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Neem oil dilution for plants

Neem is a naturally occurring pesticide that comes from the seeds of the neem tree (Azadirachta indica). Neem trees are native to tropical forests in Burma, India and Sri Lanka. Within the tree's native range, it has been used as a botanical insecticide for many hundreds of years. With growing interest in organic and less-toxic pesticide options, neem products have become very easy to find at most garden centers. It may be the first bottle many gardeners now reach for when they have a pest issue. Neem can be an important tool in an integrated pest management plan as long as you understand how it works and only apply products according to label instructions. Neem products usually have one of two active ingredients. Azadirachtin is a substance derived from neem seed oil and is most responsible for killing and repelling insects. After the Azadirachtin is extracted from neem oil, the remaining material is called clarified hydrophobic neem oil. Azadiractin is only available in commercial products used to disrupt insect hormones that control growth and reproduction. Clarified hydrophobic neem oil is the active ingredient in ready-to-use neem oil sprays that can be picked up at a garden center. Neem oil can be used for certain insect and fungal disease issues. It kills insects by suffocation, covering their bodies with oil that blocks their breathing openings. It is most effective against immature insects. Mature adult insects aren't typically killed and may continue to feed and reproduce. Thus, close monitoring of pest lifecycles is necessary for timing a neem oil application. Even when neem is applied to immature-stage insects, do not expect to see immediate results. It can take time to work, and reapplication may be necessary to completely control insect populations. Aphids, beetle larvae, caterpillars, lacebugs, leaf hoppers, leafminers, mealy bugs, thrips and whiteflies are commonly listed as pests controlled by neem pesticide products. Make sure to accurately identify insects, and only apply neem oil if that pest is listed on the product label. Neem can harm beneficial insects as well as pests. Neem oil can also be used to manage some fungal disease issues, such as powdery mildew. It works by preventing the germination and penetration of fungal spores into leaf tissue. Neem won't "cure" a plant that is already infected with a fungal disease, but it can help limit the spread of the disease to healthy tissue. Neem oil products are often labelled for a variety of crops such as herbs, vegetables, fruits, nuts and ornamental plants. Regardless of the type of plant being treated, neem oil can damage plants by burning their foliage. Do not use on recent transplants or otherwise stressed plants. Though plants must be completely covered with neem oil for the pesticide to be effective, it is a good idea to test the product on a small area first. If no toxicity symptoms occur in that spot, then the entire plant can be treated. Using neem oil, or any other pesticide, should always be a last resort. Even botanical pesticides like neem oil can have harmful effects on the body. Many pest issues can be resolved by correcting growing conditions or hand-picking insects or diseased leaves from plants. Ask UNH Extension for help diagnosing and treating your plants before you pick up the spray bottle. Disclaimer: The use of specific brand or trade names in this article is for educational purposes only. The University of New Hampshire does not support the use of one product over others of similar composition, nor does it guarantee the efficacy or quality of any product. The user is responsible for applying pesticides only as directed on the label and in compliance with the law. Product availability is subject to change depending on registration status in the State of New Hampshire and other factors. Do you love learning about stuff like this? Subscribe to NH Outside with Emma Erler Neem oil can be a great, non-toxic, useful product to protect your plants from pests or disease. That is, when it is mixed and applied properly! The big issue is that oil and water don't easily mix, and most people don't realize how to do this. When neem oil is not fully emulsified, is used in excess, at the incorrect time, or in the wrong situation, it can actually do more harm than good! If you are here, researching how to mix neem oil, chances are you may already be somewhat familiar with neem itself. Just in case you aren't, let's briefly go over what neem oil is, how it works, and what pests it fights. Then I will show how to properly emulsify concentrated neem oil in water, to create an effective and safe spray solution to use in your garden. What is Neem Oil? Neem oil is a plant-based concentrated oil, extracted primarily from the seeds of the India-native neem tree. The oil is then diluted and mixed with water, and applied to plant foliage as an organic pest control. Cold-pressed extractions yield the highest quality virgin neem oil, and contain all the desirable active constituents. That is what we use! Check out our favorite cold-pressed neem oil here. In addition to being a natural, mild insecticide, neem also has healing medicinal properties and is commonly used in personal care products for people. "Neem oil is made of many components, including Omega 3, 6, and 9 Fatty Acids. Azadirachtin is the most active component as a pesticide. It reduces insects ability to feed, and acts as a general insect repellent. It also interferes with insect hormone systems, making it harder for insects to grow and lay eggs. Azadirachtin can also repel and reduce the feeding of nematodes." Oregon State University "Neem oil" is sold either as concentrated 100% pure neem oil, a concentrated neem oil containing other ingredients, or pre-mixed, ready-to-use spray. Personally, we prefer to use the 100% pure stuff and mix our own. It is the most cost-effective and safe. Furthermore, one pre-mixed neem oil product line was recently found to be contaminated with several synthetic, non-organic pesticides that weren't included on the label, including Malathion, Chlorpyrifos, and Permethrin! Yuck. Neem tree seeds. Photo courtesy of Medical News Today About Neem Oil Safety As moderate health-nuts and toxin-phobes here, we have done quite a bit of research on pure neem oil. Studies show that the only risk of acute harm to mammals or humans is if they're exposed to very high concentrations of undiluted neem oil. Even with prolonged ingestion of high doses, the internal damage caused typically heals once the exposure is removed! When applied correctly (follow instructions!) dilute neem oil is non-toxic and safe to use around humans, birds, pets, mammals, and most wildlife. Neem is not carcinogenic, and no chronic health effects from exposure have been found. However, neem concentrates can be slightly toxic to fish and amphibians, so extra precaution should be taken around aquatic environments. What types of pests or diseases are neem oil effective against? Neem oil is particularly effective against small soft-bodied insects. Examples include aphids, thrips, spider mites, mealybugs, scale, and white flies. When applied directly, the oil can coat their bodies and kill them – or otherwise interfere with reproduction and feeding. It is also said to repel mosquitoes, flies, cabbage white butterflies, and moths. On the other hand, neem oil is not toxic to bees when used correctly! It also doesn't bother other beneficial insects like ladybugs, earthworms, parasitic wasps, spiders, or adult butterflies – as long as they aren't directly sprayed with it! Therefore, take care to spray it only in the evening hours, when beneficial insects are least active. Note that neem doesn't do much to control caterpillars, except maybe repel their adult butterfly or moth form. Additionally, that protective shine that neem oil adds to leaves makes them less susceptible to fungal diseases like powdery mildew, rust, or blight. It can help prevent fungal diseases from occurring, or slow their spreading, but is only marginally effective at treating an outbreak once established. It's okay, bee. You're safe here. In our experience, neem oil is does a great job at preventing pest issues, and deterring pests. However, if you have a full-blown infestation of something like aphids, or a serious case of powdery mildew, we have not found neem to be very successful at bringing something back from the brink of death. Therefore, it is often recommended to apply neem oil sprays as part of a preventative care routine – for plants that you know are prone to issues. Or, start neem oil applications at the first sign of disease. Catch it early! As a pest infestation or disease progresses, neem can still be used in conjunction with other pest control methods to bolster the effort, but may not be able to combat it on its own. To learn about over 25 other organic methods to battle pests in the garden, check out this post! How we use neem in our garden: In our garden, we don't use neem oil heavily, though we do have a handful of pest-prone plants that appreciate a routine neem spray. For example, on artichokes. They're total aphid-magnets, and also get powdery mildew very easily! Our citrus trees and passionfruit vines are commonly affected by mealybugs. Even though we also release predatory beneficial insects on those plants, an occasional neem spray helps knock the population back. Most often, we use neem on our cannabis plants, but only before they begin to flower. To read more about our cannabis pest control routine, see this post! On the other hand, we use very little neem oil on short-lived plants in our vegetable garden. One, because as I stated: it isn't a total problem-solver. Two, a lot of what we grow are leafy greens… I am not a fan of using neem oil on vegetation that I am going to consume, like kale, swiss chard, or lettuce. It leaves a bit of an oily residue behind that can be difficult to wash off. However, for the leaves of squash plants, tomatoes, cannabis, or other foliage we aren't going to directly consume, it is a good product to keep in your pest control toolkit! We prefer not to spray neem oil on our leafy greens like bok choy, mustards, kale, or lettuce. Instead, we use netting and row covers when the plants are small to protect them from birds, hand-pick caterpillars as needed, and blast aphids off with water. And now, what you came here for… HOW TO MAKE NEEM OIL FOLIAR SPRAY Ingredients One gallon of water1 tablespoons of concentrated, cold-pressed neem oil1 teaspoon liquid soap OR 1 teaspoon pre-wetted silica powder, explained belowOptional: 1/8 to 1/4 teaspoon aloe vera powder (recommended for cannabis plants) and/or a few drops of essential oils Scale all ingredients up or down evenly as needed Unfortunately, you can't just mix all of these things together in your pump sprayer and go to town. Just as we all learned in elementary school science class: Oil and water don't mix. Or at least, not easily. Thus, it is important to fully emulsify the neem oil before adding it to the water in your sprayer. If it is not properly emulsified, it won't mix well. The neem will come out globby and uneven on your plants. I think this is where most people go wrong with neem. Not only does this make the spray less effective, but it increases the risk of damaging the areas of the plants that get heavily dosed with undiluted neem. Strong neem can cause leaves to sunburn. Note that even if it is fully emulsified at the time of use, neem oil will try to re-separate from the water with time. If you make a large batch and attempt to store it, ensure to shake it thoroughly and check to see that it is still nicely mixed prior to use! We usually make a fresh batch of spray each time we need it. Especially because we add aloe vera, which should be used immediately after mixing. Don't worry, not all of these things are needed in this recipe! These are simply some options and supplies. This is where the soap or silica come in to play. Both act as emulsifying agents, allowing the neem to mix with water. So, should I use silica or soap? That is a personal decision. We most often use silica (potassium silicate) to emulsify neem oil, because it provides additional benefits to the plant. For example, silica increases tolerance to stress and drought, and strengthens cell walls – which leads to larger stalks and plants. It also lightly coats the leaves, making them less susceptible to fungal diseases like powdery mildew or impacts of little leaf-sucking insects. OR Liquid soap can also be used to emulsify neem oil. Dilute liquid soap is a common DIY garden spray used against aphids and other soft-bodied insects, disrupting their cell membranes – effectively killing them when sprayed in direct contact. Our choice soap is Dr. Bronner's Castile Peppermint soap. Insects are repelled by the peppermint odor! Therefore, while soap may not benefit the plant in the same way silica does, it has its own formidable pest-fighting attributes. Last but not least, we like to add aloe vera powder to all of our foliar sprays. Again, this is mostly for neem applications to our spoiled cannabis plants. Aloe both feeds the cannabis, and boosts its immune system. However, we do use aloe vera in other ways in our garden, for all types of plants! For example, we create a fresh aloe vera solution to feed seedlings and support freshly transplanted plants. To read more about the benefits of aloe vera and ways to use it in the garden, check out this post! Mixing Instructions If you choose to use neem and silica powder regularly, it is easiest to pre-mix a batch of silica powder with water and store as a liquid solution. This makes it ready-to-use and mix with neem whenever you need it. To do so, combine 35 grams of silica powder to 8 ounces of water. Mix thoroughly, and store in a cool dark place for up to a year. This is the small jar of cloudy "water" you see in the images below, which is enough for 48 one-gallon batches of neem oil spray!Fill your chosen pump sprayer with just under one gallon of water – about a quart shy. Depending on how many and how large of plants you're working with, scale up or down as needed. You'll find your groove with time. If you want to use aloe vera powder in this foliar spray, add ⅛ to ¼ teaspoon to your gallon of water now. Cap the sprayer, and shake thoroughly. This is our favorite one-gallon sprayer, and here is a smaller half-gallon option. Next, it is time to emulsify the neem oil. In small container, such as a half-pint jar or little beaker, combine 1 tablespoon of neem oil with either 1 teaspoon of liquid soap, or 1 teaspoon of the pre-made liquid silica solution described above. Stir thoroughly to combine. This should create a creamy thick yellow liquid. Fill a clean quart jar about three-quarters full with warm water. Yes, it is critical to use warm water to aid in mixing, but not hot. Now pour in your neem soap/silica solution. Cap the jar, and shake the living daylights out of it. If it is fully mixed, you won't see oil droplets forming on the surface. Your neem oil is now emulsified! (It is a tad harder to tell when using soap since it foams.)Finally, pour the warm quart of neem solution in with the water that is already in your sprayer to create your final diluted mixture. Cap, and shake well to mix. Just as the peppermint and neem odors are unappealing and therefore deter pests, essential oils can be used to accomplish the same thing. Essential oils are very, very concentrated – a little goes a long way! If you'd like, try adding just a few drops to the recipe above for a little extra protection. 10-20 drops or so per gallon of water is good. Peppermint, lavender, orange, tea tree, or eucalyptus are some good examples of essential oils that act as natural insect repellents, though there are many others as well! We personally love this little mix-pack of certified organic EOs, for personal, home, and garden use. How to Apply Neem Oil Spray When applying neem oil spray in the garden, I usually wear long, reusable, rubber dish gloves. One, because I don't want to get all oily – since I usually get deep in the plant and lift dripping leaves as I go. Two, some people can experience a mild dermal reaction or allergy. On the other hand, Aaron doesn't wear gloves. Take precautions as needed. We don't suggest spraying neem on small seedlings, as it may burn them. I would wait until plants are at least a month or two old, and start with slightly less than one tablespoon of neem per gallon. For large mature plants, feel comfortable using the full recipe. It is best to apply foliar sprays just after the sun goes down, for many reasons. One, beneficial insects are less likely to be present and active then. Second, this gives the spray overnight to do its work and dry a bit. Never apply neem oil in the middle of the day or during sunny conditions. Applying foliar sprays in direct sunlight can cause the wet leaves to sunburn. Fully drench the target plant until the leaves are dripping. Give your sprayer a shake here and there to keep things mixed. Make sure to spray the undersides of leaves as well. That is where most pests and disease fester! Frequency The frequency of application will vary based on your situation, schedule, and the severity of the problem. Neem should not be applied more frequently than once per week, but also doesn't have a very long-lasting residual effect. For plants we are actively trying to protect, like our artichokes or cannabis plants (pre-flower only), we spray those weekly or every other week for best results. This same frequency would be good for a plant showing early signs of a pest infestation or disease. On the other hand, our citrus trees are lucky to get a spray once every month or so. Neem oil and soap being applied to an artichoke after sundown. Since this is a only half-gallon sprayer, we scaled down the recipe above to half of everything. I hope you found the information in this post useful in your quest for organic pest control. If so, please leave a comment or pass it along to your friends! May your garden stay healthy, lush, and productive. Remember, an organic garden shouldn't be free of all insects and pests! That just isn't natural. If you enjoyed this article, you may also want to check out:

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