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Nematicidal potential of the neem *azadirachta indica*

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ABSTRACT

Widespread concern about the consequences of chemical pesticides use has resulted in increased interest in alternative pest control measures. Natural products derived from plant parts have been reported to control various pests including plant-parasitic nematodes. Now-a-days, botanicals are receiving greater attention as prophylactics against several species of plant-parasitic nematodes (PPNs). Various products (oils, cakes, extracts, etc.) prepared from the leaves and seeds of the neem plant (*Azadirachta indica*) have been reported as effective protectants against PPNs when used as root-dips and seed treatments. Nematoxic compounds of the neem plant, especially the azadirachtins, are released through volatilization, exudation, leaching and decomposition.

Keywords : *Azadirachta indica*, Botanicals, Nematoxic, Plant-parasitic nematodes, Prophylactics etc.

Introduction

Now-a-days, botanicals are receiving greater attention because the plant parts and their byproducts as intercropping or incorporated into soil have the potential nematicidal value. Neem (*Azadirachta indica*) is one of the effective, economic and eco-friendly agent among various botanicals. It is a versatile tree of Indian origin, belongs to family Meliaceae. Neem is a natural alternative to synthetic pesticides and considered as key ingredient in non chemical pest management system. It acts as an antifeedant, growth regulators, sterilant, anti-oviposition agent and repellent. Other factors that

have stimulated the use of neem-based products for pest control in agriculture are ecological and toxicological aspects as well as economic aspects. Neem oil is the main biochemical present in fruits and seeds that contains pesticidal properties. Neem based pesticide formulations are safe, biodegradable and manageable by the farmers unlike synthetic pesticides which leave residues polluting air, water and soil. The management of various pests including plant parasitic nematodes (PPNs), is one of the most challenging job and the economic losses caused by PPNs are fully known. Nematode toxic compounds of the neem plant, especially the azadirachtins, are released through volatilization, exudation, leaching and decomposition.

Compounds of neem possessing nematicidal activities::

Different parts of the neem tree are known to contain over 40 bitter principles belonging to the diterpenoid, triterpenoid, limoloid and flavonoid groups of natural products. The most well known are the azadirachtins and other limonoids which have been found in traces are meliantriol, salannin, nimbin and nimbidin (Acharya and Padhi, 1988). The site of synthesis and accumulation of the neem chemicals have been identified as secretory cells which are most abundant in the seed kernels. Besides the terpenoids, neem also contains more than 20 sulphurous compounds responsible for the characteristic smell of crushed seeds and neem oil.

Target group :

Almost all PPNs (ectoparasites and endoparasites) are subjected to manage by neem products like *Meloidogyne* spp. (Singh *et al.,* 1980), *Heterodera* spp., *Globodera* spp., *Rotylenchulus reniformis*, *Pratylenchus* spp., *Tylenchulus semipenetrans*, *Helicotylenchus* spp., *Hoplolaimus* spp., *Helicotylenchus* spp. etc.

Extraction of neem seed kernel extract (NSKE) from neem seeds:

Various methods are employed for extracting the oil from the neem seeds. These range from simple to complex techniques depending on the resources available.
Steps involved in one of the oil extraction method as following :

a) **Seed collection, cleaning, drying and sorting of seeds:** Matured neem seeds are collected from the trees and cleaned to remove the skin. The seeds are then dried to reduces their moisture content by spreading out in the sun. Foreign materials such as stones and dirt are then removed by hand picking.
b) **Shelling of seed and winnowing:** Once completely dried, the seeds are shelled by pounding to get clean kernels. The pounded mass is then subjected to winnowing to separate the seeds from the shells.
c) **Crushing the kernels:** The cleaned kernels are then crushed by pounding using mortar and pestle to obtain a fine mesh. To facilitate the next step, the crushed material is then winnowed.
d) **Sieving and streaming:** The pounded pulp is then sieved using a very fine-sized sieve to obtain a fine greenish brown powder and then streamed by placing it over

boiling water for about 15-20 minutes. This process lead to formation of the dough from which oil can be readily extracted.

e) **Oil extraction using the pressing machine/manually:** Upon the formation of dough, the hot material (dough) is enclosed in a fine cloth capable of allowing liquid passage and then placed in the barrel of oil extraction machine. Inside the barrel, is a metal lid which is placed on the enclosed dough to be pressed. The pressing is done and when enough pressure is exerted on the dough, oil will start to flow from the mouth of the barrel which is then collected below.

If the exercise is done correctly, one can get between 100-150 ml of neem oil from 1 kg of neem seed

Different methods of neem use as nematicide :

Many botanicals possess nematicidal and nematostatic properties in their roots, shoot, leaves, flowers, seeds etc. and their extracts, essential oil, oilseed cakes and products have been successfully tested against variety of phytonematodes (Addabbo, 1995).

- **Leaf mulch :** Application of fresh leaves of *Azadirachta indica* as leaf mulch, is useful for managing the nematode population. Dry and fresh neem leaves are quite superior and effective in reducing the nematode population by more than 60 percent under field conditions.
- **Seed treatment and bare root dip method :** Seed soaking with aqueous extracts of neem seed kernel at 20 percent proved to be most effective among various plant products tested in improving crop growth and minimizing nematode infection. Bare root-dip treatment of plant seedlings with extracts of decomposed and un-decomposed oilcake and leaves of neem have been used as prophylactics and therapeutics against nematodes on tomato and chilli plants
- **Seedlings :** Reduction in the populations of PPNs on different crops has been reported in the presence of neem seedlings. Root-exudates of neem were found to be highly toxic to some ectoparasitic nematodes and inhibitory to larval hatching of endoparasitic nematodes. Neem seedlings along with crop in microplot (one seedling/plot) have significantly reduced the nematode populations.
- **Soil amendment :** Soil is a dynamic and complex physical, chemical and biological medium and organic compounds released into it, may alter its microenvironment (Prasad *et al.,* 1994). In field trials, oilcakes and leaves of neem are generally applied at 110 kg /ha.

ADVANTAGES OF NEEM PRODUCTS AS NEMATICIDES:

- Less toxic to non-target, easy handling and application does not require high level training
- Low cost and easy applicability, improves the soil structure and nutrient status of soil; contains plant nutrients such as nitrogen (5.5-7.1%), phosphorus (1.1%) and potassium (1.5%).

- In addition, it stimulates other soil microbial population such as bacteria and fungi which may play the antagonistic role against nematodes.
- Produce toxic decomposed products like phenolics, ammonia or increased predacious and parasitic activity of soil biota.

Drawback :

- Azadirachtin has low stability under field conditions, due to a high rate of photo-degradation, as well as a short residence time and slow killing rates, compared to conventional pesticides.

Commercial available neem products in worldwide agro-market:

- **Azadirachtin-based products :** AZA-Direct®, Azamax®, Neemazal Technical® etc.
- **Neem oil :** BioNeem®, Shubhdeep Neem Oil®, OzoNeem Oil®, Neem Drop® etc.

Neem product recommendation of CCSHAU, Hisar :

- In tomato, root-knot nematode can be managed by using neem cake @ 750 g/m^2 in nursery beds.
- Citrus: Application of carbofuran (Furadan 3G) @ 7 g/sq.m. + 1Kg Neem cake (about 9 sq. m. around a plant) just before flowering; pulverize the soil in the basin area and mix the chemical thoroughly followed by flood irrigation.
- In button mushroom, apply 4% (w/v) NSKE at spawning @ 7.5 litre/q compost as prophylactic measure.
- In bottlegourd against *Meloidogyne* spp. apply neem cake @30g/spot + seed treatment with *Gluconacetobacter diazotrophicus* strain 35-47 @ 50ml/2kg seed.
- Under protected cultivation system, soil application of *Trichoderma viride* @ 20g/m^2, mixed with neem cake/FYM/Vermicompost @ 100g/m^2 in the tomato beds against *Meloidogyne* spp.

CONCLUSIONS

Neem based nematicides have a significant potential, but need to be popularized through farmer-education programmes. The contributions of nematicidal compounds of neem, other than nutrients from the decomposition of neem by-products to plant growth, the reduced toxicity to non-target organisms and the effects on crop yields require further study to assess the usefulness of neem in integrated pest management and their potential benefits brought to the attention of farmers.

REFERENCES

Acharya, A. and Padhi, N. N. (1988). Effect of neem oilcake and sawdust against root-knot nematode, *Meloidogyne incognita* on betelvine (*Piper betle* L.). *Indian J. Nematol*. **18**, 105-6.

Addabbo, T. D. (1995). The nematicidal effect of organic amendments: A review of literature 1982-1994. *Nematol. Medit*. **23**, 299-305.

Prasad, D., Nagia, D.K., Kumar S. and Saini M.L. (1994). Integrated approach for management of plant-parasitic nematodes in brinjal, *Solanum melongena* L. *Plant Prot. Bulletin* **46**, 31-3.

Singh, I., Sharma, S.K. and Singh, P.K. (1980). Effect of oilcakes extract on the hatching of root-knot nematodes, *Meloidogyne incognita. Indian J. Mycol. Pl. Pathol*. **9**, 115-16.