



NEEM

an eco-friendly botanical insecticide under IPM

Sourabh Maheshwari

Department of Entomology
College of Agriculture, GBPUAT, Pantnagar-263145, U.S. Nagar, Uttarakhand, India

Email- sourabhmaheshwari1998@gmail.com

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Neem (*Azadirachta indica*) is the most useful traditional medicinal plant of India. Each part of the Neem tree has huge insecticidal property. It is considered as a valuable source of unique natural products for botanical insecticides against various

Introduction

Neem is Native to India and Burma, it belong to family Meliaceae .it fast growing

insect pests under IPM. This article gives a bird's eye view mainly on the Neem's Chemical constituents; Mode of action, Different Neem based formulations and its advantages.

tropical evergreen plant. It is also known as Margosa tree or Indian lilac, 'Botanical

Marvel', 'Village Pharmacy', 'Wonder Tree', 'all-can-treat-tree' and 'Gift of Nature'. One closely related species that of Neem is the chinaberry tree or Persian lilac (*Melia azidarach L.*), contains the similar active components as found in *A. indica*. Neem insect control efficacy was first recognized by the withstanding of neem

Chemical Constituents present in Neem

The main Neem chemical is a mixture of three or four related compounds. They belong to tetranortriterpenoid (limonoids). Following are different active compounds found within Neem-

- **Azadirachtin:** It is the main agent for controlling insects, representing 90% of the effect on most pests; contents are usually 2-4 mg/g kernel. It is a feeding deterrent and growth regulator, repelling and disrupting the growth and reproduction of pests;

Mode of Action

Neem posses Multiple mode of action as Antifeedant, Repellent, Ovipositional Deterrent and Insect Growth Regulator (IGR) etc

1. Acts as an Antifeedant

Antifeedant are chemical that inhibits feeding and which does not kill the insect directly; the insect dies due to starvation. Crude extracts of neem showed most potent antifeedant activity against pests like defoliators and sap feeding insects. The neem products recorded a high rate of feeding inhibition against *Brevicoryne brassicae*, *Toxoptera aurantia* and *Helicoverpa armigera* etc.

2. Acts as an Ovipositional Deterrent

The plant products applied either as extracts or oils affect egg laying and egg hatching behaviour which directly influences the

trees during locust attack, which swarmed on the tree, but left without feeding. The extracts from seeds and leaves have pest insect control activities. The affected insect can no longer feed, breed, or metamorphose, and can cause no further damage to crops.

- **Meliantriol:** It is a feeding inhibitor, causing insects to cease eating in extremely low concentrations;
- **Salamlin:** It is a powerful feeding inhibitor.
- **Nimbin and Nimbidin:** It shows antiviral activity;
- Others minor compounds are also present which are known to be active in one way or another.

production of young ones. The ovipositional deterrence mainly due to the strong odour of the products and ovicidal activity due to interference with the embryonic development within the egg. Repellent activity of Neem against oviposition has been reported in lepidopterous pests for like *Earias vittella*, *Chilo partellus*, *Amrasca devastans* etc.

3. Acts as an Insect Growth Regulator (IGR)

Based on the dosage or the insect stage exposed to Neem, it may result in premature death of the insect or prolongation of larval period coupled with morphological abnormalities or production of intermediates in the case of larva, pupa and adults of the insects. Neem oil cake

applied to soil caused reduction or mortality especially for white grubs and termites

Role of Azadirachtin in Neem based formulations:-

1. All neem-based formulations are based on the naturally occurring *limonoid azadirachtin*, as a secondary metabolite.
2. *Azadirachtin* was found to be active affects over 200 species of insects, by acting mainly as an antifeedant and growth disruptor, and as such it possesses considerable toxicity toward insects.
3. It fulfills many of the criteria needed for a natural insecticide if it is to replace synthetic compounds.
4. *Azadirachtin* is biodegradable; it degrades within 100 hours when exposed to light and water.
5. It shows very low toxicity to mammals with LD-50 in rats is >3,540 mg/kg, which making it practically non-toxic.

Commercial formulations available based on the Azadirachtin content:

Depending on the various combinations & permutations, the following are the Azadirachtin levels prepared by different Indian Companies.

1. Azadirachtin 300 ppm (0.03%),
2. Azadirachtin 1500 ppm (0.15%),

A. Neem seed kernel extract (NSKE):

The NSKE have anti-bacterial, anti-inflammatory, insecticidal, anti-viral, germicidal, anti-fungal properties. NSKE have high contents of Azadirachtin. It is prepared by Grinding 20 kg of NSK is sufficient water and make in to paste. Add 10 lts of water and soak it for 12 hrs, filter through cloth and make up with water to

B. Neem seed kernel powder:

Use of NSK powder shows Ovipositional deterrency in case of storage pests like pulse beetle, *Callosobruchus chinensis* and red flour beetle, *Tribolium castaneum*. It reduced egg laying by *C. chinensis* In addition to the ovipositional deterrency, it shows ovicidal action against rice moth, *Corcyra cephalonica*. 1-2 parts NSK powder/100 parts of stored grain provide protection against stored grain pests for a month.

C. Neem cake:

3. Azadirachtin 3000 ppm (0.30%),
4. Azadirachtin 5000 ppm (0.50%),
5. Azadirachtin 10000 ppm (1.00%),
6. Azadirachtin 20000 ppm (2.00%)
7. Azadirachtin 50000 ppm (5.00%),
8. Azadirachtin 65000 ppm (6.50%)

250 lts to use for acre. Weekly spray application of 2.5-5.0% NSKE (aqueous) protects cabbage from diamond backed moth, *Plutella xylostella*. NSKE is used widely for the control of many insect pests, especially leaf eating insects. This is also effective against soft bodied sucking insect pests and also leaf minors.

Neem cake is a by-product obtained through processing of neem fruits and leaves. It is potential source of organic manure. It contains an adequate quantity of NPK and other micro nutrients as well as it promotes plant growth. Neem cake protects plant roots from nematodes, root grubs; ants as it contains residual limonoids. Neem cake also helps in reducing alkalinity of the soil. 1kg of neem cake soaked in 5 lts of water for a week with frequent agitation then filtered through a cloth and made up to 10 lts, can

be sprayed against citrus leaf minors, which acts as antifeedant.

D. Neem oil:

Neem Formulations shows the following effects:

1. Partial reduction or complete inhibition of fecundity and/or sometimes egg hatch ability;
2. Reduction of the life span of adults;
3. Oviposition repellence against females;
4. Direct ovicidal effects;
5. Antifeedant effects against larvae, nymphs, or adults;
6. Formation of permanent larvae;
7. Growth regulating effects at moulting between larval (or nymphal) instar and especially in the pre-pupal stage and giving rise to larval-pupal, nymphal, pupal, nymphal-adult, and pupal-adult intermediates, and to crippled adults.

Advantages of Neem formulations:

1. Broad spectrum of activities
2. No Known insecticide resistance mechanisms
3. Compatible with many other commercial insecticides and fungicides
4. Number of mode of action with possible multiple sites of attack.
5. Classified as a biological insecticide for registration purposes.
6. Low use rates
7. Compatible with other biological agents within IPM Programme.
8. Not persistent in the Environment
9. Minimal impact of Non-target organisms.
10. Formulation flexibility
11. Application flexibility - can be sprayed or drenched.
12. Non-phytotoxic

Conclusion

Neem is considered the most important biopesticide for pest control. Neem-based pesticides are currently widely used in agriculture all over the world. It contains Azadirachtin, a major pesticidal active ingredient with ovipositional deterrent, repellent, antifeedant, growth disruption, and sterility against a wide range of insect pests. Neem is an excellent choice for developing environmentally friendly and

long-lasting pesticides. Because of their non-toxicity to non-target organisms, ease of preparation, and compatibility with other by products, Neem products fit well into integrated pest management programmes. As a result, there is a need to educate everyone on how to use neem as a biopesticide wisely and protect their agricultural crops.