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## Usages and Benefits of Neem (*Azadirachta indica*)

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Neem, *Azadirachta indica* is native to the arid regions of the Indian sub continent, where it grows to 12-24 m high at altitudes between 50 and 100 m with 130 mm of sufficient rainfall per annum for its normal growth. In India, neem is known for its use and is more utilized in rice cultivation. Neem is also called 'arista' in Sanskrit- a word that means 'perfect, complete and imperishable'. The Sanskrit name 'nimba' comes from the term 'nimbatisyasthyamdadati' which means 'to give good health'. The seeds, bark and leaves contain compounds with proven antiseptic, antiviral, antipyretic, anti-inflammatory, anti-ulcer and antifungal uses. *Azadirachta indica* can be propagated easily by seed, or 9- to 12-month-old neem seedlings can also be transplanted. Fresh fruit yield per neem tree ranges between 37 and 50 kg per year. Forty kg fruit yields nearly 24 kg of dry fruit (60%), which in turn gives 11.52 kg of pulp (48%), 1.1 kg of seed coat (4.5%), 1 kg of husk (25%) and 5.5 kg of kernel (23%). The kernel gives about 2.5 kg of neem oil (45%) and 3.0 kg of neem cake (55%). Neem is recognized today as a natural product which has much to offer in solving global agricultural, environmental and public health problems.

Researchers worldwide are now focusing on the importance of neem in the agricultural industry. The magical tree and hundreds of its active compounds are used to manufacture a number of products. Natural properties of neem do not have any toxic reactions, so they are helpful in plant protection and management. All the parts of neem like seed, flowers, bark, and leaf can be used to produce high quality product. Products derived from Neem tree act as powerful Insect Growth Regulators (IGR) and also help in controlling several nematodes and fungi. Neem products reduce insects growth in crops and plants. Neem products are used as neem insecticide, neem pesticide, neem pest fumigant, neem fertilizer, neem manure, neem compost, neem urea coating agent and neem soil conditioner. Applications of 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. Neem has 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.

## Usages and Benefits

### 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, helps to increase the yield of plants in the long run, bio degradable and Eco friendly and excellent soil conditioner.

### 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.

### 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, environmental friendly, non-toxic, reduces urea consumption, convenient and easy to apply, high soil fertility and increases the yield of crops.

### 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 help to increase its fertility.

### 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 ecofriendly, 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. 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. 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. Antifeedant 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.