



A Review on *Azadirachta indica* A. Juss- Its Role in Health Management and Organic Farming.

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ABSTRACT

Azadirachta indica A.Juss, commonly called as neem or margossa which belongs to the family meliaceae has medicinal use as well as agricultural use as a biopesticide, as a fertilizer and in pest control. The plant is a fast growing ever green tree with wide spreading branches, imparipinnate compound leaves and drooping axillary panicle inflorescence. The secondary metabolites found in neem have so many benefits in medical field such as free radical scavenging properties, management of cancer and used as an anti-inflammatory agent. It plays a pivotal role as a hepatoprotective, has wound healing action, effective in reducing periodontal indices and has anti-fungal, anti-bacterial and anti-viral properties. In agriculture, neem cake and neem oil are used as fertilizer with pesticidal properties. This review highlights the dual role of *Azadirachta indica* plant in the medical field as well as in the agricultural field to develop a new scenario of research.

Key words: *Azadirachta indica*, Azadirachtin, hepatoprotective, anti-microbial, biopesticide

Introduction

The Ancient people used plants for both food and medicine. The useful plants were identified through keen observation on nature and their surroundings and also by seeing the interaction between plants and animals. The ancient Indian Material medica was developed through the contribution of medicinal plants in India. The cultivation practices of many medicinal plants were undertaken by several research institutes for their study. They developed the agronomical practices of many medicinal plants such as belladonna, ergot, poppy, senna, cinchona etc. for localized cultivators for commercial application. Many of the medicinal plants have use in health management. Certain plant secondary metabolite has medicinal properties and also use in organic farming. *Azadirachta indica* A.Juss, commonly called as neem or margossa belongs to the family meliaceae have medicinal use as well as use in agriculture as a biopesticide and also as a fertilizer to enhance the yield and control of pest attack.

Taxonomical classification

Kingdom- Plantae

Phylum- Tracheophyta

Class – Magnoliopsida

Order – Rutales

Family – meliaceae

Genus – *Azadirachta*

Species – *indica*

SYNONYMS: *Melia azadirachta* Linn, *Melia indica* Corr, *Media indica* Brandis

Vernacular Names

Language	Name
Bengali	Nee, Neemgachh
English	Neem tree, Margosa tree, Indian Lilac, Vep tree
Gujarati	Kohumba, Libado
Hindi	Neem, Nim, Nimba
Kannada	Kadbevina-mara, Olle, Val-venu, Huccabevu, Cikkabevu

Malayalam	Veppu, Aryaveppu, Rajaveppu
Marathi	Kadukhajur, Limba, Nimbay, Nimuri
Sanskrit	Neem, Nimbah, Vembaka
Tamil	Veppa, Vembu, Veppu
Telugu	Veppa, Veppachettu, Kondavepa, Teruka

Plant description

Azadirachta indica commonly called as margosa or neem which is found in abundance in tropical and semitropical regions like India, Bangladesh, Pakistan, and Nepal, is a fast growing ever green tree that can reach a height of 15- 25metres with wide spreading branches. The leaves with short petiole and imparipinnate compound leaves with leaflets which are opposite and serrate margined with very oblique base. Flowers cream or yellowish white, fragrant arranged in more or less drooping axillary panicles. Bisexual flowers with staminal tubes conspicuous, cylindric widening above, 9-10 lobed at the apex. Fruits are one seeded glabrous, olive -like drupes with outer thin epicarp and the bitter sweet pulpy fibrous mesocarp. The endocarp is woody and very hard enclosing the ellipsoidal seeds having thick, fleshy and oily cotyledons.

Parts used: Bark, leaves, flowers, seeds

Chemical constituents

Neem (*Azadirachta indica* L.) plant contains a rich source of various types of ingredients and therefore they show therapeutics role in health management. Tannin, non-tannin and red dye are obtained from the stembark. The clear, bright, amber colored gum commonly called as the EAST- INDIA GUM is the exudate of the bark. The phytochemicals nimbin, nimbinene, 6-desacetylnimbinene, nímbandiol, nímbolide and quercetin, along with B-sitosterol, n-hexacosanol and nonacosane are extracted from the leaves. The Analysis of the mature leaves gave moisture, carbohydrates, fats, fibres, proteins and minerals, calcium, iron, phosphorus, vitamin thiamine, niacin carotene etc. The aminoacids- glutamic acid, tyrosine, aspartic acid alanine, proline, and glutamine are also present. The fruits contain gedunin, 7-deacetoxy-7a-hydroxy gedunin, azadiradione, azadirone, 17-hydroxy-azadiradione, 17-epiazadiradione and nimbiol.

Anti-microbial activity

The different parts of neem plants (*Azadirachta indica*) show antimicrobial activity through inhibitory effect on microbes such as bacteria viruses, and pathogenic fungi.

Anti- bacterial activity

In-vitro experiments were conducted and the results suggest that the ethanol extracts of neem leaves have anti-bacterial activity against both *Staphylococcus aureus* and MRSA with greatest zones of inhibition noted at 100% concentration (Sarmiento et al, 2011). Studies were conducted to evaluate the anti-bacterial efficacy of herbal alternatives compared with the standard irrigant sodium hypochlorite and the results confirmed that the leaf extracts showed significantly greater zones of inhibition than the standard irrigant sodium hypochlorite. (Ghonmode et al, 2013).

Antioxidant Activity

Neem plants have a greater role as free radical scavengers due to their rich content of antioxidants. Concentration -dependent antiradical scavenging activity and reductive potential were shown by the metabolites azadirachtin and nimbolide present in this plant. (Hossain et al 2013). All plant parts, fruits, seeds, oil, leaves, bark and roots have important role in disease control due to their rich content of antioxidant.

Anti cancerous activity

Cancer is a world-wide multifactorial disease that may caused due to the alteration of molecular/ genetic pathways. The cancerous cells as well as the normal cells were affected by the treatment. It was reported that the plants and their constituents have inhibitory effects on the growth of malignant cells through the modulation of cellular proliferation, apoptosis, tumour suppressor gene and other molecular pathways (Rahmani et al, 2014). The flavonoids and other ingredients present in neem plants play an important role in the inhibition of cancer development. Several reports on epidemiological studies indicate the decreased risk of cancer through the intake of high rate of flavonoids (Le Marchand, 2002).

Anti- inflammatory activity

It was in practise that the pant or their isolated derivatives were used to treat or act as ant-inflammatory agents. The studies conducted in rat through cotton pellet granuloma assay, it was confirmed that the extracts of *Azadirachta indica* leaves showed significant anti-inflammatory activity (Chatopadhyay, 1998). It was reported that the nimbidin present in neem plants suppresses the functions of macrophages and the neutrophils that are relevant in inflammation (Kaur et al, 2004).

Hepatoprotective effect

Clinical experiments using rats were done to evaluate the effect of azadiractin-A on hepatotoxicity induced by carbon tetrachloride and it was noticed that the pretreatment of azadiractin-A dose dependently reduced the hepatocellular necrosis in carbon tetrachloride treated rats (Baligar et al, 2014).

Wound healing action

Laboratory experiments were conducted to study the wound healing activity of extracts of *Azadirachta indica* leaves in the excision and incision wound models of Sprague Dawley rats, and was found that the leaf extract significantly promoted the wound healing activity in both excision and incision wound models (Barua et al, 2010). It was reported that the increased inflammatory response and neovascularization of the leaf extracts of *Azadirachta indica* promote wound healing activity (Osunwoke Emeka et al, 2014).

Anti diabetic action

Experiments were conducted to examine the pharmacological hypoglycemic action of *Azadirachta indica* in diabetic induced rats and was found that the extracts of neem were significantly reduced the glucose levels in diabetic rats (Patil et al, 2013; Dholi et al, 2011).

Bio Pesticide and fertilizer in organic farming

In non-pesticidal management, margossa is the major ingredient, that provide a natural substitute for synthetic pesticides. The powdered seeds dissolved in water are sprayed over the crops to control pest attack. It does not kill the pest but it acts as an ant-feedent, repellent, and egg-laying deterrent and thus protects the crop. The neem cake may be used an effective fertilizer that provide nutrients especially NPK as well as immunity to plants. (Neem cake in Agri. Farming, 2020). In agriculture neem extract act as a nitrification inhibitor and thus it enhances nitrogen assimilation. (Heinrich et al,2007). The most important commercially available product of neem is neem oil or margossa oil extracting from the fruits and seeds. This oil acts as an ant-termite that control termite attack, and is an ecofriendly and highly economical product (Yash Roy and Gupta, 2000).

Conclusion

From ancient time onwards neem plant and its biocomponents have worldwide traditional use especially in Indian subcontinent. Several laboratory experiments and clinical trials have been done to prove the medicinal use of neem plants against various diseases. The active bioingredients have chemo preventive effects noticed in various tumours via modulation of cell signalling pathways. In organic farming, it acts as a bio-pesticide and also as a fertilizer that provide all essential nutrients. In nitrogen metabolism, it acts as a nitrification inhibitor that check free nitrogen formation. This review highlights the dual role of *Azadirachta indica* plant in medical field as well as in the agricultural field applications to develop a new scenario of research.

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