NanoKriti
NANOBUBBLE TECHNOLOGY

Impact of Air Nanobubbles on Hydroponic Growth of Coriander and Lettuce

Case Study: Water Technology Lab, Department Of Chemical Engineering, IIT Ropar.

Location:
IIT Ropar, Water Technology Lab

Application:
Hydroponic cultivation of coriander and lettuce with air nanobubbles

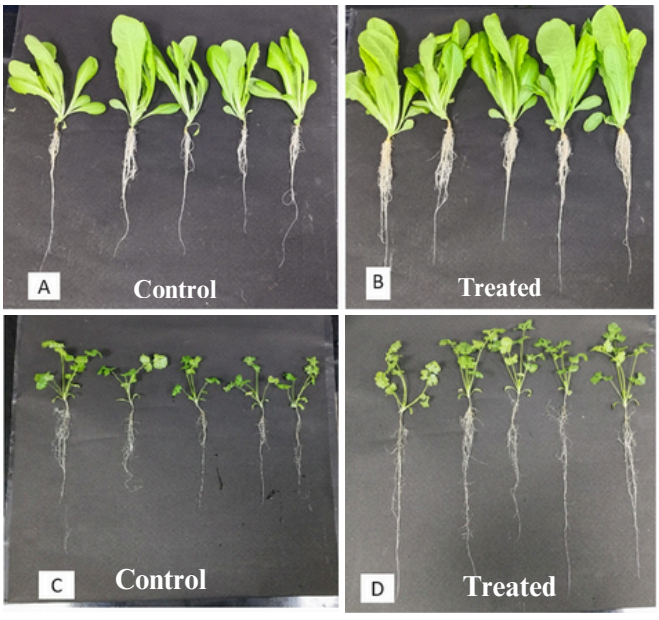
Unit Type:
NanoCloud – Nanokriti Nanobubble Generator

Results:
- Enhance Growth
- Shoot length increased
- Root Length Enhancement
- Higher Biomass Accumulation
- Improved Leaf Count

Hydroponics offers a sustainable and soil-free approach to crop cultivation. However, plant growth in hydroponic systems is highly dependent on dissolved oxygen (DO) levels in the nutrient solution. Low DO often limits root respiration, nutrient absorption, and overall plant productivity.
Air nanobubbles (NBs), due to their ultra-small size and unique properties (high stability, large surface area, high oxygen transfer efficiency), have the potential to improve oxygen availability in hydroponic systems and thereby enhance plant growth.
This case study investigates the effect of air nanobubbles generated using NanoCloud by Nanokriti on the hydroponic growth of coriander and romaine lettuce.

Experimental Setup

- System: Hydroponic nutrient reservoirs for coriander and lettuce cultivation.
- Nanobubble Integration: NanoCloud nanobubble generator introduced continuous air nanobubbles into the hydroponic solution.
- Circulation: Water enriched with nanobubbles was circulated via a controlled flow system to ensure uniform distribution.
- Monitoring Parameters: Temperature, humidity, and light exposure were kept under controlled conditions.
- Comparison: Plant growth was compared between control (no NBs) and air nanobubble-treated systems.



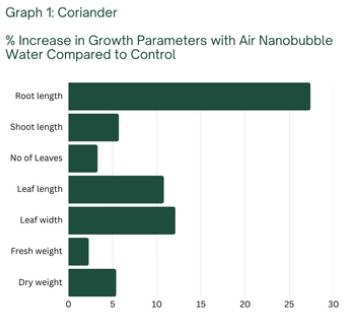
Results Summary

The hydroponic experiments with air nanobubbles showed clear improvements in plant growth parameters for both coriander and romaine lettuce when compared with the control setup.

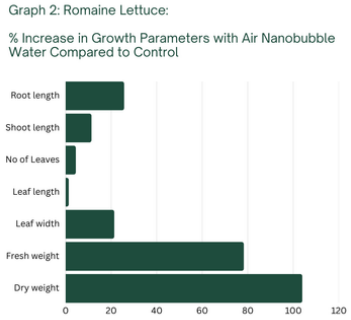
Coriander
- Root length increased by 27.4%
- Shoot length improved by 5.7%
- Leaf length increased by 10.8%
- Fresh weight improved slightly by 2.3%
- Dry weight increased by 5.4%

Romaine Lettuce
- Root length increased by 25.7%
- Shoot length improved by 11.4%
- The number of leaves rose by 4.5%
- Fresh weight increased substantially by 78.3%
- Dry weight more than doubled, with a 104% increase

Graph 1: Coriander



Graph 2: Romaine Lettuce:



Conclusion:

The study demonstrates that air nanobubbles significantly enhance hydroponic crop performance. By improving dissolved oxygen availability and root respiration, nanobubbles boost plant growth metrics across multiple parameters.
- Coriander showed measurable improvements in shoot, root, and leaf growth.
- Romaine lettuce showed substantial gains in biomass, making nanobubble-enriched hydroponics especially beneficial for leafy vegetables.

This case highlights the potential of NanoCloud nanobubble technology as a sustainable solution for high-yield hydroponic farming, reducing reliance on chemical stimulants and optimizing natural plant metabolism.

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Learn more about how nanobubbles improve lakes and ponds. Visit our website: www.nanokriti.com