

BioDox™

CONCENTRATED LIQUID STERILIZER



The Power of Integrated Pest Management to Control Hop Latent Viroid with Biocentric Solution's Biodox

In the lush fields of California's cannabis farms, a formidable adversary lurks—the Hop Latent Viroid (HLVd). This insidious pathogen silently infiltrates cannabis crops, leaving destruction in its wake and posing a significant threat to the entire cannabis industry. With over 90% of farms already infected, the need for a comprehensive solution has reached a critical juncture.

Amidst the uncertainty, a ray of hope emerges—the power of Integrated Pest Management (IPM) with **Biodox**, the Chlorine Dioxide-powered solution offered by **Biocentric Solutions**.

HLVd casts a dark shadow on cannabis cultivation, shrinking yields and devastating the precious THC content—the very essence of today's cannabis market. The potential losses in the national cannabis economy loom large, making HLVd a menace that demands urgent attention.

The enigmatic "dudding" effect of flowers that never mature and gain weight left growers feeling powerless, and the invisible pathogen spread undetected, plaguing the industry. **Biocentric Solutions** began testing **Biodox** against HLVD with great results.

However, due to HLVD's life-cycle and manner in which it infects, sometimes passing completely undetected until the entire plantation has been infested before its detrimental effects become visible, calls for an integral approach, not just last-minute emergency remedies. Last-minute treatments late in flowering have shown success with **Biodox**, but the ideal is always prevention.

IPM embodies a holistic strategy, minimizing reliance on harmful chemicals and taking a cue from nature to preserve the environment and keep people safe. At the heart of this approach lies **Biodox**, the aqueous Chlorine Dioxide-based product that aligns perfectly with **Biocentric Solutions'** ethos of "solving problems, not just symptoms." **Biodox** leaves no harmful residues or environmental threats, making it the ideal recurrent ally in the cannabis industry's battle against HLVD.

Chlorine Dioxide's prowess as a biocide has been proven time and again, showcasing its high efficacy against various pathogens, particularly viruses [1,2,3,4,5]. Currently, there are no ASTM standards for efficacy testing against Hop Latent Viroid. This limits the ability for a conclusive and peer-reviewed efficacy test of chlorine dioxide against HLVD. For now, anecdotal evidence observed on cannabis farms with plants that exhibited symptoms and tested positive for HLVD will have to suffice. Current testing procedures for HLVD assign a number of one through five based on the number of colony forming units (CFU) with five being the highest and zero being undetectable.

In this study, a farm was identified with a greenhouse that appeared to be symptomatic while in week four of flowering. The test results revealed an infection [see lab test and pictures attached] We began a root drench and foliar spray protocol. Within two weeks it was observed that the flowers gained weight again and the visual symptoms of HLVD subsided. The greenhouse was tested again and the tests revealed a lower infection level, but more importantly the flowers put on weight.

The plants were harvested two weeks later and were shown to have a similar weight to comparable plants without infection. The observational conclusion is that plants with HLVd can still be productive and yield high quality and quantity of flowers.

This conclusion was tested again at the same farm with a greenhouse of plants that were still in the vegetative stage but began to show signs of HLVd. After testing positive for HLVd, we began the same treatment protocol. This time however the plants never appeared to be symptomatic in the flowering stage. When harvested, the weight of the crop yielded slightly higher averages than usual. These anecdotal studies suggest to us that crops that have HLVd can be grown successfully if the colony forming units can be kept at low levels.

Integrated Pest Management with **Biodox** has shown promising anecdotal results as an effective tool to control HLVd in the cannabis industry. For the industry to be successful against this barrage of new pathogens, an approach that integrates soil and plant-based applications timed to the pathogen's different stages of development, must be adopted. In other words, Integrated Pest Management must follow the pathogen's growth stages and reduce the number of colony-forming units before symptoms are visible.

For this, **Biodox** is ideal. As opposed to many other biocidal chemicals, it can be applied to soil, plants, surfaces, equipment, and everywhere that HLVd might choose to go. **BioCentric Solutions'** commitment to preserving the environment and keeping people safe resonates throughout their IPM approach, fostering a resilient and thriving cannabis industry.



Manufactured in the USA by BioCentric Solutions
12400 Loma Rica Dr. Grass Valley, CA 95945
www.biocentric.solutions

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 show signs of wilt, then resume watering and feeding as usual. For preventative 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.



May 27th 2022, HLVd Infected Plants



The Higher Commitment Analytical Lab
 440 Lower Grass Valley Road, Suite A
 Nevada City, CA 95959
 (530) 264-7789

Client Name: Boon Industries
Submit Date: May 27, 2022
Report: THCA3277
Completed Date: May 27, 2022

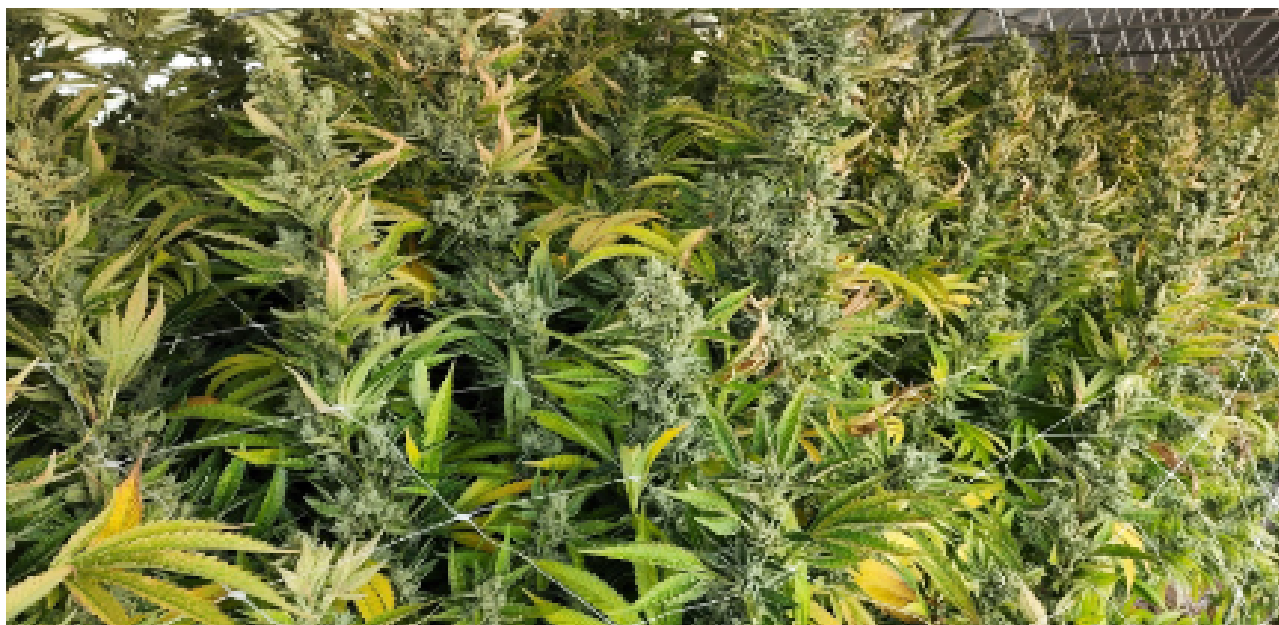
Tests Performed:
 HLVd : Hop Latent Viroid (qPCR)
 LCV : Lettuce Chlorosis Virus (qPCR)
 CCV : Cannabis Cryptic Virus (qPCR)

Sample ID	Sample Name	HLVd	LCV	CCV
THCA3277-01	5/27 Mac week 6	-	-	-
THCA3277-02	5/27 OG week 6	-	-	-
THCA3277-03	5/27 OG week 7	POS	-	-
THCA3277-04	5/27 Jet Fuel Gelato 7.5	-	-	-
THCA3277-05	5/27 OG week 7.5	POS	-	-
THCA3277-06	5/27 OG week 9	POS	-	-

- : Not Detected
 POS : Positive

Lori Katrencik
 Lori Katrencik
 Lab Director

Kyle Nesbitt
 Kyle Nesbitt
 Lab Manager



June 15th 2022, The same Infected plants gaining weight in the flowers despite having HLVd .



The Higher Commitment Analytical Lab
 440 Lower Grass Valley Road, Suite A
 Nevada City, CA 95959
 (530) 264-7789

Client Name: Boon Industries
Submit Date: June 21, 2022
Report: THCA3386
Completed Date: June 22, 2022

Tests Performed:
 HLVD : Hop Latent Viroid (qPCR)
 LCV : Lettuce Chlorosis Virus (qPCR)
 CCV : Cannabis Cryptic Virus (qPCR)

Sample ID	Sample Name	HLVD	LCV	CCV
THCA3386-01	OG WEEK 10	POS	-	-
THCA3386-02	OG WEEK 10.5	-	-	-
THCA3386-03	OG WEEK 12	POS	-	-

- : Not Detected
 POS : Positive

Lori Katrencik *Kyle Nesbitt*
 Lori Katrencik Lab Director Kyle Nesbitt Lab Manager

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2. Ogata N., Shibata T. Protective effect of low-concentration chlorine dioxide gas against influenza A virus infection. *J. Gen. Virol.* 2008;89:60–67. doi: 10.1099/vir.0.83393-0. [PubMed] [CrossRef] [Google Scholar]
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4. Tanner R.S. Comparative testing and evaluation of hard-surface disinfectants. *J. Ind. Microbiol.* 1989;4:145–154. doi: 10.1007/BF01569799. [CrossRef] [Google Scholar]
5. Junli H., Li W., Nenqi R., Li L.X., Fun S.R., Guanle Y. Disinfection effect of chlorine dioxide on viruses, algae and animal planktons in water. *Water Res.* 1997;31:455–460. doi: 10.1016/S0043-1354(96)00276-X. [CrossRef] [Google Scholar]
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