



USAGE OF NEEM PRODUCTS FOR THE PROTECTION AGAINST INSECT PETS OF RICE CROP

Priyanka

Research Scholar, Bhupendra Narayan Mandal University, Madhepura

Dr P K Potdar

Associate Professor, Bhupendra Narayan Mandal University, Madhepura

Declaration of Author: I hereby declare that the content of this research paper has been truly made by me including the title of the research paper/research article, and no serial sequence of any sentence has been copied through internet or any other source except references or some unavoidable essential or technical terms. In case of finding any patent or copy right content of any source or other author in my paper/article, I shall always be responsible for further clarification or any legal issues. For sole right content of different author or different source, which was unintentionally or intentionally used in this research paper shall immediately be removed from this journal and I shall be accountable for any further legal issues, and there will be no responsibility of Journal in any matter. If anyone has some issue related to the content of this research paper's copied or plagiarism content he/she may contact on my above mentioned email ID.

ABSTRACT

“Rice is Life” for millions of people and staple food for more than half of the worlds’ population. The demand for rice is growing with ever increasing population. At present the grain yield in rice has to be increased and the yield achieved has to be sustained. The field studies at Wetlands, Tamil Nadu Agricultural University Coimbatore resulted in compilation of agronomical use of neem and its by products in rice cultivation.

The Wetland Farm at Agricultural College and Research Institute, Coimbatore is situated in the Western Agro Climatic Zone of Tamil Nadu at 11° North Latitude and 77°East Longitude at an altitude of 426.72 m above MSL.

Key words: Agronomical cultural practices, neem, rice

INTRODUCTION

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.

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.

It has been an age-old practice to mix neem materials in stored products for protection against insect pests in countries where neem abounds. Recognition of this biodynamism of neem materials and the protection it offered to stored products was experience driven rather than being based on knowledge of neem's bioactive chemical constituents. Little consideration was given to large quantities of neem materials used because of the ubiquity of neem trees in villages and homesteads. The characteristic garlicky odor of neem materials permeating in closed storage environment presumably repelled insects and the bitter components present in neem materials mixed with the stored grains deterred feeding. Recent researches have revealed how the neem materials, whether raw, enriched, or purified, including bioactive compounds such as azadirachtin, affect insect pest behavior, growth and development, and survival and reproduction.

The sensitivity of stored product insect pests to neem materials may vary, but nearly all are susceptible to neem. As seed damage is not always reduced by neem materials at par with synthetic insecticides, there has been some loss of faith in neem as a stored products protectant. However, the use of neem can confer significant economic advantage and service to rural areas in tropical developing countries if reliable recommendations can be made and given to farmers for the protection of stored commodities.

Although agriculture began about 10,000 years ago, the practice of storing food grains began about 4,500 years ago as a safeguard against poor harvests and famines due to

adverse weather conditions and/ or pest attacks. There is evidence that several species of storage insect pest attacked granaries and other food structures in ancient times, e.g. in ancient Egypt (Levinson and Levinson 1985). Even today, storage losses remain notoriously high. According to an FAO study, world-wide loss in store approximates 10% of all stored grain., i.e., 13 million tons of grain lost due to insects or 100 million tons to failure to store properly.

Although improved storage structures and modern chemical and physical control techniques are now employed for the safe storage of produce, in many countries 70-90% of food grain is still stored for 6 months to a year at farmer's level in traditional storage structures made of locally available material, such as paddy straw, split bamboos, reeds, mud, bricks, etc., which are not insect-proof. In some countries, grains are sometimes mixed with sand, limestone, or ash to provide physical obstacles to movement of insects through the grain and reduce deposition of eggs.

RESEARCH STUDY

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.

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.

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.

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.

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.

The size of on-farm storage may range from a few hundred kilograms to a few tons. Gunny bag storage, as practised widely in some countries, is not the most efficient way of storing food grains and is vulnerable to pest attacks. Prophylactic chemical and physical treatments, such as aeration, radiation, refrigeration, heating, or hermetic storage in controlled nitrogen or carbon dioxide gaseous environments, are not only prohibitively expensive but not always feasible, because in villages the food grain is generally stored within the confines of human dwellings. Also, widespread resistance to insecticides, including the juvenoid methoprene, among populations of major post-harvest insect pest species.

Although methyl bromide has been used as a fumigant for more than 70 years for controlling insect pests in durable and perishable commodities, concerns of its role

in ozone depletion indicate that it will eventually be removed from the list of few remaining products capable of preventing the damage in food and other commodities.

This situation demands alternative control measures that reduce the dependence on contact insecticides. Over the past three decades, neem, *Azadirachta indica* (A. Juss.), a botanical cousin of mahogany, has come under close scientific scrutiny as a source of natural pest control materials. The tropical tree is widespread in Asia and Africa and has long been known to be free from pests and diseases. The scientific name of neem is derived from "azad dirakht-i-hind," which in Persian language means the "free or noble tree of India." Here, the traditional uses and the possible practical applications of neem materials for averting losses in food grains and other commodities caused by stored products insect pests are reviewed and evaluated on scientific bases.

It has been an age-old practice in India to mix dried neem leaves with grains meant for storage. The practice of mixing neem materials with stored products became rooted as part of traditional wisdom and culture. Singh (2014) recorded that neem leaves were spread in 5-7 inches thick layers in grains and neem fruits were crushed on the inner surfaces of grain containers. Mixing of neem leaves (2-5%) with wheat, rice, or other grains is even now practised in many villages in India and Pakistan. Other common practices include mixing of neem leaf paste with the mud that is used for making earthen bins and overnight soaking of gunny bags in boiled neem leaf extract (2-10%), which are then used for storing grain.

The traditional uses of neem may differ in different regions or with farmers of different cultural backgrounds. For example in southern Sind, Pakistan, farmers mix dried neem leaves with grains stored in jute sacks, or they apply crushed neem leaves on the inner surfaces of mud bins before filling them with grains. In central Sind, where “palli” (a giant basket) made of plant materials is a common storage structure, crushed neem leaves mixed with mud are used as plaster for its inner sidewalls and top. In southern Punjab, Pakistan, neem leaf extract is sprinkled on wheat straw packed at the bottom of “palli” 2 to 3 days before filling with grain. A survey of various types of on-farm storage practices revealed that a combination of two or three control measures, including the use of neem leaves, was used by 29% of the farmers in Punjab and 47% of the farmers in Sind.

DISCUSSION

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 Anti feedant, anti fertility and pest growth regulator.

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.

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.

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.

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.

CONCLUSION

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.

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.

REFERENCES

1. Grace, W. R. 1991. MSDS for Margosan-O. Washington Research Center, Columbia, MD. International Rice Research Institute, Philippines. 24-25 PP.
2. Indian Agricultural Research Institute. 1983. Specifications for neem kernel oil, 4765. Martineau Jess. 1994.

3. AgriDyne Technologies, Inc. January 26, 1994, MSDS for Azatin-EC Biological Insecticide. Rossner, J. and Zebitz, C. P. W. 1986.
4. Effect of soil treatment with neem products on earthworms (Lumbricidae). In: Proceedings of the 3 International Neem Conference, Nairobi, 1986, 627-632 PP.
5. Vethanayagam, S. M. and Rajendran, S. M. 2010. Bioefficacy of neem insecticidal soap (NIS) on the disease incidence of bhendi, *Abelmoschus esculentus* (L.) Moench under field conditions. *Journal of Biopesticides*, 3(1): 246-249.