BiOWiSH™ TECHNOLOGIES

# Hydroponics

Research Study

## Ohio Agricultural Research & Development Center, Ohio State University

### Background

The Ohio State University's Ohio Agricultural Research and Development Center (OARDC) is a premier institution committed to safe, healthy, environment friendly, sustainable, and affordable food and agricultural products. It aims to promote strong rural and urban communities and help keep Ohio positioned favorably in a global economy. Dr. Robert C. Hansen, Research Scientist in the Food, Agricultural and Biological Engineering Department of OARDC, is a recognized expert in computer-controlled irrigation and growing lettuce hydroponically. BiOWiSH Technologies partnered with Dr. Hansen to demonstrate the potential for BiOWiSH™ technology to promote plant growth and improve yields in hydroponic applications.

### Objectives

The objectives were to increase yield (as measured by plant weight at harvest) of hydroponically grown lettuce cultivars Fidel, Multileaf, and Red Oak.

### Solution

BiOWiSH™ Hydroponic was chosen for this trial because of its demonstrated efficacy in previous studies on hydroponically grown cucumbers, lettuce, tomatoes, and leafy vegetables.

Developed for the hydroponics industry, BiOWiSH™ Hydroponic is a revolutionary water treatment solution that enhances microbial activity in crop production, helping to increase nutrient availability and improve plant vigor.

Made from natural sources and safe, BiOWiSH™ Hydroponic is approved for use in organic food production.

### Implementation Program

BiOWiSH™ Hydroponic was replenished daily at a rate of 10 mg/L (ppm) with a bag hung directly into the reservoir tank for the entire post-transplant growing cycle of the cultivars.

### BiOWiSH™ Hydroponic

- Improves yield
- Reduces growth time
- Improves nutrient availability
- Improves consistency across harvest
- Improves root development
- Improves plant vigor

### Available Sizes

- 100g/3.5oz
- 1kg/2.2lb
- 5kg/11lb

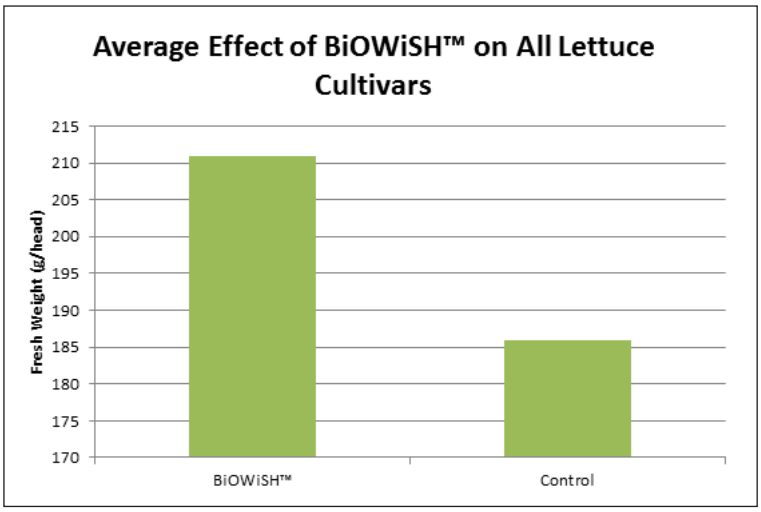
| Key Nutrient Solution Parameters | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| pH | Conductance (mmhos/cm) | Nitrate nitrogen (ppm) | Phosphorous total (ppm) | Potassium total (ppm) | Sulfate (mg/kg) | Sodium total (ppm) | Calcium total (ppm) | Magnesium total (ppm) | Iron total (ppm) |
| 5.75 | 1.950 | 61.0 | 34.4 | 14.0 | 593.0 | 94.3 | 211.0 | 59.2 | 1.5 |

BiOWiSH™ Hydroponic can be activated in water or nutrient solution allowing for easy delivery with current systems and fertility programs.

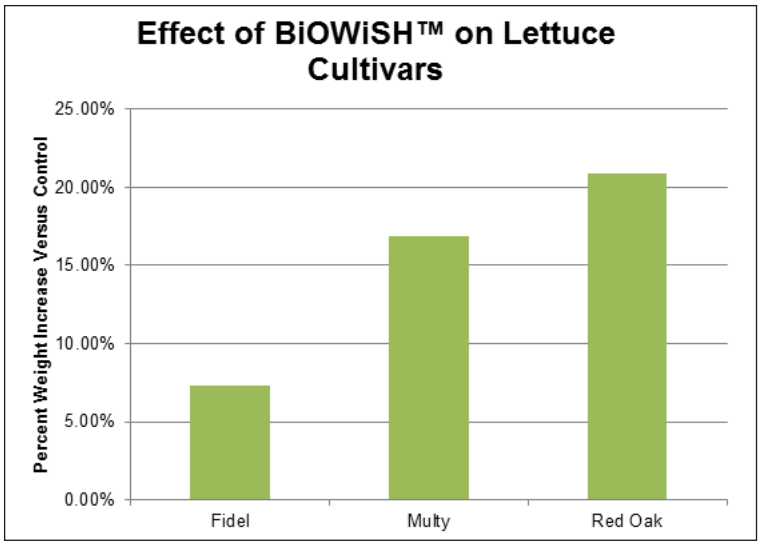
BiOWiSH™ Hydroponic can be used with all types of hydroponic systems and growing media. OARDC uses a hydroponic NFT recycle water system.

## Results

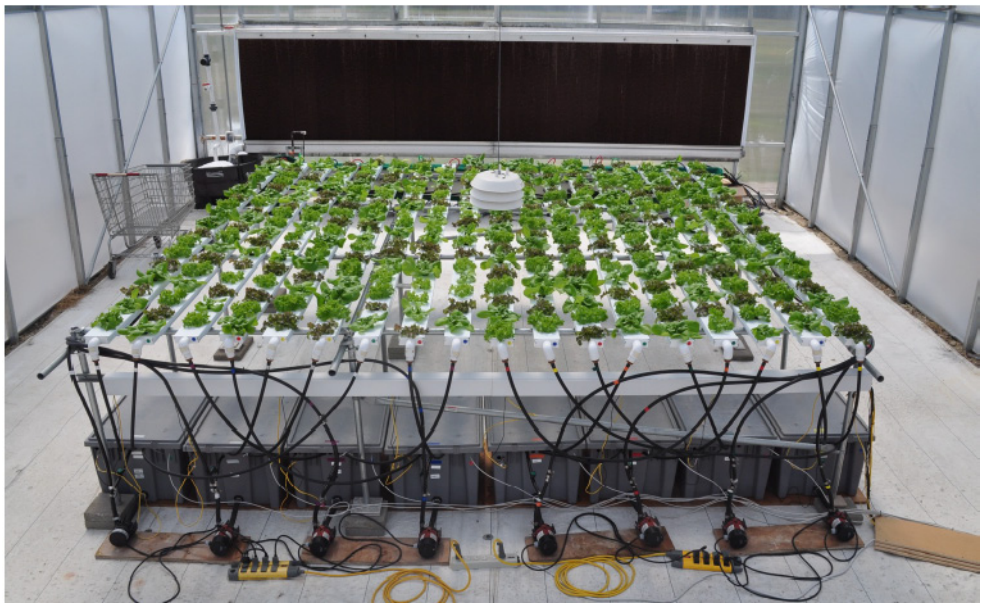
The BiOWiSH™ treated plants produced higher yields than plants in the control group. After the 4 weeks, plants treated with BiOWiSH™ Hydroponic, on average, showed production weight gains of more than 13% versus control.




The Red Oak and Multy Leaf cultivars showed overall the best response to a specified BiOWiSH™ treatment with 20.9 and 16.9% weight gain, respectively, at the 10 mg/L dose level.



The photos below show the experimental set-up early in the growing phase:



Anecdotal evidence collected after harvest and sale of the lettuce suggests the BiOWiSH™ treated plants were better tasting than those from the control treatments. Importantly, even though the BiOWiSH™ treated plants were bigger, they had the same if not better nutrient value as the control.

| | Average Micronutrient Data (ppm) Across All Cultivars | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Treatment** | **N** | **P** | **K** | **Mg** | **Ca** | **Fe** | **Mn** | **Zn** |
| **BiOWiSH™** | 5.8±0.3 | 0.86±0.04 | 7.5±0.8 | 0.30±0.5 | 1.2±0.2 | 159±21 | 16±2 | 33±8 |
| **Control** | 5.8±0.2 | 0.88±0.06 | 6.8±0.7 | 0.36±0.4 | 1.1±0.2 | 176±34 | 14±2 | 33±8 |

** The P, Mg, and Fe levels are equal to the control within the experimental error for each measurement.*

## Conclusion

BiOWiSH™ Hydroponic enables lettuce growers to produce a higher quality product, meet growing demand, and increase profitability without expanding infrastructures. The low input cost, increased production at current water usage, compatibility with current systems and fertility programs, and extraordinary return on investment are reasons why nearly 100% of test growers have included BiOWiSH™ Hydroponic in their daily crop management practice.

**"Overall, the growth of BiOWiSH™ treated lettuce was significantly greater than control."**
*- Dr. R. C. Hansen, Research Scientist, OARDC*

## Contacts

**BiOWiSH Technologies**

T: +1 312 572 6700

Email: agronomy@biowishtech.com

**Biological help for the human race**

www.biowishtech.com



*CS44AGJL12US*