

Review of Medicinal Value and Other Applications of Neem (Azadirachta indica)

Palak Bharadwaj¹, Prof. (Dr.) Garima Gupta²

¹*Research Scholer, School of Pharmacy, Monad University, N.H. 9, Delhi Hapur Road, Village & Post Kastla, Kasmabad, P.O Pilkhuwa - 245304, Dist. Hapur (U.P.), India.*

²*School of Pharmacy, Monad University, N.H. 9, Delhi Hapur Road, Village & Post Kastla, Kasmabad, P.O Pilkhuwa - 245304, Dist. Hapur (U.P.), India*

Abstract—An evergreen, temperature-tolerant, flowering plant with a common name of Azadirachtolide indica, Neem is originally from India but has since spread to other continents. It is one of many medicinal plants that have a variety of therapeutic benefits, and every part of the tree, both locally and after preparation in pharmaceutical industries, is used as medicine. It is effective against bacteria, fungi, viruses, ticks, and mites, among other microorganisms and Ectoparasites. Additionally, it has effects that are anti-malarial, anti-cancer, antioxidant, anti-diabetic, hepatoprotective, neuroprotective, and wound healing. In order to boost crop production, it is also applied to agriculture as pesticides and fertiliser. Due to the long-term use of synthetic products, drug resistance is currently the biggest issue in both humans and animals, making this plant a more preferable alternative to deal with the problem. A source of nutrients like protein, minerals, fatty acids, and vitamins, the tree is also used as animal feed.

Index Terms—Azadirachta indica, antidiabetic, hepatoprotective, neuroprotective, Ectoparasites.

I. INTRODUCTION

Originally from India, Neem (Azadirachta indica) is now grown in the majority of tropical and subtropical nations. The tree is able to adapt to a variety of climatic, topographic, and edaphic factors. It grows well in shallow soils that are dry, stony, and even have hard calcareous or clay pan. so that it can survive in the environment with little water and lots of sunlight. Currently, it can be seen flourishing in about 72 nations around the world, including those in North, Central, and South America, Asia, Africa, and Australia. West Africa first received the tree at the turn

of the century. Neem is a mahogany family member. A. indica J. Juss, a native of the Indian subcontinent, and Azadirachta excels Kack, a plant only found in the Philippines and Indonesia, are the two species of Azadirachta that have been identified the entire tree has been used traditionally as a home remedy for a number of illnesses. It creates a wide range of chemically diverse and structurally variable biologically active compounds using different components isolated from various tree parts.

The plant is used in combination with oil for greater effectiveness to reduce toxicity. The active ingredients include alkaloids, flavonoids, phenolic compounds, carotenoids, steroid, and ketones, which have anthelmintic, antimicrobial, antiulcer, antifertility, antidiabetic, anti-inflammatory, and antitumor properties. The Neem seed oil has toxicity effect against ectoparasites like ticks and mites which are common on cattle, equines, sheep, goats, wild ungulates and dogs. Alcohol and aqueous extracts of flowers of the tree also effect against cattle filarial parasite. The plant debris (after oil extraction) are potential source of organic manure and leaves could be used as a source for the preparation of compost having both fertilizer and pesticidal potential. Instead of killing the pests, it affects their life cycle. Antifeedant properties found in Neem compounds helps to protect the plants when applied on them and also it is being used to manufacture bioinsecticide that is environmentally friendly and do not have any side effect effects on plants and soil.

1.1 Synonym

margosa, Neem, nimtree or Indian lilac

1.2 Biological Source

Neem consists of the fresh or dried leaves and seed oil of *Azadirachta indica* J. Juss (*Melia Indica* or *M. azadirachta* Linn.).

Kingdom: Plantae

Family: Meliaceae

Subfamily: Melioideae

Tribe: Melieae

Genus: *Azadirachta*

Species: *indica*

Order: Rurales

Suborder: Rutinae



Fig 1. Neem (*Azadirachta indica*)

1.3 History & Origin

Neem is thought to have originated in Assam and Burma (where it is common throughout the central dry zone and the Siwalik hills). However, the exact origin is uncertain: some say Neem is native to the whole Indian subcontinent; others attribute it to dry forest areas throughout all of South and Southeast Asia, including Pakistan, Sri Lanka, Thailand, Malaysia, and Indonesia. It is in India that the tree is most widely used. It is grown from the southern tip of Kerala to the Himalayan hills, in tropical to subtropical regions, in semiarid to wet tropical regions, and from sea level to about 700 m elevation. As already noted, Neem was introduced to Africa earlier this century (see sidebar, page 85). It is now well established in at least 30 countries, particularly those in the regions along the Sahara's southern fringe, where it has become an important provider of both fuel and lumber. Although widely naturalized, it has nowhere become a pest. Indeed, it seems rather well "domesticated": it appears to thrive in villages and towns. Over the last century or so, the tree has also been established in Fiji, Mauritius, the Caribbean, and many countries of Central and South America. -In some cases, it was probably introduced by indentured laborers, who

remembered its value from their days of living in India's villages. In other cases, it has been introduced by foresters. In the continental United States, small plantings are prospering in southern Florida, and exploratory plots have been established in southern California and Arizona.



Fig 2. Neem (*Azadirachta indica*)

1.4 Chemical Composition

Neem, *Azadirachta indica* L., plays a therapeutic role in the management of health because it is a rich source of many different kinds of ingredients. Azadirachtin is the most significant active component, followed by sodium nimbin, nimbin, nimbidin, nimbidol, gedunin, salannin, and quercetin. Ascorbic acid, n-hexacosanol, amino acids, 6-desacetylnimbinene, nimbandiol, nimbolide, 7-desacetyl-7-benzoylazadiradione, 7-desacetyl-7-benzoylgedunin, 17-hydroxyazadiradione, and nimbiol are among the compounds found in leaves. Neem fresh leaves were used to purify the polyphenolic flavonoids quercetin and β -sitosterol, which are known to have antibacterial and antifungal properties. Neem seeds also contain beneficial compounds like gedunin and azadirachtin. Effects of these compounds on insects, and other inhibitory activities such as antitypanosomal and antiprotozoal. Siddiqui et al. extracted different constituents from the flowers of *Azadirachta indica* and analyzed their insecticidal activity, they found around 38 compounds in the flowers with insecticidal activity (such as: n-Hentriacontane, n-Nonacosane, n-Pentacosane, 2-Methoxy-5,40 dimethylbenzenebutanal, Methyl octadecanoate acid, etc). The group of tetranortriterpenoids, especially azadirachtin analogues are responsible for most of the active principles as it has many antiinfective and antimicrobial properties. The extracted chemical constituents of different parts of Neem tree contained

many biologically active compounds, including triterpenoids, alkaloids, phenolic compounds, flavonoids, carotenoids, ketones and steroid. The most biologically active compound is azadirachtin. This compound belongs to the C-seco limonoids which was classified as tetranortriterpenes. It is actually a mixture of seven isomeric compounds labelled as azadirachtin M and azadirachtin N. Benefits of usage of Neem: All parts of the tree, including the leaves, bark, roots, seeds, and twigs, contains medicinally useful active ingredients. Neem leaves are helpful for treating a variety of foot fungi, lowering fever, protecting against termites, treating neuromuscular pain, and acting as an anticoagulant, antihelminthic, antituberculosis, antitumor, antiseptic, antiviral, contraceptive, and in cosmetics, fertilisers, insecticides, and insect repellents. Neem bark and roots can treat skin conditions like eczema, psoriasis, scabies, and acne as well as fleas and ticks on pets. It is used to treat ulcers, diabetes, AIDS, cancer, heart disease, herpes, allergies, and other conditions as well. Neem oil has a number of therapeutic properties, including analgesic, antihelminthic, antihistaminic, antiprotozoal, antipyretic, antiviral, bactericidal, contraceptives, fungicides, insecticides, and cosmetology. Neem twigs, which are the tree's tiny, thin branches, are used as an oral deodorant, a toothache remedy, and a tooth cleaner.

II. PHARMACOLOGICAL ACTIVITIES OF NEEM

1. Bacteriophage effect

Neem has a broad spectrum of antibacterial activity that it can use to combat both Gram-positive and Gram-negative microorganisms. Neem extracts' antibacterial activity was tested against 21 different strains of foodborne pathogens, and the study's findings indicated that it contains compounds with antibacterial properties that may be useful in controlling bacteria and spoilage organisms. The results of a second experiment evaluating the antibacterial activity of *A. indica* extracts against bacteria isolated from adult mouths showed that bark and leaf extracts had antibacterial activity against all the test bacteria used.

2. Fungicide effects

At very low concentrations, nimbidin, nimbin, nimbidol, and Neem oil are very effective against

fungi such as *Trichophyton interdigitale*, *Coccidioides immitis*, and species of *Trichophyton*. High antimycotic activity from Neem extracts from various parts has already been documented. Because certain human fungi can be successfully treated with leaf, oil, and seed extracts, this property is highly valued in science. *Aspergillus flavus*, *Alternaria salami*, and *Cladosporium* are three fungal species that are resistant to the antifungal effects of *A. indica* leaf extract. Neem oil has been a lifesaver because it has the ability to treat many fungal diseases brought on by the aforementioned fungi.

3 Antiviral effect

Neem leaves have been found to be effective against Dengue virus type 2 because they prevent the virus from replicating in vitro and in lab animals. Its bark's aqueous extract was found to be effective against Herpes simplex virus type 1 by preventing it from entering the cell that it naturally targets. Although it is not a cure, it has been shown to be effective in preventing chickenpox, smallpox, and fowl pox. A 12-week oral administration of acetone water Neem leaf extract (IRAB) in HIV/AIDS patients significantly affected CD4 cells (which HIV decreases) in vivo without causing any negative side effects in the patients. Neem oil and Nimbidol are very efficient against.

4. Neem as insect repellent

Leaf Neem at very low concentrations, the potent insect repellent Azadirachtin prevents moth larvae from undergoing metamorphosis. Neem's aroma is sufficient to deter insects that feed on leaves (like grasshoppers and leafhoppers). Since it deters a wide range of pests, such as the beet armyworm, aphids, cabbage worm, white flies, mites, beetles, moth larvae, mushroom flies, leaf miners, and caterpillars, Neem oil formulation is widely used as a biopesticide for organic farming. Neem is the only food source that has been found to be effective against grasshoppers, and grasshoppers have been seen to starve to death rather than consume it.

5. Anti-oxidant function:

One of the primary initiators of many diseases is the free radical or reactive oxygen species. However, one of the crucial steps in the prevention of diseases is the neutralisation of Neem's free radical activity.

Antioxidants prevent free radicals from attacking targets in biological cells by stabilising or inactivating them. The anti-oxidative enzyme that helps control issues brought on by free radicals and reactive oxygen species is activated by Neem. There have been claims that Neem has antioxidant properties. Because they are a rich source of antioxidants, plants' fruits, seeds, oil, leaves, bark, and roots play a significant role in the prevention of diseases

6. Effect on healing wounds

Neem oil has active components that directly aid in the healing process of wounds. Since it directly aids the skin in maintaining its natural state during healing. Additionally, it contains a lot of essential fatty acids, which are crucial for giving the skin moisture and a smooth texture during the process. In addition to its capacity for skin restructuring, Neem leaf extracts and seed oil have an antimicrobial effect that speeds up wound healing by keeping the wound free of microorganisms. Neem also plays a crucial role in the prevention of inflammation, which lengthens the time it takes for a wound to heal. In addition to collagen, it also aids in the formation of granulation tissue and elastin.

III. SIDE EFFECTS & RIS

1. At recommended intake levels, Neem leaf extracts seem to be extremely safe, with few serious side effects reported.
2. Neem has additionally never been associated with any negative side effects when used as an anti-malarial or anti-retroviral agent.
3. Neem leaf extracts in water have been shown to lower blood levels of chloroquine in rabbits, but acetone water extracts of Neem have not been studied in this regard.
4. Additionally, the use during pregnancy has not been examined, so it is not yet advised.
5. Additionally, Conclusion there were no known drug interactions between Neem products.

IV. CONCLUSION

The adaptable medicinal plant Neem is a singular source of numerous types of compounds with varied chemical structures. It can be used to treat a variety of diseases brought on by microorganisms and other

factors in both humans and animals. It is used in industries for the creation of new drugs as well as in agriculture as pesticides and insecticides. Neem can be used as animal food because it contains nutrients, but only after being treated with sodium hydroxide to remove the tree's bitter taste. Neem also has a significant impact on helminthes and ectoparasites that have become resistant to antihelminthics and acaricides.

REFERENCE

- [1] Anonymous, "Neem—Growing Neem, organic farming, health, animal health, environmental use, home uses, economic potential, patents, new eJBiio Electronic," 2006.
- [2] S. K. Fathima, "Investigations on the biology and management of *Phomopsis azadirachtae* on Neem," Ph.D. dissertation, University of Mysore, Mysore, India, 2004.
- [3] N. G. Hegde, "Neem and small farmers constraints at grass root level," *Indian Journal*, vol. 121, pp. 1040–1048, 1995.
- [4] K. Biswas, I. Chattopadhyay, R. K. Banerjee, and U. Bandyopadhyay, "Biological activities and medicinal properties of Neem (*Azadirachta indica*)," *Current Science*, vol. 82, no. 11, pp. 1336–1345, 2002.
- [5] R. Subapriya and S. Nagini, "Medicinal properties of Neem leaves: A review," *Current Medicinal Chemistry—Anti-Cancer Agents*, vol. 5, pp. 149–160, 2005.
- [6] R. Verkerk and D. Wright, "Biological activity of Neem seed kernel extract and synthetic azadirachtin against larvae of *Plutella xylostella*," *Pesticide Science*, vol. 37, pp. 83–91, 1993.
- [7] J. A. Parrotta, *Healing Plants of Peninsular India*. New York, NY, USA: CABI Publishing, 2001, pp. 495–496.
- [8] M. Choudhury, "Efficacy of Neem leaf (*Azadirachta indica*, family: Meliaceae) in the control of larvae of *Boophilus decoloratus*, a one-host tick in cattle," *Journal of Nepal Pharmaceutical Association*, vol. 21, pp. 41–43, 2003.
- [9] V. Mishra, N. Parveen, and K. C. Singhal, "Antifilarial activity of *Azadirachta indica* on

- cattle filarial parasite *Setaria cervi*,” *Fitoterapia*, vol. 76, pp. 54–61, 2005.
- [10] S. Gajalakshmi and S. A. Abbasi, “Neem leaves as a source of fertilizer-cum-pesticide vermicompost,” *Bioresource Technology*, vol. 92, pp. 291–296, 2004.
- [11] S. Vethanayagam and S. Rajendran, “Bioefficacy of Neem insecticidal soap (NIS) on the disease incidence of bhendi, *Abelmoschus esculentus* (L.) Moench under field conditions,” *Journal of Biopesticides*, vol. 3, no. 1, pp. 246–249, 2010.
- [12] A. Prakash, R. Tewari, and R. Mathur, “Non-hormonal post-coital contraceptive action of Neem oil in rats,” *Journal of Ethnopharmacology*, vol. 23, no. 1, pp. 53–59, 2006.
- [13] B. Brototi and R. D. Kaplay, “*Azadirachta indica* (Neem): Its economic utility and chances for commercial planned plantation in Nanded District,” *International Journal of Pharmacy*, vol. 1, no. 2, pp. 100–104, 2011.
- [14] I. A. Ross, *Medicinal Plants of the World: Chemical Constituents, Traditional and Modern Medicinal Uses*, vol. 2. Totowa, NJ, USA, 2001, pp. 81–85.
- [15] K. Biswas, I. Chattopadhyay, R. Banerjee, and U. Bandyopadhyay, “Biological activities and medicinal properties of Neem (*Azadirachta indica*),” *Current Science*, vol. 82, pp. 1336–1345, 2002.
- [16] A. Noorul and Gayathri, *All About Neem*. Mumbai, India: Neem Foundation, 2012.
- [17] P. Sharma, L. Tomar, M. Bachwani, and V. Bansal, “Review on Neem (*Azadirachta indica*): Thousand problem one solution,” *International Research Journal of Pharmacy*, vol. 2, no. 12, pp. 97–102, 2011.
- [18] D. Imefonudoh, N. U. Asamudo, D. N. Bala, and O. Enwongo, “Inhibitory effect of varying concentrations of leaves extracts of *Centella asiatica* (Gotu Kola) on some microorganisms of medical importance,” vol. 3, no. 2, pp. 142–148, 2012.
- [19] B. S. Siddiqui, F. Afshan, and T. Gulzar, “Tetracyclic triterpenoids from the leaves of *Azadirachta indica*,” *Phytochemistry*, vol. 65, pp. 2363–2367, 2004.
- [20] B. Khillare and T. G. Shrivastav, “Spermicidal activity of *Azadirachta indica* (Neem) leaf extract,” *Contraception*, vol. 68, pp. 225–229, 2003.