

BioDox™

CONCENTRATED LIQUID STERILIZER



Arvum Plant Labs BioDox Growth Trial

Researchers: Adam Floyd and Josh Cosgrove

Project Title: BioDox Cannabis Growth Trial

Date: 02/05/2023

OBJECTIVE:

The primary goal of this experiment is to showcase the safe and effective use of BioDox (aqueous chlorine dioxide) on cannabis plants. BioDox was applied in addition to a standard fertilizer regiment. BioDox is a liquid solution that is diluted and used as a root drench and foliar spray. Growth, yield, potency, and terpene content will all be considerations in the efficacy of the product. A total of four treatments will be utilized in the overall efficacy of the study.

MATERIALS & METHODS:

Wedding Crashers was the strain selected for this study. A total of four treatments were utilized in this trial using four replicates per treatment. The BioDox will be applied at the following rates: 2, 4, and 8 mL per gallon. A standard fertilizer regiment will be applied to each of the treatments. The total growth cycle of the plants will be 12 weeks. Leaf tissues samples were collected every two weeks and analyzed for mineral nutrient concentrations. The samples will be analyzed on a dry weight basis using inductively coupled plasma optical emission spectroscopy (ICP-OES) and combustion analysis. In addition, yield, potency, and terpene content were measured. Potency was measured using a high-pressure liquid chromatograph (HPLC) with a diode array detector. Terpenes were measured using headspace gas chromatography couple with mass spectrometry (HSGC/MS).

Use Site: *Palomar Craft Cannabis*

Crop Cultivar/Source: *Wedding Crasher (Indica Dominate Hybrid)*

Potting/Rooting Media: *Greenlite for 1 gal and Roots Original Organic Soil 5 gal by Aurora Innovations*

Growth Stage Used: *Entire Harvest Cycle*

Number of Reps per Treatment: *4 replicates*

Pot Size & Spacing: *1 gal pots in a 6"x6" space and 5 gal pots in a 1.77'x1.77' space*

<i>Treatment Code</i>	<i>BioDox-Treatment</i>	<i>Varietal</i>	<i>Application Type</i>
<i>1.</i>	<i>No Application</i>	<i>Wedding Crasher</i>	<i>N/A</i>
<i>2.</i>	<i>2 oz/gal</i>	<i>Wedding Crasher</i>	<i>Foliar Spray</i>

Table 1. Treatment rates and application type

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Treatments were applied on the following dates:

11/7/22

11/11/22

11/16/22

11/21/22

Yield

The plants were dried, cured, and trimmed prior to separation and weighing. The average yield per plant of each bud size is listed in table 2.

<i>Bud Size</i>	<i>Untreated Yield (g)</i>	<i>Treated Yield (g)</i>
Total Shucked	42.50	49.36
Machine Trimmed	37.05	39.36
Bigs	13.29	17.36
Smalls	9.49	11.79
Popcorn	5.85	5.36
Trim	8.53	12.93

Table 2. Yield data

Potency

There was not a substantial difference in potency values from the control sample and the treated samples.

<i>Cannabinoid</i>	<i>Untreated</i>	<i>Treated</i>
THCa	18.15%	18.61%
Δ 9-THC	9.74%	9.35%
Δ 8-THC	ND	ND
THCV	ND	ND
CBDa	<0.050	<0.050
CBD	ND	ND
CBN	0.27%	0.26%
CBGa	0.41%	0.41%
CBG	0.28%	26.90%
CBC	0.13%	0.13%
Total CBD	<LOQ	<LOQ
Total THC	25.97%	25.67%

Table 3. Potency data

Terpene Profile

The terpene values trended upward with the use of BioDox with 14% higher yields and 12% higher terpenes.

<i>Analyte</i>	<i>Control (µg/g)</i>	<i>Treated (µg/g)</i>
a-Pinene	131.4	150.1
Camphene	66.6	72.7
b-Myrcene	738.5	930
b-Pinene	196.1	228
3-Carene	BDL	BDL
a-Terpinene	BDL	BDL
Limonene	1257.9	1616
p-Cymene	BDL	BDL
Ocimene	BDL	BDL
Eucalyptol	BDL	BDL
γ-Terpinene	BDL	BDL
Terpinolene	BDL	BDL
Linalool	1067.15	1177.7
Isopulegol	BDL	BDL
Geraniol	BDL	BDL
Caryophyllene	2562.4	2192.5
α-Humulene	797.9	919.5
Trans-Nerolidol	BDL	BDL
Geraniol	BDL	BDL
Caryophyllene	2562.4	2192.5
α-Humulene	797.9	919.5
Trans-Nerolidol	BDL	BDL
Cis-Nerolidol	BDL	BDL
Caryophyllene Oxide	198.7	188.7
α-Bisabolol	BDL	BDL
Total (µg/g)	Total (µg/g)	Total (µg/g)
Total (%)	0.74%	0.86%

Table 4. Terpene data



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Discussion:

Potency values did not change from the treated to untreated samples. The yield and terpene values both trended upward with the use of BioDox with 14% higher yields and 12% higher terpenes. The application of BioDox does not appear to negatively affect the chemical profile of the plant. Powdery mildew was observed on the control plants. None of the treated plants exhibited symptoms of powdery mildew, while it was present on the untreated plants (see below).



Powdery mildew on the control plants not sprayed with BioDox

SUMMARY

BioDox as a foliar spray in cannabis cultivation successfully managed Powdery Mildew compared to the control group without adverse affects. Unexpected side benefits of using BioDox included higher yields and terpenes compared to the control. This may be contributed to increasing photosynthesis by oxidating the biofilm layer on the leaf surface allowing the plant to uptake more light, producing greater yields. The additional terpenes may be contributed to this same effect due to increased light exposure on the leaf. These affects need to be studied more closely to understand the exact mechanism driving these results. These observations are promising and merit further study.

BioDox may be used directly on cannabis plants as part of an Integrated Pest Management program without adverse affects to the soil, plants, or finished flower.



**BioCentric
Solutions**

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.



Arvum Plant Labs Project Report Form

Picture:



Plants being treated with BioDox



Arvum Plant Labs Project Report Form

Picture:



Untreated plants from the control group



Arvum Plant Labs Project Report Form

Picture:



Plants treated with BioDox



Arvum Plant Labs Project Report Form

Picture:



Untreated plants



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O.T. #1

Sample ID: THCA23012302-02

Strain: O.T. #1

Matrix: Plant

Type: Flower - Cured

Sample Size: 2 g; Batch:

Received: 01/23/2023

Completed: 01/24/2023

Batch#:

Client

The Higher Commitment

Lic. #

440 Lower Grass Valley Road

Nevada City, CA 95959



Summary

Test	Date Tested	Method	Result
Batch			Complete
Cannabinoids	01/23/2023		Complete
Moisture	01/23/2023	GLT-02; Sartorius MA35	12.0%
Terpenes	01/23/2023	OG-02; GCMS	Complete
Density			*g per mL

Cannabinoids

Complete

25.972% Total THC	<LOQ Total CBD	27.016% Total Cannabinoids
12.0% Moisture	Not Tested Water Activity	Not Tested Foreign Matter

Analyte	LOD	LOQ	Result	Result
	mg/g	mg/g	mg/g	%
THCa	0.25	0.50	185.12	18.512
Δ9-THC	0.25	0.50	97.37	9.737
Δ8-THC	0.25	0.50	ND	ND
THCV	0.25	0.50	ND	ND
CBDa	0.25	0.50	<0.50	<0.050
CBD	0.25	0.50	ND	ND
CBN	0.25	0.50	2.68	0.268
CBGa	0.25	0.50	4.12	0.412
CBG	0.25	0.50	2.81	0.281
CBC	0.25	0.50	1.33	0.133
Total CBD			<LOQ	<LOQ
Total THC			259.718 mg/g	25.972%
Total			270.158	27.016

Total THC = THCa * 0.877 + Δ9-THC + Δ8-THC; Total CBD = CBDa * 0.877 + CBD

LOQ = Limit of Quantitation; The reported result is based on a sample weight with the applicable moisture content for that sample; Unless otherwise stated all quality control samples performed within specifications established by the Laboratory. Test method: OG-01 - Cannabinoids by HPLC.



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01/24/2023

Kyle Nesbitt
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Lab Manager
01/24/2023

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O.T. #1

Sample ID: THCA23012302-

02 Strain: O.T. #1

Matrix: Plant

Type: Flower - Cured

Sample Size: 2 g; Batch:

Received: 01/23/2023

Completed: 01/24/2023

Batch#:

Client

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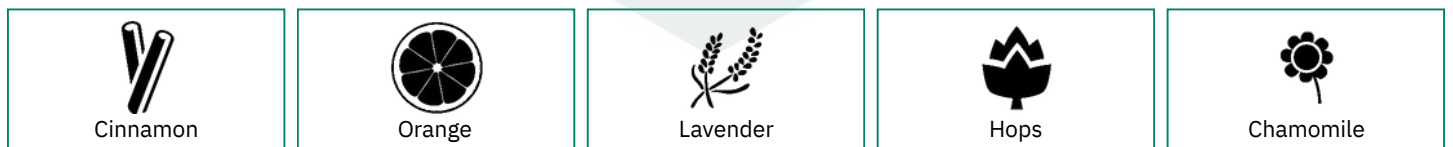
440 Lower Grass Valley Road

Nevada City, CA 95959

Terpenes

Analyte	LOD mg/g	LOQ mg/g	Results mg/g	Results %
β-Caryophyllene	0.000078	0.000156	2.192540	0.2192540
Limonene	0.000078	0.000156	1.257940	0.1257940
Linalool	0.000078	0.000156	1.067150	0.1067150
α-Humulene	0.000078	0.000156	0.797850	0.0797850
β-Myrcene	0.000078	0.000156	0.738520	0.0738520
α-Bisabolol	0.000078	0.000156	0.721960	0.0721960
Caryophyllene	0.000078	0.000156	0.198710	0.0198710
Oxide	0.000078	0.000156	0.196100	0.0196100
β-Pinene	0.000078	0.000156	0.131370	0.0131370
α-Pinene	0.000078	0.000156	0.066630	0.0066630
Camphene	0.000078	0.000156	ND	ND
3-Carene	0.000078	0.000156	ND	ND
α-Terpinene	0.000078	0.000156	ND	ND
cis-Nerolidol	0.000078	0.000156	ND	ND
Eucalyptol	0.000078	0.000156	ND	ND
γ-Terpinene	0.000078	0.000156	ND	ND
Geraniol	0.000078	0.000156	ND	ND
Guaiol	0.000078	0.000156	ND	ND
Isopulegol	0.000078	0.000156	ND	ND
Ocimene	0.000078	0.000156	ND	ND
p-Cymene	0.000078	0.000156	ND	ND
Terpinolene			ND	ND
trans-Nerolidol			7.368770	0.7368770
Total				

Primary Aromas



Date Tested: 01/23/2023
Test method: OG-02 - Terpenes by GCMS.



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01/24/2023

Kyle Nesbitt
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O.T. #

Sample ID: THCA23012302-

03 Strain: O.T. #0

Matrix: Plant

Type: Flower - Cured

Sample Size: 2 g; Batch:

Received: 01/23/2023

Completed: 01/24/2023

Batch#:

Client

The Higher Commitment

Lic. #

440 Lower Grass Valley Road
Nevada City, CA 95959



Summary

Test	Date Tested	Method	Result
Batch	01/23/2023		Complete
Cannabinoids	01/23/2023	GLT-02; Sartorius MA35	Complete
Moisture	01/23/2023	OG-02; GCMS	10.7%
Terpenes	01/23/2023	OG-02; GCMS	Complete
Density			*g per mL

Cannabinoids

Complete

25.669% Total THC	<LOQ Total CBD	26.686% Total Cannabinoids
10.7% Moisture	Not Tested Water Activity	Not Tested Foreign Matter

Analyte	LOD mg/g	LOQ mg/g	Result mg/g	Result %
THCa	0.25	0.50	186.08	18.608
Δ9-THC	0.25	0.50	93.50	9.350
Δ8-THC	0.25	0.50	ND	ND
THCV	0.25	0.50	ND	ND
CBDa	0.25	0.50	<0.50	<0.050
CBD	0.25	0.50	ND	ND
CBN	0.25	0.50	2.62	0.262
CBGa	0.25	0.50	4.07	0.407
CBG	0.25	0.50	2.69	0.269
CBC	0.25	0.50	1.29	0.129
Total CBD			<LOQ	<LOQ
Total THC			256.692 mg/g	25.669%
Total			266.861	26.686

Total THC = THCa * 0.877 + Δ9-THC + Δ8-THC; Total CBD = CBDa * 0.877 + CBD

LOQ = Limit of Quantitation; The reported result is based on a sample weight with the applicable moisture content for that sample; Unless otherwise stated all quality control samples performed within specifications established by the Laboratory. Test method: OG-01 - Cannabinoids by HPLC.



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O.T. #0

Sample ID: THCA23012302-03
Strain: O.T. #0
Matrix: Plant
Type: Flower - Cured
Sample Size: 2 g; Batch:


Received: 01/23/2023
Completed: 01/24/2023
Batch#:

Client
The Higher Commitment
Lic. #
440 Lower Grass Valley Road
Nevada City, CA 95959


Terpenes

Analyte	LOD	LOQ	Results		Results
	mg/g	mg/g	mg/g	%	
β-Caryophyllene	0.000078	0.000156	2.562460	0.2562460	
Limonene	0.000078	0.000156	1.616000	0.1616000	
Linalool	0.000078	0.000156	1.177750	0.1177750	
β-Myrcene	0.000078	0.000156	0.930040	0.0930040	
α-Humulene	0.000078	0.000156	0.919570	0.0919570	
α-Bisabolol	0.000078	0.000156	0.770380	0.0770380	
β-Pinene	0.000078	0.000156	0.228010	0.0228010	
Caryophyllene Oxide	0.000078	0.000156	0.188730	0.0188730	
α-Pinene	0.000078	0.000156	0.150100	0.0150100	
Camphene	0.000078	0.000156	0.072750	0.0072750	
3-Carene	0.000078	0.000156	ND	ND	
α-Terpinene	0.000078	0.000156	ND	ND	
cis-Nerolidol	0.000078	0.000156	ND	ND	
Eucalyptol	0.000078	0.000156	ND	ND	
γ-Terpinene	0.000078	0.000156	ND	ND	
Geraniol	0.000078	0.000156	ND	ND	
Guaiol	0.000078	0.000156	ND	ND	
Isopulegol	0.000078	0.000156	ND	ND	
Ocimene	0.000078	0.000156	ND	ND	
p-Cymene	0.000078	0.000156	ND	ND	
Terpinolene	0.000078	0.000156	8.615790	0.8615790	
trans-Nerolidol	0.000078	0.000156	ND	ND	
Total					


Primary Aromas




Cinnamon




Orange



Lavender



Hops



Chamomile

Date Tested: 01/23/2023
Test method: OG-02 - Terpenes by GCMS.



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01/24/2023

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