, "Effects of neem-based insecticides on consumption and utilization of food in larvae of spodoptera eridania (lepidoptera: Noctuidae)," *J. Insect Sci.*, 2015, doi: 10.1093/jisesa/iev134.

7. G. Benelli *et al.*, "Neem (Azadirachta indica): towards the ideal insecticide?," *Natural Product Research*. 2017, doi: 10.1080/14786419.2016.1214834.

8. R. Paul, M. Prasad, and N. K. Sah, "Anticancer biology of Azadirachta indica L (neem): A mini review," *Cancer Biol. Ther.*, vol. 12, no. 6, pp. 467–476, 2011, doi: 10.4161/cbt.12.6.16850.

9. A. Maithani, V. Parcha, G. Pant, I. Dhulia, and D. Kumar, "Azadirachta indica (neem) leaf: A review," *J. Pharm. Res.*, vol. 4, no. 6, pp. 1824–1827, 2011.

10. J. F. Islas *et al.*, "An overview of Neem (Azadirachta indica) and its potential impact on health," *J. Funct. Foods*, vol. 74, no. April, p. 104171, 2016.