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## NEEM: THE VILLAGE PHARMACY

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### Abstract:

Neem has become important in the global context today because it offers answers to the major concerns facing mankind. Each part of neem tree has some medicinal property. It is the world's most studied tree in the world and most promising one in the 21<sup>st</sup> century. Name of neem tree in Sanskrit is 'Arishta' which means 'Reliever of sickness'. Neem (*Azadirachta indica*) a tree originally from India and Myanmar called by many "The village pharmacy" because of its many health properties. It contains many medicinal values and biological activities like use in the treatment of anti-allergic, anti-dermatic, anti-viral, anti-malarial, anti-fungal, anti-bacterial, anti-diabetic, anti-oxidant, anti-parasitic, anti-cancer, anti-HIV, anti-bone resorption, anti-pyretic, anti-diarrheal, immunomodulation, hypolipidemic, hepatoprotective, gastro protective, spermicidal.

**Key words:** Neem, village pharmacy, *Azadirachta Indica*, pharmacological activity.

### Introduction:

Neem, a tropical evergreen primarily native to India and Ayurveda herbal product. Neem tree is botanical cousin of mahogany and belongs to the family maliaceae. Its botanical name is *Azadirachta Indica* which means 'the free tree of India'. Native to Indo-burma region. Neem is spread throughout South and Southeast Asia, India, Pakistan, Bangladesh, Sri Lanka, Burma, Thailand, Malaysia and Indonesia. [1] The word *Azadirachta* came from "azadhirakt" in Persia, known as noble tree.

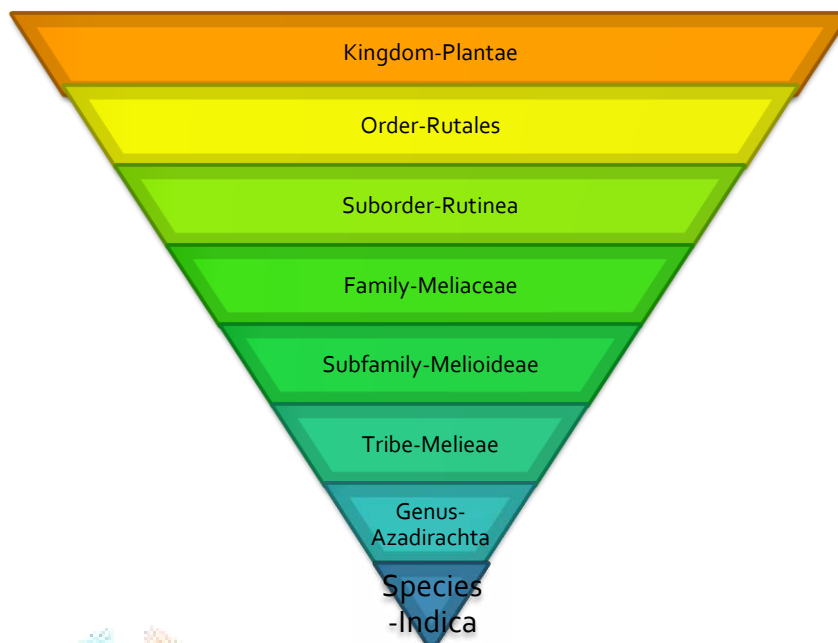
It can easily grow to an average height of 15-20m but Rarely to 35-40m [2] with straight trunk and spreading branches forming a broad crown [3]

Neem has universally been known as a wonder tree because of its various uses since from the ancient times and in Ayurveda medicine it has been used for more than 4000 years due to its ayurvedic healing properties. So it has been called by a variety of names like "the village of pharmacy", "Drug cabinet of Mother Nature" [4]. The neem tree is an unbelievable plant that has been proclaim the "Tree of the 21<sup>st</sup> century" by United Nations [5]. Value of the neem tree has been recognized by united states (US) National Academy of Sciences, which publish a report in 1992 entitled 'Neem- a tree for solving global problems' [6].

Neem is known as the 'store house' of a number of phytochemical. more than 300 phytochemical were discovered from neem tree. Two most essential classes of phytochemical which have been extracted from various part of neem are isoprenoid and non-isoprenoids.

- Isoprenoid= Diterpenoids, vilasinins, triterpenoid, limonoid, and c-secomeliacins.
- Non-isoprenoids= Proteins, Carbohydrates, Sulphur compounds, polyphenols [7]

The chemical constituents contain many biologically active compound that can be isolated from neem, comprise alkaloids, flavonoids, triterpenoids, phenolic compound, carotenoids, steroids, and ketones, biologically active compound is azadirachtin, it is literally a mixture of seven isomeric compound labelled as azadirachtin A-G and Azadirachtin E is more productive. Other compound that have a biological activity are salannin, volatile oils, meliantriol and nimbin [8]



**taxonomical position of neem (*azardichta indica*) fig no-01**

In India there are 25 million tree of neem out of which 55.7% available in Uttar Pradesh, 17.8% found in tamilnadu and 5.5% discovered in Karnataka.[3] India hold first rank in neem seed production and almost 4,42,300 tons of seed are grow annually supply 88,400 tons of neem oil and 3,53,800 tons of neem cake [9].

#### **Macroscopic properties:**

##### **Macroscopy of leaf:**

- **Apex** :- Ovate – Lanceolate
- **Base** :- Unequal
- **Colour** :- Smooth and dark green
- **Odour** :- Typical
- **Taste** :- Bitter

##### **Microscopic Characteristics of leaf :-**

Dorsiventral Leaf

Covering and glandular trichome on both surface

Glandular trichomes are short, unicellular stalk and bi-cellular or Uni-cellular head

**Table no:01 anomocytic stomata**

| PARAMETER         | RANGE | AVERAGE |
|-------------------|-------|---------|
| Vein islet number | 10-16 | 14      |
| Palisade ratio    | 3-3.5 | 3.0     |
| Stomatal index    | 8-8.2 | 8.0     |

**Table no:02 pharmacopoeial standards :-**

|                            |            |
|----------------------------|------------|
| <b>Foreign matter</b>      | <b>Nil</b> |
| Total                      | 9.7%       |
| Acid insoluble ash         | 1.7%       |
| Water soluble ash          | 7.7%       |
| Alcohol soluble extractive | 8.18%      |
| Water soluble extractive   | 13.5%      |

Table no :03 neem tree part use as medicine and its biological component

| Sr No. | Part                                        | Medicinal use                                                                                                                                                 |
|--------|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | Leaf                                        | Eye problem, intestinal worm, anorexia, skin problem, anti- fungal, anti-inflammatory, leprosy, epistaxis, biliousness, cancer,                               |
| 2      | Bark                                        | Analgesic, alternative and curative fever, anti-inflammatory, immunomodulatory, anti-bacterial, anti-tumor,                                                   |
| 3      | Flower                                      | Bile suppression, and elimination of intestinal worms, phlegm                                                                                                 |
| 4      | Fruit                                       | Relieves piles, intestinal worms, urinary disorder, epistaxis, eye problem, diabetes, wound, leprosy                                                          |
| 5      | Twig                                        | Relieves cough, asthma, piles, intestinal worm, spermicidal, diabetes,                                                                                        |
| 6      | Gum                                         | Effective against skin diseases like ring worm, scabits, wounds, ulcer,                                                                                       |
| 7      | seed pulp                                   | Intestinal worm, leprosy                                                                                                                                      |
| 8      | seed oil                                    | Intestinal worms, spermicidal, anti-pyretic, anti-arthritis, anti-fungal, anti- bacterial, diuretic, anti-inflammatory, anti-malarial, hypoglycaemic, leprosy |
| 9      | root, bark, leaf, flower and fruit together | Blood morbidity, biliary afflictions, itching, skin ulcer, burning sensation and leprosy                                                                      |

**[10,11,12,9,13 ]**

Neem is used in the treatment of inflammation, infection, fever, skin diseases and dental disorder. It is also used for its hypoglycemic, hypolipidemic, hepatoprotective and hypotensive activities and to control fever. It is also used to treat various diseases like cancer, urinary tract infection, diuretics, eye problem, wounds, ulcer, leprosy etc.

The main important active constituent is azadirachtin and the other are nimbolinin, nimbin, nimbidin, nimbidol, sodium nimbinat, gedunin and salannin. [5]



### 1) THERAPEUTIC BENEFITS OF AZADIRACHTA INDICA (NEEM)

- Anti-cancer activity
- Wound healing effect
- Anti-nephrotoxicity activity
- Hepato-protective activity
- Anti-oxidant activity
- Antifungal activity
- Antibacterial activity
- Anti-inflammatory activity
- Anti-viral activity
- Anti-malarial activity
- Dentistry
- Sexually transmitted disease
- Ulcer protective
- Antimicrobial
- Anti diabetic
- Antifertility

### 1.a) ANTI-CANCER ACTIVITY

Cancer is very harmful disease and crucial health problem around the globe. The activation of molecular/genetic pathway plays significant role in formation and progression of cancer. The chemotherapeutic treatment is successful for cancer but it also exhibit numerous side effect. Neem oil containing nimbolide which resist the development of DMBA (7,12-Dimethylbenz[a]anthracene) induced HBP carcinomas by,

- I. Inhibition of procarcinogen alteration and oxidative DNA damage
- II. Upregulation of anti-oxidant and carcinogen detoxification enzyme
- III. Inhibition of tumor invasion

Neem has been investigated to be a good stimulator of tumor suppressor gene and inhibitor of VEGF (vascular endothelial growth factor) and phosphoinositol (PI3K/Akt). [5]

### 1.b) WOUND HEALING EFFECT

several plant and their extract are play a main role in the wound healing process. A study is conduct to identify the wound healing action of the extract of leaves of neem tree using external and internal wound model in Sprague rat and outcome shows that *Azadirachta indica* help in wound healing process.

In the study carryout by Nakao et al. 2009 shows that after applying neem oil and neem gel to wound of diabetic rat it enhance the process of wound contraction when compare to diabetic contraction. *Azadirachta indica* develop wound healing activity through enhance inflammatory response and neovascularization. [14]

### 1.c) ANTI-NEPHROTOXICITY ACTIVITY

An experiment was conducted to find the effect of methanolic leaves extract of neem on cisplatin increased nephrotoxicity and oxidative stress in rats and concluded that extract strongly save the kidney from CP-mediated oxidative damage. Moreover, PCR results for caspase-3 and caspase-9 and bax genes downregulation in MLEN treated group [15]

### 1.d) HEPATO-PROTECTIVE ACTIVITY

Medicinal plant and their chemical constituent show vital role as hepatoprotective effect without any side effects. A study was conducted to evaluate part of *Azadirachatin-A* in carbon tetrachloride comprise hepatotoxicity in rats and histology and microstructure result verify that pretreatment with *Azadirachatin-A* dose dependently decreased hepatocellular necrosis. [15]

A study was take place to identify the protective effect of active ingredient of neem such as nimbolide against carbon tetrachloride enhance liver toxicity in rat and result shows that nimbolide processed hepato protective effect against carbon tetrachloride rise liver damage with efficiency and another experiment discover that leaves extract was shown to have protection against paracetamol enhance liver necrosis in rat. [5]

### 1.e) ANTI-OXIDANT PROPERTY

free radical or reactive oxygen species are one of the important culprit in the development of variety of health problem. However, neutralization of free radical activity is one of the vital step for protection from disease. Plant's fruits, seed, oil, leaves, bark, and roots found very effective role in disease prevention due to the rich source of anti-oxidant.

The result of the experiment found that root bark extract show elevated amount free radical scavenging effect with 50% scavenging activity at 27.3 micro gram/ml and total anti-oxidant activity of this extract was discovered to be 0.58 mm of standard ascorbic acid. [15]

### 1.f) ANTI-FUNGAL PROPERTY

native communities of southern Odisha, India use neem leaf pulp from ancient time treat animal disease application for skin infection include fungal, in small ruminants. Experiment have found that alcoholic and aqueous extract of neem leaf retard the growth of seed borne fungi like *aspergillus* and *Rhizopus*. [16] Locke(1995), Martinez(2002), and Da-costa et al. (2010) all discover that due to the antifungal property of neem seed extract, it's biodegradability and minimum side effect, *azadirachtin*, a tetranortriterpenoid obtained from the seed has arise as a natural biopesticide. [17]

### 1.g) ANTI-BACTERIAL PROPERTY

Neem generally used in medicine and pharmaceuticals. The stem and bark of neem has prominent antibacterial activity against *Klebsiella*, *Serratia* species and *Streptococcus*. The methanolic extract of neem has antibacterial activity against *Vibrio cholerae* and chloroform extract against *E. coli*, *Bacillus subtilis*, *Enterococcus faecalis* and *Streptococcus faecalis*. [18] The experiment carry out by Gayatri R Menon et al, 2016 to identify the antibacterial activity of neem oil by using the bacterial pathogen after the result it is shown that the maximum zone of resistance was seen with *Streptococcus mutans* which is found to be 27mm in diameter. [14]

**1.h) ANTI-INFLAMMATORY PROPERTY**

The chloroform extract of neem show prominent effect against carrageenan- which induced paw edema in rat and ear inflammation in mouse. [18]

Nimbidin, a active ingredient of neem has been shown to have a prominent anti -inflammatory activity. Nimbidin decreased the action of microphages and neutrophils take part in inflammation. [19]

A important bioactive ingredient exhibit in neem is limonoid. limonoid is a furanolactone, known for its apposing properties in the formation of inflammatory mediators, it is also known as pain anesthetizer, as it enhanced the activation of endogenous opioid pathway. [20]

**1.i) NEUROPROTECTIVE ACTIVITY**

An study was conducted to discover the impact of *Azadirachta indica* leaves against cisplatin-(CP) prompted neurotoxicity and results reveal that morphological discoveries of neem where CP infusion inferred an all-around protect brain tissue. No change in biochemical parameter, were seen with neem treated group [21]

**1.j) ANTIVIRAL ACTIVITY**

The antiviral and virucidal effect of methanolic extract fraction of leaves of neem was discovered concerning its activity and viable mechanism of action against coxsackie B group of viruses. The proof suggest that existence of a battery of compound beside flavonoid, triterpnoids and their glycosides in NCL-11 have antiviral action for coxsackie B group of viruses 'in vitro'. [12]

The inhibited polio virus type 1 at the primary stage of viral application. [16]

Neem oppose the growth of Dengue virus, a hemorrhagic fever related to Ebola, and interrupt with the reproduction of the coxsackie B-virus. [5]

**1.k) ANTI-MALARIAL ACTIVITY**

Wood scraping of neem bark were absorb in 5% neem oil ( *Azadirachta indica* ) and then dilute in acetone and in 45 days the reproduction of *Anopheles stephensi* and *Aedesaegypti* were controlled, when it is put in water storage tank.

Nimbolide synthesizes from plant extract show the antimalarial activity by inhibiting the plasmodium falciparum growth the aqueous and alcohol extract of bark and leaves of neem show antimalarial activity, mainly on chloroquine-resistance strains. [4]

**1.l) DENTISTRY**

an experiment was carry out to identify the antimicrobial activity of organic extract of neem against three bacterial strains causing dental caries and result found that petroleum ether and chloroform extract showed strong antimicrobial activity. [15]

In India many people are using the twigs from the branches of the neem tree and you can found that these people have very good teeth and gum and that without using any chemical toothpaste. [1]

A neem extract dental gel promisingly decrease plaque and bacteria over control group that used commercially available mouthwash contain the germicide chlorhexidine gluconate (0.2% W/v ). [8]

**1.m) Sexually transmitted disease**

AIDS may perhaps be treated by ingesting neem leaf separte or the entire leaf or the by drinking a neem tea [21]

Neem give 75% protection against the HIV infection. [5]

In HIV/AIDS patients, a 12 week oral administration of acetone water neem leaf extract (IRAB) had a prominently increase in vivo on CD4 cell without any side effects in patients. [8]

**1.n) ANTI-ULCER ACTIVITY**

Neem bark extract decreased human gastric acid hypertension, and gastro-esophageal and gastroduodenal ulcer. After 10 week, the duodenal ulcer were fully cured . [8]

Utilizing neem bark reduce 77% gastric corrosive emissions just as gastric discharge volume 63% and pepsin movement 50%, because of it's anti-inflammatory compound, gastric damage is decreased. [21]

Nimbidin was known to be responsible for ANTI-ULCER activity which protect acetylicylic acid, omethacin, serotonin-induced gastric lesions and duodenal ulcer or histamine [18]

**1.o) ANTI- DIABETIC**

Decreased in glucose level activity of the concentrate ethanolic (90%) extract of neem and *andrographis paniculata* were studied. limonoids from neem are used for their therapeutic effect against pancreatic alpha-amylase, a known antidibetic target [4]. The seed oil exhibit active ingredient capable of decreased blood glucose in both normal and hyperglycemic animals[5]

### **1.p) ANTIFERTILITY**

Neem seed oil has been found to possess a dominant spermicidal as well as spermatogenesis opposing characteristics. It has been discovered that spermatozoa of human and Rhesus monkeys die within 30 min of contact with neem seed oil using an intravaginal dose of 1M.[5]

### **2) AGRICULTURAL USE OF NEEM**

Around one-third of world agriculture food product get demolished by more than 20,000 species of fields and storage pests [3]. Neem is one of weak pesticides use as a biocontrol agent to control many plant diseases. Its pesticides are normally water soluble and help in the overall growth of the plants by increasing their capability to resist harmful insects [10]. Neem is used as a fertilizer both for food crops and cash crops mainly rice and sugarcane crop. Neem is a natural oil conditioner that helps enhance the quality of soil, thereby increased the growth of plant and fruits. Active component Azadirachtin, exhibit in neem tree, act as an insect inhibitor and insects feeding inhibitors, thereby protecting the plant it is important to note that neem doesn't kill insect, but alters their life process. [22]

### **3)INDUSTRIAL USE OF NEEM**

In 2002, at the world neem conference, idea of recommend neem as an industrial plant was offered. Numerous industry including pharmaceutical, cosmetics, disinfectant, rubber, biopesticides, and textiles industry use neem oil. Neem oil and powder neem leaves are used in many cosmetic preparations such as face cream, nail polish, nail oil, shampoo, conditioner. Neem cake a by product neem oil industries used as livestock feed, fertilizer and natural pesticides. Neem oil is normally used in manufacturing of soap. India rank first in neem production and about 5,40,000 tons of seed are produced annually yielding 1,07,000 tons of neem oil and 4,25,000 tons of neem cake. [3]

Neem seed paste is used as a main source of carbohydrates in fermentation industry and methane gas production. [10]

Therefore, in India right now is the main time to take good steps in promoting neem both for the benefit of farmers and industries. [3]

### **MARKETED PREPARATION OF NEEM**

Apart from all the available pesticides and pharmaceuticals, neem give many useful and valuable ordinary materials. For example, oil extracted from the seeds moves into soaps, waxes, and lubricants, additionally it also make fuels for lighting and heating.

#### **1. NEEM OIL**

Of all these products, the oil is possibly the most commercially important. In composition, it is much like other vegetable oils, made up of mainly of triglycerides of oleic, stearic, linoleic, and palmitic acids.

To gain neem oil, the seeds are first open and the kernels separated. The kernels are then bear down in industrial expellers or in hand- or bullock-operated wooden presses (ghanis). The oil yield is sometimes maximum 50 percent of the weight of the kernel.



#### **2. SOAP**

India's supply of neem oil is now used greatly by soap manufacturers. Despite the fact that much of it goes to small-scale mainly soaps, large-scale manufacturer also use it, especially because it is low cost. Generally, the crude oil is used to manufacture coarse laundry soaps. However, highly expensive soaps are made by saponifying the crude oil and distilling the resulting fatty acids before adding the lye. The resulting almost colorless and odorless product is suitable for high quality toilet and laundry soaps.



### 3. COSMETICS

Neem is recognize in India as a beauty product. Powdered leaves, for example, are main ingredient of at least one widely used facial cream. Purified neem oil is also used in nail polish and other cosmetics.

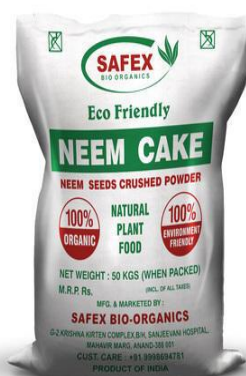


### 4. NEEM CAKE

The by product left after the oil has been removed varies widely in composition. However, the broad ranges in composition are:

- Carbohydrates - 26-50%
- Crude fibre - 8-26%
- Fat - 2-13%
- Ash - 5-18 %
- Acid insoluble Ash - 1-17%

This so-called "neem cake" has considerable local potential. Although too bitter for animal feed, it seems to have unique promise as a fertilizer.



### CONCLUSION

In this article we try to provide a detail review on every useful aspect of neem tree from its pharmacological activities to its uses in different fields. Having it's own unique identity and variety and numerous uses from the decade neem is correctly called the 'village pharmacy'.

National research council (NRC), Washington, USA consider neem, " one of the most promising of all plant and the fact is that it may eventually benefit every person on this planet.

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