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A Review on Medicinal Applications of Azadirachta Indica or Neem

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Abstract- Neem, commonly known as Azadirachta indica is an evergreen, temperature tolerant, flowering plant in the mahogany family Meliaceae native to India but now it distributed to other continents of the world. It is among medicinal plants those have a wide range of medicinal values. Almost every part of the tree is used as medicine both locally and after preparation in pharmaceutical industries. All parts of the neem tree- leaves, flowers, seeds, fruits, roots and bark are used for various preparations in Ayurveda. It is effective against microorganisms and ectoparacites including bacteria, fungi, viruses, ticks and mites. In addition it has antimalarial, anticancer, antifertility, antioxidant, antidiabetic, anti-inflammatory, hepatoprotective, neuroprotective and wound healing effects. It is also used in agriculture as pesticides and fertilizer to increase crop production. It is also a source of feed for animals which provides a number of nutrients like protein, minerals, fatty acids, vitamins etc. This paper focuses on the different medicinal applications of neem tree.

Keywords- Medicinal plants, Azadirachta indica, Neem, Ayurveda.

I. INTRODUCTION

Neem or Azadirachta indica is considered a boon for mankind by nature. It is very important medicinal plant which is used to treat different diseases in Unani System of Medicine as well as traditional system of medicine (Ayurveda, Homeopathic, Chinese and European). The scientific name of neem, Azadirachta indica, has been derived from the Arabic language Azadirach-E-Hind, meaning a free growing tree of India.

Neem fruits, seeds, oil, roots, leaves, flowers and bark have been used traditionally for the treatment of inflammation, infections, fever, skin diseases and dental disorders.

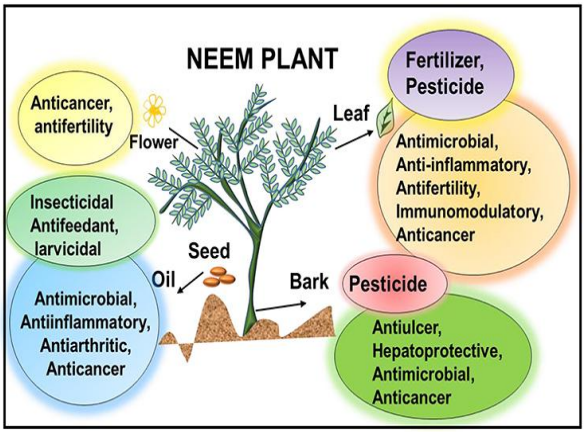

Fig 1. Neem Plant.

Neem leaf and its constituents have been demonstrated to exhibit immunomodulatory, anti-inflammatory, antihyperglycaemic, antiulcer, antimalarial, antifungal, antibacterial, antiviral, antioxidant, antimutagenic and anticarcinogenic properties.

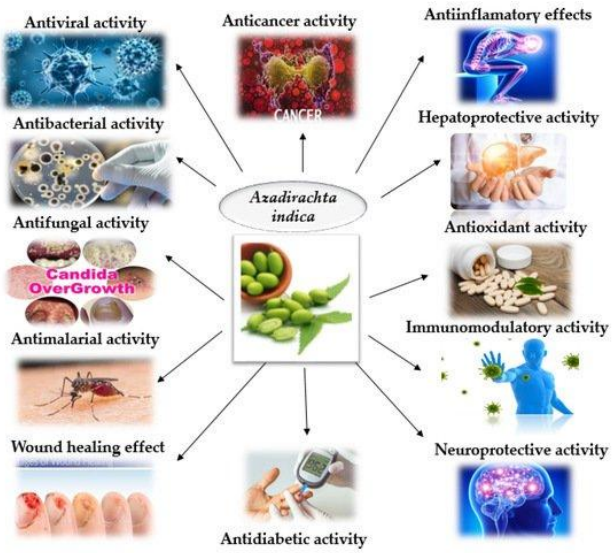

Fig 1. Medicinal uses of various parts of neem.

Generally, there are a wide range of medicinal plants in India including neem tree, which are used for healing purpose both traditionally and in preparation form. Regardless of its medicinal values only few researches and reviews have been done on neem tree.

Therefore, the objective of this paper is to review medicinal values and other applications of neem tree.

II. MEDICINAL APPLICATIONS OF NEEM TREE

All parts of the tree including leaves, bark, roots, seed and twigs contain active ingredients and used as medicine. Neem leaves are useful to increase immunity of the body, reduce fever, treating various foot fungi, useful against termites, used in curing neuromuscular pains and anticlotting agent, antihelminthic, antituberculosis, antitumour, antiseptic, antiviral, contraceptive, cosmetics, fertilizers, insecticides and insect repellents.

Neem bark and roots can control fleas and ticks on pets, relieve skin infections such as acne, psoriasis, scabies and eczema. In addition used for treatment of diabetes, cancer, heart disease, herpes, allergies and ulcers. Neem oil acts as analgesic, antihelminthic, antihistaminic, antiprotozoal, antipyretic, antiviral, bactericidal, contraceptives, fungicides and insecticides. Neem twigs (small thin branches of the tree) act as oral deodorant, toothache reliever and tooth cleaners.

Many biologically active compounds can be extracted from neem including triterpenoids, phenolic compounds, carotenoids, steroids and ketones. Some bioactive constituents of neem are Nimbdin, Nimbidol, Nimbanene, Nimbadiol, Quercitin and Azardirachtin. Some medicinal benefits of neem tree are given here:

1. Antibacterial effect:
Neem possesses a wide spectrum of antibacterial action against Gram-negative and Gram-positive microorganisms. The antibacterial activity of neem extracts against 21 strains of food borne pathogens was evaluated and result of the study suggested that it possess compounds containing antibacterial properties that can potentially be useful to control bacteria and spoilage organisms. Another experiment was made to evaluate the antibacterial activity of the extracts of A. indica on bacteria isolated from adult mouth and results revealed that bark and leaf extracts showed antibacterial activity against all the test bacteria used.

Water extracts of neem twigs inhibits growth of dental caries organisms Streptococcus mutans, S. salivarius, S. mitis, and S. sanguis. Neem has suppressed several species of pathogenic bacteria, including: Staphylococcus aureus, a common source of food poisoning and much pus forming. The susceptibility of the microorganisms to the extracts of neem leaves was compared with certain specific antibiotics. Its leaves possessed good anti-bacterial activity, confirming the great potential of bioactive compounds and is useful for rationalizing the use of this plant in primary health care. The methanol extract of A. indica exhibited pronounced activity against Bacillus subtilis.

2. Antifungal effect:
Nimbidin, Nimbin, Nimbidol and Neem oil are very effective against fungi like Tinea rubrum ring worm fungus, Trichophyton interdigitale, Coccidioides immitis and species of Trichophyton at very low concentration. High antimycotic activity with extracts of different parts of neem has already been reported. Extracts of leaf, oil and seed kernels are effective against certain human fungi; due to this property is given great importance in the field of science. A. indica leaf extract has antifungal activity against three fungal species: Aspergillus flavus, Alternaria solani and Cladosporium. Neem oil has been the cure for many fungal diseases caused by the above fungi which has been a life saver.

In a study done by shows that the ethanolic extract of A.indica leaves is more effective against Rhizopus compared to aqueous leaf extract. Aqueous and ethanolic extract of neem leaves were found effective against Candida albicans by which these organism shows sensitivity at the concentration of 15% and 7.5% on aqueous extract.

Neem oil is used to prevent aflatoxin which is produced due to contamination of the poultry feed by fungus and the neem leave extract antagonises the production of Patulin caused by Penicillium expansium.

3. Antihelmethic effect:
Diseases caused by helminthes parasites in livestock continue to be a major productivity constraint, especially in small ruminants in the tropics and subtropics. In the Developing world, the greatest impact of parasitic diseases is in direct and potential productivity losses. The greatest losses associated with nematode parasite infections are sub-clinical, and economic assessments show that financial costs of internal parasitism are enormous. A. indica leaves were dispensed to animals without processing even locally.

4. Anticancerous activity:
A. indica and their active compounds play vital role in the prevention of cancer development and progression. The exact molecular mechanism is not understood fully. But, it contains flavanoids and various other ingredients that play an important role in inhibition of cancer development by activating the tumour suppressor genes and inactivate the activity of several genes involved in the cancer development and progression. Presence of anti angiogenic agents to block new blood vessel growth is crucial step in the inhibition/prevention of tumour growth.

5. Effects against ectoparasites:
The application of neem extracts to livestock is effective in the control of ticks or mites are wide spread in the

developing world. The idea of cultivation of plants and low-cost extraction of active compounds as a local industry in developing countries has considerable appeal. There seems to be a prevailing view that plant extracts or botanicals are safer and cheaper to produce than synthetic products. Control of ticks with chemical acaricides has become difficult because of its diminishing efficiency due to resistance development.

6. Neem as insect repellent:
Azadirachtin is a powerful insect repellent that disrupts metamorphosis in moth larvae at extremely low concentrations. The smell of neem is enough to repel leaf eating insects (such as grasshoppers and leafhoppers). Neem oil formulation find wide usage as a biopesticide for organic farming, as it repels a wide variety of pests including, beet armyworm, aphids, the cabbage worm, white flies, mites, beetles, moth larvae, mushroom flies, leaf miners, caterpillars. Grasshoppers have been observed to starve to death rather than eat neem as the only food source.

7. Hepatoprotective effect:
Neem helps to protect liver from damage, which in turn helps to cleanse blood. The active ingredients of the tree minimize chemically induced liver damage by stabilizing level of serum enzymes and boosting level of antioxidants like those found in vitamin A, E and natural carotenoids, which neutralize free radicals and prevent liver damage. The aqueous extract of neem offer protection against paracetamol induced liver necrosis.

The elevated levels of serum aspartate aminotransferase (AST), alanine aminotransferase (ALT) and gamma glutamyl transpeptidase (GGT) indicative of liver damage significantly reduced on administration of this extracts.

8. Antidiabetic, Antifertility and Antiulcer effects:
Aqueous extract of neem leaves significantly decreases blood sugar level and prevents adrenaline as well as glucose-induced hyperglycaemia. When orally fed, also produces hypoglycaemia in normal rats and decreased blood glucose levels in experimentally induced diabetes in rats. Neem and seed extracts have contraceptive property when administered orally at the beginning of the post-implantation stage resulted in pregnancy termination in rodents and primates, without any permanent effects. Neem bark extract reduce human gastric acid hypersecretion, and gastro-esophageal and gastroduodenal ulcers. It gives significant protection from discomfort speed healing of gastric and duodenal lesions.

9. Wound healing effect:
Neem oil contains active ingredients that directly deal with wound healing process. Because it directly helps the skin to retain its nature as it heals. It also has high amount of essential fatty acids which plays an important role in adding moisture and soft texture to the skin during the process. In addition to its ability to restructuring of skin, neem leaf extracts and seed oil keeps the wound free from microorganism due to their antimicrobial effect which reduces the time of healing. Neem also has another important role in healing of wound, it inhibit the inflammation which prolong the duration of healing. Finally it helps the formation of granulation tissue and elastin as well as collagen.

10. Antioxidant activity:
Free radical or reactive oxygen species are one of the main factors in the genesis of various diseases. However, neutralization of free radical activity of neem is one of the important steps in the diseases prevention. Antioxidants stabilize/deactivate free radicals, often before they attack targets in biological cells. Neem plays role in the activation of anti-oxidative enzyme that plays role in the control of problem caused by free radicals/reactive oxygen species. Neem has been reported to have antioxidant activity. Plants fruits, seeds, oil, leaves, bark, and roots show an important role in diseases prevention due to the rich source of antioxidant.

11. Industrial Uses of Neem:
Several industries including pharmaceuticals, cosmetics, disinfectants, rubber, bio-pesticide and textile industries use neem oil for preparation of different products. Such neem based commercial preparations are currently available. A new shampoo, based on seed extract of neem was highly effective, more than permethrin based product, against head lice under in vitro conditions. Its oil and powdered neem leaves are employed in various cosmetic preparations such as face creams, nail polish, nail oils, shampoos, and conditioners. Neem cake, a byproduct of neem oil industry is used as livestock feed, fertilizer and natural pesticide. Also neem oil is commonly used in soap production.

III. CONCLUSION

Neem, the versatile medicinal plant is the unique source of various types of compounds having diverse chemical structure. It has a wide range of application in both humans and animals as treatment for several diseases caused by microorganism and another factors. It is used as pesticides and insecticides on agriculture and also it is used in industries for development of new drugs. Due to its content of nutrients neem can be used as animal nutrition after treating by sodium hydroxide which prevents the bitter taste of the tree.

Neem also has considerable effect on ectoparasites and helminthes those developed resistance to acaricides and antihelmenthic. Very little work has been done on the biological activity and plausible medicinal applications of these compounds and hence extensive investigation is needed to exploit their therapeutic utility to combat diseases.

Despite the great role of neem in the primary health care, the knowledge on this medicinal plant depth and width become declining due to its secrecy, unwillingness of young generation to gain the knowledge, influence of modern education, religious impacts, and lack of awareness.

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