MOLEAER®

ADVANCING NANOBUBBLE TECHNOLOGY

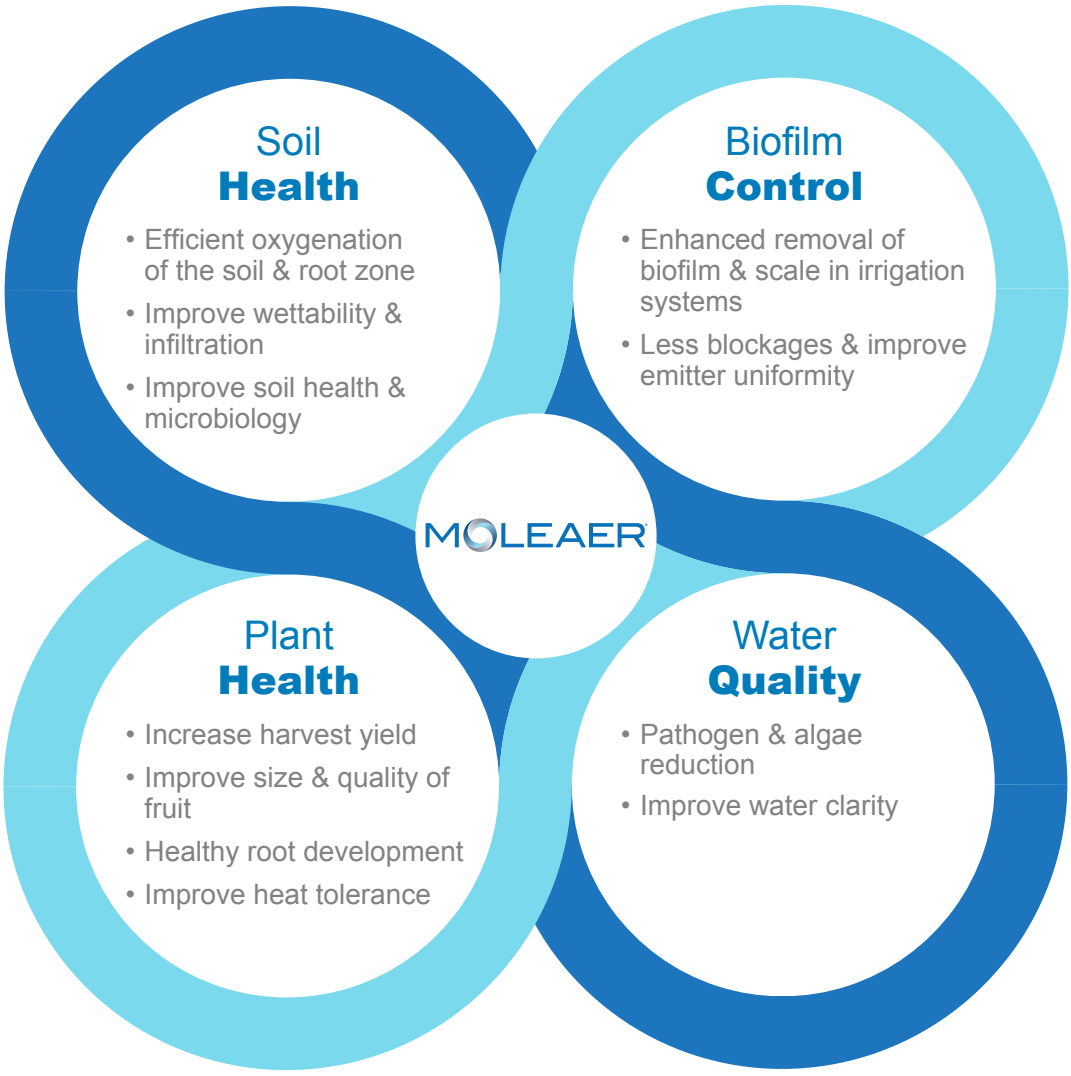
NANOBUBBLES IN AGRICULTURE

Oxygenation, Infiltration & Disease Control

About Moleaer

Moleaer produces cost-effective and proven solutions that increase productivity, reduce reliance on chemicals, and help restore balance to the environment through nanobubble technology. We partner with experienced engineering and innovation teams at world-renowned universities and research institutions to validate new applications of our nanobubble technology. Through these partnerships as well as over 1000 installations around the world, we have proven that nanobubbles can solve a wide array of challenges in the agriculture industry across the irrigation water cycle to improve crop health.

BENEFITS OF NANOBUBBLES



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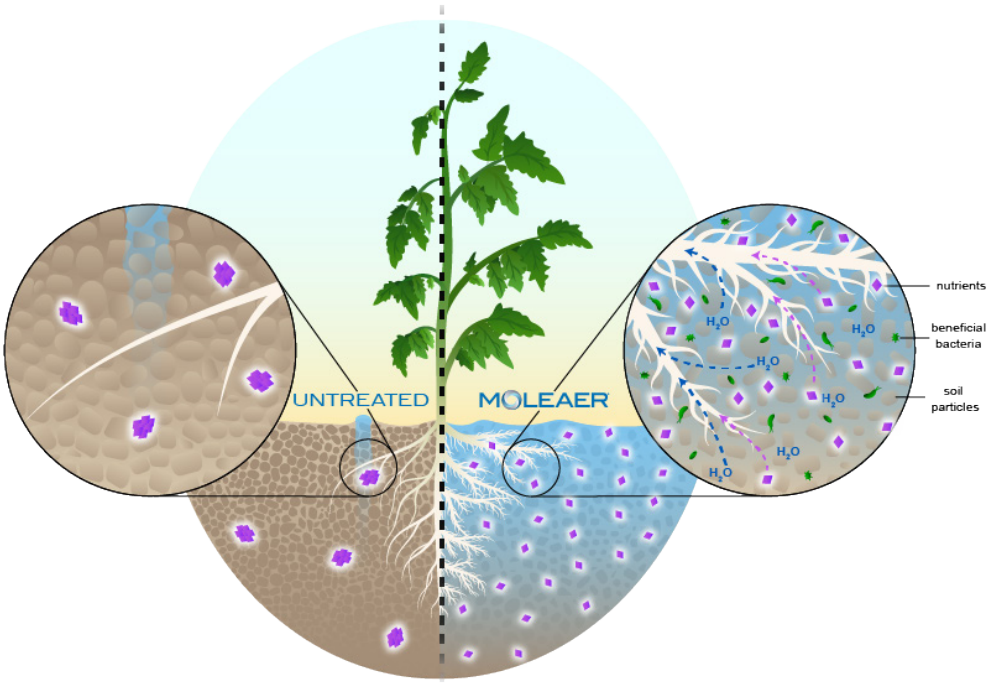
DISSOLVED OXYGEN IN WATER & SOIL

Oxygen is a determining factor for any crop

Optimal oxygen in the soil yields healthier crops:

- Plant roots need oxygen present to take up nutrients and water. Without sufficient oxygen, plant metabolic rates slow, which reduces nutrient absorption resulting in slow plant growth, nutrient deficiencies, and impaired foliage and fruit development.
- Hypoxic stress in plants causes the stomata to close, reducing photosynthesis. The plant generates metabolic inhibitors with a higher incidence of fungal diseases, such as Pythium.
- Oxygen deficiency transforms nitrate (NO_3) to nitrite (NO_2). A high level of nitrite is toxic to humans and plants and serves to alert roots that a problem has arisen.

Nanobubbles are a stable vehicle for oxygen enrichment in water and soil



Nanobubble Effects on Plant Health

- More lateral & capillary root development
- Increased nutrient uptake
- Less health & water stress

Nanobubble Effects on Water

- Reduction in surface tension
- Reduction in water molecule cluster size
- Improved penetration & infiltration

Nanobubble Effects on Soil

- Improved flocculation & reduced compaction
- Improved nutrient conversion & availability
- Increased capillary water distribution
- Decreased nutrient cluster size

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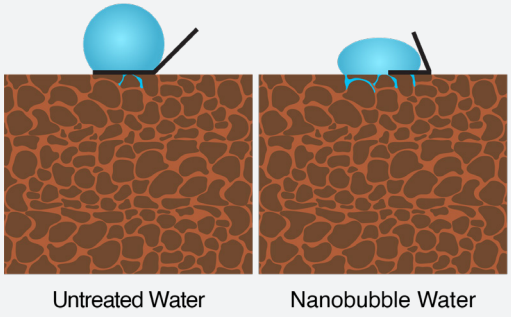
DISSOLVED OXYGEN IN WATER & SOIL

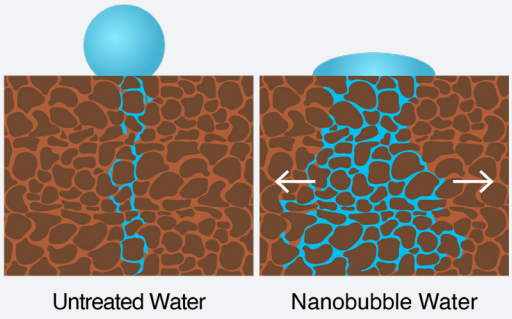
Better water quality for healthy crops, less chemicals and less operational costs

- Water quality is one of the primary cultivation inputs that can have a significant influence on plant health and productivity
- Water with low oxygen levels facilitates more growth-limiting pathogens like Pythium or Phytophthora
- Biofilm can harbor pathogens and is pervasive on most surfaces that are in frequent contact with water
- Algae clogs filters and drip emitters

Nanobubbles are a chemical-free, sustainable means to improve water quality and remove biofilms

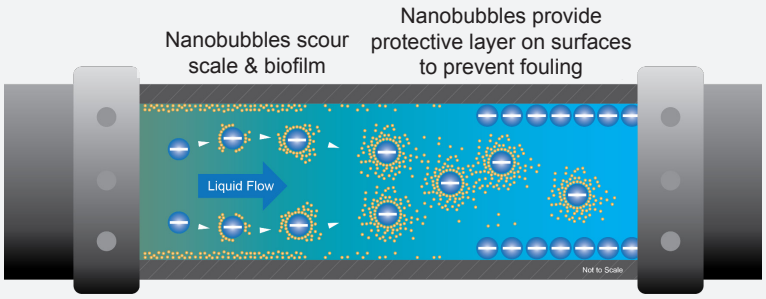
Increase Penetration & Infiltration





- **Surface Tension Reduction:** Nanobubbles act like a surfactant to reduce the intermolecular forces and surface tension of water. Reduced surface tension improves infiltration rates, soil moisture levels and nutrient mobility
- **Contact Angle Reduction:** Nanobubbles are hydrophobic and decrease the contact angle on a hydrophobic soil surface. Reduced contact angle enables irrigation water to more easily penetrate through smaller capillaries and compacted soil particles, facilitating better water distribution throughout the root zone

Scouring & Adhesion



- **Anti-Biofouling:** Nanobubbles are stable in bulk solution and will scour the surfaces of piping to remove and prevent biofilm from developing in irrigation systems. Reducing biofilm build up improves irrigation system hygiene and performance while lowering sanitary treatment costs
- **Disease Control:** Nanobubbles continuously disrupt the environment prohibiting disease-causing bacteria from forming on surfaces. They also promote aerobic/beneficial microbial activity that out competes anaerobic bacteria growth
- **Scale Inhibitor:** Nanobubbles effectively remove and prevent mineral deposits like calcium from sticking to the walls of pipes and irrigation equipment, alleviating clogged emitters, improving irrigation system efficiency and reducing chemical treatment costs

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Summary

MOLEAER®
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Improve Water Quality

Observation	Moleaer Nanobubble Solution
High Temperatures Decrease Oxygen in the Water	• Increase DO levels and provide reserve oxygen nanobubbles for slow targeted release in the root zone
Algae & Turbid Water Clogs Filters & Drip Emitters	• Reduce algae through oxidation • Improve water clarity • Reduce irrigation system hygiene costs • Improve emitter & irrigation uniformity
Build Up of Biofilm & Harmful Pathogens	• Remove biofilm from irrigation pipes • Reduce chemical applications

Improve Root & Plant Health

Plant Functions	Oxygen Benefits
Metabolic Rates	• Oxygen is vital to centra energy pathway of plant cells
ATP & Enzyme Production	• Maintains optimal ATP production • Facilitates nutrient absorption & transport
Root Health	• Reduces environmental stress like heat • Improves root development • Reduces pathogens like Pythium
Turgidity	• Helps maintain the permeability of cell membranes to keep the turgid and resistance to heat stress
Yield	• Fruit setting • Size and quality of produce

Please reach out to info@moleaer.com to learn more.