

RESEARCH REPORT

Efficacy of mycorrhizal inoculants on vegetable transplants

Farmer-Researcher

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IN A NUTSHELL

Given the incredible importance of fungi in our world, Dianne was curious if inoculants improved lettuce and onions yields, as these two species are known to grow in relationship with arbuscular mycorrhizal fungi (AMF).

- In 2019, she used AMF inoculants for the first time and observed particularly large, healthy lettuce and onions.
- In 2020, she set-up a randomized and replicated trial comparing two inoculants to uninoculated controls for Ariana, Cantarix, Nevada and Skyphos lettuce and Patterson onion. While they were also large and healthy, Dianne detected no effects of the inoculants yield.
- She wonders if the design of the trial was flawed because she unsuspectingly inoculated and/or resuscitated the mycorrhizal community of her whole garden in 2019.

MOTIVATION

Dianne wants to promote fungal life on her farm and in her vegetable gardens, because of their immense importance for pest and disease resistance and overall crop productivity. In 2019, tried some mycorrhizal inoculants on transplants. She observed an amazing response to inoculant that she thought warranted a more sophisticated trial. Indeed, published research shows that AM mycorrhizal can increase lettuce and onion yield (references 1 & 2).

DESIGN

Treatments

- No inoculant (control) (●)
- Root Rescue Transplanter, applied to the seed at seeding (●)
- Myco-Grow®, applied to the seed at seeding (●)

Crops tested

Lettuce: Ariana, Cantarix, Nevada and Skyphos - 4 succession plantings each, starting with 66 seeds each.

Onion: Patterson (seeded in February 2020) - 1 succession planting

Seeding

Dianne seeded onions and lettuce in paper pots. She kept seeds for the control treatment in separate trays and used wooden stakes to identify the different treatments.

In-field design

When she transplanted the lettuce and onion, Dianne randomly assigned the order of lettuce varieties in a row and the order of treatments within a variety section. She repurposed venetian blinds to mark the location of treatments for each variety.

Harvest

For every variety and treatment of lettuce, Dianne harvested and weighed the 10 fastest maturing

heads over a 5 week period for each succession. She calculated a cumulative weight for each treatment and variety. For onions, Dianne harvested and weighed 100 bulbs from each treatment.

FINDINGS

Yield

Of the four succession plantings of lettuce, Dianne was able to collect data on three of them because of a crop failure due to weed pressure. To evaluate the effect of the amendments on lettuce and onion yield for three replicates, we used a statistical model called analysis of variance (ANOVA) with a 95% confidence level to calculate the least significant difference (LSD) that we needed to see among treatments in order to call them “statistically different”.

Dianne found no effect of either inoculant on lettuce yield, as shown in **Figure 1**. She needed to see an LSD of 1.0 kg to call a treatment



effective and she observed average differences of 0.5 kg at most.

Dianne also found that onions (100 bulbs each) were not affected by mycorrhizal inoculation. The average for **Control** was **16.3 (+/- 3.6) kg**; **Root Rescue** was **13.8 (+/- 3.6) kg**; and **Myco-Grow®** was **12.1 (+/- 4.4) kg**. Because of variability among bulbs, the LSD was 10.8 kg.

Other observations

Nevada lettuce is susceptible to brown spots on the ribs especially in the midsummer. These spots were noticeably absent in replicate 3 for those inoculated with Root Rescue.

NEXT STEPS

Dianne’s observations of larger, healthier lettuce and onion with inoculation over two years have convinced her to continue with the inoculants for these crops and also uses Root Rescue on her cover crop seeds. The inoculants are relatively inexpensive and seem low-risk given her observations.

In the future, she’d like to design a trial with a more rigorous control - perhaps a new patch of garden or growing crops in separate containers.

MORE ON STATISTICS

Using a 95% confidence level means:

- When we measure yield difference between any two treatments that is greater than the calculated least significant difference (LSD), we expect this difference would occur 95 times out of 100 and, therefore, consider it a reliable difference.
- When we measure a yield difference between any two treatments that is less than the calculated LSD, we consider these treatments unreliably different and not statistically different.

REFERENCES

1. eOrganic, Organic High Residue Reduced-Till Pumpkin Production: Weed Em and Reap: <https://www.youtube.com/watch?v=gspMfZMbZK4&list=PLB4AE9DB8C30652F3&index=18>.
2. eOrganic, Organic High Residue Reduced-Till Broccoli Production: Weed Em and Reap: <https://www.youtube.com/watch?v=4SRyB8mBEV8&index=21&list=PLB4AE9DB8C30652F3>.

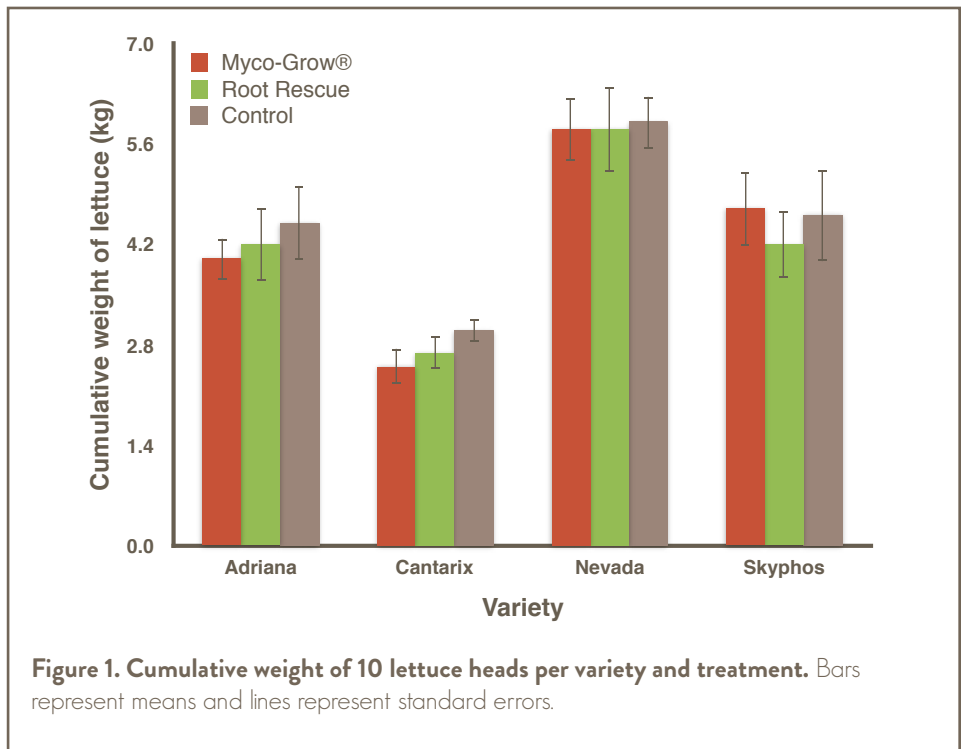


Figure 1. Cumulative weight of 10 lettuce heads per variety and treatment. Bars represent means and lines represent standard errors.

TAKE HOME MESSAGE

Given that Dianne was unable to use one replicate succession of lettuce because of crop failure, she reaped the benefit of having a “back-up” replicate by designing a trial with at least four.

There was no detectable effect on lettuce and onion yield of the two mycorrhizal inoculants that Dianne tested in this study. These results do not corroborate what Dianne observed in 2019 and are contrary to published academic research (examples: reference 1 & 2). Dianne grew particularly

large, high quality lettuce and onions in 2019 and 2020. She wonders if her transition in 2019 to no-till methods in some beds - including adding ramial wood chips, compost and using occultation instead of tillage - means the design of the trial was flawed. Maybe the indigenous mycorrhizae were resuscitated by her efforts in 2019, such that there was no true inoculation-free control in 2020. Or, in the case of lettuce, the control plants and inoculated plants were on opposite sides of a 42” wide bed so 18” apart. How far can a fungi move in 6 weeks?