BIO-ORGANIC CATALYST

THE POWER IN NATURE®

Phyto-C_3™ is a breakthrough water treatment which keeps irrigation lines and greenhouses free of scale and slime, reduces water use, improves soil health and improves crop yields and quality

Technology Overview And Case Studies

www.bio-organic.com

Summary

Phyto-C_3™ is a highly concentrated liquid biocatalytic agent that keeps irrigation lines and greenhouses free of scale and slime. Phyto-C_3™ is completely safe and green. Phyto-C_3™ immediately increases oxygen transfer, increases dissolved oxygen and breaks down biofilms. This creates many benefits:

- **Reduce Water Use**: Phyto-C_3™ reduces water use up to 50%. Phyto-C_3™ increases crop yields and crop quality, so less water produces the same or increased yield.
- **Increase Labor / Water Efficiency**: By keeping lines free of scale and slime, Phyto-C_3™ saves labor, time and money. This also increases the efficiency of water usage.
- **Improve Soil Health**: Phyto-C_3™ enhances the soil microbiome, especially the aerobic microbes and AMF (Arbuscular Mycorrhizal Fungi) within the soil which are essential to its health. Phyto-C_3™ dramatically reduces the accumulation of salts and iron in soils. Phyto-C_3™ replaces the acids and bleaches that are usually used to clear lines. These chemicals can enter the soil, make it acidic and damage the soil microbiome.
- **Use Less Fertilizer / Water**: Phyto-C_3™ improves nutrient and water uptake by plants.
- **Control Small Pests**: Applied as a foliar spray at 1:1000 dilution, Phyto-C_3™ breaks the biofilm on mites, white fly and other small pests, causing them to dry out and die.

Phyto-C_3™ is easy to use – simply add 2ppm to all the water, all the time.

About Bio-Organic Catalyst, Inc.

Bio-Organic Catalyst, Inc., headquartered in California, has developed a breakthrough water treatment, currently being used in over ten countries, which helps solve major environmental problems in waste/water (nitrogen, organic pollution, H_2S, odors), agriculture (water demand, soil health, crop yields) and industry (effluent, emissions, fouling) in a simple and profitable way.

Our Bio-Organic Catalysts ("BOCs") are highly concentrated liquid biocatalytic agents that immediately increase oxygen transfer, increase dissolved oxygen and break down biofilm and FOGs.

This triggers beneficial effects wherever water is present, so there are surprisingly many useful applications, including pulp & paper, cooling towers, agriculture, anaerobic digestion, aquaculture, fire control, hydrocarbon remediation, commercial cleaning and many others.

BOCs are made from plant and mineral extracts, yeast fermentation by-products and a non-ionic surfactant.

BOCs are easy to use (just add to water), cost-effective (just 1 - 4 parts per million), increase operating profits (important for rapid large-scale adoption) and are completely safe and green.

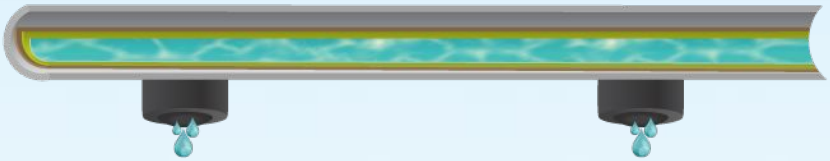
The Technology:
How It Works, Step By Step

- Irrigation systems are wet, nutrient-rich environments.
- Bacteria in the water secrete sticky polysaccharide biofilms.
- These polysaccharide biofilms act like a glue to bind minerals, to form deposits or “scale” that clogs emitters and filters.
- Phyto-C_3™ is a fermentation of organic plant materials, with a small amount of a surfactant.
- Phyto-C_3™ saturates the irrigation water with highly reactive micro-bubbles.
- Unlike normal bubbles, which have shells that are “hard” and very difficult for gas to penetrate, Phyto-C_3™ micro-bubbles have loose “porous” shells. This allows for very rapid oxygen transfer into the water column.

The Technology: How It Works, Step By Step

- The surfactant in Phyto-C_3™ eliminates the hydrophobic resistance of the biofilm so the micro-bubbles can adhere to them at the molecular level.
- A rapid gas transfer occurs across the membrane of each micro-bubble, causing the biofilms to oxidize and shatter.
- Mineral deposits break up and wash out with the irrigation water.
- Dissolved oxygen levels are elevated which enhances healthy aerobic microbial conditions in the soil.
- Video: https://www.youtube.com/watch?v=1SPvqGDOb_o&feature=youtu.be

The Technology: How Phyto-C_3™ Clears Lines



Organic and mineral components within the irrigation water feed the formation of bacteria and mineral fouling of irrigation emitters. These organic components also form the molecular glue which holds inorganic mineral elements together and result in substantial fouling problems in emitters.

Phyto-C_3™ forms very fine microbubbles in the irrigation water. These have a negative charge and attach themselves to the organic binders of inorganic elements and to the slime layers created by bacteria adhesion. This initiates an immediate bio-catalytic breakdown of these molecular linkages.

Phyto-C_3™ allows the optimal maintenance of free-flowing lines and clear emitters, while remediating anaerobic soil conditions and optimizing aerobic soil microbiology.

Case Study: Keeping Irrigation Lines Clear At Foley Wines

Foley Wines (https://www.foleywines.com) is a premium winery in Santa Barbara County, owned by finance billionaire Bill Foley.

Foley Wines uses drip irrigation. These systems suffer from blockages by scale and slime (biofilm). This is normally treated by flushing with bleaches and/or acids. However, this is expensive, polluting, corrodes equipment, damages and acidifies the soil, creates runoff pollution and puts workers at risk. Worst of all, it doesn't actually work very well, so they must still do manual cleaning.

For two years, Foley Wines has been using BOCs to keep their irrigation lines free of slime and scale. In this time, they have had literally zero problems with scale, slime or blockages. This saves them time and money. Moreover, the vines show much improved growth and health.

Here's a 2-minute testimonial from the Foley Wines farm manager:
https://www.youtube.com/watch?v=vzyV8zOPXpE&feature=youtu.be

Here's a testimonial on using BOC compared with hydrogen peroxide with irrigation water heavy in iron: https://www.youtube.com/watch?v=birDTZd06A4

Case Study: Reducing Water Consumption In Agriculture

We completed a two-year study at University of California, Davis to examine the impact of Phyto-C_3™ on viticulture and, by extension, on agriculture in general. The study was led by Dr. S. Kaan Kurtural, Associate Specialist in Cooperative Extension in Viticulture. Dr. Kurtural is a well-known viticulture expert with over 70 published papers. He specializes in improving production efficiency in vineyards and improving berry composition.

Key findings:

- Decreased water consumption up to 50%, while improving grape yields 50% - 90%.
- Increased berry flavonols, anthocyanins and other quality parameters.
- Increased photosynthesis, stem water potential and water use efficiency.
- Improved the transport of sugars from source to sink organs in grapevines, resulting in healthier plants, higher yields and greater resilience to heat and water stress.
- Increased root mass by 36%, leaves by 107%, trunk by 22%, shoots by 100% and shoot to root ratio by 35% over two years.
- Kept drip irrigation system free of scale/slime, saving time and labor.
- Replaced phosphoric / sulfuric acid, thus reducing corrosion and soil acidity.
- Link: https://bio-organic.com/wp-content/uploads/2020/12/PhytoCat2020Report.pdf

Case Study: Increasing Soil Health By Increasing AMF

We completed a one-year study at the University of California, Davis to examine whether Phyto-C_3™, added at 2ppm into the irrigation water during the first year of berry production, could help increase vine health by increasing the amount of AMF (Arbuscular Mycorrhizal Fungi) in the soil.

During the first year of berry production, because the berry harvest is not yet economically meaningful, the farmer's goal is to maximize the growth and health of the vines.

The vines were deliberately stressed. One group of vines received normal irrigation and one group received half this amount, thus creating water stress. Additionally, the 2020 growing season was the hottest and driest in 20 years.

Key findings:

- At full irrigation, Phyto-C_3™ increased mycorrhizal colonization 80%. At half irrigation (more stress), Phyto-C_3™ increased mycorrhizal colonization 150%.
- At half irrigation, the vines showed increased trunk size and leaf cover.
- Phyto-C_3™ increased photosynthetic activity.
- Phyto-C_3™ improved C assimilation and water use efficiency
- Link:https://bio-organic.com/wp-content/uploads/2021/03/boc_presentation_agriculture_kaan_study_young_vines.pdf

Case Study: Increasing Yields 100% In Habanero Chili Peppers

In 2019, working with the Mexican state of Quintana Roo, agronomist Dr. Eliseo Sanchez conducted a study to determine the effects of Phyto-C_3™ on greenhouse habanero chilis.

Phyto-C_3™ was tested at concentrations of 2ppm and 4ppm against a control.

Key findings:

- Kept greenhouse completely free of slime/scale. No acid flush needed.
- At 2ppm, increased yields 100%. At 4ppm, increased yields 140%.
- Applied as a foliar spray at 1:1000, Phyto-C_3™ was more effective than a leading industrial pesticide at controlling white fly and mites, while being much easier to work with, since it is non-toxic. The combination of Phyto-C_3™ with the industrial pesticide provided 100% protection against white fly and mites.
- Here's a link to the original report, translated into English and certified by the Quintana Roo state government: https://bio-organic.com/wp-content/uploads/2019/11/case_study_boc_habaneros-1.pdf

Dosage Guidelines

Phyto-C_3™ is used in two steps. First, an overnight system flush. Second, an ongoing maintenance dosage.

- We first perform an overnight flush to clear accumulated scale and slime. The dosage is 1 liter per acre (2.5 liters per hectare). Leave in the irrigation system overnight (12-24 hours, longer is better).

- We then perform ongoing maintenance. This is usually 2ppm (1 liter of Phyto-C_3™ per 500,000 liters of water) in all the water all the time. However, depending on conditions, this can range from 1 to 4ppm. In some cases where water use is very high, Phyto-C_3™ may be dosed at intervals, for example, every second week.

711 West 17th Street, #E6
Costa Mesa, CA 92627
Email info@bio-organic.com
800.982.8676

www.bio-organic.com