Research Journal of Phytomedicine 01[01] 2015
www.asdpub.com/index.php/rjp

Review Article

A brief study on neem (*Azarrdirachta indica* A.) and its application-A review

Asha Roshan[1] and Navneet Kumar Verma*[2]

[1]Department of Pharmacognosy, R.K. College of Pharmacy Azamgarh, UP, India
[2]Department of Pharmacy, Kailash Institute of Pharmacy and Management, GIDA, Gorakhpur, UP, India

***Corresponding Author**
Navneet Kumar Verma
Department of Pharmacy,
Kailash Institute of Pharmacy and Management,
GIDA, Gorakhpur, UP, India
E-mail: navneet_its04@rediffmail.com

Abstract

Neem, *Azadirachta indica* A. is a tree, which has a wide application in animal kingdom. *Azadirachta indica* is fast growing evergreen popular tree found commonly in India, Africa and America. In the application of Neem, Neem used as Fertilizer, Manure, urea coating agent, fumigant, pesticide, Soil Conditioner and Neem pest control is very beneficial for proper crop and pest management. This review is mainly focused on application of neen.

Keywords:
Neem, *Azadirachta indica,* Fertilizer, Fumigant,

1. Introduction

The neem tree *Azadirachta indica* A. belongs to family Meliaceae, is a tropical evergreen related to mahogany. Native to east India and Burma, it grows in much of Southeast Asia and West Africa; a few trees have recently been planted in the Caribbean and several Central American countries, including México. The people of India have long revered the neem tree; for centuries, millions have cleaned their teeth with neem twigs, smeared skin disorders with neem-leaf juice, taken neem tea as a tonic, and placed neem leaves in their beds, books, grain bins, cupboards, and closets to keep away troublesome bugs. Trees will reach up to 30 m tall with limbs reaching half as wide. The shiny dark green pinnately compound leaves are up to 30 cm long. Each leaf has 10–12 serrated leaflets that are 7 cm long by 2.5 cm wide. It will grow where rainfall is as little, and thrives in areas that experience extreme heat of up to 48°C. Even some of the most cautious researchers are saying that neem deserves to be called a "wonder plant." The neem tree, was introduced to Baja California Sur, México, in 1989 by a group of private producers dedicated to organic horticulture in San José del Cabo. The first trees were brought from the Philippines [1,2], and in 1992, this species was introduced to Yaqui Valley, Sonora, México [3]. Since 1994, trees have been planted in small areas along roadsides, as a windbreak. Neem populations planted in Southern, Sonora, México, have phenotypic and quality differences, fruits are heterogeneous in size and form, and oil content and quality is variable. The objective of this study was to characterize 216 trees in a collection at the Instituto Tecnológico Agropecuario, in Southern Sonora Mexico.

Classification [4]
Kingdom: Plantae
Division: Magnoliophyta
Order: Sapindales
Family: Meliaceae
Genus: *Azadirachta*
Species: ***A. indica***

Fig.1: leaves of neem

2. Application of Neem

Neem oil is extracted from the seeds of the neem tree and has insecticidal and medicinal properties due to which it has been used in pest control in rice cultivation. Neem seed cake (residue of neem seeds after oil extraction) when used for soil amendment or added to soil, not only enriches the soil with organic matter but also lowers nitrogen losses by inhibiting nitrification. It also works as a nematicide. Neem leaves are used as green leaf manure and also in preparation of litter compost. Neem leaves are also used in storage of grains. Twigs of neem when tender is used as green manure after decomposing and widely incorporated in rice cultivation fields. Neem (leaf and seed) extracts have been found to have insecticidal properties. It is used as foliar spray and in treating seeds in rice cultivation. Neem bark and roots also have medicinal properties. Bark & roots in powdered form are also used to control fleas & sucking pests in rice cultivation. Neemhas anti-bacterial, anti-fungal and anti-nematicidal properties and positive effect in combating several diseases in rice cultivation, and there are many active constituents of Neem which are still to be exploited.

2.1 Neem used as Fertilizer

The material left after oil is squeezed out from seeds and is popularly known as the seed cake; It acts as a bio fertilizer and helps in providing the required nutrients to plants. It is widely used to ensure a high yield of crops. Neem is used as a fertilizer both for food crops and cash crops, particularly rice and sugarcane crop.

Benefits: Neem seed cake performs the dual function of both fertilizer and pesticide, acts as a soil enricher, reduces the growth of soil pest and bacteria, provides macro nutrients essential for all plant growth, and helps to increase the yield of plants in the long run, bio degradable and Eco friendly and excellent soil conditioner.

2.2 Neem used as Manure

Manure is any animal or plant material used to fertilize land especially animal excreta for improving the soil fertility and thus promoting plant growth. Neem manure is gaining popularity because it is environmental friendly and also the compounds found in it help to increase the nitrogen and phosphorous content in the soil. It is rich in sulphur, potassium, calcium, nitrogen, etc. Neem cake is used to manufacture high quality organic or natural manure, which does not have any aftermaths on plants, soil and other living organisms. It can be obtained by using high technology extraction methods like cold pressing or other solvent extraction. It can be used directly by mixing with the soil or it can be blended with urea and other organic manure like farm yard manure and sea weed for best results.

Benefits: It is bio degradable and eco friendly, nourishes the soil and plants by providing all the macro and micro-nutrients, helps to eliminate bacteria responsible for denitrifying the soil, ideal for cash crops and food crops, increases the yield of crops, helps to reduce the usage of fertilizer, thus reducing the cost of growing plants,

antifeedant properties that help to reduce the number and growth of insects and pests.

2.3 Neem as urea coating agent

Neem and its parts are being used to manufacture urea coating agent to improve and maintain the fertility of soil. The fertility of the soil can be measured by the amount of Nitrogen, Potassium and Phosphorous it has; there are certain bacteria found in soil, which denitrify it. Use of neem urea coating agent helps to retard the activity and growth of the bacteria responsible for denitrification. It prevents the loss of urea in the soil. It can also be used to control a large number of pests such as caterpillars, beetles, leafhoppers, borer, mites etc. Urea coating is generally available either in liquid form or powdered form. Properties of Neem Urea Coating are Antifeedant, anti fertility and pest growth regulator.

Benefits: Neem Urea Coatings are excellent soil conditioners, natural or bio pesticides, and environmental friendly, non toxic, reduces urea consumption, convenient and easy to apply, high soil fertility and increases the yield of crops.

2.4 Neem as Soil Conditioner

Neem seed granules or powdered seeds are used to manufacture the soil conditioner. It can be applied during sowing of plants or can be sprinkled and raked into the soil. The process of sprinkling should be followed by proper irrigation so that the product reaches the roots. It is a natural soil conditioner that helps improve the quality of soil, thereby enhancing the growth of plants and fruits. Organic soil conditioner is gaining popularity in agricultural industry, not only in Asian countries like India but also in western counterparts such as USA, UK and Australia.

Benefits: Neem is a natural soil conditioner that helps improve the quality of soil, thereby enhancing the growth of plants and fruits. It not only helps the plants grow, but also prevents them from being destroyed by certain pests and insects. Organic soil conditioner is gaining popularity in agricultural industry. Because they are organic, they have no harmful effects and are cheaper than the other soil conditioners. This natural soil conditioner is also multi-functional and in the sub tropical regions. Neem soil conditioner application in plantation crops is known to be a soil enhancer that helps to increase its fertility.

2.5 Neem as fumigant

Neem tree has been used against household, storage pests and crop pests. Neem pest fumigant is available in gaseous state and is used as a pesticide and disinfectant. It is being used by a large number of countries on a commercial basis by farmers and agriculturists. This 100% natural product is being exported as it is non toxic and does not affect the environment. It assumes more importance in developing countries where millions of deaths are reported every year due to the accidental intake of synthetic pest fumigants. This natural fumigant not only kills pests but also affects them negatively by acting as feeding and oviposition deterrence, mating disruption, inhibition of growth etc. According to studies undertaken, neem fumigant helps to protect stored rice grains from pests. One of the major benefits of this organic fumigant is that pests do not develop resistance to it. With the increasing trend of using bio fertilizers, insecticides and pesticides, neem is being increasingly cultivated and grown all over the world to get active ingredient-azadirachtin, responsible for stopping the growth cycle of insects and pests, fungi etc. Neem is also assuming a lot of importance in crop management. Considering the fact that neem is not only a cheaper, naturally occurring product and an effective method to control pests and insects, but also has no side effects on plants or other living beings, it is not a wonder that researches are being carried to try neem and its products for large scale production of natural pesticides and insecticides. This is a good opportunity for manufacturers and exporters to produce quality bio agricultural products. Neem oil and seed extracts are known to possess germicidal and anti bacterial properties which are useful to protect the plants from different kinds of pests. This natural product does not leave any residue on plants.

Benefits: Neem fumigants are eco friendly, do not harm other micro organisms, are non toxic, and do not contaminate terrestrial and aquatic environment. Pests do not develop resistance to it, there are no negative after effects, are relatively less expensive, are pest repellent and nourish the soil and function as pest reproduction controller.

2.6 Neem as pesticide

Neem pesticides play a vital role in pest management and hence have been widely used in agriculture. There has been an evident shift all over the world from synthetic pesticides to non-synthetic ones; this is largely because of the wide spread awareness of the side effects of these synthetic pesticides not only on plants and soil but also on other living organisms. This is a great opportunity for neem pesticides manufacturers to cash in on the growing popularity of natural or herbal pesticides. Neem pesticides are being manufactured and exported to various countries as a lot of research has been conducted to test the safety and efficacy of neem for use as a pesticide [5, 6]. Azadirachtin is the main ingredient used to manufacture bio pesticides. Neem oil and seed extracts are known to possess germicidal and anti-bacterial properties which are useful to protect the plants from different kinds of pests. One of the most important advantages of neem-based pesticides and neem insecticides is that they do not leave any residue on the plants.

Neem pest control is very beneficial for proper crop and pest management

It also helps to nourish and condition the soil, it is environmental friendly, it is non toxic and it can be used in combination with other pesticide and oil for more effectiveness. Instead of killing the pests, it affects the life cycle of the pests. Anti-feedant properties found in neem compounds helps to protect the plants. Pests generally do not develop a resistance to neem based pesticides. Neem pesticides are generally water soluble and help in the growth of the plants. It acts as pest repellent and pest reproduction controller. The transition from use of synthetic products to natural ones is evident in agricultural industry also. Excessive use of synthetic insecticides has resulted in a series of problems like the development of insect resistance to insecticides, harm to other natural enemies of insects, toxic effects on plants and soil etc. Neem is being used to manufacture what is known as the natural or bio insecticide, that are environmental friendly and do not have any toxic effects on plants and soil. Neem insecticides are used to protect both food as well as cash crops like rice, pulses, cotton, oils seeds, etc. Great for use on all crops, trees, plants, flowers, fruits and vegetable round the home as well as organic and commercial growers. Active ingredient Azadirachtin, found in neem tree, acts as an insect repellent and insect feeding inhibitor, thereby protecting the plants. This ingredient belongs to an organic molecule class called tetranortriterpenoids. It is similar in structure to insect hormones called “ecdysones,” which control the process of metamorphosis as the insects pass from larva to pupa to adult stage. It is interesting to note that neem doesn’t kill insects, but alters their life process. The major parts/extracts of neem seed that are used for making neem insecticides. According to recent studies conducted on parts of neem, it was found that neem seed extracts contain azadirachtin, which in turn works by inhibiting the development of immature insects. Neem oil or the neem seed oil is extensively used to manufacture insecticides used for different crops. Neem oil enters the system of the pests and obstructs their proper working. Insects do not eat, mate and lay eggs resulting in the breaking of their life cycle. Another interesting function of neem oil pesticides is that they do not harm the beneficial insects. The neem oil insecticides only target the chewing and sucking insects.

3. Mode of Action

Neem acts as a biopesticide at different levels and in various ways. Primarily it acts as antifeedant *i.*e., when an insect larva is hungry and it wants to feed on the leaf but if the leaf is treated with neem product, because of the presence of azadirachtin, salaninand melandriol there is an antiperistalitic wave in the alimentary canal and this produces something similar to vomiting sensation in the insect. Because of this sensation the insect does not feed on the neem treated surface and ability to swallow is also blocked. Secondly it actsoviposition deterrent *ie.* by not allowing the female to deposits eggs comes in very handy when the seeds in storage are coated with neem kernel powder and/or neem oil. It also acts as insect growth regulator. It is a very interesting property of neem product and unique in nature, *i.*e., it works on juvenile harmone.

4. Conclusion

Neem *Azadirachta indica* is a important plant in plant kingdom, which shows various applications for animal kingdom. Neem is one of the most powerful blood-purifiers, detoxifiers and immune system boosters known. Hundreds of diseases have been shown to respond favorably to neem. Neem leaf can be taken as tea or in capsules. Neem oil can be applied externally or a few drops can be put in an empty capsule and taken internally. It is also helpful to enhance the soil fertility.

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