

Use of neem and neem based products

in organic farming

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Neem (Azadirachta indica) is considered as the most useful traditional plant in India. It is also called “the wonder tree” that has multiple pesticidal, medicinal and anti-feedant properties, making it ecofriendly. Since time immemorial, it has been extensively used in Ayurveda, Unani and Homeopathic medicines. Neem has great potential as an organic amendment for sustainability of environment, health and nutrition. Neem cakes and neem leaves can be used as organic manure, biopesticide, fertilizer coating agent, soil conditioner in organic farming. The natural pesticides obtained from neem are biodegradable, less harmful, least persistent, less toxic to non-target organisms and economical. Fruitful results of applying formulated neem based products in agriculture can provide a cost effective technology to the farming community.

Keywords: Azadirachtin, Biopesticides, Neem cake, Neem coating

IN ancient India, about 60% income was based on agriculture. Land was fertile and it was cultivated using all natural methods and components. At that time, there was no use of pesticides, only natural products like animal waste were used as pesticides. Instead of inorganic chemical fertilizers, only organic manures made with harmless natural ingredients were used. But nowadays, agriculture is mainly dependent on inorganic fertilizers and pesticides. Though these chemicals give more profit but are harmful for human health as well as soil fertility.

Organic farming is a technique which uses natural and biological methods to enhance soil fertility and maintain ecological balance in farming systems. Organic farming makes use of biopesticides, organic manure and bio-fertilizers for nutritional supply to the crop plants. From an environmental standpoint, organic farming is the preferred method for pest and disease control in agriculture. It is considered to be non-toxic, has less input requirements, and greatly enhances the ecological balance while

promoting biological diversity and saving the environment.

Sustainable agriculture encourages practices that present low risks to the environment and human health. Neem oil extracted from the *Azadirachta indica* tree contains azadirachtin which is the active

ingredient in multiple commercially available biopesticides. Neem based products like neem cake are used for coating inorganic fertilizers to prevent the loss of nutrients. Products derived from neem can contribute to sustainable development and resolve pest control



Neem tree (*Azadirachta indica*)

problems in agriculture.

Scientists world over are now focusing on the importance of neem in the agricultural industry. All the parts of neem tree, viz. leaves, bark, twigs, kernel etc. contain hundreds of active compounds which are antibacterial, antifungal as well as antiviral. Natural properties of neem do not have any toxic effect on plants, soil as well as human beings. Neem products are powerful insect growth regulators (IGR) that regulate several harmful bacteria, fungi and nematode. It reduces insect growth and development in different crops which affects their life cycle and leads to decline in insect population.

Neem tree products are used as organic fertilizer, biopesticides, neem manure, nitrification inhibitor, coating agent in different fertilizers and neem soil conditioners. In recent decades, Neem has attracted worldwide attention mainly due to its bioactive ingredients that find increasing use in organic farming storage grain protection. The terpenoids are the unique chemical compounds found in neem plant. Neem leaves might be used in green leaf manuring, litter compost, mulching and also in storage of grains. Neem leaf extracts have great antibacterial and antifungal properties. The extract is beneficial against leaf eating caterpillars, grubs, locusts and grasshoppers. Neem bark and roots also have medicinal properties.

NEEM PRODUCTS AND THEIR USES IN ORGANIC FARMING

Neem as fertilizer

Neem has shown great potential as

an organic fertilizer. Neem cakes and neem leaves can be used for this purpose. When it is ploughed into the soil it protects plant roots from nematodes and white ants. It should be applied 30-35 days before sowing of seeds in the field. Neem cake can also be used as a fertilizer, providing the macronutrients essential for plant growth. Among primary nutrients, Nitrogen (N) is one of the major nutrients required by plants for their growth and development, and urea is the main source of nitrogenous fertilizer used worldwide to meet the nitrogen demand of crops. Neem acts as a nitrification inhibitor, which inhibits the activity of *Nitrosomonas* bacteria, so that conversion of $\text{NH}_4\text{-N}$ into $\text{NO}_3\text{-N}$ occurs very slowly. When neem cake is thoroughly mixed with urea, it forms a fine coating on it and protects from the Nitrogen losses by denitrification and ensures continuous availability of nitrogen for a longer period, as per the requirement of different crops. It also stimulates the phosphorus uptake slightly but has no effect on potassium uptake. 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, cotton and sugarcane. It is harmless to earthworms in fact earthworm populations are known to proliferate in plots treated with neem cake.

Neem cake

Neem cake acts as a natural manure that does not have any negative impact on soil, plant as well as living organisms. It can be used directly by mixing with the soil or it can be blended with urea and other organic manures like FYM for best

results. Neem cake also enrich nutrients in other organic manures like FYM, compost, and vermicompost etc.

Neem cake is completely organic, botanical product containing 100% natural NPK and other micro nutrients in organic form, essential for plant growth. Macronutrients such as Nitrogen (2.0–5.0%), P h o s p h o r u s (0.5–1.0%), Potassium (1.0–2.0%), Calcium (0.5–3.0%), Magnesium (0.3–1.0%), and Sulphur (0.2–3.0%) while micronutrients such as Zinc (15–60 ppm), Copper (4–20 ppm), Iron (500–1200 ppm) and Manganese (20–60 ppm) are found in it. The cake is also rich in both sulphur compounds and liminoids. Neem cake improves the soil reaction by reducing its alkalinity and producing organic acids on decomposition. Being completely natural and organic, neem is compatible with soil microorganisms, improves rhizosphere microflora and ensures stable soil structure, high water holding capacity and aeration in the soil for better root development.

Neem as urea coating agent

Neem and its parts are being used to manufacture urea coating agent to improve and maintain the nitrogenous fertilizer efficiency in soil. Urea is highly water soluble, nitrification and denitrification reduce its efficiency. If urea is coated with neem, the loss can be minimized by slow release of fertilizer, making it available to plants for a longer time. Neem coated urea is ecofriendly which reduces solubility of urea and controls groundwater contamination. The coating reduces ammonia losses through volatilization and controls atmospheric pollution. This environment friendly endeavor can be converted into economic boon for farmers also. It can also be used to control a large number of pests such as caterpillars, beetles, leafhoppers, borer, mites etc. Urea coating with neem is generally done either in liquid form or powdered form. Properties of neem urea coating include anti feedant, and pest growth regulator.



Neem cake

Neem as manure

Manure is used as organic fertilizer in agriculture. Most of the manure consists of animal excreta and plant materials that improve soil fertility and promote plant growth. Neem manure is gaining popularity because it is environmental friendly and also helps increase the nitrogen and phosphorous content in the soil.

Neem as soil conditioner

Soil conditioner is a product which is added to the soil to improve soil's physical condition, usually its fertility. It can also enhance soil quality parameters that stimulate the growth and yield of different crops. Neem seeds, usually powdered seeds are used to manufacture the soil conditioner. It can be applied during sowing of seeds or can be spread and raked over the field. The process of raking into the soil should be followed by proper irrigation so that the product reaches the root zone. Organic soil conditioner is gaining popularity in agricultural industry, not only in India but also in other countries. It can also be used in preparation of different inorganic fertilizer as a soil conditioner.

Neem for storage grain pests

The practice of storing foodgrains is a post harvest technique against adverse weather conditions and insect pest attacks. There are number of species of insect pest that attack granaries and other food structures since ancient times. In India, about 10% foodgrain losses take place during storage at the farm level. It is an old practice in India to mix dried neem leaves with grains meant for

storage. Gunny bag should be dipped in 10% neem kernel solution for 15 min. Dry it in shade and use for storing grains. If the gunny bags are new then it should be soaked for half an hour. Stored grains are also fumigated with the smoke of neem leaves in many parts of India. Neem leaves are a good fumigant against storage pests, household and crop pests. Grains and pulses can be stored by mixing them with neem products like dried leaf powder, kernel powder or neem oil. The neem oil used against stored grain pests should be 1% by weight of the grains. If the grain is used for the purpose, 2% can be used. Using oil is easier than leaves. The active ingredient of neem plant is more in seed and kernel. Neem fumigation is non-toxic, eco friendly and does not contaminate the terrestrial and aquatic environment. This fumigant not only kills insect pests but also affects life cycle, growth and development. The main advantage of this fumigant is that pests do not develop resistance to it.

Neem: a potential biopesticide

Neem is a potential biopesticide for organic agriculture and it is widely used either in Integrated Pest Management (IPM) singly or in conjunction with chemical pesticides. Neem based pesticide is superior to other botanical pesticides such as Rotenone and Pyrethrins. Azadirachtin is the main ingredient of neem plant which is used to manufacture biopesticides. 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 insect-pests. One of the most important advantages of neem-based pesticides and neem insecticides is that they do not leave any toxic residue on the plants.

Neem based products do not destroy the natural predators and parasites of pests like pollinators, honeybees, mammal etc., thereby, allowing these natural enemies to keep a check on the pest population. Neem also is a systemic biopesticide, therefore, seedlings can absorb and accumulate the neem compounds to make the whole plant pest resistant. Neem oil reduces pest population by not allowing the female to deposit eggs on stored grains or feed on them. It is an Oviposition deterrent. Positive and significant effect of neem products on mortality, growth and reproduction of earthworms has been observed. Neem oil, oilseed cake extracts, commercial neem based products such as Suneem, Suneem G, Nimin, Achook, and Jawan when used as seed-coating were found to be highly effective against nematodes.

SUMMARY

Neem products are eco-friendly and superior in quality compared to chemical pesticides. By using these products, we can overcome the ecological and health threats imposed by chemical pesticides. Neem based products like neem cakes are a boon for organic agriculture in order to maintain sustainability of environment.

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