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APPLIED DREAMS.

Preliminary Evaluation of the Performance of Zeolite-based NEREA® as a Hydroponic Media Substitute for Commercial Production of Leafy Greens

October 1, 2021





Project Team

- **Research Lead:** Christine George
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- **Research Project Manager:** Kimberley Cathline
- **Research Laboratory Technologist:** Branka Milunovic
- **Industry Partner Representatives:** Ray Paquette, CEO, Mark Pearlman, Director

Project Description

A small-scale trial on leafy greens in Niagara College hydroponic system was performed using NEREA® as substrate embedded with nutrients. NEREA® acted as a hydroponic substrate substitution for rockwool media. Crop performance was measured from germination to harvest in the trial comparing NEREA® and rockwool (Oasis®) as substrates.

Growing Trials



Germination

Lactuca sativa (lettuce) var. 'Buttercrunch' seeds germinated on the propagation bench under misters for two weeks

July 27th-Aug 9th

Hydroponics

Two Nutrient Film Technique (NFT) systems for two weeks. Both NFT systems were located in the SW corner of the NC Greenhouse

Aug 9th – Aug 23rd

Observations:

On July 27th (day 0) we seeded 180 pots:

90 pots of NEREA®

90 pots of Oasis®

In first 13 days,

- NEREA® seedlings grew in size while Oasis® seedlings did not
- NEREA® seedlings grew "true" leaves while Oasis® seedlings did not

August 5
(9 days after seeding)

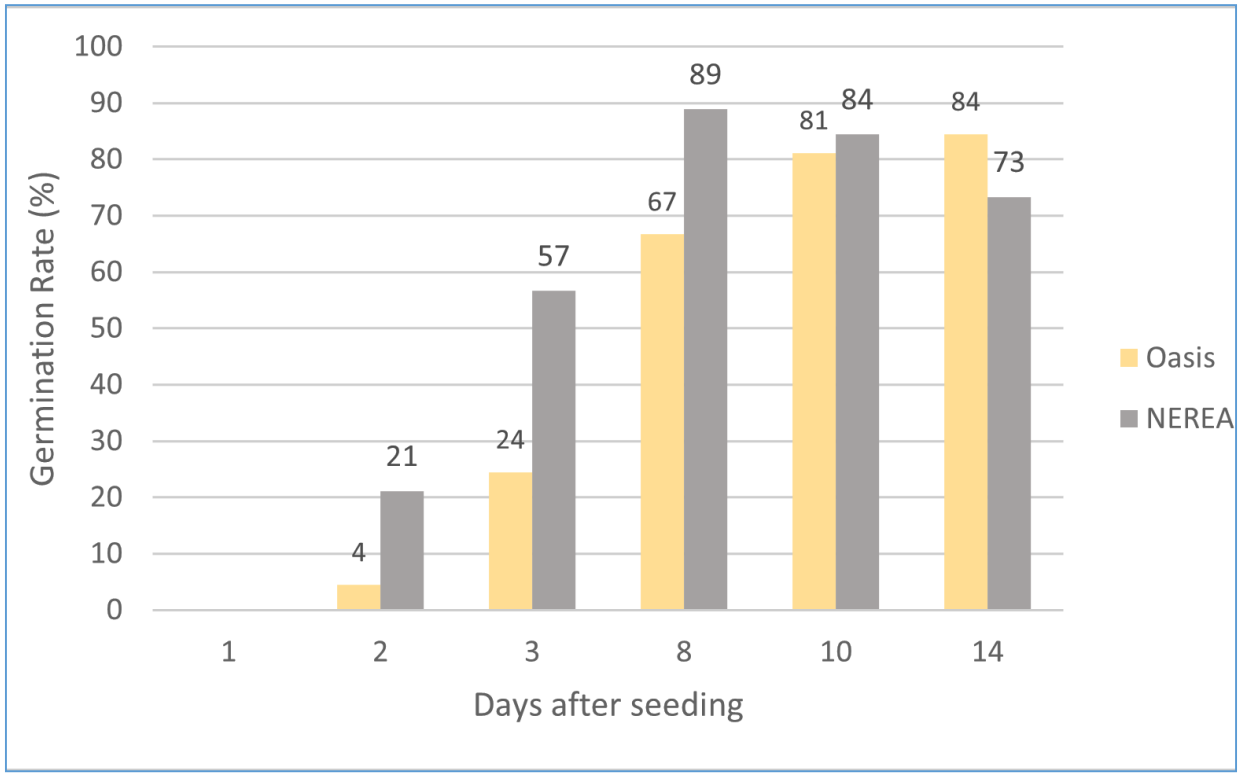
August 9
(13 days after seeding)



Observations: Germination

- Shorter time to germinate and more seeds germinated in NEREA® when compared Oasis®
- Some NEREA® seedlings perished during second germination week
  - Transplant to hydroponics earlier (at day 8)

***SUMMARY*:** Faster germination in NEREA® demonstrated a potential for shortened cropping, allow more crops grown per year.



Observations: Seedlings

- Overall, seedlings in NEREA® were larger than those in Oasis®
- Inconsistency in NEREA® seedling size, while most Oasis® seedlings were consistently sized

***SUMMARY*:** NEREA® seedlings were larger, however better seedling size consistency seen in Oasis®, a solid substrate. NEREA® as a solid may offer improved size consistency.



Images: Seedlings at day 14 grown in NEREA® and Oasis® (inset)

Observations: Hydroponics Setup

Two NFT systems:

#1: with fertilizer solution

pH 5.8-6.5

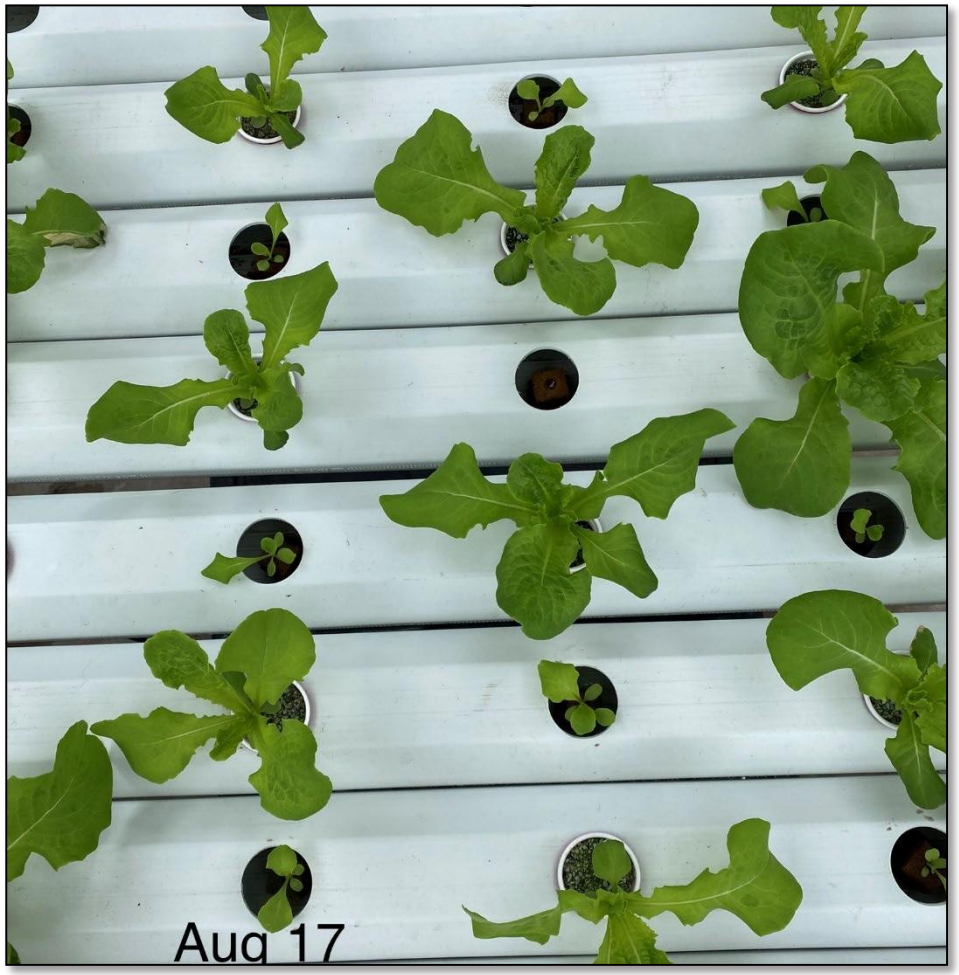
E.C. 1.7-2.1 mS/cm

#2: with water only

pH 5.8-6.5

E.C. 0.3 mS/cm

- Each with 32 pots NEREA®, 32 pots Oasis®, arranged in alternating pattern (as shown in photo)

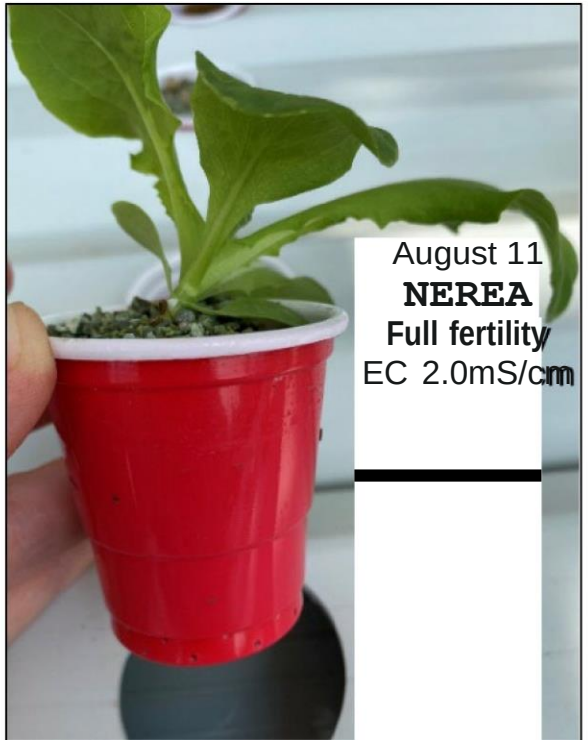


Observations: Root Growth

- Rooting rate varied by treatment and substrate
- Long, healthy roots in NEREA® (photo to right taken on day 23)




August 11
NEREA
Water only
EC 0.3mS/cm


August 11
NEREA
Full fertility
EC 2.0mS/cm


August 19
(day 24)
NEREA
Full fertility


August 19
(day 24)
Oasis
Full fertility

NEREA®


FERTILITY ADDED
AUG. 23
(4 WKS.)

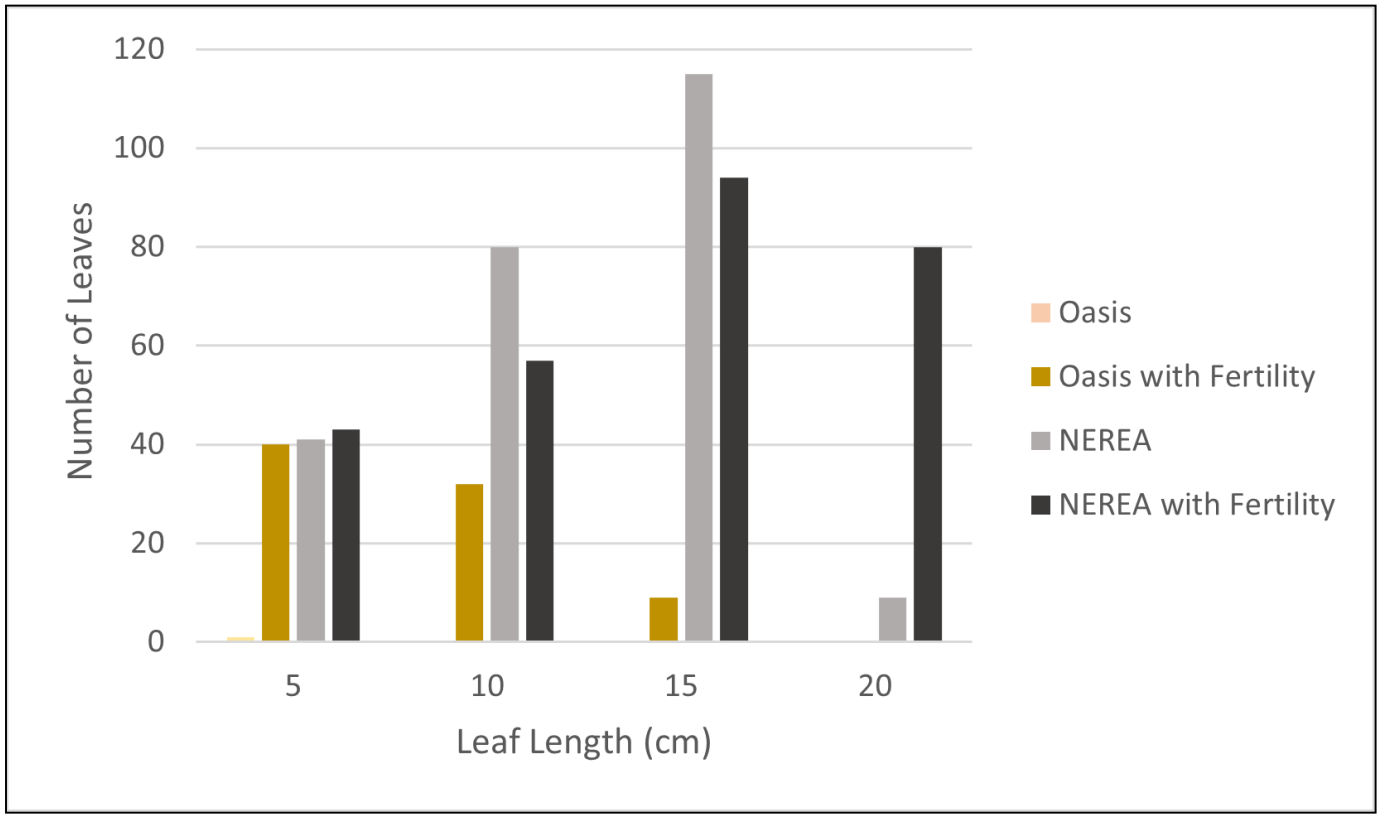
Oasis®


AUG. 23
(4 WKS.)
FERTILITY ADDED
AUG. 23
(4 WKS.)

Observations: Number of Leaves

By the end of 28 days:

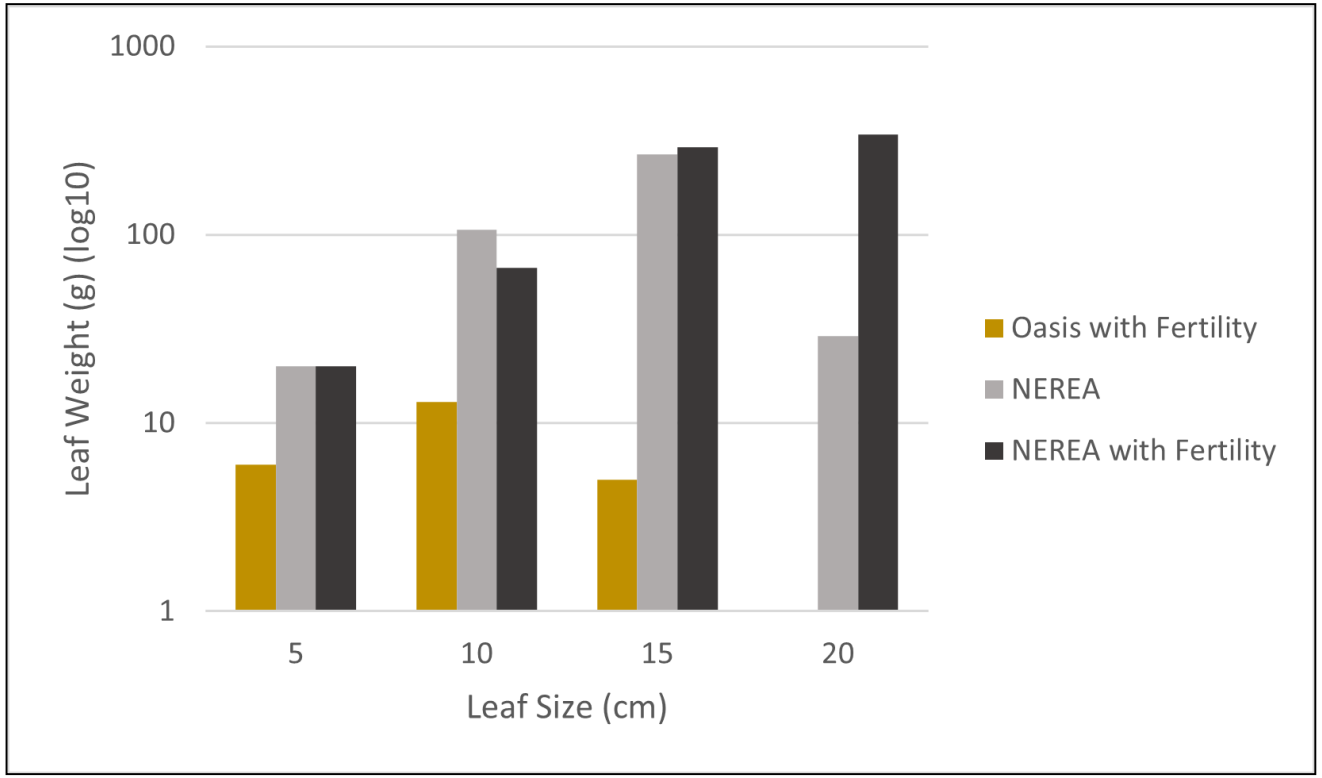
- NEREA® with added fertilizer grew the most leaves overall, with NEREA® without added fertility a close second
- The standard Oasis® (see graph: Oasis with fertility) grew the least



Observations: Weight of Leaves

- NEREA® with fertilizer grew the heaviest leaves of all treatments.
- Harvest day was exceptionally hot and humid
- SPAD (not shown) tested highest in NEREA® , followed by NEREA® with fertilizer

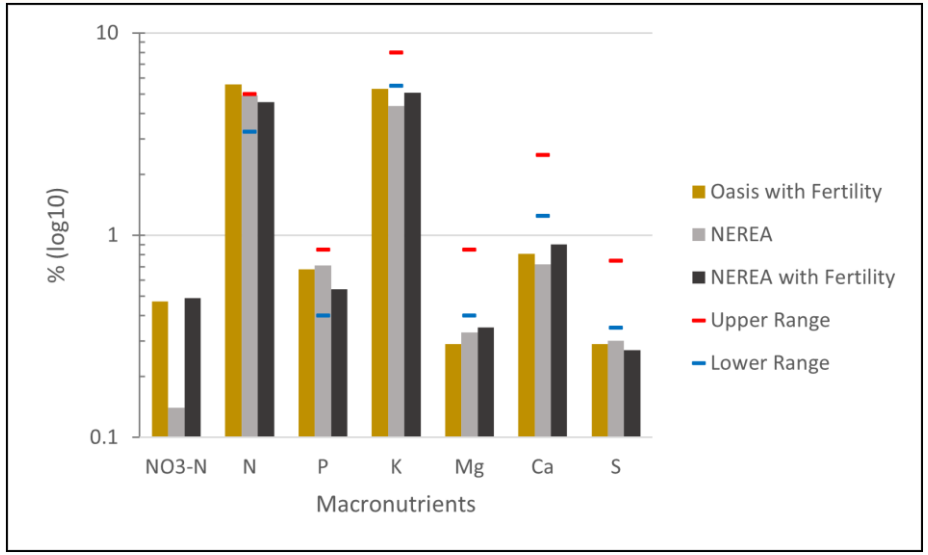
***SUMMARY*:** Lettuce grown in NEREA® grew the most numerous and largest leaves

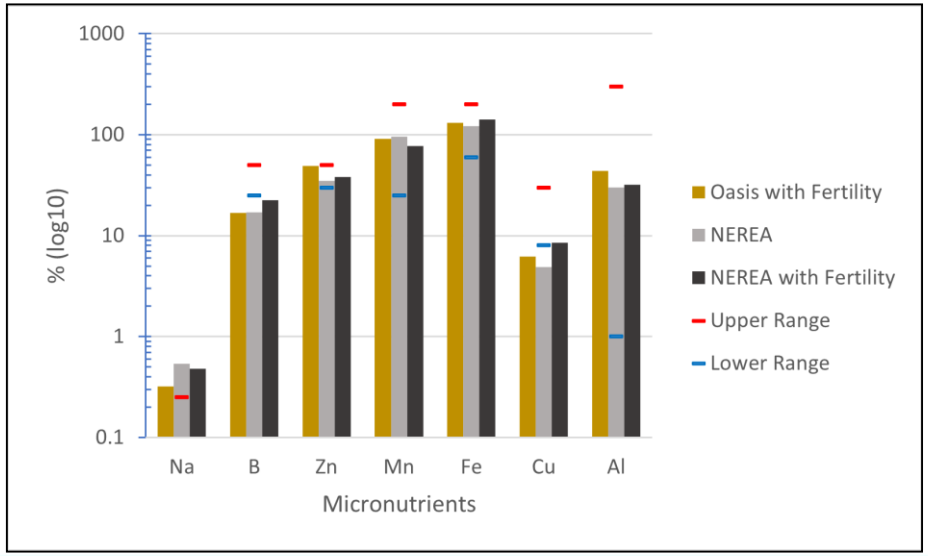


Observations: Leaf Tissue Analyses

- There weren't enough leaves to test nutrients in the Oasis® with no added fertilizer treatment
- Leaf tissue of most tested treatments were within normal range
- Sodium (Na) was very high for all treatments, including Oasis®

***SUMMARY*:** NEREA® can provide all necessary nutrients for growth of Lettuce over 28 days





Conclusions

PROS

- The NEREA® substrate has demonstrated faster and more abundant germination of *Lactuca sativa* (lettuce) var. 'Buttercrunch'
- NEREA® provided nutrients for leaf and root growth with no observable deficiencies
- Lettuce grown in NEREA® was larger and more leafy than in Oasis®

CONS

- Seedlings in NEREA® were inconsistent in size, leading to potential variability at harvest
- Sodium levels potentially too high



Next Steps…

- Future research ideas with NEREA®:
  - Test earlier transplant dates (i.e. day 8 and earlier) in hydroponics
  - Test growth in NEREA® without additional fertilizer versus Oasis® in standard fertilizer in separate systems
  - Work on a solid NEREA® substrate for consistent germination size
  - Analyze NEREA® for all nutrients over growing period, and test leachate for potential nutrient loss
  - Blend NEREA® with other substrates for different crops and growing setups

Thank you!

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