BIODOX™

CONCENTRATED LIQUID STERILIZER

Is there an all-round way to control Fusarium pests? Try this.

Although Fusarium is a soil-borne pathogen, it has a life-cycle that infests not only the ground, but potentially all areas, not just of plants, but also boots, gardening tools, and farm equipment.

Different species of Fusarium behave differently, but in general terms there is asexual (mitotic) sporulation, and sexual (melodic) sporulation. Once these spores come into contact with the soil, they affect the roots, producing Fusarium Root-Rot. As they spread up the stem, Fusarium reproduces plugging up vessels, thus constricting the uptake of water and nutrients, resulting in stunted growth and potentially death. Fusarium can reach leaves and buds allowing spores to either fall to the ground or be carried by the wind, infecting the rest of the plantation.

Once Fusarium has spread, it's considered hard or nearly impossible to get rid of it.

Biodox, an aqueous chlorine dioxide, has been tested and applied to what would be considered the full cycle of viral, bacterial and fungal pests with great success and without the common side effects found when using other types of disinfectants, such as, accumulation of toxic chemicals, production of trihalomethane (in the case of chlorinated disinfectants, which chlorine dioxide is not), and resistance over time.

However, the question whether chlorine dioxide is effective against Fusarium specifically comes to the forefront.

In the tests done by W.E. Copes, from the Small Fruit Research Station in Poplarville, MS, G.A. Chastaganer and R.L. Hummel, both from the Puyallup Research Extension Center at the Washington State University in Puyallup, they proved that Chlorine Dioxide solutions are effective under different types of water conditions and qualities, which is one of the problems related to the use of disinfectants (like sodium hypochlorite), which are highly sensitive to pH levels, suspended solids, organic matter, and water hardness in general.

Their study,[1] "Activity of Chlorine Dioxide in a Solution of Ions and pH Against Thielaviopsis basicolaand Fusarium oxysporum," states the following: "Chlorine dioxide exhibits biocidal activity against a range of organisms, including algae, animal planktons, bacteria, fungi and viruses."

The effectiveness of the biocidal activity, as mentioned above, will depend on the medium (water quality and characteristics), but they found that:[2]

> *This research demonstrates the need to adjust the rate of ClO2 according to the demand requirements of the water solution as well as the pathogen and propagule type being targeted. Fungi and types of fungal propagule ranked in order of increasing levels of ClO2 necessary to achieve mortality were: F. oxysporum f. sp. narcissi (conidia) ≤ T. basicola (conidia) << T. basicola (aleurio- spores). The factors that affected activity of ClO2 in the order of decreasing reactivity were concentration of the divalent metal ion solution >> pH > concentration of the nitrogen and hard water solution.*

In other words, an adjustment in the concentration, contact time, and type of pathogen is necessary to ensure the effectiveness of Chlorine Dioxide.

> *Researchers have demonstrated that high biocidal activity was obtained from ClO2 with con- centrations and duration of exposure that ranged from 1 to 9 mg/liter and 1 to 20 min, respectively. For example, a high reduction in viable propagules resulted when conidia or sporangiospores of Botry- tis cinerea, Penicillium expansum, Mucor piriformis, and Cryptosporiopsis peren- nans were exposed to ClO2 at 3 to 5 mg/liter for 1 min, and when Phytophthora cinnamomi, Fusarium oxysporum, Colleto- trichum capsici, Pythium ultimum, and Alternaria zinniae were exposed to ClO2 at 3 mg/liter for 8 min (18,24). These papers demonstrated that concentration of ClO2 varies with time, with an equal mortality of propagules obtained at lower concentra- tions of ClO2 by lengthening the duration of exposure. The upper rate of 9 mg ClO2 per liter is higher than rates commonly used to treat drinking water or in fruit and vegetable dump tanks, where rates of 2 to 5 mg/liter are commonly used.[3]*

The good news is that Chlorine Dioxide solutions do, in fact, control and kill various fungal infections, among them Fusarium:[4]

> *Chlorine dioxide rates needed to achieve LD50 values were similar for conidia of F. oxysporum f. sp. narcissi and T. basicola. Roberts and Reymond (24) noted mortality of Cryptosporiopsis perennans, Mucor piriformis, Penicillium expansum, and Botrytis cinerea spores reached 100.0, 100.0, 99.2, and 93.9%, respectively, from 30 s exposure to 3 mg ClO2 per liter.*

This means that different types of fungal infections were easily dealt with (between 93.9% to 100% kill rate) at solutions as low as 3 ppm (parts per million), in a time-period of only 30 seconds of exposure.

The suggested application of Biodox™ goes from 2.5ppm for preventative root drench, 5ppm for infection control (with plants in the ground), 25ppm for soil sterilization (without plants in the ground), 25ppm for foliar spray on the plants and up to 100ppm for equipment and surface sterilization, which exceeds by far the tested concentrations as well as times of exposure.

When you try this, you will come to realize that there is indeed an all-round way to control Fusarium (and other fungal, as well as bacterial and viral) infections, without endangering your investment through undesired side-effects.

BioCentric Solutions
Manufactured in the USA by BioCentric Solutions
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The BioCentric Solutions Ethos

BioDox™ was developed by BioCentric Solutions, a company that believes in creating the most effective solutions to dangerous pathogens without harming people or our planet. Our mission is to create safe and effective solutions that improve the health of the world around us.

BioDox™

Pathogen Prevention

Plant Life Cycle	CLONE		VEG				FLOWERING							
WEEK			W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12
Soil Sterilization	25ppm		25ppm											
Root Drench		2.5ppm		2.5ppm		2.5ppm	5ppm		2.5ppm					
Foliar Spray			25ppm			25ppm		25ppm		50ppm		50ppm		50ppm

Infection Outbreak Control

Plant Life Cycle	CLONE		VEG				FLOWERING							
WEEK			W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12
Soil Sterilization	25ppm		25ppm											
Root Drench		2.5ppm			5ppm		5ppm		5ppm		5ppm			
Foliar Spray		25ppm		25ppm		25ppm		25ppm		50ppm	50ppm	50ppm	50ppm	50ppm

Soil Sterilization

Soil Sterilization is a critical step to insure that colonies of pathogens are reduced or eliminated before the plants are introduced to the soil. This is accomplished by using a 25ppm solution of Biodox in the water system for the farm. This solution travels from the water tank through the pipes and emitters to then fully saturate the soil. Depending on conditions, 60-80 gallons per yard is applied and allowed to completely dry back. It is recommended to allow the product to dissipate for three days before introducing new plants into the soil. Biodox is a gas in solution and will completely dissipate. Additional benefits of this approach include cleaning the tank, lines and emitters of biofilm. Soil Sterilization is recommended at the beginning of the growing season, or between harvesting and planting the next round.

Root Drench

Root Drench is a soil treatment with Biodox performed while the plant is in the soil. The dosage is one tenth of the dosage used for soil sterilization. A preventative approach includes using a 2.5ppm solution regularly and a 5ppm solution if there are symptoms of infection. The root drench method allows for colonies of pathogens to be reduced without destroying good microbes or causing lock out. This allows the beneficial microbes an opportunity to dominate the terrain. Apply product through the watering system during the watering cycle between feedings. Allow the soil to dry back as much as possible until plants begin to shows signs of wilt, then resume watering and feeding as usual. For preventive maintenance use a 2.5ppm (1oz per ten gallons)solution every other week throughout Veg and the first six weeks of flowering. If there is an infection, use Biodox at a 5 ppm solution (2oz per ten gallons) every week until symptoms subside and then every other week until harvest.

Foliar Spray

Foliar applications are critical to maintain a sterile environment. Third party studies show that using Biodox as a plant wash removes biofilm from the leaves allowing for greater photosynthesis, creating higher yields and terpenes. Most importantly, Biodox targets pests like PM, Boytritis, and many others agricultural pathogens by selectively oxidizing them in a way no other chemical does. It discourages and oxidizes small pests like mites, aphids and thrips without toxicity or residue. Biodox can be used during the curing phase after harvest to discourage spider mites or pm without reducing THC or terpene content. Biodox is completely non-toxic and made of compounds not tested for in DCC testing, making it ideal for the last weeks of flowering.

[1] Copes, W. E., et al. *"Activity of Chlorine Dioxide in a Solution of Ions and pH Against Thielaviopsis Basicola and Fusarium Oxysporum." Plant Disease*, vol. 88, no. 2, Feb. 2004, pp. 188–94. DOI.org (Crossref), https://doi.org/10.1094/PDIS.2004.88.2.188

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