



Method of Improving Nutrient Delivery to Plants via Hydrodynamic Cavitation

<http://www.infinitysupercritical.com>

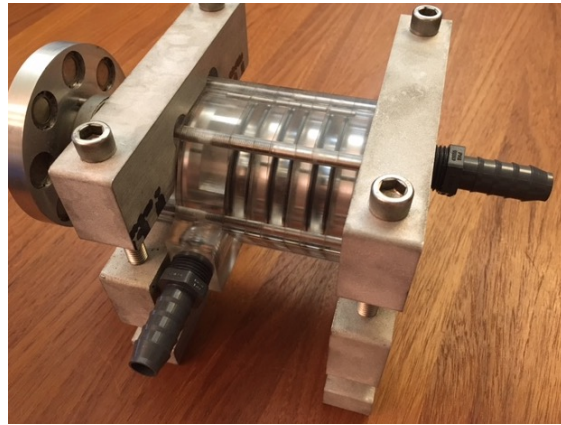
Technology Review | Blog | Industry Series | September 2017

9/1/2017

Delivering nutrients to plants in mechanized cultivation can be improved by utilizing methods that reduce the nutrient size, to better match plant root receptors (pores).

Making delivery of nutrients in an efficient way can reduce both water and nutrient costs.

Infinity Supercritical has been researching and developing new ways to make processing and delivering nutrients to plants more cost effective, while reducing demand for raw ingredients. This in turn, reduces infrastructure and maintenance.



Spinning Disc Reactor Hydro Mix Pump

While there are many ways to nourish plants in cultivation, one of the most effective and efficient, is aeroponics. A system called FogPonics was developed and improved by John Baker. The premise of his system is to macerate nutrients by mechanical breakdown to around 1 micron which is made more efficiently delivered to plant root pores.

The nutrients and water are pumped over 1,000 psi and ejected through small nozzles, which turn the liquid stream into vapor, which resembles fog.

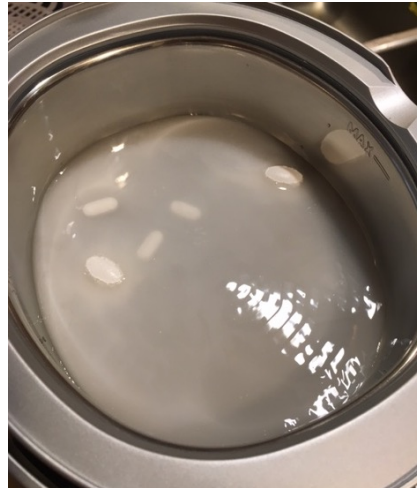
The system delivers nutrient-rich fog to plant roots at around 95 percent relative humidity.

While ultrasonics can be used to reduce the nutrient particle size in water, it also throws off the pH (more acidic).

<http://www.dtic.mil/dtic/tr/fulltext/u2/a031182.pdf>

In this case, we can compare acoustical (16 - 40 kHz) versus hydrodynamic cavitation.

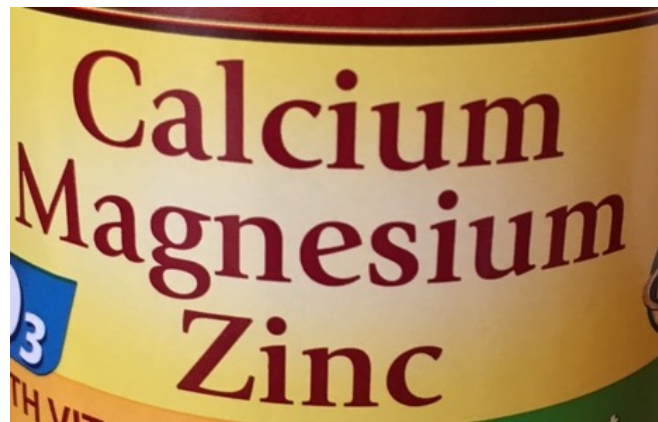
Both will change the pH value, however the hydrodynamic cavitation is more effective, and efficient. Better yet, it's highly tunable to your specific nutrient and water pH.



An example of reducing nutrient tablets using ultrasonics

"The hydrodynamic cavitation is more energy efficient as compared to acoustic cavitation and an almost 13 times higher cavitation yield was obtained in case of hydrodynamic cavitation as compared to that in acoustic cavitation. "

Source: https://www.researchgate.net/publication/231377138_Hydrodynamic_Cavitation_as_an_Advanced_Oxidation_Technique_for_the_Degradation_of_Acid_Red_88_Dye

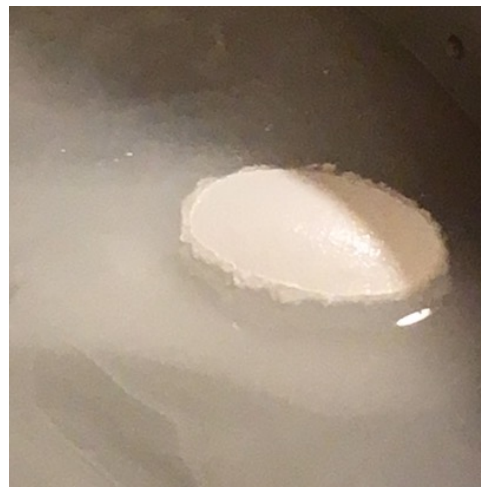


Nutrient Tablets Used In Example

Even better, using hydrodynamically cavitated water increases root growth.

"... hydrodynamic cavitation has increased growth of root system of saplings of a pine ordinary and has raised their resistibility to pathogenic micro flora."

Source: <http://www.hrpub.org/download/20131107/UJES4-14601241.pdf>



Nutrient Tablet Dissolving During Sonification

The only downside of the FogPonics system, is the high pressure 1,000+ psi pump. High pressure pumps are loud, and prone to maintenance issues, and expensive.

The alternative is using a Spinning Disc Reactor (SDR) from Infinity Supercritical, which they have developed (patented) which provides mixing, maceration, and tunable (for pH level dynamics).

The SDR is a quiet alternative, which can provide a pressurized waterflow through any lower pressure nozzle to fog the water and nutrients, while providing the benefits of hydrodynamic cavitation.

As far as plant health goes, the ambient temperature doesn't matter for the main plant foliage above the surface. But compared to the root structure below, the desired temperature should be within 58-68 F in the root zone. The root pores (plant mouth), is around 3 to 5 micron. So if you can provide a nutrient delivery system at or below that range, you can more efficiently deliver food to the plants.

As long as the roots have a healthy environment (around 95 percent RH with nutrients) the foliage will thrive. This can be done with roots suspended, in the enclosed environment described above.

The goal is to provide a water and nutrient delivery system, combined with a low power, silent running pump.

Not only do you get the benefits of a integrated nutrient reduction (down to 1 micro) system, but also a pressurized system with hydrodynamic cavitation, where you can select the temperature, in one simple device.

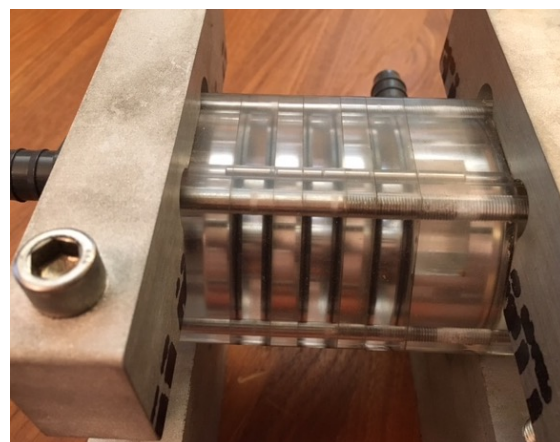
It is suggested that the FogPonics system can reduce nutrient costs, water consumption, energy, and maintenance costs anywhere from 10-35 percent.



Finished Nutrient Liquid After Sonification



Bamboo Seedling Using Nutrient Liquid



Close-up of the Spinning Disc Reactor

