

Explaining Azadirachtin and Neem

By Raymond A. Cloyd

QUESTION: WHAT IS THE DIFFERENCE BETWEEN AZADIRACHTIN AND NEEM?

ANSWER: Neem is not a single substance but is a general term for both azadirachtin and neem oil, which are derived from the neem tree, *Azadirachta indica*. The seed kernels contain the highest concentrations of active compounds. Seeds are soaked in water and alcohol in order to extract any pesticidal constituents. After the natural neem oil is removed from the seeds, it is treated with alcohol, which causes the azadirachtin and related substances to separate from the neem oil. The subsequent remaining oil without the azadirachtin is referred to as clarified hydrophobic extract of neem oil. The two main active ingredients derived from the neem tree seeds are azadirachtin and clarified hydrophobic extract of neem oil (also referred to simply as “neem oil”).

Azadirachtin. Azadirachtin is not a single compound. It has a very complex structure, being

a mixture of related substances extracted from the neem seed kernels. The seeds are the only source of azadirachtin. Azadirachtin affects insects in many different ways including acting as an insect growth regulator, anti-feedant, repellent, sterilant and oviposition inhibitor.

As an insect growth regulator, azadirachtin acts as an antagonist by inhibiting the synthesis or metabolism of the insect molting hormone ecdysone. Consequently, by inhibiting the molting process and subsequently metamorphosis, this causes insects to die when transitioning into the next life stage or instar (insect stage between molts) thus disrupting the life cycle of insects, which prevents the production of future generations.

Azadirachtin is more effective on the immature/young life stages of insects than eggs or adults. However, azadirachtin is slower-acting than conventional insecticides, which is primarily due to azadirachtin altering or modifying the behavior of insects. Azadirachtin works as a stomach poison in which insects must ingest the active ingredient during feeding in order to be negatively affected. Activity seems to be better on chewing than sucking insects. This may be the reason why azadirachtin is most effective against caterpillars.

Azadirachtin has minimal contact activity against most insect pests and works best at warmer temperatures (>70° F) with reduced efficacy at lower temperatures. Azadirachtin has been shown to have systemic properties with activity against certain insect pests, although this is contingent on plant type and pH of the growing medium, with less systemic activity at a pH greater than 7.0 (alkaline). This is interesting as azadirachtin has a low water solubility (0.05 ppm).

In addition, some studies have reported that foliar applications of azadirachtin are effective in suppressing populations of the two-spotted spider mite, *Tetranychus urticae*. A number of products registered for use in greenhouses that contain azadirachtin as the active ingredient include Azatin, Ornazin, AzaGuard, Molt-X, Azatrol, AzaSol and Aza-Direct. Most of these products are labeled


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for use against aphids, caterpillars, leafminers, mealybugs, scales, thrips and whiteflies.

Clarified hydrophobic extract of neem oil.

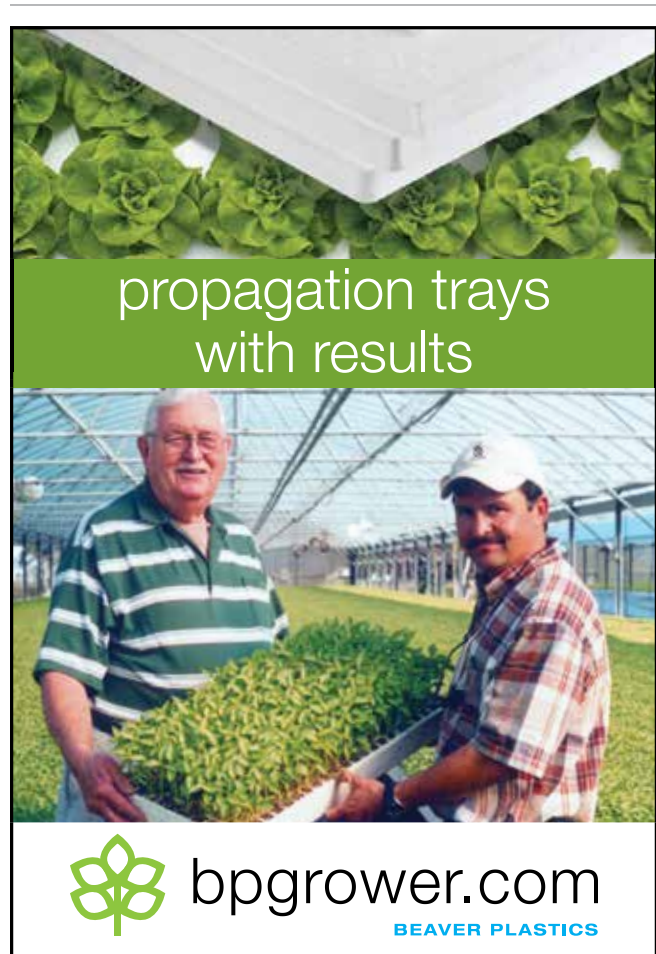
Clarified hydrophobic extract of neem oil (neem oil) works by suffocating (blocking breathing pores) insect and mite pests. Neem oil is most active on soft-bodied insect and mite pests such as aphids, whiteflies, spider mites, mealybugs and scales.

Neem oil may kill eggs, immatures (larvae or nymphs) and adults. However, neem oil only has contact activity so it is important to obtain thorough coverage of all plant parts and make repeat applications based on label recommendations. The one product containing clarified hydrophobic extract of neem oil as the active ingredient that is registered for greenhouse use is Triact. This product is labeled for use against aphids, leafhoppers, mealybugs, mites, scales and whiteflies.


Azadirachtin and clarified hydrophobic extract of neem oil have short residual activity, primarily due to their susceptibility to ultra-violet light (sunlight) degradation, which means that repeat applications are typically required. Both compounds have low toxicity to humans and mammals with an LD₅₀ >5,000 mg/kg. In addition, azadirachtin and clarified hydrophobic extract of neem oil, in general, are less harmful to most natural enemies (parasitoids and predators) than conventional pesticides. 



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