

Smart Ag Applied Research

Enhancing Lettuce Biomass

This controlled environment trial evaluated Green Lightning Treated Water (GLT) as a weekly foliar treatment for lettuce grown under a standard hydroponic nutrient program. The study compared crop growth and harvest biomass between lettuce receiving standard nutrients and lettuce receiving standard nutrients plus GLT.

The trial was conducted in the Olds College controlled environment vertical growing system.

INTRODUCTION

Nitrogen remains one of the most important drivers of lettuce biomass production utilizing inorganic fertilizers within a hydroponic controlled environment system typically through nitrate or ammonium (Zayed O. 2023). GLT provides a nitrate-rich water enhancement generated from atmospheric nitrogen conversion and represents a potential alternative or complementary nitrogen strategy for controlled environmental production systems. Nitrogen is the primary nutrient used in plants for foliage/leaf development, leading to lettuce being the evaluated crop. Lettuce was additionally selected due to its rapid vegetative growth rate and identifiable symptomatic signals to nutrient deficiencies.

OBJECTIVES

The objectives were outlined to:

- Determine whether foliar-applied GLT increases lettuce leaf and canopy development.
- Determine whether GLT increases fresh biomass at harvest.
- Evaluate plant nutrient status following GLT application.

STUDY DETAILS

Trial Detail	Description
Crop	Lettuce
Production System	Vertical controlled environmental system
Treatments	"T1: Standard nutrients T2: Standard Nutrients with GLT foliar Application"
GLT Application	Sprayed once weekly
GLT Concentration	30% concentration of GLT (9.98ppm)
Production Period	9 weeks from seeding to harvest
Growth Assessment	Consisted of weekly measurements of Leaf and Canopy area as well as Vigor rating on 9 point scale
Harvest Assessment	Fresh foliage mass weight
Additional Monitoring	Environmental conditions, nutrient solution and plant tissue nutrients

RESULTS

Key Findings

- GLT-treated lettuce produced significantly greater fresh biomass at harvest compared with lettuce receiving the standard nutrient program.
- 74.2 g Average fresh biomass – GLT
- 49.75 g Average fresh biomass – Standard nutrient
- This represents approximately 49 per cent greater average fresh biomass in the GLT treatment.
- Canopy and leaf area were larger in lettuce receiving GLT compared to Standard nutrients.

NEXT STEPS/FUTURE RESEARCH

- Recommended ongoing research of GLT water to be conducted within the Controlled Environment Zippy Pod Container at Olds College
- A current four-phase plan to rerun trial to evaluate consistency of results
- Additional work will look at GLT being supplied through drip irrigation vs foliar. This will allow for the potential of other more complex crop types to be evaluated on the effectiveness of GLT as a liquid nitrogen supplement/replacement on commercially grown crops.

