

NEEM OIL

At the 2001 Ottawa Orchid Show, Bill Sutherland of B&B Hydroponics was selling numerous hydroponic supplies and drew my attention to a new product that he recently acquired and was selling: Neem Oil. There are so many new products constantly coming on the market that I did the usual eye rolling, sighing and patiently listened to what Bill had to say before moving on to tend to other show related matters. Later, I learned from other orchid vendors that some of them were also distributing Neem Oil and that a favorable article on this product was published in the newsletter of the American Orchid Society. My wife and I have used the product and find it to be an effective agent for controlling some of the orchid insect pests that we all come across from time to time.

POINTS TO REMEMBER:

Store the Neem Oil in a cool spot, such as a refrigerator. Only use what you need. As the Neem Oil may solidify when kept cool, you will need to warm up the container of Neem Oil in a container of very warm water until the Neem Oil turns into a liquid state. If you have a large container of Neem Oil, you may wish to pour this oil into several smaller containers so that you have a handy amount to warm up when required.

When mixing up a solution of the Neem Oil with your water be sure to add some soap such as Sunlight Dish Soap, as this will break down the oil in the water. If you fail to include the soap, the oil will not mix with the water and your spray application will be of little value.

INFORMATION ON NEEM OIL

I turned to the Internet to find what I could on this product and found numerous helpful sources of information on Neem Oil and the Neem tree. One of the sources was Larry Evans of Blue Pagoda Orchids in Englewood, Florida. I found what he had to say quite useful because he talks about proportions (how much Neem Oil to use with water) and the results he has had with his pets, something that a lot of orchid growers who also have pets are concerned about. The second source of information is the Neem Foundation whom I have quoted to a great extent. There are many other benefits to be derived from the Neem tree and for those of you who have wider interests, the extracts from the Neem Foundation are offered for your reading pleasure and information.

NEEM OIL

Here is the Larry Evans information, extracted from his web site:

I can only tell you of my experience with Neem oil. I cannot directly recommend Neem oil because the US government has not approved its use on orchids or on any plants. When I refer to Neem oil, I mean pure Neem Oil as pressed from the seeds of the Neem tree. I have never used any product with Neem oil in it. I don't know that it would be as safe as pure

NEEM OIL

Where does Neem oil come from? Originally it came from India. The Indian natives have been using Neem for about 3000 years as an internal remedy as well as an ingredient in tooth paste, soap, shampoo, cosmetics and skin creams. I have never used a product in the greenhouse whose effects were as efficient and long lasting as Neem. Insecticides and fungicides that I had previously used were a short-term fix - about two weeks. And the smell was offensive and lasted for days. But it was what was available to keep a clean insect free greenhouse even if the fumes from most insecticides caused me to have allergic reactions.

Due to a long-term illness, my greenhouse became a disaster area. In January, as the phalaenopsis were spiking, the mealy bugs moved in by the thousands. About 75% of the mature plants had fire ants in the pot. Scale was rampant. We had snails and slugs so big they looked dangerous. Toxic sprays did not get rid of them completely.

The first time I used Neem oil (1 oz. to 1 gallon of water + few drops of dishwashing liquid {Editor's note: Sunlight or Ivory Dishwashing Soap is recommended}), I sprayed every plant, bench, walkway and under every bench. In a few days there was a definite improvement. I waited 2 weeks and sprayed again. I kept a close eye on the plants, no mealy bugs, scale and best of all the fire ants were gone. And no more slugs and snails.

I didn't spray again for six months. I found a snail and a slug, no other 'live stock', but I decided to spray everything again. The beauty part of using Neem oil is that you don't have to wear protective clothing or special breathing equipment and there are no sickening odors. Neem oil does have an odor, best described as 'kind of like onion soup'. However, the odor only lingers for a short time.

How does Neem get rid of insects? Most insects die shortly after spraying. Those remaining become sterile and do not reproduce. I've heard a story of 2 desert locusts, 2 grape leaves and 2 bell jars. One grape leaf was sprayed with an insecticide, the other with Neem. One locust and one grape leaf were put under each bell jar. The locust ate the toxic leaf and died. The other locust refused to eat the Neem sprayed leaf and starved to death. From my experience the story could be true. I believe it is better if you can prevent the insect from eating the plant, than to let them eat the plant and then die. It takes years to lose the damaged leaves on most orchids. Flowers can be ruined before the critters will die from insecticide. I've not been disappointed with Neem Oil. I'm sure that many who read this will be sceptical because of the 'do everything' claim.

NEEM OIL

We have a cat that has grown up in the greenhouse. Neem hasn't bothered her at all. Panzie greets all comers and we certainly would not use anything that would hurt her. We also used Neem on my daughter's dog, a Shar-pei. The dog was biting and chewing her fur and making sores and bald spots all over her coat. The veterinarian said she had hair mites. There is a treatment for this - a series of 6 dips at \$65.00 per dip and only a 50% chance of a cure. I suggested that she try using a 'Neem rinse' after bathing the dog, using a 1 oz. to 1 gallon of water. This treatment was followed for three weeks. The dog has stopped chewing herself and has grown back a full glossy coat. It is also harmless on people. A lady in our orchid society has an allergy to mosquito bites. Living in Florida she had a problem working in her garden, fishing or taking an evening stroll. She had used spray repellents but it was difficult to use and not always satisfactory. She tried Neem oil and she swears by it.

When I use Neem oil I only mix the amount I will use within four hours. Neem is very biodegradable and will start to break down quickly. If it is kept in the refrigerator at approximately 40F the shelf life is extended. As any organic oil, it will turn rancid. How soon will depend on the storage temperature. We have used pure Neem oil on cattleya, dendrobium, phaleanopsis, oncidiums, vanilla, vanda, peristeria, etc. We have detected no damage to any of these plants.

TIPS ON USING NEEM OIL

1. Pure Neem Oil will retain its potency much longer if stored at about 40 F in a low light area such as a refrigerator.
2. Do not mix anything with Neem oil until you are ready to use it. Mix only the amount of Neem oil you will use in 4 to 6 hours.
3. A new batch of Neem oil, water and a little soap (according to the label) should be mixed each time you are going to spray.
4. The soap (dishwashing detergent) is used to help emulsify the oil. If no soap is used the Neem will not mix into solution with the water and spraying will not be effective.
5. Spray the complete plant including the top of the potting media. Spray benches, walkways and any surface over which an insect might travel.
6. A mixture of 1 oz. to 1 gallon of water should be used for spraying. A weaker solution may be used as a maintenance spray. It is impossible to give a definite schedule for spraying, however a "close eye" will help each person to adjust a timetable to maintain clean plants. You will probably not have to spray as often with Neem as with toxic insecticides.

*The different Neem Oil products on the market may require handling different from what is described here. Please be sure to read the manufacturer's instructions carefully before use.

NEEM OIL

MORE BACKGROUND INFORMATION

The following article was taken from the website of the Neem Foundation. For more information, readers are invited to go directly to the Neem Foundation website.

A RICH HERBAL HERITAGE

India has a rich heritage of using herbal remedies that have their origin dating back some 7000 years or more; plants such as the traditional Neem, Karanj, Tulsi, Kevda, Ginger, Amla and Turmeric which have through the centuries lent their medicinal properties to mankind's health and well-being. More so, they have provided mankind with their invaluable inherent gifts.

Today, the products of these plants are used in pest control, toiletries, cosmetics, pharmaceuticals, plant and animal nutrition, etc. Their pharmaceutical effects cover a wide spectrum from skin-care and health to agriculture and veterinary uses. One of the most promising resource for the future is the grand old tree of India, the Neem.

NEEM: THE LIVING LEGEND

Neem is one of the most valuable and fascinating trees of India. For centuries Indians have used the extracts of various parts of the Neem tree (*Azadirachta indica* A Juss) as a health and beauty aid for endless benefits to the human body. The healing and revitalizing properties of Neem have been successfully tested and filtered through centuries of experience and generations of use in skin and hair care in India. Neem is nature's answer for protection against the degenerative effects of a modern polluted environment. The Neem tree has been known as the wonder tree for centuries in the Indian subcontinent. It has become important in the global context today because it offers answers to the major concerns facing mankind:

POLLUTION:

Environmentally, Neem has a reputation as a natural air purifier, exhaling out oxygen and keeping the oxygen level in the atmosphere balanced. Neem's ability to withstand extreme heat and water pollution is well known. It also helps to improve fertility of the soil and to rehabilitate degraded wastelands. The Neem tree can also play a vital role in controlling soil erosion, salination and preventing floods. But Neem is far more than a tough tree that grows vigorously in difficult sites. Among its many benefits, the one that is most unusual and immediately practical is the control of farm and household pests. Some entomologists now believe that Neem has such remarkable powers for controlling insects that it will usher in a new era in safe, natural pesticides.

PRESERVING THE ECO-SYSTEM:

The ecosystem is a major issue on the global agenda and preserving the ecosystem is a priority. A UN study predicts that by the year 2050, most of Asia and Africa will be reduced to a dust bowl if we continue the way we are going. Another study by FAO points out that some pests may soon be beyond control! Neem seeds contains bio-active fractions that can help in pest

NEEM OIL

management strategies and help us save our environment. This bio-activity of Neem based products has been extensively evaluated and proven. Because of the fear of toxic residues in food products associated with the use of chemical pesticides, there is a growing need for pest control agents of plant origin which do not leave any toxic residues. Though many plant chemicals have been reported to be suitable for this, Neem is the only plant from which the bio-pesticides are commercially manufactured, found effective, eco-friendly and acceptable to the farmers. Neem pesticides are now increasingly used in India on crops like cotton, vegetables, fruit trees, coffee, tea, rice and spices.

POVERTY:

As our chairman, Dr. Saxena points out "Poverty is not necessarily the want of money or cash in hand. In a wider sense it is the lack of options, whether it is the non-availability of fertilizer for crop cultivation or pesticides for crop protection, medical remedies for family welfare, safe contraceptives for regulating family size, fuel or firewood for cooking, timber for furniture or dwelling, or the availability of appropriate technology for restoring wastelands, or absence of income generation and employment opportunities. In all these respects, Neem could be a 'panacea,' particularly in rural areas."

POPULATION EXPLOSION:

Today's exploding growth in human population is seriously depleting the world's natural reserves and economic resources. Unless the run-away human population growth rate is slowed down, there would be little hope for raising everyone out of poverty in the developing world. Besides educational constraints, the non-availability of inexpensive methods of contraception, which do not cause trauma or aesthetic, cultural, and religious sensitivities of people, limit the success of birth regulation programs. However recent findings indicate that some Neem derivatives may serve as affordable and widely available contraceptives. According to a recent report by the Washington based International Food Policy Research Institute, by 2020, the world will be an even more unfair place than it is at present, with food surpluses in the industrialized world and with chronic instability and food shortages in the south, particularly in the African countries. By 2050, the scenario may become worse for food importing countries as with even 1 % growth in population levels, countries such as USA may cease to become food exporting countries.

The US academy of sciences currently attaches very high importance to the Neem tree. The UN declared Neem as the "Tree of the 21st century". All these developments indicate the growing global importance of Neem. Incidentally over 60% of the entire Neem population is in India.

BIOACTIVITY OF THE NEEM TREE

Search for environmentally safe pesticides received an impetus in early 1960s following the publication of 'Silent Spring' by Rachel Carson in 1962. It was around this period that Indian scientists reported the feeding deterrent property of the Neem tree. Subsequently, several bioactive ingredients were isolated from various parts of the tree, more notable being the isolation of meliantriol and azadirachtin. These findings aroused world-wide interest in the bioactivity of the Neem tree. The Neem seems to be a virtual designer tree - one that could very

NEEM OIL

well be the brainchild of a genetic engineer - tailor-made for combating the serious problems confronting mankind today. The information being generated on it in the modern format of science continues to confirm all the ancient claims. Its mammalian safety and environment friendliness reports are highly encouraging. Its bioactivity spectrum against the harmful organisms is ever increasing.

NEEM FOR ECO-FRIENDLY PEST MANAGEMENT

Pest control, as practiced today in most developing countries relies mainly on the use of imported pesticides. This dependence has to be reduced. Although pesticides are generally profitable on direct crop return basis, their use often leads to the contamination of terrestrial and aquatic environments, damage to beneficial insects and wild biota, accidental poisoning of humans and livestock, and the twin problems of pest resistance and resurgence. More than 500 arthropods pest species have become resistant to one or more insecticides. Resistance of the cotton bollworm, *Helicoverpa armigera*, in India and Pakistan, and of the Colorado potato beetle, *Leptinotarsa decemlineata*, in the USA to all available insecticides, and resistance of the diamondback moth, *Plutella xylostella*, to all classes of insecticides, including acillus thuringiensis, in Hawaii, Malaysia, the Philippines, Taiwan, and Thailand, illustrate the complexity of the problem. Shifts in pest status—from minor to major, and resurgence of pests, such as white flies, caused by direct or indirect destruction of pests' natural enemies are other unwelcome developments associated with pesticide use.

A World Health Organization and UN Environmental Programme report (WHO/UNEP 1989) estimated there are 1 million human pesticide poisoning cases each year in the world, with about 20,000 deaths, mostly in developing countries. The problem is rendered even more difficult because few, if any, new compounds are coming to replace old insecticides. The cost of developing and registering new pesticides is staggering, almost US\$ 60 million, and pesticide manufacturers are unwilling to risk investments on products whose market life could be shortened by development of pest resistance. For ecologically sound, equitable, and ethical pest management, there is a need for control agents that are pest-specific, nontoxic to humans and other biota, biodegradable, less prone to pest resistance and resurgence, and relatively less expensive. Among various options, neem has been identified a source of environmentally "soft" natural pesticides.

CROP PESTS

Neem has had a long history of use primarily against household and storage pests and to some extent against crop pests in the Indian sub-continent. It was a common practice in rural India to mix dried neem leaves with grains meant for storage. Mixing of Neem leave (2-5%) with rice, wheat and other grains is even now practiced in some parts of India and Pakistan. Also, as early as 1930, neem cake was applied to rice and sugarcane fields against stem borers and white ants. Some innovative farmers in Karnataka and Tamil Nadu states in India even today "puddle" green twigs and leaves in rice nursery beds to produce robust seedling and simultaneously ward-off attack by early pests-leafhoppers, planthoppers, and whorl maggots.

NEEM OIL

Controlled experiments confirmed that rice seedlings raised from seed treated with neem kernel extract or cake were vigorous and resistant to rice leafhoppers and planthoppers. Early observations that neem leaves were not attacked by swarming locusts were also confirmed in laboratory studies and attributed to neem's anti-feedant activity against locusts.

PEST CONTROL POTENTIAL OF NEEM

The pest control potential of neem in developing countries, however, remained largely untapped due to the advent of DDT and other broad-spectrum synthetic insecticides. Also, wide publicity given to slogans such as "the only good bug is a dead bug" and identifying traditional uses of neem as backward, gradually influenced people away from using neem. It is only in the past decade, that the pest control potential of neem, which does not kill pests but affects their behaviour and physiology, has been recognized. Though subtle, neem's effects such as repellence, feeding and oviposition deterrence, growth inhibition, mating disruption, chemo-sterilization etc. are now considered far more desirable than a quick knock-down in integrated pest management programs as they reduce the risk of exposing pests' natural enemies to poisoned food or starvation.

In spite of high selectivity, neem derivatives affect ca. 400 to 500 species of insects belonging to Blattodea, Caelifera, Coleoptera, Dermaptera, Diptera, Ensifera, Heteroptera, Homoptera, Hymenoptera, Isoptera, Lepidoptera, Phasmida, Phthiraptera, Siphonoptera, and Thysanoptera, on species of ostracod, several species of mites and nematodes, and even noxious snails and fungi, including a flatoxin-producing *Aspergillus flavus*. Results of field trials in some major food crops in tropical countries will illustrate the value of neem-based pest management for enhancing agricultural productivity in Asia and Africa.

PEST OF STORED PRODUCTS

Post harvest losses are notoriously high in developing countries. Worldwide annual losses in store reach up to 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. Dr. R.C. Saxena has recently reviewed the potential of neem against pest of stored products grain legumes, maize, sorghum, wheat rice and paddy, potato tubers. At farm level storage and warehouses, the application of neem derivatives to bags and stored grains has provided protection against insect pests. Powdered neem seed kernel mixed with paddy (1 to 2%) significantly reduced infestation and damage to grain during a 3 month storage period; the effectiveness capacity jute bag (100 x 60 cm) controlled 80% of the population of major insects and checked the damage to wheat up to 6 months. The neem seed extract treatment was as effective as that of 0.0005% primiphos methyl mixed with the grain. Using this technology in Sind, Pakistan, high benefit-cost ratios were obtained by small, medium, and large-scale farmers.

EFFECTIVENESS OF NEEM OIL

The effectiveness of neem oil alone or in combination with fumigation was evaluated against five major species of stored grain pests infesting rice and paddy grains in a warehouse trials conducted in the Philippines. Rice grain treated with 0.05 to 0.1% neem oil or treated with neem

NEEM OIL

oil after fumigation with 'Phostoxin', and stored for 8 months had significantly less *Tribolium castaneum* adults than in untreated control. Both kinds of neem treatments were as effective as the bag treatment with 'Actellic' at 25ug/cm² or grain treatment with Actellic at 0.0005%, and suppressed the pest population by 60%. The population build-up also was reduced when either fumigated or non-fumigated rice was stored in bags treated with neem oil at > 1 mg/cm². *Rhizopertha dominica*, *Sitophilus oryzae*, *Oryzaephilus surinmensis*, and *Corcyra cephalonica* were similarly affected by neem treatments alone or in combination with prior grain fumigation.

Fumigation and Phostoxin were effective only for about 2 months against *R. dominica*, and for up to 6 months against other pest species, while neem oil treatments were effective up to 8 months. Compared with the pest damage to untreated or fumigated rice, neem oil treatment significantly reduced the damage to rice grain. At 8 months after storage, weevil attacked grains in neem treatments were 50% of those in the fumigated rice and 25% of those in the untreated rice. Neem treatments also reduced the pest populations and damage in paddy. In studies conducted in Kenya, the growth and development of 1st instars of the maize weevil, *Sitophilus zeamais*, was completely arrested in maize grain treated with neem oil at 0.02%, while the weight loss of treated cobs was less than 1% as compared with a 50% reduction in weight of untreated cobs stored for 6 months. (Kega and Saxena 1996).

While neem treatments cannot replace completely chemical pesticides used in stored products preservation, the amounts of pesticides needed could be reduced, thereby decreasing the pesticide load in food grains. With proper timing and innovative methods of application, their use could be integrated in stored products management.

BLOOD-SUCKING PESTS

Ascher and Meisner have reviewed the effects of neem on hematophagous insects affecting humans and livestock. Application of a paste made from neem leaves and turmeric in 4:1 proportion to the skin cured 97% of the patients suffering from scabies caused by the mite *Sarcoptes scabiei* in 3-15 d. Monthly sprays of ethanoilic extracts of neem or weekly bathing in azadirachtin-rich aqueous 1:20 'Green Gold' controlled the bush tick, *Ixodes holocyclus*, and the cattle tick, *Boophilus microplus* in Australia, but were less effective against the brown dog tick, *Rhipicephalus sanguineus*. In Jamaica, neem kernel extract controlled ticks on cattles and dogs.

Neem products repel and affect the development of mosquitoes. Two percent neem oil mixed in coconut oil, when applied to exposed body parts of human volunteers, provided complete protection for 12 hours from bites of all anophelines. Kerosene lamps containing 0.01-1% neem oil, lighted in rooms containing human volunteers, reduced mosquito biting activity as well as catches of mosquitoes resting on walls in the rooms; protection was greater against *Anopheles* than against *Culex*.

Effectiveness of mats with neem oil against mosquitoes has also been demonstrated; the vaporizing repelled mosquitoes for 5-7 hours at almost negligible cost. The sandfly, *Phlebotomus argentipes*, also was totally repelled by neem oil, mixed with coconut or mustard oil, throughout the night under field conditions in India. Application of neem cake @ 500 kg/ha, either alone or mixed with urea, in paddy fields in southern India reduced the number of pupae of

NEEM OIL

Culex tritaeniorhynchus, the vector of Japanese encephalitis, and also resulted in higher grain yield.

PEST RESISTANCE TO NEEM MATERIALS?

A few herbivorous insects, including Homoptera, Coleoptera, and Lepidoptera do survive on neem but, largely, it is free from serious pest problems. Although Taylor indicated that insects may possibly adapt to limonoid rather quickly, but Vollinger demonstrated that two genetically different strains of *P. xylostella* treated with a neem seed extract showed no sign of resistance in feeding and fecundity tests up to 35 generations. In contrast, deltamethrin-treated lines developed resistance factor of 20 in one line and 35 in the other.

There was no cross resistance between deltamethrin and neem seed extract in the deltamethrin-resistant lines. Also, the esterase and multi-function oxidase enzyme activity did not change during the 35 generations. The diversity of neem allelochemicals and their combined behavioural and physiological effects on insect pests seem to confer a built-in resistance prevention mechanism in neem. However, wisdom demands that users should refrain from exclusive and extended application of single bioactive materials, such as azadirachtin.

AGRICULTURAL PRODUCT

Neemark: A natural Neem based formulation well accepted by Agriculturist and Horticulturist in India for over a decade. It provides natural protection over a wide range of insect pests, including sucking and biting. Being totally bio degradable it does not have any residual effect.

Neem 15G: It is a granular formulation contain Neem biomass. It is effective against soil borne insects like Nematodes and root grubs. Its application will create same conditions as growing of Neem tree. It is recommended for soil application before and during the wet season. The granules have been specially coated to prevent losses by leaching

N-Save: A Neem base formulation recommended for coating of urea. Triterpenes in the formulation have unique power to arrest the action of denitrifying bacteria. Coating with this product makes nitrogen in urea available to the root zone for a longer time.

Meenark: A formulation based on fish oil which is recommended as wetting and sticking agent. When used in combination with bio pesticide (Neemark) or insecticides it helps to prolong the effect of insecticide. Specially effective against white fly, leaf miner, mealy bug and scales.

Bactosan: It is based on a natural seed extract of Karanj (*Pongamia pinnata*) for inducing immunity against bacterial diseases. It is highly effective against gram + ve and gram - ve bacteria. It is recommended against bacterial leaf spot, wilt, canker, blast diseases and black arm.

Phytoalexin-84: It is a inducer which induces Phytoalexins in plant to ward off diseases. Recommended against damping off, downy mildew, late blight, soft rot, quick wilt and die back.

NEEM OIL

Phytoalexin 15 G: It is a granular formulation for increasing immunity against quick wilt, soft rot, and die back. It is recommended for soil application before and during the wet season. The granules have been specially coated to prevent losses by leaching.

Agrophos: It is a Phosphate solubilizing biofertilizer. A valuable product for retrieving accumulated phosphorus from the soil. It contains correct blends and proportion of cultures containing phosphate- solubilizing material. Agroderma: A unique product containing friendly fungi for the control of soil and seed borne diseases. It helps produce growth - promoting substance, which assist in improving crop growth.

These biorational products are widely used by farmers in India and are being increasingly recommended as part of IPM (Integrated Pest Management) program of Ministry of Agriculture, Govt. of India.