CERTIFICATE of ANALYSIS

Phytocannabinoid Mixture 11 (CRM)

Certified Reference Material

ACCREDITED
ISO/IEC 17025 #AT-1773
ISO 17034 #AR-1774

Item No.:	220-91239-21
Batch No.:	0617687
Expiry Date:	14APR2022 (valid from date of certification)
Supplied as:	A 250 ug/ml (nominal) multi-component solution in acetonitrile
Volume per Ampule:	Not less than 1 ml. Ampules are overfilled.
Storage:	Unopened at -20˚C.
Safety:	Refer to Safety Data Sheet
Intended Use:	For analytical testing purposes only, not intended for human or animal use.
Instructions for Use:	This product is designated for one-time use and should be used immediately after opening. It is advised that laboratories warm the vial to room temperature prior to opening and use measured volumes.

Certified Concentration

Compound	Corrected Purity*	Concentration
Δ^9-THC	96.21% ± 0.56%	250.2 µg/mL ± 2.1 µg/mL
Δ^8-THC	96.46% ± 0.52%	252.0 µg/mL ± 1.9 µg/mL
THCA-A	98.64% ± 0.56%	250.0 µg/mL ± 2.4 µg/mL
Cannabinol	99.21% ± 0.52%	249.7 µg/mL ± 2.0 µg/mL
Cannabidiol	99.28% ± 0.55%	249.4 µg/mL ± 2.0 µg/mL
Cannabidiolic Acid	99.36% ± 0.77%	249.9 µg/mL ± 2.7 µg/mL
(±)-Cannabichromene	99.01% ± 0.55%	249.2 µg/mL ± 1.9 µg/mL
Cannabidivarin	99.20% ± 0.56%	249.5 µg/mL ± 2.0 µg/mL
Cannabigerol	99.12% ± 0.55%	249.1 µg/mL ± 2.4 µg/mL
Cannabigerolic Acid	97.08% ± 0.55%	250.1 µg/mL ± 2.2 µg/mL
Tetrahydrocannabivarin	94.47% ± 0.52%	250.9 µg/mL ± 2.3 µg/mL

Concentration is calculated based on product mass, solution mass, corrected purity, and density at 20˚C. It is traceable to SI units through an unbroken chain of measurements. Uncertainty of concentration is expressed as an expanded uncertainty in accordance with ISO standards for Testing Laboratories and Reference Material Producers at the approximate 95% confidence interval using a coverage factor of k=2 and incorporates uncertainties from the corrected purity, solution preparation, homogeneity, and long- and short-term stability. Concentration was verified by comparison to an independently prepared calibration standard.

*Corrected purity is determined as follows:
Corrected Purity = [(100 - % LOD - % ROI)*Chromatographic Purity/100] or [(100 - % KF - % RS - % ROI)*Chromatographic Purity/100].
All measurement uncertainties are expressed as expanded uncertainties in accordance with ISO standards for Testing Laboratories and Reference Material Producers at the approximate 95% confidence interval using an appropriate coverage factor. Where applicable, optical rotation, chiral purity, and/or isotopic purity testing are performed to support the identification of the reference material, therefore the uncertainty is considered null.

Approval: 

Title: ISO Quality Manager

Certification Date: 14APR2021

Cayman Chemical certifies that this standard meets the specifications stated in this certificate and warrants this product to meet the stated acceptance criteria through the expiration date when stored unopened as recommended.

ANAB ANSI National Accreditation Board ACCREDITED ISO 17034 REFERENCE MATERIAL PRODUCER

ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 TESTING LABORATORY

Certificate #220-91239-21-0617687-01

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CRM Assay

Method Parameters	
Cayman Method	TST SD173
Column	4.6 x 150 mm, 2.7 µm NexLeaf CBX
Mobile Phase	A: 0.17% Phosphoric Acid in water B: 0.17% Phosphoric Acid in methanol
Gradient	*Time (min)* *%A* *%B* 0-3.3 35 65 10.6 28 72 14.6 5 95 16.6 5 95 17 35 65 20 35 65
Flow Rate	1.5 ml/min
Column Temp	50˚C
Wavelength	UV monitored at 220 nm

Neat Material Quality Information

Qualifier	CAS No.	Item No.	Batch No.
Δ^9-THC	1972-08-3	ISO00157	0588823
Δ^8-THC	5957-75-5	ISO00158	0581755
THCA-A	23978-85-0	14238	0586844
Cannabinol	521-35-7	12066	0541840
Cannabidiol	13956-29-1	90080	0578704
Cannabidiolic Acid	1244-58-2	14028	0575936
(±)-Cannabichromene	20675-51-8	21721	0588462
Cannabidivarin	24274-48-4	9001574	0569210
Cannabigerol	25654-31-3	15293	0585090
Cannabigerolic Acid	25555-57-1	9001572	0578787
Tetrahydrocannabivarin	31262-37-0	15538	0588429

Property values are traceable to SI units through an unbroken chain of measurements.

Homogeneity

A minimum sample size of 0.3 ug was used to determine homogeneity. Homogeneity was determined by HPLC using ampules selected from a random sampling plan from the master batch 21306-0612688 at early, middle, and late fill positions.

Qualifier	%RSD Result	Acceptance Criteria
Δ^9-THC	1.13%	≤3%
Δ^8-THC	1.13%	≤3%
THCA-A	1.14%	≤3%
Cannabinol	1.12%	≤3%
Cannabidiol	1.16%	≤3%
Cannabidiolic Acid	1.12%	≤3%
(±)-Cannabichromene	1.15%	≤3%
Cannabidivarin	1.17%	≤3%
Cannabigerol	1.15%	≤3%
Cannabigerolic Acid	1.14%	≤3%
Tetrahydrocannabivarin	1.07%	≤3%

The recommended minimum quantity for use is 0.3 µg. Quantities below this have not been evaluated.

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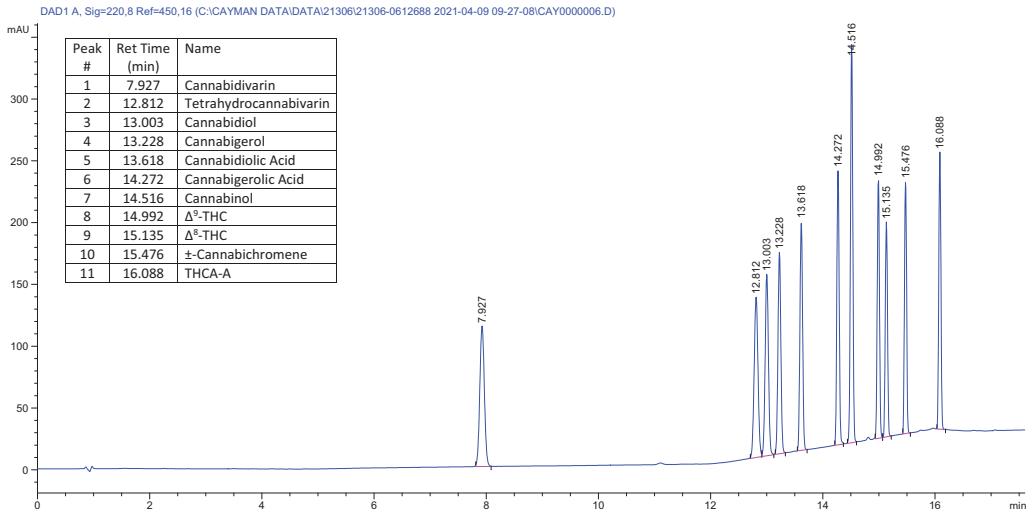
Supplemental Data

HPLC-UV



Peak #	Ret Time (min)	Name
1	7.927	Cannabidivarin
2	12.812	Tetrahydrocannabivarin
3	13.003	Cannabidiol
4	13.228	Cannabigerol
5	13.618	Cannabidiolic Acid
6	14.272	Cannabigerolic Acid
7	14.516	Cannabinol
8	14.992	Δ^9-THC
9	15.135	Δ^8-THC
10	15.476	±-Cannabichromene
11	16.088	THCA-A

Stability

The effect of the components of stability on the combined standard uncertainty of the CRM property value are considered negligible unless indicated in stability studies.

Short-Term Stability

Degradation was observed at 4˚C and room temperature after 2 weeks. This data supports shipping of this product on dry ice.

Long-Term Stability

Long-term stability data confirmed one year stability at the -20˚C storage temperature.

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Revision History

Revision No.	Date	Reason for Revision
01	14APR2021	Initial version

Disclaimers

Material Safety Data

This material should be considered hazardous until information to the contrary becomes available. Do not ingest, swallow, or inhale. Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. This information contains some but not all of the information required for the safe and proper use of this material. Before use, review the complete Safety Data Sheet, which has been sent *via* email to your institution.

Warranty and Limitation of Remedy

Cayman Chemical Company makes no warranty or guarantee of any kind, whether written or oral, expressed or implied, including without limitation, any warranty of fitness for a particular purpose, suitability and merchantability, which extends beyond the description of the chemicals hereof. Cayman warrants only to the original customer that the material will meet our specifications at the time of delivery.

Cayman will carry out its delivery obligations with due care and skill. Thus, in no event will Cayman have any obligation or liability, whether in tort (including negligence) or in contract, for any direct, indirect, incidental or consequential damages, even if Cayman is informed about their possible existence.

This limitation of liability does not apply in the case of intentional acts or negligence of Cayman, its directors or its employees.

Buyer's exclusive remedy and Cayman's sole liability hereunder shall be limited to a refund of the purchase price, or at Cayman's option, the replacement, at no cost to Buyer, of all material that does not meet our specification.

Said refund or replacement is conditioned on Buyer giving written notice to Cayman within thirty (30) days after arrival of the material at its destination. Failure of Buyer to give said notice within thirty (30) days shall constitute a waiver of Buyer of all claims hereunder with respect to said material.

For further details, please refer to our Warranty and Limitations of Remedy located on our website and in our catalog.

ISO CRT SD03 V. 2.0

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