Supelco®

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Certified Reference Material - Certificate of Analysis

Cannabinoid Mixture (Neutrals) - 8 Component

Catalog Number: C-219S-1ML
Solution Lot: FE02242207
Retest Date: January 2027
Solvent: Methanol
Volume per Ampoule: Not less than 1 mL
Storage: Store unopened in freezer (-10 °C to -25 °C).
Shipping: Ship ambient. See Stability Section.
Intended Use: This Certified Reference Material is suitable for the *in vitro* identification, calibration, and quantification of the analyte(s) in analytical and R&D applications. Not suitable for human or animal consumption.
Instructions for Use: Users should quantitatively transfer desired volume using established good laboratory practices to spike into matrix or to dilute to the desired concentration. Each ampoule is intended for one-time use.
Regulatory: USDEA Exempt | Canadian CTK# 007-044
Safety: Danger. See Safety Data Sheet

- Retest Date - stability studies ongoing. Certificate of Analysis will be updated upon completion of retest.
- Ampoules are overfilled to ensure a minimum 1 mL volume can be transferred when using a 1 mL Class A volumetric pipette.
- For quantitative applications, the minimum sample size for intended use is 1 µL.

Component	Chromatographic Purity	Concentration
Cannabichromene (CBC)	98.8%	500 ± 3 µg/mL
Cannabidiol (CBD)	99.6%	500 ± 3 µg/mL
Cannabidivarin (CBDV)	99.2%	500 ± 3 µg/mL
Cannabigerol (CBG)	99.2%	500 ± 3 µg/mL
Cannabinol (CBN)	99.1%	500 ± 3 µg/mL
(-)-delta8-THC	99.2%	501 ± 3 µg/mL
(-)-delta9-THC	99.3%	500 ± 3 µg/mL
Tetrahydrocannabivarin (THCV)	99.1%	501 ± 3 µg/mL

- Uncertainty of the concentration is expressed as an expanded uncertainty in accordance with ISO 17025 and ISO 17034 at the approximate 95% confidence interval using a coverage factor of k = 2 and has been calculated by statistical analysis of our production system and incorporates uncertainty of the purity factor, material density, and balance and weighing technique.
- This standard is prepared gravimetrically and mass results are reported on the conventional basis for weighing in air. Concentration is calculated based on: the actual measured mass; Purity Factor of the analyte(s); measured mass of the solution; and the density of the pure diluent at 20°C.
- Concentration is corrected for chromatographic purity, residual water, residual solvents and residual inorganics.

Cerilliant certifies that this standard meets the specifications stated in this certificate and warrants this product to meet the stated acceptance criteria through the expiration/retest date when stored unopened as recommended. Product should be used shortly after opening to avoid concentration changes due to evaporation. Warranty does not apply to ampoules stored after opening. This material is a product of USA.

ANAB ACCREDITED ISO 17034 REFERENCE MATERIAL PRODUCER

James Schmitt, Quality Assurance Manager

August 12, 2024
Date

Cerilliant Corporation, 811 Paloma Drive, Suite A Round Rock,
TX 78665, USA, Tel: 800-848-7837 / 512-238-9974; www.cerilliant.com

Traceability

- This standard has been gravimetrically prepared using balances that have been fully qualified and calibrated to ISO 17025 requirements. All calibrations utilize NIST traceable weights which are calibrated externally by a qualified ISO 17025 accredited calibration laboratory to NIST standards. Qualification of each balance includes the assignment of a minimum weighing by a qualified and ISO 17025 accredited calibration vendor taking into consideration the balance and installed environmental conditions to ensure compliance with USP tolerances of NMT 0.10% relative error.
- Concentration is verified against an independently prepared calibration curve gravimetrically prepared using balances calibrated to NIST.
- In addition, each neat material utilized has been identified and thoroughly characterized through the use of multiple analytical techniques. Spectral data is provided on subsequent pages of the COA.

Standard Solution Assay Parameters

Analysis Method:	HPLC/UV
Column:	Ascentis Express C18, 2.7 µm, 3.0 x 100 mm
Mobile Phase:	Acetonitrile:0.1% Phosphoric acid in Water (70:30)
Flow Rate:	1.5 mL/min
Wavelength:	228 nm

Calibration Curve

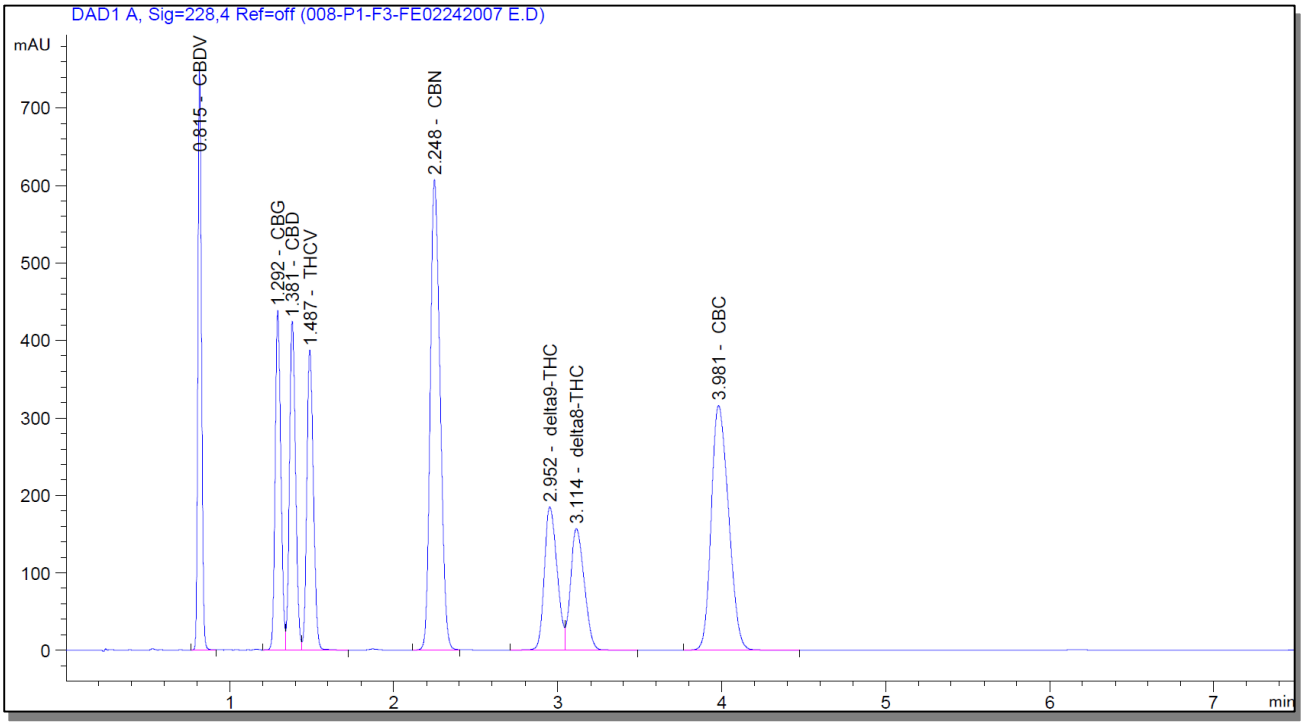
Calibration Curve:	Linear Regression
Number of Points:	1

Solution Standard Verification and Homogeneity

Compound	Verified Concentration µg/mL	Acceptance Criteria	%RSD - Homogeneity %	Acceptance Criteria
Cannabichromene (CBC)	499	± 5%	0.3	≤ 3%
Cannabidiol (CBD)	497	± 5%	0.3	≤ 3%
Cannabidivarin (CBDV)	502	± 5%	0.3	≤ 3%
Cannabigerol (CBG)	483	± 5%	0.3	≤ 3%
Cannabinol (CBN)	498	± 5%	0.3	≤ 3%
(-)-delta8-THC	500	± 5%	0.3	≤ 3%
(-)-delta9-THC	500	± 5%	0.3	≤ 3%
Tetrahydrocannabivarin (THCV)	501	± 5%	0.3	≤ 3%

- Concentration is verified through multiple analyses and is calculated as the average of multiple analyses compared to an independently prepared calibration curve.
- Homogeneity is ensured through rigorous production process controls statistically analyzed to evaluate risk and verified by analysis. The %RSD of samples pulled from across the lot demonstrate homogeneity.

Solution Standard Analysis



Neat Material Data

Compound	Lot Number	CAS Number	Chemical Formula	Molecular Weight	Identity Confirmed By
Cannabichromene (CBC)	FC02052009	20675-51-8	$C_{21}H_{30}O_2$	314.46	LC/MS
Cannabidiol (CBD)	FN05112008	13956-29-1	$C_{21}H_{30}O_2$	314.46	GC/MS
Cannabidivarin (CBDV)	FN07142105	24274-48-4	$C_{19}H_{26}O_2$	286.41	LC/MS
Cannabigerol (CBG)	FN08301903	25654-31-3	$C_{21}H_{32}O_2$	316.48	LC/MS
Cannabinol (CBN)	FC04181901	521-35-7	$C_{21}H_{26}O_2$	310.43	GC/MS
(-)-delta8-THC	FN03232107	5957-75-5	$C_{21}H_{30}O_2$	314.46	GC/MS
(-)-delta9-THC	FC06022001	1972-08-3	$C_{21}H_{30}O_2$	314.46	GC/MS
Tetrahydrocannabivarin (THCV)	FC05262101	31262-37-0	$C_{19}H_{26}O_2$	286.41	LC/MS

Compound	Chromatographic Purity	Residual Solvent [1]	Residual Water [1]	Residual Inorganics	Mass Balance Purity Factor
Cannabichromene (CBC)	98.8% [4]	0.05%	BQL [2]	NA	98.74%
Cannabidiol (CBD)	99.6% [5]	0.05%	BQL [2]	< 0.2%	99.52%
Cannabidivarin (CBDV)	99.2%	0.23%	ND [3]	BQL [2]	98.99%
Cannabigerol (CBG)	99.2% [6]	None Detected	BQL [2]	< 0.2%	99.20%
Cannabinol (CBN)	99.1% [7]	0.08%	BQL [2]	< 0.2%	99.05%
(-)-delta8-THC	99.2% [8]	1.02%	ND [3]	NA	98.23%
(-)-delta9-THC	99.3% [9]	0.09%	0.19%	NA	98.99%
Tetrahydrocannabivarin (THCV)	99.1%	0.33%	0.45%	NA	98.37%

- Purity is calculated as the average of two independently performed analyses utilizing two different methods. Acceptance criteria requires the purity values to be within 0.5% of each other. A secondary purity method is used as a control but is not reported on the Certificate of Analysis.
- Mass Balance Purity Factor = [(100 - wt% residual solvent - wt% residual water - wt% residual inorganics) x Chromatographic Purity/100]
- Mass Balance Purity Factor does not include adjustment for chiral and/or isotopic purity.

[1] Validated analytical method

[2] Below Quantitation Limit

[3] Not Detected

[4] 0.02% Δ^9-THC detected by HPLC/UV analysis.

[5] No (-)-Δ^9-THC or Cannabinol detected by HPLC/UV analysis.

[6] No Δ^9-THC detected by HPLC/UV analysis.

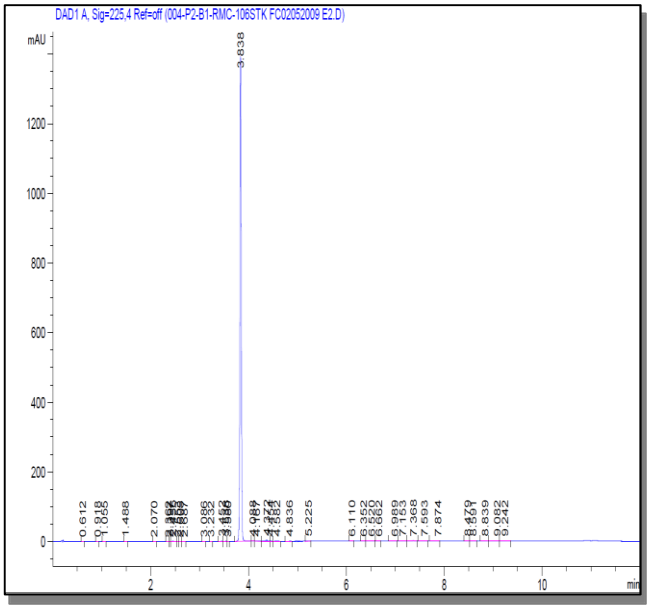
[7] 0.24% (-)-Δ^8-THC detected by HPLC/UV analysis. No Cannabidiol or (-)-Δ^9-THC detected.

[8] 0.17% Cannabadiol detected by HPLC/UV analysis. No Cannabinol or (-)-Δ^9-THC detected.

[9] Purity value adjusted for known impuritiies as shown on the chromatographic trace below.

Cannabichromene (CBC)

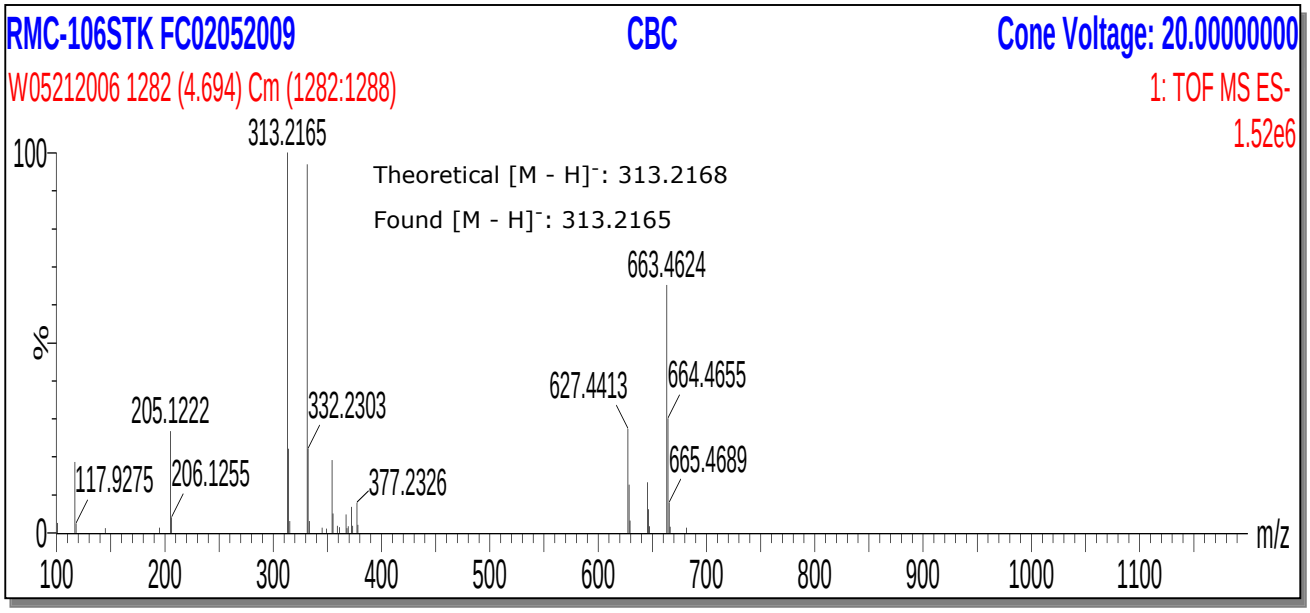
Material Purity by HPLC/UV



Peak #	Ret Time	Area %	
1	0.61	0.00	
2	0.92	0.00	
3	1.06	0.02	
4	1.49	0.01	
5	2.07	0.01	
6	2.36	0.01	
7	2.40	0.02	
8	2.46	0.07	
9	2.55	0.00	
10	2.61	0.00	
11	2.69	0.01	
12	3.09	0.00	
13	3.23	0.01	
14	3.45	0.03	
15	3.54	0.02	Δ^9-THC
16	3.58	0.00	
17	3.84	98.74	
18	4.09	0.01	
19	4.17	0.08	
20	4.37	0.35	
21	4.45	0.01	
22	4.58	0.11	
23	4.84	0.01	
24	5.23	0.01	
25	6.11	0.01	
26	6.35	0.01	
27	6.52	0.02	
28	6.66	0.01	
29	6.99	0.01	
30	7.15	0.10	
31	7.37	0.15	
32	7.59	0.01	
33	7.87	0.01	
34	8.48	0.02	
35	8.59	0.01	
36	8.84	0.02	
37	9.08	0.03	
38	9.24	0.05	

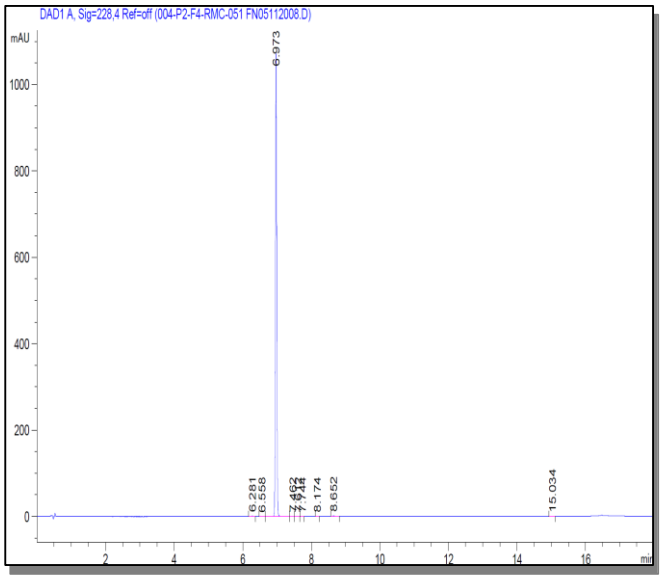
Cannabichromene (CBC) (cont.)

Material Identity by LC/MS



Cannabidiol (CBD)

Material Purity by HPLC/UV



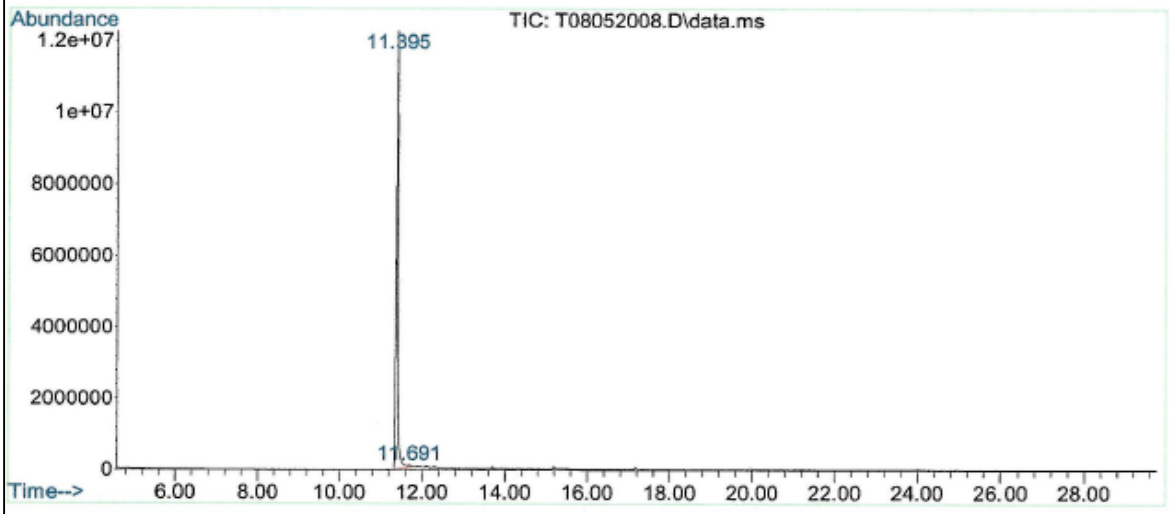
Peak #	Ret Time	Area %
1	6.28	0.09
2	6.56	0.03
3	6.97	99.61
4	7.46	0.02
5	7.61	0.03
6	7.74	0.01
7	8.17	0.01
8	8.65	0.19
9	15.03	0.02

Cannabidiol (CBD) (cont.)

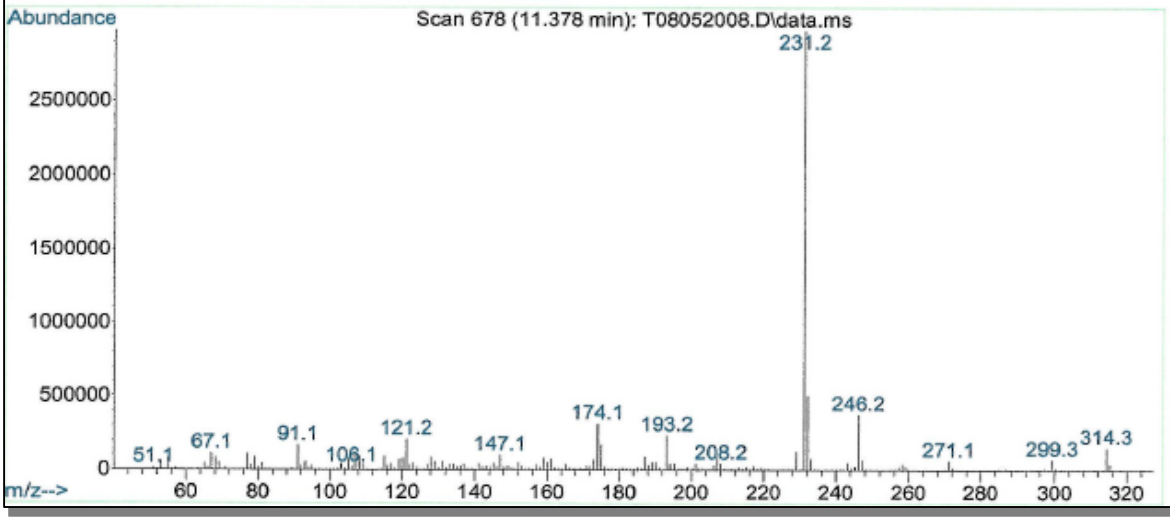
Material Identity by GC/MS

Compound Name	:	Cannabidiol
Lot Number	:	FN05112008
Instrument	:	Agilent GCMS
Operator	:	ECM(SGIUFFRE)
Date Reported	:	Thu Aug 06 10:51:08 2020
Column Type	:	DB-5ms, 30m x 0.25mm ID, 0.25um film thickness
Temp. Program	:	50°C to 200°C@40°C/min, 200°C to 300°C@10°C/min, 16min hold
Injector Temp.	:	Cool on-column
Carrier Gas	:	Helium
Flow Rate (mL\min)	:	0.80 mL/min
Transfer Line Temp.	:	280°C
Scan Range	:	50-500

Total Ion Chromatogram

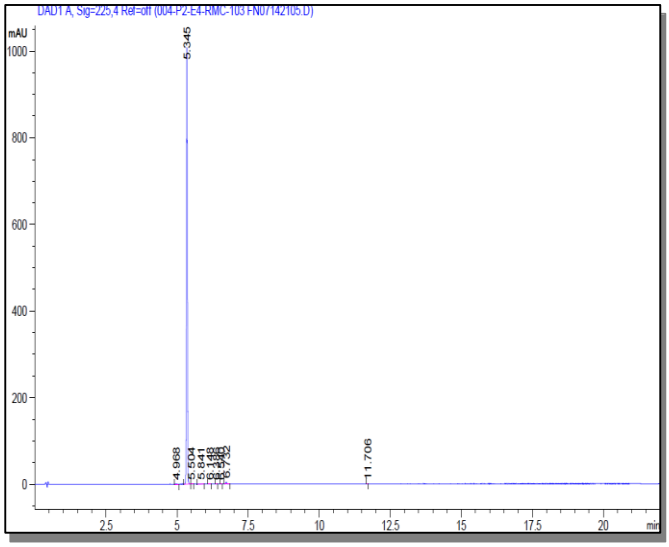


Mass Spectrum



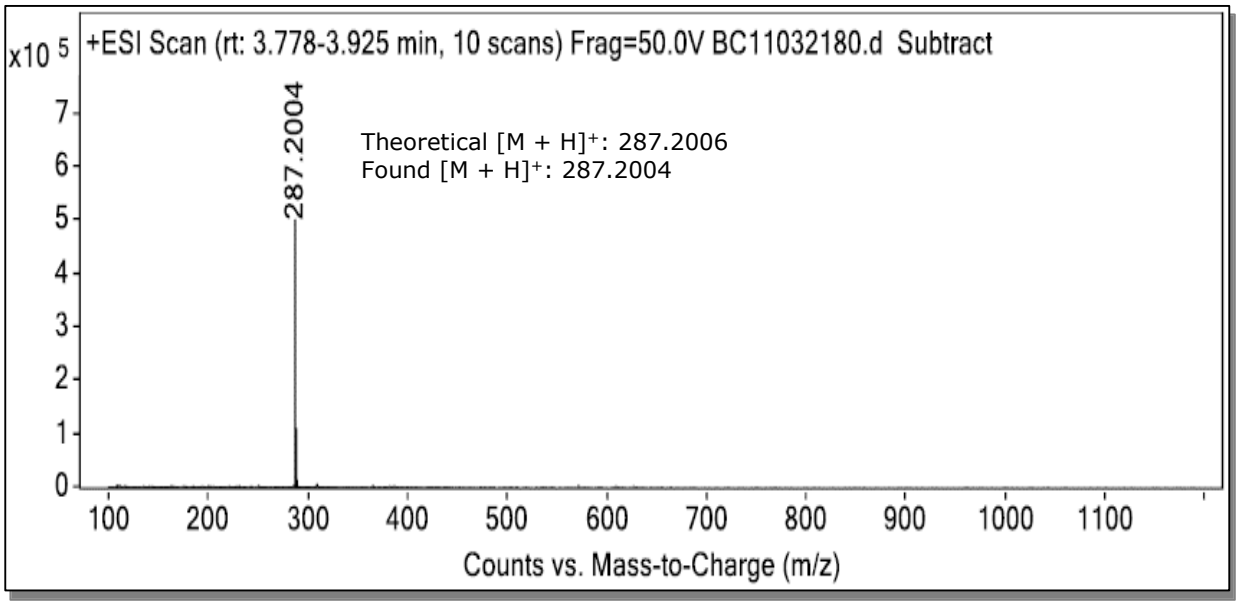
Cannabidivarin (CBDV)

Material Purity by HPLC/UV



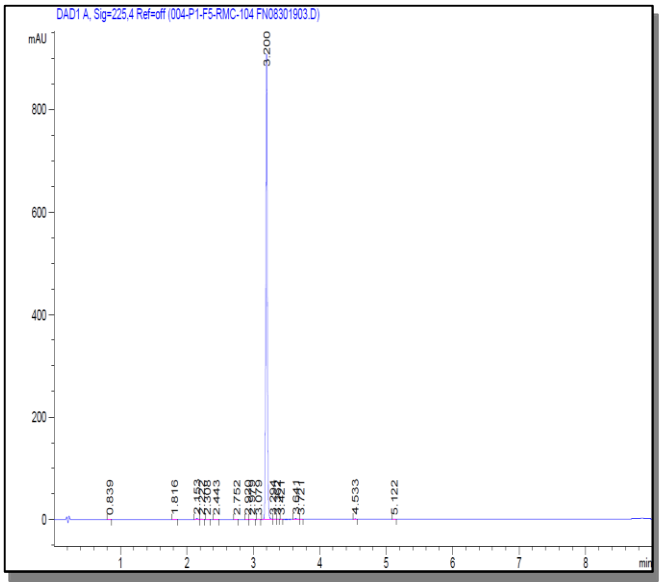
Peak #	Ret Time	Area %
1	4.97	0.07
2	5.35	99.22
3	5.50	0.01
4	5.84	0.07
5	6.15	0.03
6	6.39	0.02
7	6.54	0.04
8	6.73	0.52
9	11.71	0.01

Material Identity by LC/MS



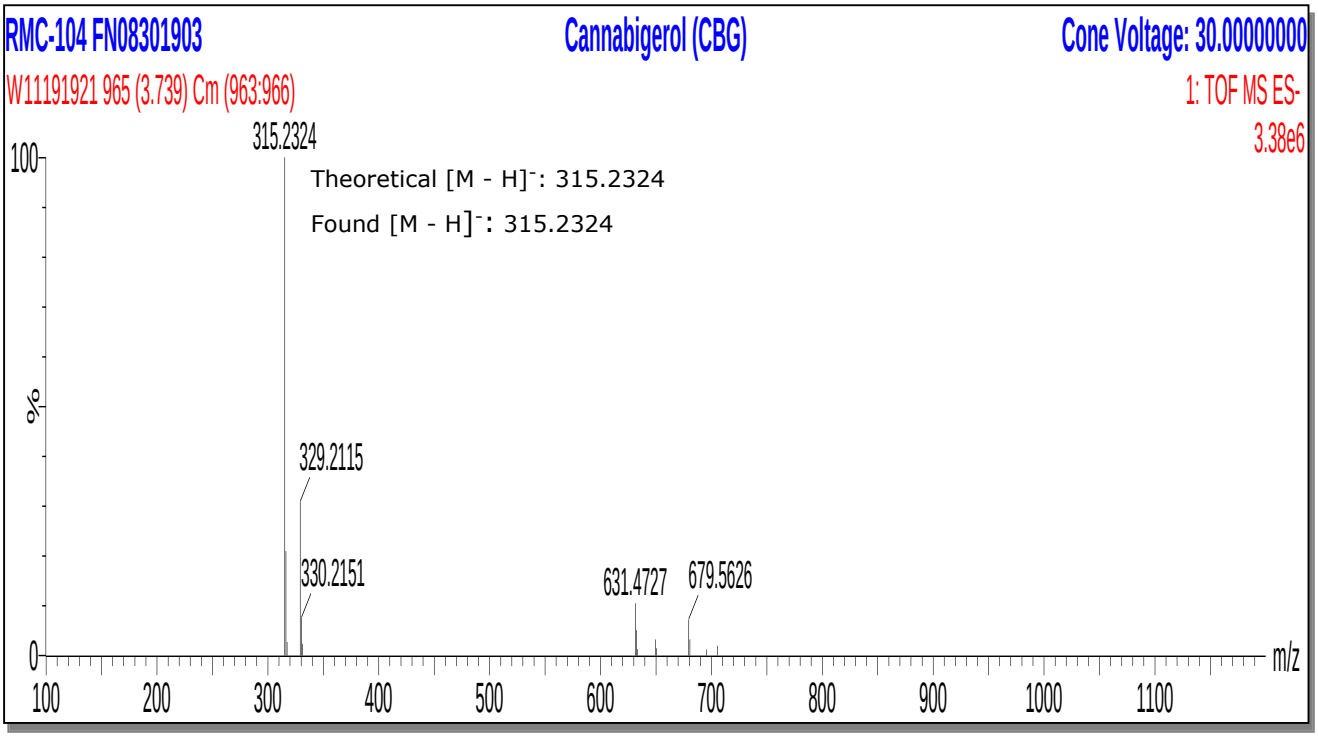
Cannabigerol (CBG)

Material Purity by HPLC



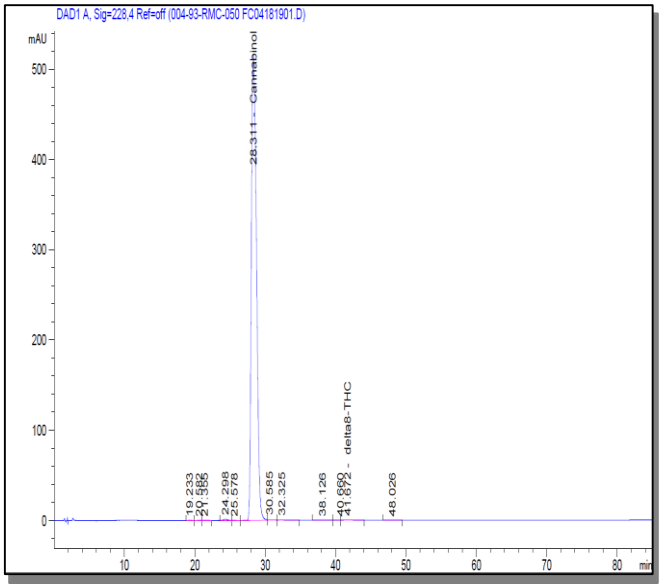
Peak #	Ret Time	Area %
1	0.84	0.01
2	1.82	0.01
3	2.15	0.18
4	2.22	0.08
5	2.31	0.01
6	2.44	0.04
7	2.75	0.01
8	2.92	0.01
9	2.98	0.08
10	3.08	0.04
11	3.20	99.21
12	3.29	0.04
13	3.36	0.02
14	3.42	0.01
15	3.64	0.17
16	3.72	0.01
17	4.53	0.05
18	5.12	0.02

Material Identity by LC/MS



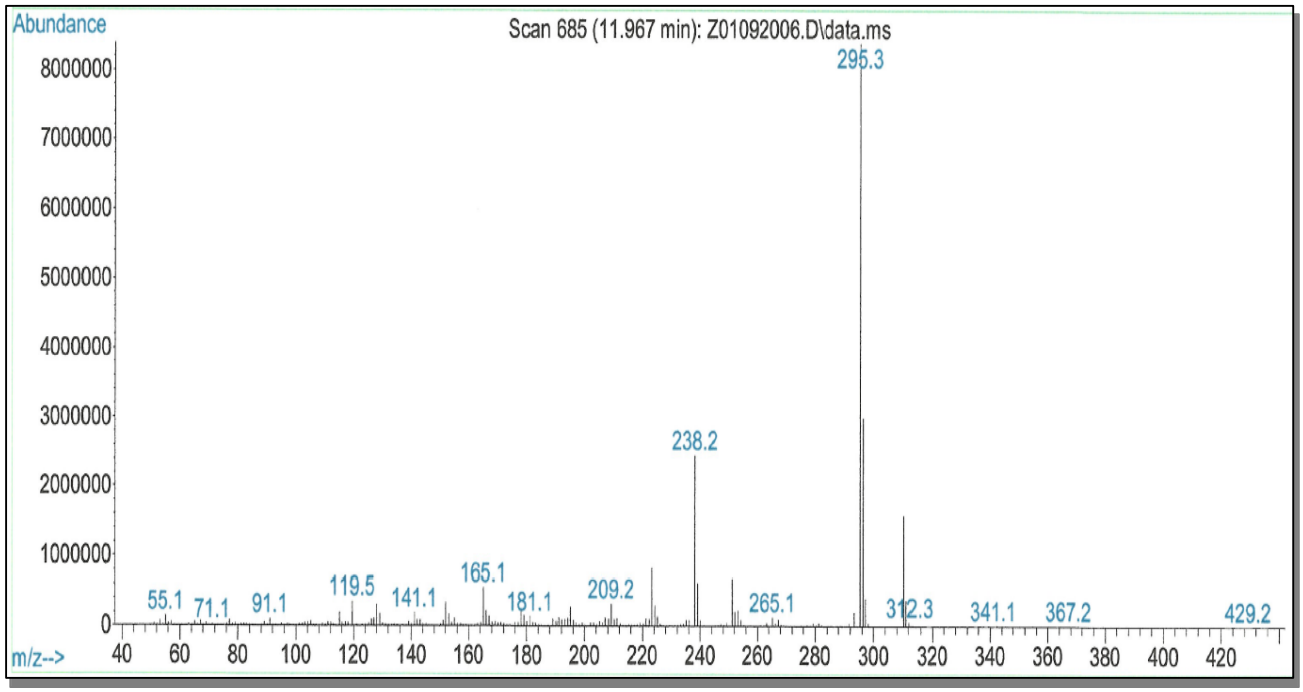
Cannabinol(CBN)

Material Purity by HPLC/UV



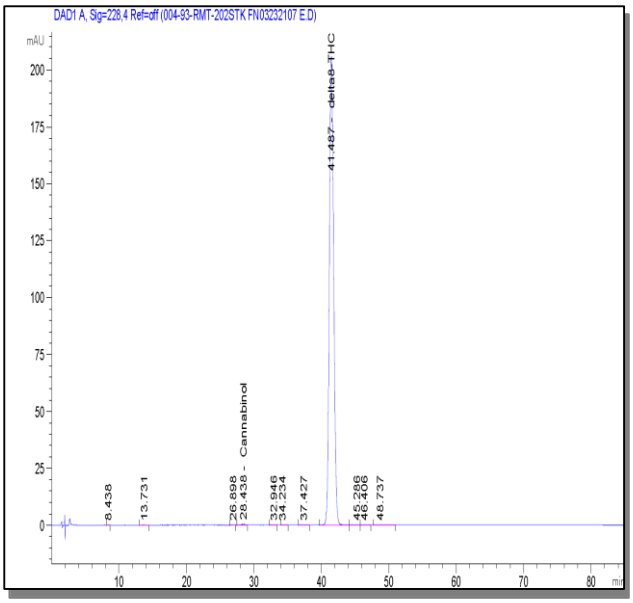
Peak #	Ret Time	Area %	
1	19.23	0.05	
2	20.58	0.02	
3	21.36	0.03	
4	24.30	0.23	
5	25.58	0.01	
6	28.31	98.97	
7	30.59	0.21	
8	32.33	0.15	
9	38.13	0.03	
10	40.66	0.03	
11	41.67	0.24	(-)-Δ^8-THC
12	48.03	0.02	

Material Identity by GC/MS



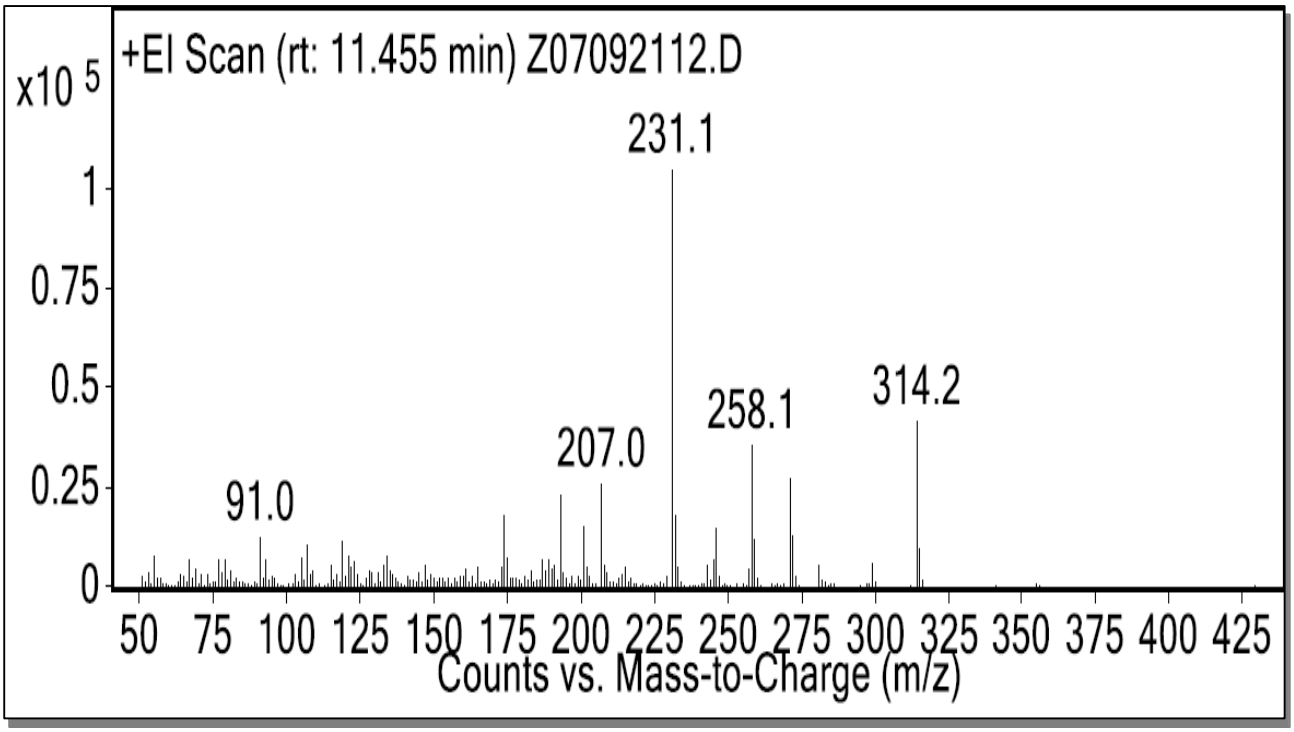
(-)-delta8-THC

Material Purity by HPLC/UV



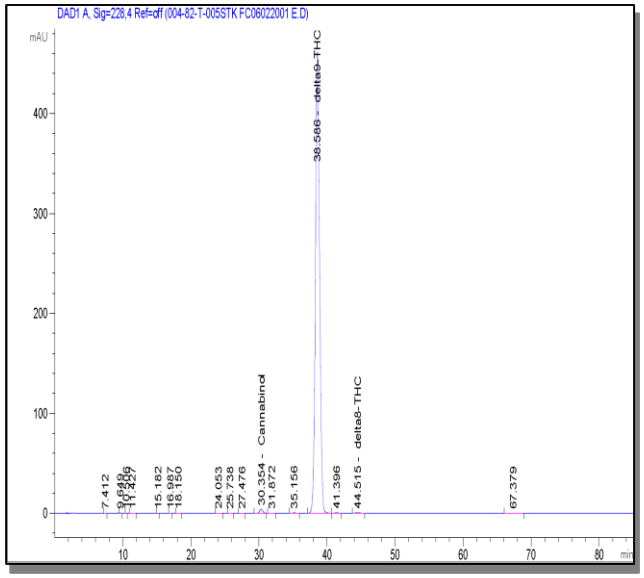
Peak #	Ret Time	Area %	
1	8.44	0.02	
2	13.73	0.02	
3	26.90	0.02	
4	28.44	0.17	Cannabinol
5	32.95	0.02	
6	34.23	0.02	
7	37.43	0.07	
8	41.49	99.44	(-)-Δ^8-THC
9	45.29	0.08	
10	46.41	0.06	
11	48.74	0.07	

Material Identity by GC/MS



(-)-delta9-THC

Material Purity by HPLC/UV



Peak #	Ret Time	Area %	
1	7.41	0.00	
2	9.65	0.02	
3	10.51	0.00	
4	11.43	0.03	
5	15.18	0.00	
6	16.99	0.01	
7	18.15	0.01	
8	24.05	0.02	
9	25.74	0.01	
10	27.48	0.02	
11	30.35	0.67	Cannabinol
12	31.87	0.04	
13	35.16	0.08	
14	38.59	98.85	(-)-Δ^9-THC
15	41.40	0.06	
16	44.52	0.12	(-)-Δ^8-THC
17	67.38	0.04	

(-)-delta9-THC (cont.)

Material Identity by GC/MS

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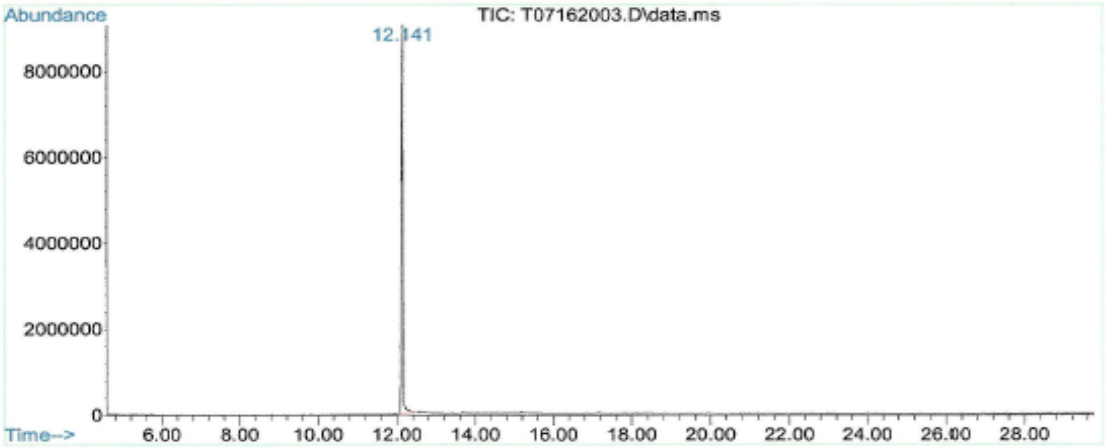
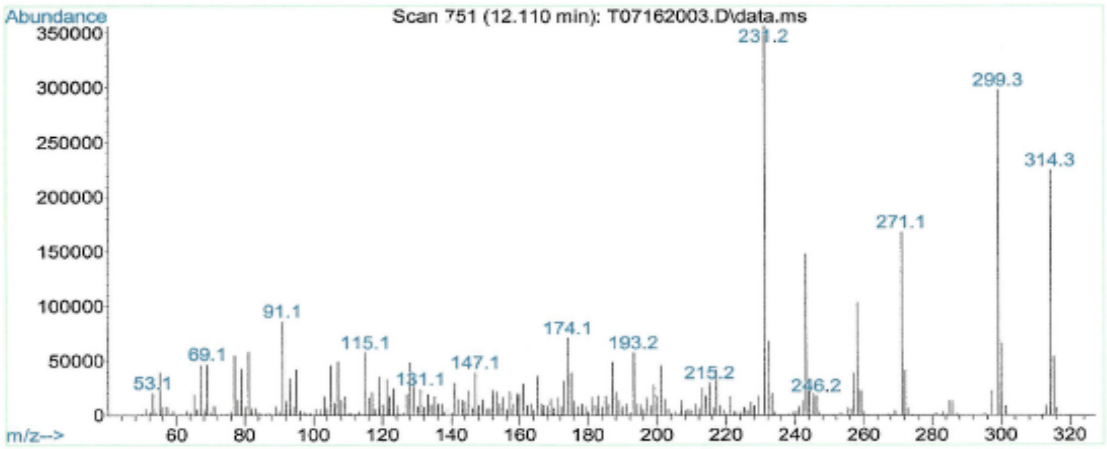
Compound Name          : Delta-9 THC
Lot Number             : FC06022001
Instrument             : Agilent GCMS
Operator               : ECM(SGIUFFRE)
Date Reported          : Thu Jul 16 11:14:56 2020
Column Type            : DB-5ms, 30m x 0.25mm ID, 0.25um film thickness
Temp. Program          : 50°C to 200°C@40°C/min, 200°C to 300°C@10°C/min, 16min hold
Injector Temp.         : Cool on-column
Carrier Gas            : Helium
Flow Rate (mL\min)     : 0.80 mL/min
Transfer Line Temp.    : 280°C
Scan Range             : 50-500
```

Total Ion Chromatogram

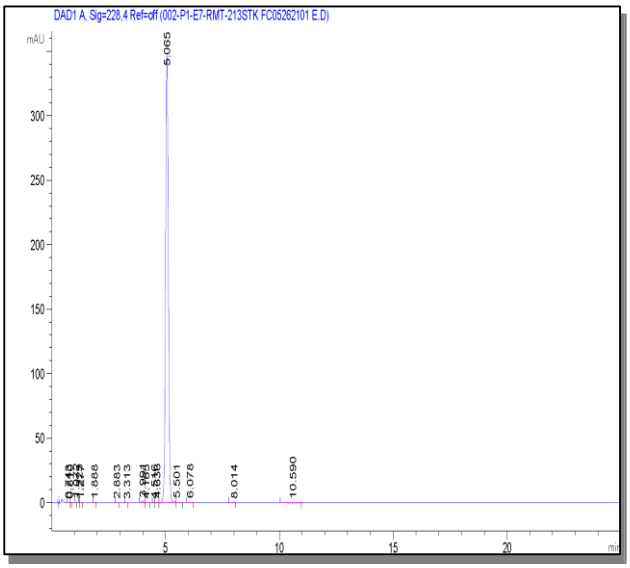


Mass Spectrum



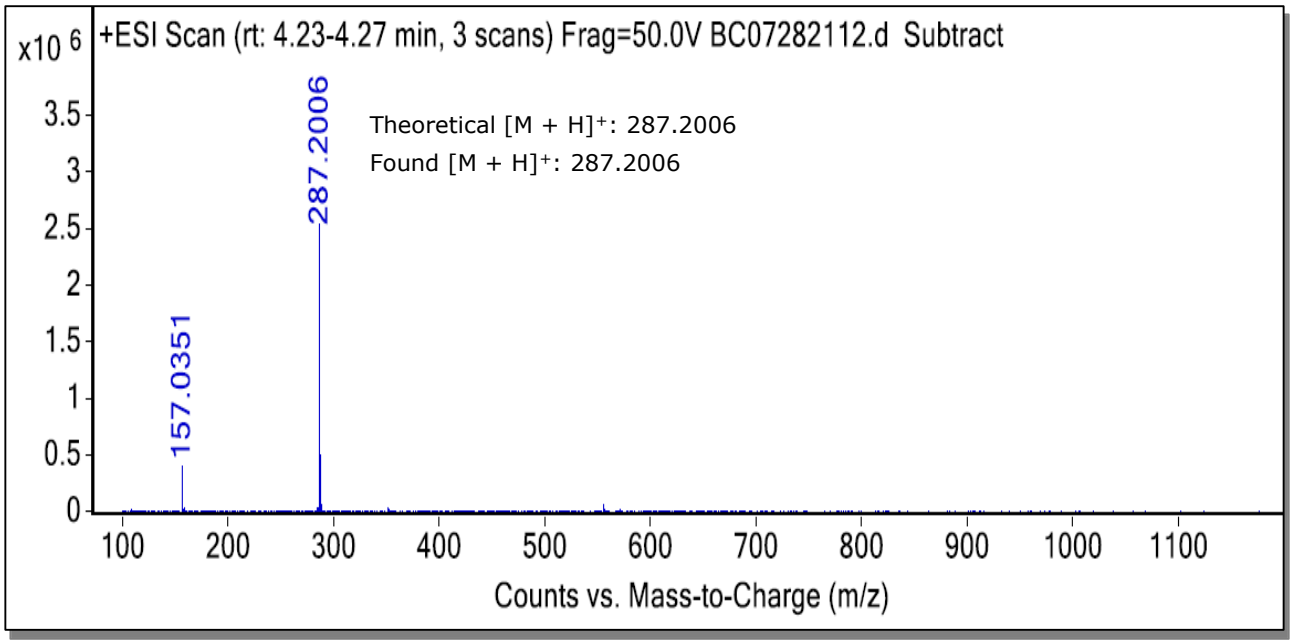
Tetrahydrocannabivarin (THCV)

Material Purity by HPLC/UV



Peak #	Ret Time	Area %
1	0.74	0.02
2	0.81	0.02
3	1.07	0.03
4	1.22	0.01
5	1.28	0.03
6	1.89	0.02
7	2.88	0.05
8	3.31	0.03
9	3.99	0.24
10	4.17	0.03
11	4.52	0.01
12	4.64	0.08
13	5.07	99.04
14	5.50	0.09
15	6.08	0.09
16	8.01	0.03
17	10.59	0.17

Material Identity by LC/MS



Stability

Short term stability studies have been performed under accelerated conditions for a period of up to one week. Short term data is utilized to predict long term stability and to support transport conditions and normal laboratory use. Real-time stability studies are performed at the recommended storage conditions over the life of the product.

Short Term Stability: *A summary of accelerated stability findings for this product is listed below.*

Storage Condition	Mean Kinetic Temperature (MKT)	Time Period/Result
Freezer	-15°C	No decrease in purity was noted after one week.
Refrigerator	4°C	
Room Temperature	21°C	
40°C	40°C	

Transport/Shipping: *Stability studies support the transport of this product at ambient conditions.*

Long Term Stability: *Long term stability has been assessed for Freezer storage (-10 °C to -25 °C) conditions. Stability of a minimum of 45 months has been established through real-time stability studies.*

COA Revision History

Revision No.	Date	Reason for Revision
00	May 06, 2022	Initial version.
01	July 07, 2022	Revised Retest Date from November 2024 to January 2025.
02	January 11, 2023	Revised Retest Date from January 2025 to July 2025.
03	May 08, 2023	Added Canadian CTK# 007-044 to page 1.
04	August 12, 2024	Revised Retest Date from July 2025 to January 2027. Revised Quality Assurance Manager signature.