

# The Effectiveness of Neem Oil and Beneficial Nematode Treatments on the Growth of Early Vegetative State Soybean Plants

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# Hypothesis and Introduction

Neem oil is a natural solution treatment that is often used on indoor and outdoor plants to get rid of pests, improve plant growth, etc. They act as fungicides, insecticides, miticides, and even nematicides. However, most neem oil products, including Captain Jack's Neem Max oil, claim to not kill beneficial nematodes. This project aims to test this claim with the application (along with the question of which works best) of neem oil and beneficial nematodes (Hb, Sc, and Sf) on soybean plants indoors. Should the neem oil not impede beneficial nematodes, the plant treated with both neem oil and beneficial nematodes will grow the fastest and the healthiest (that is, the plant with the least yellowing, browning, damage to roots, and lesions).

# Background

Neem oil is pressed from the evergreen tree *Azadirachta indica* that grows in South Asia, India, and Africa. Its use is not limited to plant applications; in fact, neem oil is often employed in South Asian household cooking. However, it is also a great way to treat plants and get rid of any pests, which is why it is so often employed.

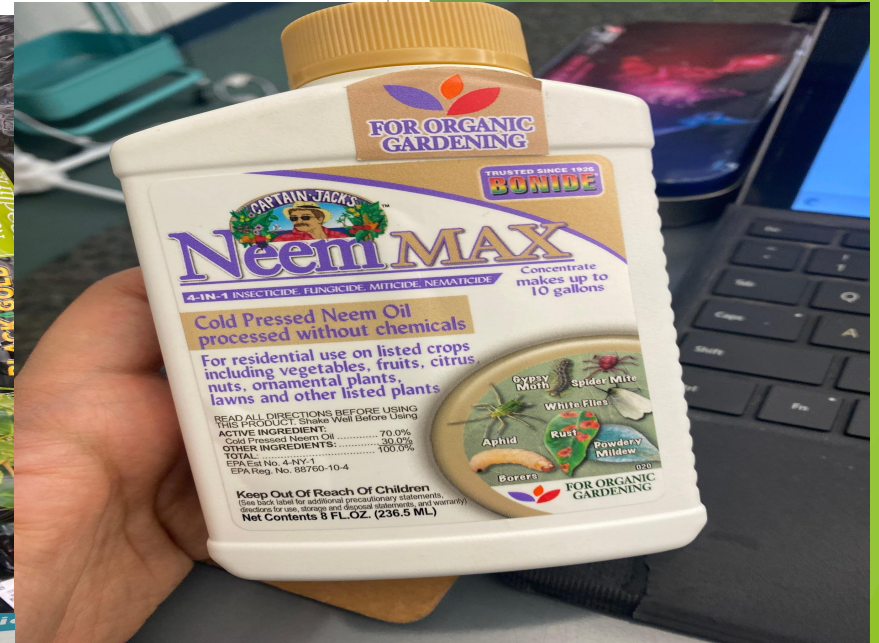
Beneficial nematodes, on the other hand, are not common treatments for plants (at least at the level of household gardening). Farmers usually have a good understanding of the bad nematodes: plant parasitic microorganisms that leech off of plant nutrients, like root-knot nematodes or soybean cyst nematodes. However, beneficial nematodes is also an uncommon practice of treatment when it comes to plants -- especially soybeans.

This experiment aims to explore the effects of the uncommon treatment that is beneficial nematode applications with neem oil applications on household soybean growth. With this treatment combination, one can deduce its effectiveness and, when compared to a plant treated with just neem oil, whether or not the neem oil inhibits beneficial nematodes or not.

# Materials

- ▶ Sungro Black Gold Seedling Mix
- ▶ Sungro Black Gold Natural and Organic Potting Mix Fertilizer
- ▶ Bonide Captain Jack's Neem Max
- ▶ Soybeans
- ▶ NaturesGoodGuys Soldier Bugs beneficial nematodes (type Hb, Sc, and Sf)

# Materials



ATTACKS OVER 200 SOIL-DWELLING PESTS & MORE

### Beneficial Nematodes

Release 2-3 times per year for maximum control

Beneficial nematodes are live micro-organisms that hunt down and kill soil pests. They attack pests in all stages of their life cycle and can be used indoors, outdoors, in greenhouses, nurseries, and on lawns. They are safe for humans, pets, and beneficial insects.

Quantity	Treats Up To:	Item #
5 million	2,000 sq. ft.	B0002788C
10 million	4,000 sq. ft.	B004H501H20
25 million	10,000 sq. ft.	B0002788A
50 million	1/2 - 1 Acre	B0127V37R
250 million	1 - 3 Acres	B0130615Y

Quantity	Treats Up To:	Item #
5 million	2,000 sq. ft.	B0010ZV0111
10 million	4,000 sq. ft.	B007XPE1AR6
25 million	10,000 sq. ft.	B0002788S
50 million	1/2 - 1 Acre	B0127Z2Z31
250 million	1 - 3 Acres	B0130E5CW5

Quantity	Treats Up To:	Item #
5 million	500 sq. ft.	B0010ZUGLK
10 million	1,000 sq. ft.	B007CF14VC
25 million	2,500 sq. ft.	B0010ZB1SU
50 million	5,000 sq. ft.	B0127ZAM1DK
250 million	1/2 Acre	B0130E5H8Q

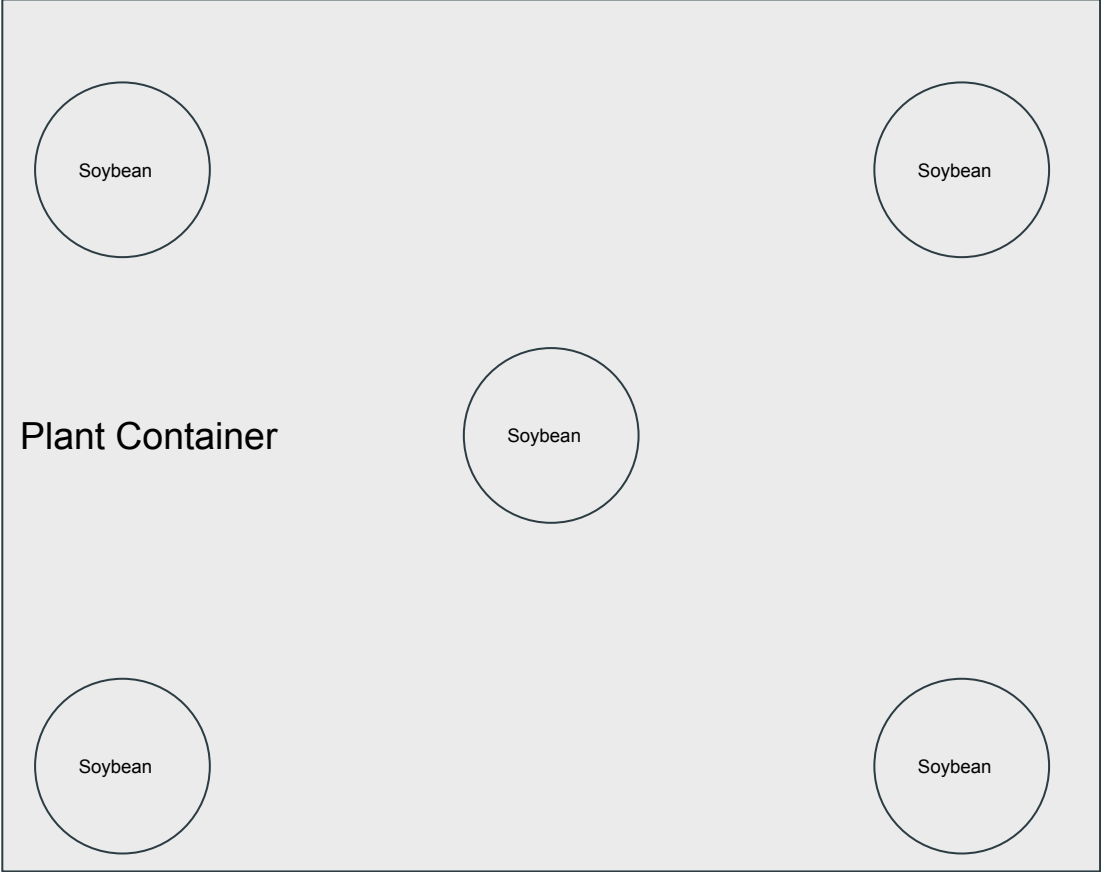
Nematode Blends on Next Page

NaturesGoodGuys | @naturesgoodguys

# Procedures

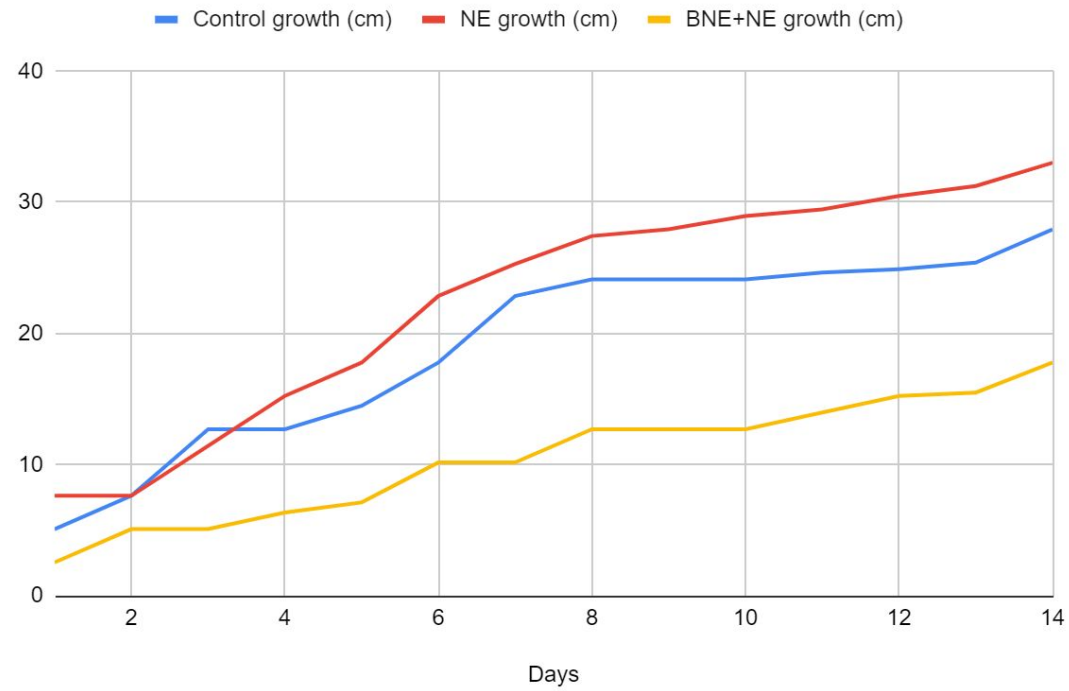
1. Drill five holes two inches apart in twelve to fourteen inch plant pot containers.
2. Fill containers up to 2 inches from the top with an equal mix of Sungro Black Gold Seedling Mix and Sungro Black Gold Natural and Organic Potting Mix Fertilizer.
3. Poke in one inch holes to plant soybean seeds. Plant five soybeans four inches away from each other. Once inserted into holes, cover the beans with soil. Do not compact the soil.
4. Water plants with one hundred fifty to two hundred milliliters of water.
5. Place plastic wrap over plants and place the container in a lightbox.
6. Repeat steps one through seven for three separate containers: C (control); NE (neem oil); and BNE + NE (beneficial nematodes and neem oil).
7. Water plants with one hundred fifty to two hundred milliliters of water daily.
8. Before the NE soybeans sprout, pour a quarter of Captain Jack's Neem Max oil directly on the roots. Let it seep.
9. Before the BNE + NE soybeans sprout, open a five milliliter packet of nematodes and mix in two-hundred and fifty milliliters of water. Stir well and then water the plants with this mixture. After letting the mixture seep into the soil, pour a quarter of Captain Jack's Neem Max oil directly on the roots. Let it seep.
10. Start recording height and qualitative health measures after sprouting period.
11. Remove and finish the experiment after ten days of growth (post-sprouting).
12. Graph recordings, determine the healthiest plant, and determine the best treatment plan.

Planting positions  
example:



# Data

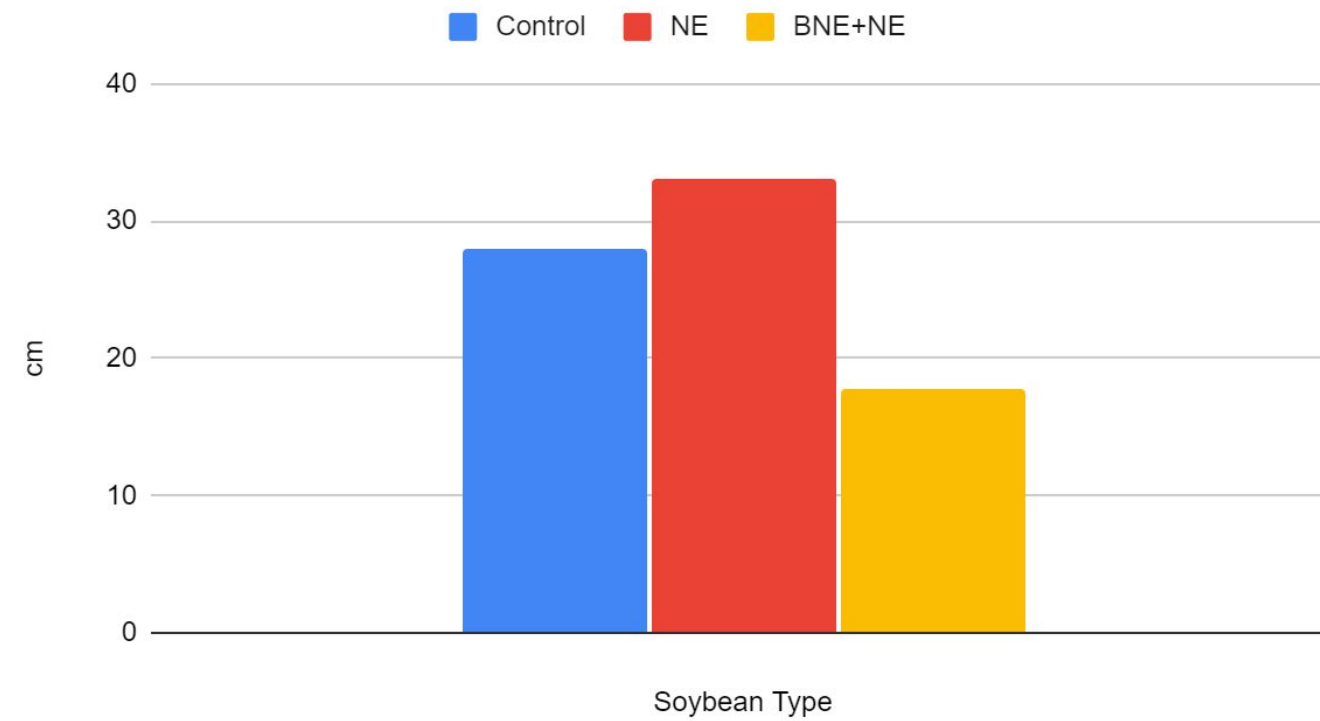
Growth (post-sprout) of Soybean Plants with a Variety of Treatments





# Data

Final Plant Heights (cm) after 14 Days of Growth



# Pictures (control plant)



# Pictures (NE plant)



# Pictures (BNE+NE plant)



# Pictures (BNE+NE and NE plant)



# Analysis

- ▶ The plant treated with Jack's Neem Oil Max grew the most in the early vegetative state of soybean plant growth. However, the plant treated with Beneficial Nematodes and Neem Oil Max observed the greatest number of soybeans sprouting (three out of five soybean seeds sprouted) in comparison to the other plants (one out of five soybean seeds sprouted in the control and neem oil treated plants).
- ▶ In terms of health, the control plant exhibited some browning but overall observed good color and health. The neem oil treated plant observed less browning (but more yellowing) and exhibited the best health of the three. The plants treated with beneficial nematodes and neem oil observed the most yellowing and even some lesions on some of the leaves, qualifying it as the plant that observed the worst health.

# Summary

- ▶ After fourteen days of growth post-sprouting, it can be concluded that the Neem Oil treated plant grows the fastest and the healthiest. It had the least browning and minimal yellowing of the leaves and over the course of fourteen days, it grew up to thirteen inches. However, it should be noted that only one of the five seeds sprouted in both the Neem Oil treated plant and the control plant. In the Neem Oil and Beneficial Nematode treated plant, three seeds sprouted. However, this plant also observed the most health problems.
- ▶ This result goes against the hypothesis, in which the beneficial nematode with the neem oil treatment was predicted to grow the largest and the most healthy. Despite sprouting the most seeds, it grew the least and observed the most lesions and yellowing. This could be a result of the activation timing of the beneficial nematodes and the stage at which they may have been inhibited; perhaps the nematodes activated and helped nurture plant growth during the early stages of their life, but they were later inhibited by neem oil. Of course, this is speculation and more tests need to be conducted to determine a conclusive reason as to why the beneficial nematode treated soybeans sprouted the most seeds yet grew the least and were the least healthy (as determined by qualitative measures).

# Future Work

- ▶ More samples.
- ▶ Longer vegetative period of growth.
- ▶ More combinations of different treatments.
- ▶ More ground to work with.
- ▶ On-season treatments.