

AZADIRACHTA INDICA A. JUSS. (NEEM): A GOD GIFTED MEDICINAL TREE

B. L. JAGETIYA, S. KOTHARI and A. SONI

Laboratory of Plant Physiology and Biotechnology, Department of Botany, M.L.V. Government College, Bhilwara - 311001 (Raj.), India.

Email: lppb_2002@yahoo.com

Neem or Margosa (*Azadirachta indica* A. Juss. family- Meliaceae) is a native tree of India. It occurs throughout the greater part of India and about 18 million Neem trees present in our country. It is an incredible and versatile tree that has been declared the "tree of the 21st century" by the United Nation. In India it is variously known as "divine tree", "life giving tree", "nature's drug stores", "villager's dispensary" and "panacea for all diseases". It is one of the major components in Ayurvedic medicine. Each and every part of Neem has been used in the Indian Ayurvedic and Unani systems of medicine. Research on plant chemistry aspect of this fabulous tree has yielded more than a hundred terpenoids apart from other classes of organic compounds. Medicinal properties of Neem have been known to Indians since a very long time. Various parts of neem are used to cure varied range of diseases, both external and internal disorder in human body. Our ancestors had lived long and healthy lives due to their healthy eating habits and the regular use of medicinal herbs like Neem. Nowadays Neem and its extracts are used in numerous herbal and allopathic medicines. There are various other valuable Neem products available at present in the market. The popular types of medicinal and oral-hygiene product manufactured by this herb include oils, powders, tablets, toothpaste, gels, herbal tea and soaps. What's more even Neem contraceptives are available in market these days. One great thing about Neem medicines and products are that they are absolutely free from any kind of side effects. Herbal remedies are often touted as wonder drugs but fail to stand up to their claims. A growing body of evidence indicates that Neem may be valuable medicinal plant.

Keywords: *Azadirachta indica*; Antihaemorrhoids; Anthelmintic; Margosa; Muarubaini.

Introduction

Neem or Margosa (*Azadirachta indica* A. Juss. family- Meliaceae) is a native tree of India and found all over the country. It is most versatile esteemed, and an incredible tree that has been declared the "Tree of 21st century" by the united nation¹. In wild, it is found in parts of the Indo-Gangetic plain in the Deccan, Karnataka and West Cost, up to an altitude of 3000 ft. The related species of Neem are Thai Neem tree (*Azadirachta siamensis*), Sentang or Marrango tree (*Azadirachta excelsa*), Persian Lilac or China Berry tree (*Melia azederach*), *M. toosenden*, *M. volkensili* etc.

A lot of heed has been given to this fabulous tree, especially in the Indian culture. It has been closely associated with the socio-cultural and religious aspects of Indian life science. In India, it is variously known as "Divine tree", "Villager's dispensary", "life giving tree", "natures drugstore" and "panacea of all diseases"². This tree has been so important and invaluable that from its

various names we can guess its worth. In Sanskrit Neem is known as "Aristha" which means "warder off evil and pestilence". Africans call it as "muarubaini" meaning forty uses or forty cures. Some other familiar names of Neem tree are 'Kalpavriksha', 'Miraculous tree' and 'wonder plant' or a tree of solve global problem. The Washington based National Research Council says "probably no other plant yield as many stranged and varied products or has as many exploitable by products as this"³. This tree is famous for a lot of qualities that it possesses, but its most noticeable attribute is its medicinal value. Ayurveda, the ancient Indian medical science has made use of this majestic herb for curing innumerable diseases. The Neem is an ancient Indian cure, all due to its antibacterial, antifungal, antiviral, antihistamine and antiseptic properties. The Neem leaves, flowers, seeds, roots, bark and fruits are utilized to treat inflammation, infections, skin diseases and for dental care⁴. This tree is not only beneficial for human health but also very advantageous from the ecological point of view.

Today Neem is once again steadily becoming an agro-scientific celebrity. It has figured as the priority in seminars and serious agriculture workshop all over the world. Modern Western medicine is finally discovering what the ancient Indians have known for thousands of years that the Neem tree has superb pharmaceutical and pesticide controlling qualities. Its effectiveness, availability and safety have made agro-scientists promote cultivation of Neem forests. The azadirachtin compound in Neem has been recognized as an effective insecticide that is biologically selective, not harming the useful pest-predators but keeping almost 250 harmful ones at bay. Scientists recommend coating urea with Neem cake to kill nitrifying bacteria. Even water management with Neem to control vectors of Japanese encephalitis was the success of Neem over DDT.

Systematic position of Neem

Kingdom; Plantae; Division; Magnoliophyta Order; Sapindales; Family; Meliaceae; Genus; *Azadirachta*; Species; *A. indica*; Margosa tree (English); Nimbah, Arishta (Sanskrit); Neem (Hindi); Vempu, Veppai (Tamil); Kondavepa (Telgu); Nimba (Marathi); Turagavepu (Kannada); Other Indian names; Neem, Nim, Indian lilac, Limbo, Limda

Morphology of Neem tree- Neem is a fast-growing tree that can reach a height of 15-20 m (about 50-65 feet) rarely to 35-40 m (115-131 feet). It is evergreen, but in severe drought it may shed most or nearly all of its leaves. The branches are wide spreads. The fairly dense crown is roundish or oval and may reach the diameter of 15-20 m in old, free-standing specimens⁵.

Trunk- Trunk is relatively short, straight and may reach a diameter of 1.2 m (about 4 feet). It is classified as a bush but it is not very weak.

Leaves- Opposite, pinnate leaves are 20-40 cm (8 to 16 in) long, with 20 to 31 medium to dark green leaflets about 3-8 cm (1 to 3 in) long. The terminal leaflet is often missing. The petioles are short. Very young leaves are reddish to purplish in color. The shape of mature leaflets is more or less asymmetric and their margins are dentate with the exception of the base of their basis copal half, which is normally very strongly reduced and cuneate or wedge shaped.

Flowers- White and fragrant flowers are arranged auxiliary, normally in more or less drooping penicles which are up to 25 cm (10 in) long. The inflorescence, which branch up to the third degree, bears 150 to 250 flowers. An individual flower is 5-6 mm long and 8-11 mm wide. Protandrous, bisexual flowers and male flowers exist on the same individual.

Fruits- Fruit is a smooth (glabrous) olive-like drupe which varies in shape from elongate oval to nearly roundish and when ripe are 1.4-2.8 x 1.0-1.5 cm, the fruit skin (exocarp) is thin and the bitter-sweet pulp (mesocarp) is yellowish-white and very fibrous. The mesocarp is 0.3-0.5 cm thick. The white, hard inner shell (endocarp) of the fruit encloses one, rarely two or three elongated seeds (kernels) having a brown seed coat. The Neem tree is very similar in appearance to the Chinaberry, all parts of which are extremely poisonous.

Ecology of Neem tree-The Neem tree is noted for its drought resistance normally it thrives in areas with sub-arid to sub-humid condition with an annual rainfall between 400 and 1200 mm. It can grow in regions with an annual rain fall below 400 mm but in such cases it depends largely on ground water levels. Neem can grow in many different types of soil, but it thrives best on well drained deep and sandy soils. It is a typical tropical to subtropical tree and exists at annual mean temperatures between 21-32°C. It can tolerate high to very high temperature and does not tolerate temperature below 4°C. Neem is a life-giving tree, especially for the dry coastal, Southern districts of India.

It is one of the very few shade-giving trees that thrive in the drought-prone areas. The trees are not at all delicate about the water quality and thrive on the merest trickle of water whatever the quality. In India, it is very common to see Neem trees very used for shade lining the streets or in most people backyards. In very dry areas, the trees are planted in large tracts of land.

Ethnobotany- The Neem tree has been used for more than 4500 years in the Indian subcontinent. The Indian physician Charak (2nd Century AD) and Susruta (4th century AD), whose books provided the foundation of the Indian system of natural treatment. The Ayurveda, also mention the tree and its medicinal uses. In ancient times Neem was the most celebrated medicinal tree of India and found mention in a number of puranic texts like the Atharva veda, Upanishad, Amarkosha and Ghryutra. In Aurveda the Neem tree was called the "sarvaroganivarini" (one that could cure all ailments and ills). At the beginning of this century the Neem tree was still highly esteemed by Indian emigrants and they took it long to the places where they settled. Thus the Neem tree was introduced in places like Australia, East and Sub-Saharan Africa, South-East Asia and South America. Pioneering work in the possible commercial use of Neem oil and cake had been done by the Indian institute of science in Bangalore as early as the 1920s².

In the last two decades research on Neem has

been intensified and many of the trees agricultural and medicinal properties were rediscovered. Today Neem plays a major role in the rural industry of India and projects for the commercial use of Neem have been successfully introduced in other countries.

Chemistry of Neem-The chemical constitutes of Neem are diverse and the complex chemical compounds can be divided in two broad group - Terpenoids and others (Non terpenoids). Non terpenoid group include flavonoids and their glycoside, dihydro-chalcones, tannins, amino acids, glycerides, polysaccharides, aliphatic compounds and sulphur compounds etc. However, biological activity of Neem depends mainly on various terpenoids present in different parts of Neem. Among the terpenoid, diterpenoids and triterpenoids are most commonly encountered⁶. A number of tricyclic diterpenoids have been isolated from Neem stem bark and Neem root bark, but in only one case was biological activity against a number of microorganisms reported for a fraction containing nimbinone, nimbinone, nimbionone and nimbionol. Triterpenoids are the most important chemical constituents present in Neem by virtue of their wide array of biological activities¹⁵.

More than 135 compounds have been isolated from different parts of Neem and several reviews have also been published on the chemistry and structural diversity of these compounds⁷.

Triterpenoids in Neem can be broadly classified on the basis of carbon skeleton as under:

- i. Trinortriterpenoids viz. - Limonin isolated from neutral fraction of Neem kernel extract.
- ii. Tetranortriterpenoids- These are the most important group of triterpenoid as far as biological activity is concerned. They are formed from the Δ^7 euphol / tirucallol and apo-euphol / apo-triucallol, respectively by oxidative degradation of the C-17 side chain resulting in the loss of 4 carbon atoms⁸.
- iii. Pentanortriterpenoids viz. - Nimbindiol and its 6-acetyl derivative, nimbenene and its 6 deacetyl/derivative isolated from Neem seed oil, leaves and barks.
- iv. Hexanortriterpenoids viz. - Nimoliciniocic acid which is so far the only hexanortriterpenoids isolated from *A. indica* and the first hexanortriterpenoidal acid isolated from any source.
- v. Octanortriterpenoids viz. - Desfuranoazadiradione, a new octanortriterpenoids isolated from fresh fruit coating.

With above mentioned chemical groups Neem also have sodium, potassium salts, chlorophyll, calcium, phosphorous, iron, thiamine, riboflavin, nicotin, vitamin C, carotene and oxalic acid. Ingredients that form its

therapeutic value are as follows:-

- a. Limonoids, b. Terpenoids and steroids, c. Tetranortriterpenoids, d. Fatty acid derivative like margosinone and margosinolone, e. Coumarins like scopoletin, dihydrosocoumarins, f. Hydrocarbons like docosane, pentacosane, heptacosane, octacosane etc., g. Sulphur compounds, h. Phenolics, i. Flavonoglycosides, j. Tannins

Medicinal properties of Neem-Medicinal properties of Neem have been known to Indians since a very long time. Each and every part of Neem tree has been used in the Indian Ayurveda and Unani systems of medicine⁹. In Ayurvedic literature Neem is described as follows- Neem bark is cool astringent, bitter, acrid and refrigerant. It is useful in cough, fever, tiredness, loss of appetite and worm infestation. It heals wounds and vitiated conditions of kapha, excessive thirst, vomiting, skin diseases and diabetes. Neem leaves are beneficial for insect poisons and eye disorders. Neem treats vatic disorder. It is antileprotic. Neem fruits are purgative, bitter anti-hemorrhoids and anthelmintic. Neem possesses anti-inflammatory, antiarthritic, antipyretic, hypoglycemic, spermicidal, antifungal, antibacterial, diuretic, antimalarial, antitumor etc. properties¹⁰.

Health benefits of Neem- Neem tree has various health benefits. Few of these are followings-

1. Neem tree is generally considered to be an air purifier and a preventive against malarial fever and cholera. An infusion or a decoction of the fresh leaves is a bitter vegetable tonic and alterative, especially in chronic malaria fevers because of its action on the liver, it should be taken in doses of 15 to 60 grams.
2. The leaves applied externally are very effective in skin disease. They are especially beneficial in the treatment of boils, chronic ulcers, eruptions of small pox, syphilitic sores, glandular swelling and wounds. They can be used either as a poultice, decoction or liniment¹¹.
3. The use of 3 grams of the inner bark with 6 grams of jaggery every morning is very effective in piles. To check bleeding piles, 3 or 4 Neem fruits can be administered with water.
4. Neem water can be applied on the injuries due to burns and this helps to heal the burns and also to prevent infections. Neem water bath is also found to be ideal for fighting the infections.
5. Health tonic made of Neem leaf extractions may be used to improve oxidation level of blood cell¹².
6. Neem water extractions help to clean digestive tract by removing the harmful bacteria and their toxins present in the digestive tract. It also helps to cure infection in the

urinary tract¹.

7. Bark, leaves and seed oils contain, polysaccharides and limonoides which can be used for fighting the cancer. These ingredients can block the cancer cells from adhering to the normal cells present in the body and can easily excrete them with help of the immune system of the body¹³.

8. Neem leaves have antihistamine properties due to the presence of nimbodin and it can be used for expanding the blood vessels and thereby reducing the blood pressure¹.

9. One fresh leaf of Neem, along with tender coconut water, taken for a week, before the rainy season helps to enhance the immune system of the body.

10. Fresh juice from the tender leave of Neem slightly warmed and cool can applied to the eyes, against conjunctivites.

11. The tender stem of Neem used as a toothbrush can protect the gums and teeth from infection.

12. Fresh juice of Neem along with honey slightly warmed and cooled can be used for gargling to get relief from throat pain.

13. Juice of fresh leaves (15-30 ml) along with honey taken orally on empty stomach for 14-days to treat jaundice.

14. The ash of dried leaves of Neem (2 g) with a glass of water helps to prevent the formation of urinary calculi.

15. Neem oil (15-20 drops) taken twice daily for ten days help to prevent malaria and also acts as a remedy against malaria.

16. Fresh juice of Neem leaves to be applied externally over the anal region for relief from irritation and redness due to worm infection of children.

17. Neem oil may be applied externally to reduce exceptive sweating of the palm of the hand and sole of the foot.

18. Neem dried leaf powder (10-15gms) along with pure ghee on empty stomach for a month helps to cure anemia.

19. Fresh leaves of Neem along with turmeric and hen's egg white is prepared in form of the paste and applied over the face. This helps to get rid of pimples.

20. Decoction prepared from Neem leaves *Tinospora cordifolia* and sandal wood (60ml, twice daily for 14 days) help to prevent allergy/allergic rashes.

21. Decoction made from Neem leaves and turmeric can be used a vaginal douche to prevent/cure irritation and itching due to vaginal discharge.

22. Treatment for AIDS- The national institutes of health reported positive result from a 1993 study using Neem to kill the AIDS virus in a lab. The suggested pathway is via Neem's immune modulating polysaccharide compound that may cause increased antibody production. Further research is underway.

23. Diabetes-Neem leaves juice approximately 5 ml taken

early in the morning for 3 months helpful in diabetes.

24. Neem flowers soaked in honey taken every night is found to boost immunity¹⁴.

25. Treatment for several diseases-

-*Heart diseases* including high blood pressure, blood clots, cholesterol and Arrhythmia/rapid heartbeat.

-*Blood disorders*- Including poor circulation blood poisoning and kidney problems.

-*Digestive disorders*- Including heart burn/indigestion, peptic/duodenal ulcers gastritis and hemorrhoids.

-*Nervous disorders*- Including anxiety epilepsy and lives.

-*Sexually transmitted diseases*- Including gonorrhea, syphilis, chlamydia, genital herpes, genital/vaginal warts, candidiasis and urinary tract infections. As far as AIDS is concerned the immune-modulator properties of Neem appear to enhance cell-mediated immune responsive in people who are HIV positive but who do not full blown AIDS.

-*Birth control*- Works for men and women.

-*Cancer*- Neem being depurative purifies the blood and being an astringent decreases the body heat. Chewing of 10 to 20 Neem leaves chewed or powder taken daily in warm water is helpful.

-*Leprosy and Leucoderma*- 10 drops of Neem oil mixed with 1 teaspoon sugar twice a day acts as a supportive parts of treatment. The anti-leprotic action of Neem works.

-*Allergy*- 8 to 10 fresh Neem leaves are to be eaten early morning on an empty stomach. This helps in purifying blood and control the allergic condition.

Neem Products- Neem is used in making various useful products. A large number of Neem products are available in the market. Few of these are as follows¹⁶.

Neem Skin products (Neem soap, Neem antiseptic cream, Neem face wash etc.), Neem hair products (Neem hair oil, Neem shampoo), Neem toothpaste, Neem spray, Neem cleanser, Neem disinfectant, Neem pharmaceutical/ medicinal products, Neem fertilizers and pesticides products, Neem tea, Neem mosquito repellent.

References

1. Dhanya 2009, *Medicinal value of Neem*. <http://www.seoflicks.com>.
2. <http://www.Gits4u.com>. 2006, *Medicinal tree Neem*.
3. Nag S K, Oria B K and Raikwar M K 2004, Chemistry and structure activity relationship of chemicals from Neem and allied species as potential botanical pesticide. *Everyman's Science*. 38(5) 266-277.
4. Gupta V K 2009, *Amazing benefit of the medicinal herb Neem*. <http://www.ezinearticles.com>.
5. [http://en.wikipedia.org/wiki/Azadirachta indica](http://en.wikipedia.org/wiki/Azadirachta_indica)

- 2009.
6. Jarvis A P, Johnson S and Meregán E D 1997, *Pestic. Sci.* **53** 217-222.
 7. Chattopadhyay B, Chattopadhyay K, Chattopadhyay I, Banerjee R K and Bandhyopadhyay U 2002, Biological activity and medicinal properties of Neem (*Azadirachta indica*) *Curr. Sci.* **82**(11) 1336-1345.
 8. Schumutterere H 1995, *The Neem Tree* (Schumutterere, H. Ed.), VCH Publication.
 9. Rehman S Z and Jairajpuri M S 1993, *Neem in Unani medicine*. Neem research and development society of pesticide science, India New Delhi, pp 208-219 (Randhva V S and Parmar B S ed.).
 10. Ganguli S 2002, *Neem : A therapeutic for all seasons. Curr. Sci.* **82** (ii) 1304.
 11. <http://www.home-remediesguide.com>.2010, *Margosa - medicinal properties and benefits.*
 12. Smith D M 2009, *Research support value of Neem herbal extracts.* <http://www.suite101.com>.
 13. Parekh H 2008, *Medicinal properties of Neem.* <http://www.healthjockey.com>.
 14. Jshaiju 2010, *Medicinal uses of Neem.* <http://hubpages.com>.
 15. <http://www.neem foundation.com/Chemistry of Neem>. "Greening India with Neem"1980-2008 Mumbai, India.
 16. <http://www.neemproduct.com>. 2010, *Neem medicinal properties.*