

Neem A Versatile Tree

Neem (*Azadirachta indica* A. Juss) is a deciduous tree native to India. It grows rapidly and can grow to a height of 15-20 meters. Besides being tolerant to high temperatures, Neem can also be grown easily on waste and barren land. Neem stem is woody and its bark is hard, fissured (cracked) or scaly. Neem flowers are white and fragrant. Its fruit is glabrous (globular) spherical to oval and it is locally known as *Nimboli*. A group of different chemical substances (Azadirachtin, Meliantriol, Nimbin, Nimbidin, Nimbinin, Nimbolides and Salannin) are found in the bark, leaves and seeds of Neem. These are collectively known as limonoids. Due to presence of these biologically active chemicals, apart from wood and shade, many types of health and agricultural benefits are also taken from the Neem tree. Because of various health benefits Neem is known as “village pharmacy”.

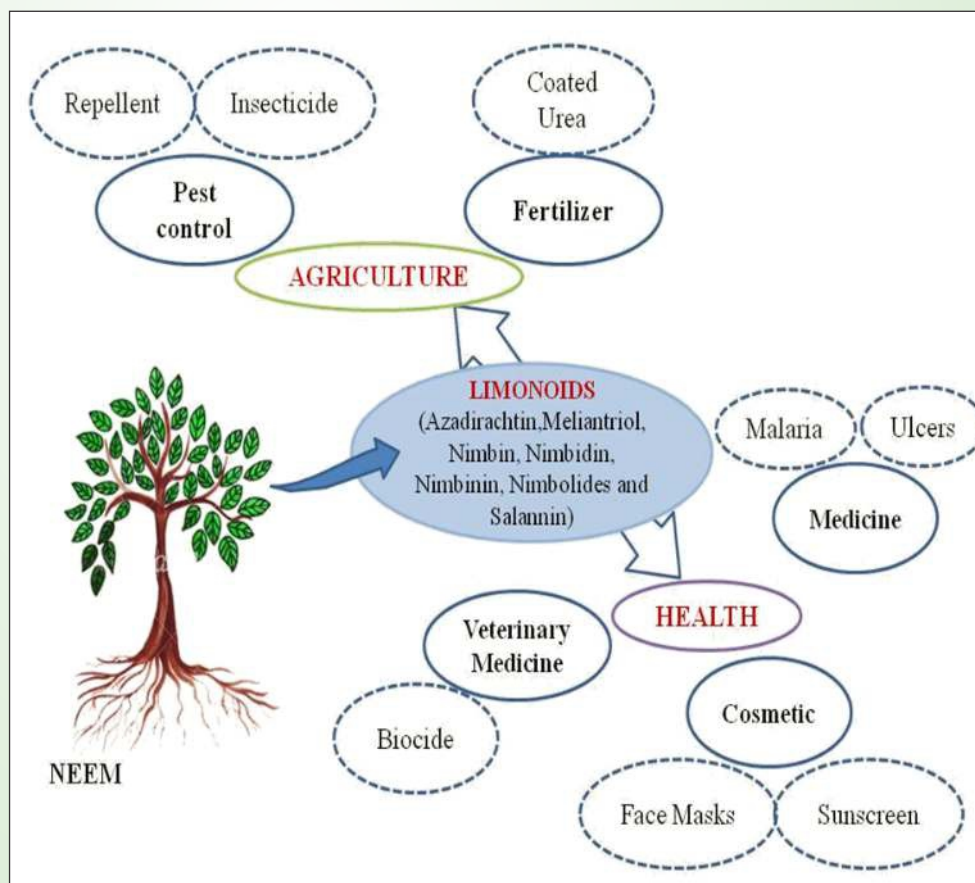
1. Health benefits

Neem is a very beneficial tree for health. Its medicinal properties are described in various mythological texts. Apart from this, many scientific findings also support that each part of the Neem tree exhibits

medicinal properties. Some of the major home uses of Neem are described below:

Domestic uses

- Chewing raw leaves of Neem helps in purifying blood.
- Boiling Neem leaves in water and bathing with that water prevents skin infections and disorders.
- Applying the paste of Neem leaves on the hair keeps the hair healthy and strong.



Diagrammatic representation of multiple benefits of Neem

Campos et al. Front. Plant Sci 7, 1494

- Neem contains antibacterial properties, brushing with young twig provides relief from gingivitis.

2. Agricultural importance

Apart from health, Neem tree is very important for agriculture. The productivity of the crop can be increased by protecting it from various insect pests, soil and seed borne diseases and toxic chemical fertilizers by applying various home-made Neem based products and pesticides and fertilizers available in the market.

- Neem cake is very beneficial to treat insects and fungus in any crop.
- The crop can be saved from damage done by aphids, whitefly, locust, caterpillar by making a solution of Neem leaves and spraying it on the crop.
- Neem oil cake is used to improve the soil, to compensate for the lack of nitrogen and for the nutrition of the crop. It works as a great fertilizer and nutrient.

Marketable health products

Due to the compositional complexity and use of limonoids (a group of chemicals found in Neem), a variety of Neem-based health products can be made. Many companies, both Indian and foreign, are

developing Neem-based health products for a variety of reasons and market of Neem products is growing.

Marketable agricultural products

In current agriculture, pest control is often done through agrochemicals (poisonous substances), which can result in environmental pollution and the development of resistant pests. Biopesticides (pesticides made from natural resources) may provide a better alternative, allowing for the safe control of insect populations. Neem contains several types of limonoids that have shown to be effectiveness in inhibiting the growth of insects. Neem seed cake/ Neem cake also reduces the number of soil insects, fungi, bacteria and nematodes. Neem acts as a nitrification inhibitor, which helps in slowing down the activity of bacteria.

Neem cake is the most preferred product, used for the growth of crops as a fertilizer. Neem based fertilizer is very popular among farmers and entrepreneurs. Neem cake is widely used as a fertilizer in sugarcane, vegetables and other food crops in India.

3. Neem based modern farming methods

Neem based agroforestry is a unique example of an inclusive and sustainable development model. It integrates social (employment), economic (higher



Monitoring of Banthra Located Neem Germplasm



Successful cultivation of Satavar, Lemongrass, Vetiver and Turmeric in Neem Plantation

income) and environmental development (increasing soil fertility, supporting biodiversity and reducing the use of synthetic chemicals). Therefore the Neem tree holds tremendous potential in sustainable agricultural systems around the world. Under the UNIDO project, CSIR-NBRI is conducting a scientific study of the cultivation of several types of medicinal (*Asparagus*) and aromatic (Lemongrass, Vetiver, Turmeric, Pipli, and Sarpagandha) plants in the field of four dwarf cultivars of Neem. Being a dwarf variety, a large number of plants can be planted in a unit area and due to the availability of sufficient light on the surface of the field; different types of crops can also be cultivated. On the basis of preliminary data, it has been found that cultivation of medicinal plants on waste land among Neem plants can provide additional economic benefits and increase the fertility of the soil.

4. Methods of Propagation of Neem

Although Neem seeds germinate easily and the germination rate is between 75 and 90%, most Neem seeds show the highest germination soon after ripening. Therefore, it becomes difficult to prepare seedlings from these seeds at any time throughout the year. Apart from this, there is variation in the quality of Neem seeds from generation to generation due to genetic variations. The quality of seeds



Tissue Culture of Neem

collected from different geographical areas also varies.

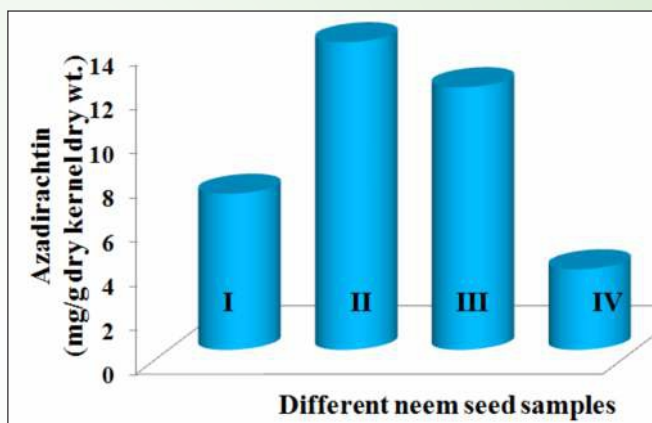
Therefore, on the basis of morphology and functions, Neem plants with similar properties can be prepared by tissue culture and vegetative propagation. Scientists at CSIR-NBRI studied both these methods (tissue culture and vegetative propagation) recorded success at various levels. In tissue culture, six types of chemical substances were prepared by mixing many types of growth hormones and nutrients, under scientific supervision. Efforts were made to prepare plants of Neem in all these mediums but only one substance was suitable for tissue culture. This medium was further used to prepare number of plants.



A view of clonal propagation of Neem

Similarly, the work of preparing Neem saplings by vegetative method (stem cuttings) was also done. Although Neem is a hardy plant, it is difficult task to propagate the plant from its stem cuttings, our experiments have shown that propagation through stem cuttings in the right season, following scientific methods can produce good quantity (up to 50% rooting/development) of plants. The right time for planting cuttings is from February to May and cuttings should be planted in temperature and humidity controlled polyhouse. Soil, vermiculite, coarse sand, etc. can be used as rooting medium in the rooting tray. Using hormones e.g. auxins which promote root growth gives better results.

The scientists of CSIR-NBRI have identified four dwarf cultivars of Neem from the germplasm collected from all over India. These cultivars are



shorter in height (maximum 6 to 8 meters), as compared to other Neem trees and contain high amounts of Azadirachtin. Due to dwarf character, more plants can be planted in an acre and more economic benefits can be taken from their seeds. Apart from this, many other shade tolerant crops can be cultivated as intercrops in the Neem plantation.

Neem has been used in India for agriculture and health benefits since ancient times. Over the years, the use of chemical fertilizers and pesticides in intensive agriculture has increased due to industrialization and the use of Neem based fertilizers and pesticides is decreasing due to non-availability of high quality Neem varieties. CSIR-NBRI is working with the financial assistance from UNIDO for national level propagation of four high quality cultivars of Neem, its plantation at multiple locations and promotion of Neem-based agro-forestry.

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