

CERTIFICATE OF ANALYSIS:
CRYSTALLINE CANNABIDIOL



Product Name

CC - Crystalline Cannabidiol

Batch Number

190127FE

Manufacture Date

October 7, 2019

Expiration Date

October 2021

Botanical Source

Industrial hemp, grown and processed in Kentucky, USA in compliance with Section 7415 of the Farm Bill and applicable Kentucky State Law and State Department of Agriculture regulations.

Product Description

This product is hemp derived crystalline cannabidiol, isolated through CO₂ extraction and crystal precipitation.

Qualitative Analysis

OBSERVATION	METHOD	RESULT
Foreign Matter	Gross Visual	Absent
Color	Gross Visual	White to Pale Yellow
Molds & Mildews	Gross Visual	Absent
Smell	Olfactory	Odorless to Slight Terpenoid
Product Feel	Tactile	Fine Powder

Quantitative Analysis

Cannabinoid Analysis**

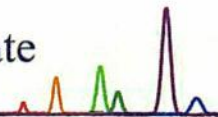
RESULT: PASS

IDENTIFICATION	METHOD	RESULT
Cannabinoid	UPLC-PDA	%wt/wt
Cannabidiol (CBD)	UPLC-PDA	103.14%
Cannabidiol (CBD)	UPLC-PDA	103.14%
Cannabidiolic Acid (CBDA)	UPLC-PDA	N/D
Cannabinol (CBN)	UPLC-PDA	N/D
Δ-9-Tetrahydrocannabinol (Δ-9-THC)	UPLC-PDA	N/D
Cannabichromene (CBC)	UPLC-PDA	N/D
Tetrahydrocannabinolic Acid (THCA)	UPLC-PDA	N/D
Cannabigerol Acid (CBGA)	UPLC-PDA	N/D
Cannabigerol (CBG)	UPLC-PDA	N/D
Δ-8-Tetrahydrocannabinol (Δ-8-THC)	UPLC-PDA	N/D

**Denotes third party analysis. Source data available upon request.

LOQ Limit of quantitation

N/D None detected above the limits of detection



Certificate ID: **67280**
 Client Sample ID: **190127FE**
 Lot Number: **190127FE**
 Matrix: **Isolates - CBD**

Received: **10/8/19**



Authorization: Jon Podgorni, Lead Research Chemist	Signature: <i>Jon Podgorni</i>	Date: 10/23/2019
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The data contained within this report was collected in accordance with the requirements of ISO/IEC17025:2017. I attest that the information contained within the report has been reviewed for accuracy and checked against the quality control requirements for each method. These results relate only to the test article listed in this report. Reports may not be reproduced except in their entirety.

CN: Cannabinoid Profile & Potency [WI-10-17 & WI-10-17-01] Analyst: RAS Test Date: 10/16/2019

The client sample was analyzed for plant-based cannabinoids by Liquid Chromatography (LC). Due to the unique precision and accuracy demands of assay testing for highly purified materials, samples were prepared in class-A volumetric glassware and quantitated against a single point calibration function. Five replicate injections of cannabidiol (CBD) certified reference standard are averaged to derive the calibration function and verify injection precision less than 2% RSD. For components other than CBD, the relative response factor of the identified component is used for quantitation. Relative response factors are calculated from certified reference standards. Relative percent difference (RPD) of the Laboratory Duplicate for this sample preparation batch was less than 2%. Assay values exceeding 100.00% are scientifically valid and result from the unavoidable accumulation of uncertainty at every stage of sampling and analysis.

67280-CN

ID	Weight %	Concentration (mg/g)		
D9-THC	ND	ND		
THCV	ND	ND		
CBD	103.14	1031.39		
CBDV	0.21	2.13		
CBG	ND	ND		
CBC	ND	ND		
CBN	ND	ND		
THCA	ND	ND		
CBDA	ND	ND		
CBGA	ND	ND		
D8-THC	ND	ND		
exo-THC	ND	ND		
Total	103.35	1033.53	0%	Cannabinoids (wt%) 103.1%
Max THC	ND	ND		
Max CBD	103.14	1031.39		

Limit of Quantitation (LOQ) = 0.05 wt%

Max THC (and Max CBD) are calculated values for total cannabinoids after heating, assuming complete decarboxylation of the acid to the neutral form. It is calculated based on the weight loss of the acid group during decarboxylation: Max THC = (0.877 x THCA) + THC. This calculation does not include other cannabinoid isomers (eg. D8-THC and exo-THC). ND = None detected above the limits of detection (LOD), which is half of LOQ.

EA: Elemental Analysis [WI-10-13]

Analyst: JFD

Test Date: 10/17/2019

This test method was performed in accordance with the requirements of ISO/IEC 17025. These results relate only to the test article listed in this report. Reports may not be reproduced except in their entirety.

67280-EA

Symbol	Metal	Conc. ¹ (µg/kg)	RL (µg/kg)	Limits ² (µg/kg)	Status
Al	Aluminum	674	50	-	
As	Arsenic	ND	50	200	PASS
Cd	Cadmium	ND	50	200	PASS
Ca	Calcium	3,001	500	-	
Cr	Chromium	233	50	300	PASS
Co	Cobalt	ND	50	300	PASS
Cu	Copper	145	50	3,000	PASS
Fe	Iron	1,238	50	-	
Pb	Lead	ND	50	500	PASS
Mg	Magnesium	8,460	50	-	
Mn	Manganese	ND	50	-	
Hg	Mercury	ND	50	100	PASS
Mo	Molybdenum	ND	50	1,000	PASS
Ni	Nickel	ND	50	500	PASS
P	Phosphorus	6,136	500	-	
K	Potassium	ND	500	-	
Se	Selenium	ND	50	-	
Ag	Silver	ND	50	700	PASS
S	Sulfur	ND	500	-	
Sn	Tin	2,026	500	6,000	PASS
Zn	Zinc	337	50	-	

1) ND = None detected to the Method Detection Limit (MDL)

2) USP recommended maximum daily limits for inhalational drug product.

MB1: Microbiological Contaminants [WI-10-09]

Analyst: MM

Test Date: 10/9/2019

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67280-MB1

Symbol	Analysis	Results	Units	Limits*	Status
AC	Total Aerobic Bacterial Count	<100	CFU/g	100,000 CFU/g	PASS
CC	Total Coliform Bacterial Count	<100	CFU/g	1,000 CFU/g	PASS
EB	Total Bile Tolerant Gram Negative Count	<100	CFU/g	1,000 CFU/g	PASS
YM	Total Yeast & Mold	<100	CFU/g	10,000 CFU/g	PASS

Note: All recorded Microbiological tests are within the established limits.

MB2: Pathogenic Bacterial Contaminants [WI-10-10]

Analyst: LabAdmin

Test Date: 10/10/2019

This test method was performed in accordance with the requirements of ISO/IEC 17025. These results relate only to the test article listed in this report. Reports may not be reproduced except in their entirety.

67280-MB2

Test ID	Analysis	Results	Units	Limits*	Status
67280-ECPT	E. coli (O157)	Negative	NA	Non Detected	PASS
67280-SPT	Salmonella	Negative	NA	Non Detected	PASS

Note: All recorded pathogenic bacteria tests passed.

MY: Mycotoxin Testing [WI-10-05]

Analyst: CJB

Test Date: 10/10/2019

This test method was performed in accordance with the requirements of ISO/IEC 17025. These results relate only to the test article listed in this report. Reports may not be reproduced except in their entirety.

67280-MY

Test ID	Date	Results	MDL	Limits	Status*
Total Aflatoxin	10/10/2019	< MDL	2 ppb	< 20 ppb	PASS
Total Ochratoxin	10/10/2019	< MDL	3 ppb	< 20 ppb	PASS

TP: Terpenes Profile [WI-10-27]

Analyst: CMA

Test Date: 10/11/2019

The client sample was analyzed by Head-Space Gas Chromatography (HS-GC). The collected data was compared to data collected for certified reference standards at known concentrations. All values are semiquantitative estimates based on recorded peak areas relative to terpene calibration data.

67280-TP

Compound	ppm	Terpene Profile	Compound	ppm	Terpene Profile	
beta-myrcene			camphene			
isopulegol			L-fenchone			
menthol			beta-pinene			
cis-nerolidol			eucalyptol			
trans-nerolidol			alpha-terpinene			
gamma-terpinene			delta-3-carene			
alpha-bisabolol			alpha-pinene			
linalool			D-limonene			
beta-caryophyllene			geraniol			
caryophyllene oxide			cis-beta-ocimene			
guaiol			alpha-ocimene			
sabinene			alpha-phellandrene			
alpha-humulene			terpinolene			
p-cymene						
	ppm 0.00	5.00	10.00	0.00	5.00	10.00
Total Terpene: <0.1 wt%						

VC: Analysis of Volatile Organic Compounds [WI-10-28]

Analyst: CMA

Test Date: 10/10/2019

The client sample was analyzed by Head-Space Gas Chromatography (HS-GC). The collected data was compared to data collected for certified reference standards at known concentrations.

67280-VC

Compound	CAS	Amount ¹	Limit ²	RL	Status
Propane	74-98-6	ND	1,000 ppm	100	PASS
Isobutane	75-28-5	ND	1,000 ppm	100	PASS
Butane	106-97-8	ND	1,000 ppm	100	PASS
Methanol	67-56-1	ND	3,000 ppm	100	PASS
Pentane	109-66-0	ND	5,000 ppm	100	PASS
Ethanol	64-17-5	ND	5,000 ppm	100	*
Acetone	67-64-1	ND	5,000 ppm	100	PASS
Isopropanol	67-63-0	ND	5,000 ppm	100	PASS
Acetonitrile	75-05-8	ND	410 ppm	100	PASS
Hexane	110-54-3	ND	290 ppm	100	PASS
Heptane	142-82-5	ND	5,000 ppm	100	PASS

1) ND = Not detected at a level greater than the Reporting Limit (RL).

2) In ppm, based on USP recommended limits for residual solvents, adopted by the Massachusetts Department of Public Health for cannabis concentrates and extracts on 3/31/16. Butane/Propane limits are based on limits established for state of Colorado.

(*) For ethanol, as many formulations contain flavorings based on ethanol extracts of natural products, no status has been assigned.

END OF REPORT



GenCanna Global
4274 Colby Rd.
Winchester, KY 40391

Report Number: P193122
Report Date: October 22, 2019
Client Project ID:

Client Sample ID: 190127FE
PAL Sample ID: P193122-02

Sample Date: 10/07/2019
Received Date: 10/08/2019
Extraction Date: 10/14/2019

Certificate of Analysis

Analysis Date	Analyte	Amount Detected	LOQ (mg/kg)	Notes	Analysis Date	Analyte	Amount Detected	LOQ (mg/kg)	Notes
JASBC 69(3):121-126, 2011 (GC-MS/MS)									
10/14/2019	a-BHC	ND	0.20		10/14/2019	Aldrin	ND	0.20	
10/14/2019	b-BHC	ND	0.20		10/14/2019	Benfluralin	ND	0.20	
10/14/2019	Bolstar	ND	0.20		10/14/2019	Bromopropylate	ND	0.20	
10/14/2019	Captan	ND	4.0		10/14/2019	Chlordane	ND	0.20	
10/14/2019	Chlorfenapyr	ND	0.20		10/14/2019	Chloroneb	ND	0.20	
10/14/2019	Chlorothalonil	ND	0.20		10/14/2019	Chlorpropham	ND	0.20	
10/14/2019	Chlorpyrifos	ND	0.20		10/14/2019	Chlorpyrifos-methyl	ND	0.20	
10/14/2019	cis-Nonachlor	ND	0.20		10/14/2019	Cyfluthrin	ND	1.0	
10/14/2019	Cypermethrin	ND	1.0		10/14/2019	Dacthal	ND	0.20	
10/14/2019	d-BHC	ND	0.20		10/14/2019	Deltamethrin	ND	1.0	
10/14/2019	Diazinon	ND	0.20		10/14/2019	Dichlobenil	ND	0.20	
10/14/2019	Dichlorofenthion	ND	0.20		10/14/2019	Dichlorvos	ND	0.20	
10/14/2019	Diclofop-methyl	ND	0.20		10/14/2019	Dicloran	ND	1.0	
10/14/2019	Dicofol	ND	0.20		10/14/2019	Diphenamid	ND	0.20	
10/14/2019	Dithiopyr	ND	0.20		10/14/2019	Esfenvalerate	ND	0.20	
10/14/2019	Ethalfuralin	ND	0.20		10/14/2019	Ethofumesate	ND	0.20	
10/14/2019	Ethoprophos	ND	0.20		10/14/2019	Ethoxyquin	ND	0.20	
10/14/2019	Etoxazole	ND	0.20		10/14/2019	Etridiazole	ND	0.20	
10/14/2019	Fenarimol	ND	0.20		10/14/2019	Fenvalerate	ND	0.20	
10/14/2019	Fipronil	ND	0.20		10/14/2019	Fludioxonil	ND	0.20	
10/14/2019	Flutolanil	ND	0.20		10/14/2019	g-BHC	ND	0.20	
10/14/2019	Heptachlor	ND	0.20		10/14/2019	Heptachlor epoxide	ND	0.20	
10/14/2019	Hexachlorobenzene	ND	0.20		10/14/2019	Kresoxim-methyl	ND	0.20	
10/14/2019	lambda-Cyhalothrin	ND	0.57		10/14/2019	Malathion	ND	0.20	
10/14/2019	Mefenoxam	ND	0.20		10/14/2019	Metolachlor	ND	0.20	
10/14/2019	MGK-264	ND	0.20		10/14/2019	Myclobutanil	ND	0.20	
10/14/2019	o-Phenylphenol	ND	0.40		10/14/2019	Oxadiazon	ND	0.20	
10/14/2019	Oxyfluorfen	ND	0.40		10/14/2019	p,p'-DDD	ND	0.20	
10/14/2019	p,p'-DDE	ND	0.20		10/14/2019	p,p'-DDT	ND	0.20	
10/14/2019	Pacllobutrazol	ND	0.20		10/14/2019	Parathion-methyl	ND	0.20	
10/14/2019	Pendimethalin	ND	0.20		10/14/2019	Pentachlorophenyl methyl sulfide	ND	0.20	
10/14/2019	Permethrin	ND	0.40		10/14/2019	Pirimicarb	ND	0.20	
10/14/2019	Procymidone	ND	0.20		10/14/2019	Prodiamine	ND	0.40	
10/14/2019	Pronamide	ND	0.20		10/14/2019	Pyriproxyfen	ND	0.20	
10/14/2019	Quinoxifen	ND	0.20		10/14/2019	Spirodiclofen	ND	0.20	
10/14/2019	Tetraconazole	ND	0.20		10/14/2019	trans-Nonachlor	ND	0.20	



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GenCanna Global
4274 Colby Rd.
Winchester, KY 40391

Report Number: P193122
Report Date: October 22, 2019
Client Project ID:

Client Sample ID: 190127FE
PAL Sample ID: P193122-02

Sample Date: 10/07/2019
Received Date: 10/08/2019
Extraction Date: 10/14/2019

Certificate of Analysis
(Continued)

Table with 10 columns: Analysis Date, Analyte, Amount Detected, LOQ (mg/kg), Notes, Analysis Date, Analyte, Amount Detected, LOQ (mg/kg), Notes. Contains two sections of data: JASBC 69(3):121-126, 2011 (GC-MS/MS) and JASBC 69(3):121-126, 2011 (LC-MS/MS).

Handwritten signature of Rick Jordan



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Certificate of Analysis
(Continued)

Table with 10 columns: Analysis Date, Analyte, Amount Detected, LOQ (mg/kg), Notes, Analysis Date, Analyte, Amount Detected, LOQ (mg/kg), Notes. Contains data for JASBC 69(3):121-126, 2011 (LC-MS/MS) (Continued) listing various pesticides and their detection results.

Rick Jordan, Laboratory Manager



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Report Number: P193122
Report Date: October 22, 2019
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Sample Date: 10/07/2019
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Notes and Definitions

<u>Notes</u>	<u>Definition</u>
LOQ	Limit of Quantitation
ND	Not Detected
*	Not included under current scope of accreditation

The results contained in this report relate only to the items tested.
The results reflect the condition of the samples as received by PAL.
Samples will be stored for a minimum of 60 days after the final report is issued, as described in our Quality Manual.
Reports should not be reproduced, except in full, without written approval from PAL.
PAL is accredited to ISO/IEC 17025:2017 Standard, by PJLA, Accreditation #64422, Testing.

Rick Jordan, Laboratory Manager