



CERTIFICATION

The AOAC Research Institute hereby certifies that the performance of this method has been evaluated and found to perform as stated in the applicability of the method. Approval has been granted with the following certificate number:

102201

LOM-7.1c Cannabinoid Analysis in Flower by UHPLC-DAD

developed by:

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This method has been evaluated in the AOAC Research Institute *Reviewed and Recognized*SM Program and found to perform as stated in the applicability of the method. This certificate indicates an AOAC Research Institute Certification Mark License Agreement has been executed which authorizes the method developer to display the AOAC Research Institute *Reviewed and Recognized*SM certification mark on the above-mentioned method for the period below. Renewal may be granted by the Expiration Date under the rules stated in the licensing agreement.



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N/A

METHOD NAME

LOM-7.1c Cannabinoid Analysis in Flower by UHPLC-DAD

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APPLICABILITY OF METHOD

Analytes – Delta-9 Tetrahydrocannabinol, Tetrahydrocannabinolic Acid, Cannabidiol, Cannabidiolic Acid, Cannabinol, Delta-8 Tetrahydrocannabinol, Cannabigerol, Cannabigerolic Acid, Cannabichromene, Cannabichromenic Acid, Cannabidivarin, Cannabidivarinic Acid, Cannabicyclol, Tetrahydrocannabivarin, and Tetrahydrocannabivarinic Acid.

Matrixes – Cannabis flower (>0.3% delta-9 THC, 0.5 to 1.0 g). Samples are analyzed as received and are not further dried or desiccated before analysis.

Performance claims – The Viridis Laboratories LOM – 7.1c Cannabinoid Analysis by UHPLC – DAD method meets the acceptance criteria for the determination of cannabinoids as outlined in *Standard Method Performance Requirements*SM (SMPR) 2017.002. The calibrator concentration range is 0.2 to 200 ppm. The methodology is designed so that test portions of 0.5 to 1.0 grams will be diluted 1500x and the expected cannabinoid values in the diluted sample will fall within this range. Final values are then calculated according to sample weight and dilution. If the values in the diluted sample fall above or below the calibration range of 0.2 to 200 ppm, the sample may be reanalyzed at a higher or lower dilution level to be within the desired range. At test portion sizes of 0.5 to 1.0 grams and a typical 1500x dilution, the LOQs and analytical ranges fall within the requirements of SMPR 2017.002.

REFERENCE METHOD/STANDARD

Official Method of Analysis (2019) 21st Ed., AOAC INTERNATIONAL, Rockville, MD SMPR 2017.002.(2)

ORIGINAL CERTIFICATION APPROVAL DATE

October 7, 2022

CERTIFICATION RENEWAL RECORD

New Approval 2022.

METHOD MODIFICATION RECORD

NONE

SUMMARY OF MODIFICATION

NONE

Sub-licensed under AOAC *Reviewed and Recognized*SM License Number 102201:

NONE

PRINCIPLE OF THE METHOD (1)

The Viridis Laboratories LOM – 7.1c Cannabinoid Analysis by UHPLC – DAD method tests for the presence and concentration of delta-9 cannabiniol (THC), tetrahydrocannabinolic acid (THCA), CBD, Cannabidiolic acid (CBDA), cannabiniol (CBN), delta-8 tetrahydrocannabinol (Δ 8-THC), cannabigerol (CBG), cannabigerolic acid (CBGA), cannabichromene (CBC), cannabichromenic acid (CBCA), cannabidivarin (CBDV), cannabidivarinic acid (CBDVA), cannabicyclol (CBL), tetrahydrocannabivarin (THCV), and tetrahydrocannabivarinic acid (THCVA) in dried cannabis flower. These phytocannabinoids are found in plant material and/or extracts of *Cannabis sativa* and *C. indica*. The method uses (Ultra) High Pressure Liquid Chromatography (UHPLC) coupled with a Diode Array Detector (DAD) to analyze extracts from plant materials for the concentrations of the specified compounds. Testing is performed using the Thermo Vanquish UHPLC System with VF-P10-A UHPLC pump and a DAD Lightpipe™ VH-D10, with a Restek sub-2 micron UHPLC column (Raptor ARC-18 LC Column 1.8 μ m 100 x 3.0 mm) and an optional precolumn filter with a 0.2 μ m frit. Results are obtained in mg/g of extract and reported as such along with percent (%) in weight/weight. Total THC and CBD values are calculated and reported as follows, as required by the State of Michigan's Cannabis Regulatory Agency:

- Total THC = (THCA * 0.877) + Δ 9-THC
- Total CBD = (CBDA * 0.877) + CBD

These calculations rely on the assumption that THCA and CBDA are converted entirely to THC and CBD, and that no other cannabinoids would contribute a significant amount to the total levels. However, the nature of the studies here is to measure and quantify all individual cannabinoids to provide empirical as well as calculated concentration information to the user. Cannabinoid results are reported "as is" and not corrected for moisture content.

DISCUSSION OF THE VALIDATION STUDY (1)

The validation report established a method for reliable and repeatable analysis of fifteen cannabinoids in cannabis flower which demonstrated more effective recovery and representation of cannabinoid levels than methods now in use. A difficulty most analyses must contend with is the inhomogeneity of the cannabis matrix and its sensitivity to environmental conditions. Cannabinoids are found in the resinous trichomes on the underside of the flower. During homogenization, this material tends to stick to the grinding apparatus, resulting in loss of the most concentrated cannabinoid fraction and lower compound recovery. Consumers of cannabis flower are aware of this and make an effort to recover the resin before use. Laboratory analyses that do not recover this material will underreport cannabinoid levels, which might result in inadvertent overuse and toxicity to consumers relying on labels for dosing information. The method presented here makes use of grinding beads which come into random contact with all parts of the plant during the homogenization process. This recovers more of the material ordinarily lost to the grinding process and more accurately measures doses consumers would be exposed to. Due to the random nature of the contact with the naturally heterogenous matrix, there is no bias in recovery with respect to the parts of the plant sampled. The material adhering to the sides of the jar was coated in fine powder and ground plant material. If this material is considered to be partly or largely trichomes, it is clear that some percentage of the total cannabinoid content of the sample is lost in this process. Kief is the fraction of the plant material that is mostly or completely trichomes. The potency of kief is thought to be 40 – 50%, meaning some 40- 50% of the total weight is cannabinoids and the rest would be the structural elements of the trichome gland. A sample that is all trichomes, that is all kief, could have a cannabinoid content of 40 – 50%; a plant with no trichomes at all would have very little measured cannabinoid content. In-house studies show that in a 30-gram flower sample, an average of 2.789 grams, or 9.3% of the sample, is lost to the container and the grinding media. If this material was resin with a cannabinoid content of 100%, the cannabinoid content of the final sample would be under-reported by over 9.3%. If the lost material contains resin at 30% cannabinoid, then the concentration in the entire sample would be under-reported by approximately 2.78%. Adding back material from two of the grinding balls (the standard way this method is performed) means recovering from 0.36 to approximately 1.2% in cannabinoid content. If the material from all four grinding balls was added, this would return up to 2.4%. Therefore, recovering resin from the grinding media does not artificially inflate cannabinoid levels. On the contrary, the use of material from the grinding media only partially recovers that which is displaced during the homogenization process.

This method was tested against real-world samples in the form of NIST QAP proficiency test materials and cannabis flower obtained from dispensaries. Use of this method to analyze NIST proficiency test samples gave acceptable results for all samples tested in both laboratories. Unlike the NIST samples, however, the cannabinoid levels in the commercial samples are associated with a higher degree of uncertainty. No certificates of analysis were available, and the processing and testing methods used to determine the reported cannabinoid levels are unknown. The only documentation of cannabinoid content was the level reported on the product labels and, in one case, a verbal confirmation from the dispensary staff. As the shelf residence time and environmental conditions for the purchased samples may differ from the sample originally tested, it is unclear how accurate the labels may actually have been and a direct comparison with the current results is not possible. However, the overall results obtained show that recovery using the candidate method is improved compared with the analyses originally performed on the commercial samples.

In the independent laboratory testing, the second analysts' results closely matched those of the first analyst for 6 cannabinoids detected (CBDA, CBGA, CBG, THC, THCA, and CBCA), and repeatability supported the use of the LOM 7.1c Cannabinoid method for determination of cannabinoid profile in dried cannabis flower samples (>0.3% delta-9 THC). The Viridis Laboratories LOM 7.1c method UHPLC-DAD is a simple and straightforward way to determine cannabinoid concentration, and data from two analysts align with defined method performance requirements.

The sample preparation, extraction, and instrument run time are all simple and straightforward and would allow for efficient, high throughput sample analysis in a production laboratory setting. Determining cannabinoid content in dried cannabis flower using this method meets most acceptance criteria outlined in the SMPR for cannabinoid quantitation, 2017.002 (Table 28). Repeatability parameters for CBDA were not statistically significant due to the low levels detected. Based on repeatability values for composite sample 1, CBG, THCA, and CBCA did not meet the acceptance criteria on the test portions analyzed by analyst 1. Test portions prepared by analyst 2 did not meet acceptance criteria for CBG in composite samples 2 and 3, and THC in composite sample 3. Intermediate precision across all test materials met reproducibility parameters from the SMPR.

In summary, the extraction method is straightforward. The instrument method has excellent sensitivity, reproducibility, accuracy, and precision and brackets the range of concentrations seen in commercially available cannabis flower samples. The method is robust to minor variations in flow rate or sample amount, as well as grinding conditions adjusted to the amount of sample used. It gives acceptable results when applied to NIST proficiency test samples and comparable or improved recovery from commercially available cannabis samples. It is eminently suited for the purpose intended.

Table 6. Results of the selectivity study (1)

Analyte	Compound ^a	Replicate 1 (mg/mL)	Replicate 2 (mg/mL)	Replicate 3 (mg/mL)
CBD	CBDVA	ND ^b	0.0000	0.0000
	CBDV	ND	ND	ND
	CBDA	0.0000	ND	ND
	CBGA	0.0000	0.0000	0.0000
	CBG	0.0001	0.0001	0.0001
	CBD	0.2172	0.2158	0.2164
	THCV	ND	ND	ND
	THCVA	ND	ND	ND
	CBN	ND	ND	ND
	THC	0.0001	0.0001	0.0001
	Delta 8 THC	ND	ND	ND
	CBL	ND	ND	ND
	CBC	ND	ND	ND
	THCA	ND	ND	ND
	CBCA	ND	ND	ND
CBDA	CBDVA	ND	0.0001	ND
	CBDV	0.0006	0.0006	0.0005
	CBDA	0.1797	0.1799	0.1792
	CBGA	ND	ND	ND
	CBG	0.0001	0.0002	0.0002
	CBD	0.0003	0.0004	0.0004
	THCV	0.0001	0.0001	0.0001
	THCVA	0.0002	0.0002	0.0002
	CBN	ND	ND	ND
	THC	0.0001	0.0001	0.0001
	Delta 8 THC	0.0001	0.0001	0.0001
	CBL	ND	0.0001	0.0001
	CBC	ND	ND	ND
	THCA	0.0000	0.0000	0.0000
	CBCA	0.0004	ND	0.0001
CBN	CBDVA	ND	ND	ND
	CBDV	ND	ND	0.0000
	CBDA	ND	ND	ND
	CBGA	0.0001	0.0000	ND
	CBG	ND	ND	ND
	CBD	ND	ND	ND
	THCV	ND	0.0000	0.0000
	THCVA	0.0001	0.0001	0.0001
	CBN	0.2044	0.2034	0.2029
	THC	ND	0.0001	0.0001
	Delta 8 THC	ND	ND	ND
	CBL	ND	ND	ND
	CBC	ND	ND	ND
	THCA	ND	ND	ND
	CBCA	ND	ND	ND
THC	CBDVA	0.0001	0.0002	ND
	CBDV	0.0001	0.0002	0.0001
	CBDA	ND	ND	ND
	CBGA	0.0001	0.0001	0.0001
	CBG	0.0002	0.0002	0.0002
	CBD	0.0016	0.0017	0.0016
	THCV	0.0001	0.0001	0.0001
	THCVA	0.0001	0.0001	0.0001
	CBN	0.0003	0.0003	0.0001
	THC	0.1970	0.1975	0.1964
	Delta 8 THC	0.0009	0.0010	0.0009
	CBL	ND	ND	0.0001
	CBC	ND	ND	ND
	THCA	ND	ND	0.0000
	CBCA	ND	ND	ND
THCA	CBDVA	0.0001	0.0001	0.0001
	CBDV	0.0003	0.0003	0.0003
	CBDA	0.0002	0.0000	0.0000
	CBGA	ND	ND	0.0001
	CBG	ND	ND	0.0000

	CBD	ND	ND	0.0000
	THCV	ND	ND	ND
	THCVA	ND	ND	ND
	CBN	ND	ND	ND
	THC	0.0017	0.0017	0.0018
	Delta 8 THC	ND	ND	ND
	CBL	ND	ND	ND
	CBC	ND	ND	ND
	THCA	0.2038	0.2041	0.2037
	CBCA	ND	ND	ND
CBC	CBDVA	ND	ND	ND
	CBDV	ND	ND	ND
	CBDA	ND	0.0000	ND
	CBGA	ND	0.0000	0.0000
	CBG	ND	ND	0.0000
	CBD	ND	ND	ND
	THCV	0.0001	0.0001	0.0001
	THCVA	ND	ND	ND
	CBN	ND	ND	ND
	THC	ND	0.0000	0.0000
	Delta 8 THC	ND	0.0000	0.0000
	CBL	ND	ND	ND
	CBC	0.1932	0.1915	0.1920
	THCA	ND	ND	ND
	CBCA	ND	ND	ND
CBCA	CBDVA	0.0001	0.0000	0.0001
	CBDV	ND	ND	ND
	CBDA	ND	ND	ND
	CBGA	ND	ND	ND
	CBG	0.0002	ND	ND
	CBD	ND	ND	ND
	THCV	0.0013	0.0013	0.0014
	THCVA	ND	ND	ND
	CBN	ND	ND	ND
	THC	ND	ND	ND
	Delta 8 THC	0.0002	0.0002	0.0003
	CBL	ND	ND	ND
	CBC	0.0005	0.0005	0.0004
	THCA	0.001	ND	ND
	CBCA	0.2444	0.2453	0.2437
CBG	CBDVA	ND	ND	ND
	CBDV	ND	ND	ND
	CBDA	ND	0.0000	0.0000
	CBGA	ND	ND	ND
	CBG	0.2030	0.2024	0.2017
	CBD	ND	ND	ND
	THCV	ND	ND	ND
	THCVA	ND	ND	ND
	CBN	ND	ND	ND
	THC	ND	ND	ND
	Delta 8 THC	ND	ND	ND
	CBL	ND	ND	ND
	CBC	0.0001	0.0001	ND
	THCA	ND	ND	0.0001
	CBCA	ND	ND	ND
CBGA	CBDVA	0.0001	0.0001	0.0001
	CBDV	ND	0.0000	0.0000
	CBDA	ND	ND	ND
	CBGA	0.2174	0.2150	0.2139
	CBG	0.0011	0.0011	0.0012
	CBD	ND	ND	ND
	THCV	ND	ND	ND
	THCVA	ND	ND	ND
	CBN	0.0001	0.0000	ND
	THC	ND	ND	ND
	Delta 8 THC	ND	ND	ND
	CBL	ND	ND	ND
	CBC	ND	ND	ND
	THCA	ND	ND	ND
	CBCA	ND	ND	ND
Delta 8 THC	CBDVA	ND	ND	ND
	CBDV	ND	ND	ND

	CBDA	ND	0.0000	0.0000
	CBGA	ND	ND	ND
	CBG	0.0001	0.0001	0.0001
	CBD	ND	ND	ND
	THCV	ND	ND	ND
	THCVA	ND	ND	ND
	CBN	0.0001	0.0000	0.0000
	THC	ND	0.0008	0.0008
	Delta 8 THC	0.2099	0.2093	0.2097
	CBL	0.0001	0.0001	0.0002
	CBC	ND	ND	ND
	THCA	ND	ND	ND
	CBCA	ND	ND	ND
CBDV	CBDVA	0.0002	0.0002	0.0002
	CBDV	0.2072	0.2076	0.2068
	CBDA	ND	ND	ND
	CBGA	0.0001	0.0001	ND
	CBG	ND	0.0000	ND
	CBD	ND	ND	ND
	THCV	0.0001	0.0001	0.0001
	THCVA	ND	ND	ND
	CBN	ND	ND	ND
	THC	ND	ND	ND
	Delta 8 THC	ND	ND	ND
	CBL	ND	ND	ND
	CBC	ND	ND	ND
	THCA	ND	ND	ND
	CBCA	ND	ND	ND
CBDVA	CBDVA	0.2039	0.2038	0.2050
	CBDV	0.0006	0.0006	0.0005
	CBDA	0.0001	0.0001	0.0001
	CBGA	ND	ND	ND
	CBG	ND	ND	ND
	CBD	ND	ND	ND
	THCV	ND	ND	ND
	THCVA	0.0000	0.0000	0.0000
	CBN	ND	0.0000	ND
	THC	0.0001	ND	ND
	Delta 8 THC	ND	0.0001	0.0001
	CBL	ND	ND	ND
	CBC	ND	ND	ND
	THCA	ND	ND	ND
	CBCA	ND	ND	ND
CBL	CBDVA	ND	ND	ND
	CBDV	ND	0.0000	ND
	CBDA	ND	ND	ND
	CBGA	ND	ND	ND
	CBG	ND	ND	ND
	CBD	ND	ND	ND
	THCV	ND	ND	ND
	THCVA	0.0000	ND	ND
	CBN	ND	0.0000	0.0000
	THC	ND	0.0008	0.0008
	Delta 8 THC	0.0005	0.0005	0.0005
	CBL	0.2127	0.2131	0.2127
	CBC	ND	ND	ND
	THCA	ND	ND	ND
	CBCA	ND	ND	ND
THCV	CBDVA	0.0004	0.0004	0.0004
	CBDV	0.0004	0.0004	0.0004
	CBDA	0.0005	0.0005	0.0006
	CBGA	0.0009	ND	ND
	CBG	0.0001	0.0001	0.0000
	CBD	0.0014	0.0014	0.0014
	THCV	0.1848	0.1840	0.1843
	THCVA	0.0001	ND	0.0000
	CBN	ND	0.0001	0.0001
	THC	ND	ND	ND
	Delta 8 THC	ND	ND	ND
	CBL	ND	ND	ND
	CBC	ND	ND	ND
	THCA	ND	ND	ND

	CBCA	ND	ND	ND
THCVA	CBDVA	ND	ND	ND
	CBDV	0.0001	0.0001	0.0001
	CBDA	ND	ND	ND
	CBGA	0.0001	0.0001	0.0001
	CBG	ND	ND	ND
	CBD	0.0009	0.0009	0.0011
	THCV	0.0004	0.0003	0.0004
	THCVA	0.2113	0.2112	0.2118
	CBN	0.0010	0.0009	0.0010
	THC	0.0000	ND	ND
	Delta 8 THC	ND	ND	ND
	CBL	0.0001	0.0001	0.0001
	CBC	ND	ND	ND
	THCA	ND	ND	ND
	CBCA	ND	ND	ND

^aCBDVA – Cannabidiavarinic Acid; CBDV - Cannabidiavarin ; CBDA – Cannabidiolic Acid; CBGA - Cannabigerolic Acid; CBG - Cannabigerol; CBD – Cannabidiol; THCV - Tetrahydrocannabivarin; TCHVA - Tetrahydrocannabivarinic Acid; CBN - Cannabinol; THC - Delta 9 Tetrahydrocannabinol; Delta 8 THC -Delta 8 Tetrahydrocannabinol; CBL - Cannabicyclo; CBC - Cannabichromene; THCA – Tetrahydrocannabinolic Acid; CBCA - Cannabichromenic Acid. ^b ND – Not Detected

Table 2. Method recovery from NIST CannaQAP Program Exercise 2 (1)

Compound	NIST Targets ^a	% Recovery ^b	SMPR
CBDVA	< 0.1	104.46	No requirement
CBDV	< 0.1	N/A	No requirement
CBDA	1.5 - 8.3	98.56	97 - 103
CBGA	< 0.1	129.25	No requirement
CBG	< 0.1	191.45	No requirement
CBD	0.233 - 0.58	95.08	95 - 105
THCV	None Given	N/A	
THCVA	None Given	N/A	
CBN	< 0.1	86.82	No requirement
Delta 9 THC	< 0.1	75.90	No requirement
Delta 8 THC	None Given	N/A	
CBL	None Given	N/A	
CBC	< 0.1	89.59	No requirement
THCA	0.11 - 0.24	101.20	95 - 105
CBCA	< 0.1	82.95	No requirement
Total THC	0.14 - 0.28	97.45	95 - 105
Total CBD	1.9 - 7.7	97.05	97 - 103

^aThe target value or range of values for the sample(s) that contained the target compound. Samples included Sample 1, Sample 4, and Sample 6 from NIST CannaQAP Exercise 2.

^bRecovery represents the average recovery from triplicate test portions (2 analyzed in Lansing and 1 analyzed in Bay City) of each Exercise 2 sample containing that compound. See Tables 13 and 14 for individual sample results.

Table 13. Results of analysis of NIST CannaQAP Exercise samples – Viridis Laboratories Lansing. (1)

Compound	Avg (mg/g)	SD (mg/g)	Avg (%)	SD (%)	%RSD	NIST Consensus Mean	NIST Consensus SD	Acceptable
Sample 1 (A) (n=2)								
CBDVA	0.9767	0.1492	0.0976	0.00145	1.53	0.0834	0.0026	Y
CBDV	< 0.2		< 0.02			0.026	0.0025	Y
CBDA	13.5987	0.0119	1.3598	0.0012	1.34	1.337	0.013	Y
CBGA	< 0.2		< 0.02			< 0.02		Y
CBG	< 0.2		< 0.02			< 0.02		Y
CBD	4.6730	0.0335	0.4673	0.0033	0.72	0.5172	0.0046	Y
THCV	< 0.2		< 0.02			< 0.02		Y
THCVA	< 0.2		< 0.02			< 0.02		Y
CBN	< 0.2		< 0.02			0.0484	0.00054	Y
D9 THC	0.2519	0.0098	0.0252	0.0009	3.90	0.0374	0.0014	Y
D8 THC	< 0.2		< 0.02			< 0.02		Y
CBL	< 0.2		< 0.02			< 0.02		Y
CBC	0.2817	0.0074	0.0282	0.0007	2.63	0.03094	0.00062	Y
THCA	1.0373	0.0443	0.1037	0.0044	4.27	0.091	0.0016	Y
CBCA	0.3855	0.0325	0.0385	0.0032	8.44	0.0465	0.0022	Y
Sample 4 (B) (n=2)								
CBDVA	0.3971	0.0163	0.0397	0.0016	4.12	0.0387	0.0012	Y
CBDV	< 0.2		< 0.02			< 0.02		Y
CBDA	73.9711	0.7540	7.3971	0.0754	1.02	7.061	0.063	Y
CBGA	2.2193	0.0156	0.2219	0.0015	0.070	0.1592	0.0057	Y
CBG	0.5096	0.0674	0.0509	0.0067	13.24	0.0253	0.001	Y
CBD	5.5695	0.0356	0.5569	0.0305	5.49	0.5897	0.0059	Y
THCV	< 0.2		< 0.02			< 0.02		Y
THCVA	< 0.2		< 0.02			< 0.02		Y
CBN	< 0.2		< 0.02			< 0.02		Y
D9 THC	0.5238	0.0192	0.0523	0.0019	3.67	0.0683	0.0013	Y
D8 THC	< 0.2		< 0.02			< 0.02		Y
CBL	< 0.2		< 0.02			< 0.02		Y
CBC	0.5225	0.0143	0.0522	0.00144	2.75	0.0564	0.0013	Y
THCA	2.4028	0.0068	0.2403	0.0006	0.28	0.2139	0.0023	Y
CBCA	3.17090	0.05080	0.31709	0.00508	1.60	0.3741	0.0048	Y
Sample 6 (C) (n=2)								
CBDVA	< 0.2		< 0.02			0.02589	0.00091	Y
CBDV	< 0.2		< 0.02			< 0.02		Y
CBDA	40.5845	0.0459	4.0584	0.0045	0.11	4.248	0.044	Y
CBGA	0.8179	0.0091	0.0817	0.0092	1.12	0.0657	0.0028	Y
CBG	< 0.2		< 0.02			< 0.02		Y
CBD	2.3936	0.0220	0.2393	0.0022	0.92	0.2778	0.0036	Y
THCV	< 0.2		< 0.02			< 0.02		Y
THCVA	< 0.2		< 0.02			< 0.02		Y
CBN	< 0.2		< 0.02			< 0.02		Y
D9 THC	0.2152	0.0023	0.0215	0.0002	1.10	0.0313	0.00082	Y
D8 THC	< 0.2		< 0.02			< 0.02		Y
CBL	< 0.2		< 0.02			< 0.02		Y
CBC	0.2331	0.0137	0.0233	0.0013	5.89	0.02487	0.00089	Y
THCA	1.3522	0.0316	0.1352	0.0031	2.34	0.1371	0.0018	Y
CBCA	1.6739	0.0140	0.1673	0.0014	0.84	0.2064	0.0034	Y

Table 14. Results of analysis of NIST CannaQAP Exercise samples – Viridis Laboratories Bay City (1)

Compound	Result (mg/g)	Result (%)	NIST Consensus Mean	NIST Consensus SD	Acceptable
Sample 1 (A) (n=1)					
CBDVA	0.9496	0.0949	0.0834	0.0026	Y
CBDV	< 0.2	< 0.02	0.026	0.0025	Y
CBDA	13.6650	1.3665	1.337	0.013	Y
CBGA	< 0.2	< 0.02	< 0.02		Y
CBG	< 0.2	< 0.02	< 0.02		Y
CBD	4.9317	0.4931	0.5172	0.0046	Y
THCV	< 0.2	< 0.02	< 0.02		Y
THCVA	< 0.2	< 0.02	< 0.02		Y
CBN	< 0.2	< 0.02	0.0484	0.00054	Y
D9 THC	0.3916	0.0391	0.0374	0.0014	Y
D8 THC	< 0.2	< 0.02	< 0.02		Y
CBL	< 0.2	< 0.02	< 0.02		Y
CBC	0.2249	0.0224	0.03094	0.00062	Y
THCA	0.9244	0.0924	0.091	0.0016	Y
CBCA	< 0.2	< 0.02	0.0465	0.0022	Y
Sample 4 (B) (n=1)					
CBDVA	0.4231	0.04231	0.0387	0.0012	Y
CBDV	< 0.2	< 0.02	< 0.02		Y
CBDA	71.1002	7.1100	7.061	0.063	Y
CBGA	2.4187	0.2418	0.1592	0.0057	Y
CBG	0.4198	0.0419	0.0253	0.001	Y
CBD	5.6763	0.5676	0.5897	0.0059	Y
THCV	< 0.2	< 0.02	< 0.02		Y
THCVA	< 0.2	< 0.02	< 0.02		Y
CBN	< 0.2	< 0.02	< 0.02		Y
D9 THC	0.6047	0.0604	0.0683	0.0013	Y
D8 THC	< 0.2	< 0.02	< 0.02		Y
CBL	< 0.2	< 0.02	< 0.02		Y
CBC	0.5249	0.0549	0.0564	0.0013	Y
THCA	2.1966	0.2196	0.2139	0.0023	Y
CBCA	2.9540	0.2954	0.3741	0.0048	Y
Sample 6 (C) (n=1)					
CBDVA	< 0.2	< 0.02	0.02589	0.00091	Y
CBDV	< 0.2	< 0.02	< 0.02		Y
CBDA	44.5363	4.4536	4.248	0.044	Y
CBGA	1.0718	0.1071	0.0657	0.0028	Y
CBG	< 0.2	< 0.02	< 0.02		Y
CBD	2.6943	0.2694	0.2778	0.0036	Y
THCV	< 0.2	< 0.02	< 0.02		Y
THCVA	< 0.2	< 0.02	< 0.02		Y
CBN	< 0.2	< 0.02	< 0.02		Y
D9 THC	0.2829	0.0282	0.0313	0.00082	Y
D8 THC	< 0.2	< 0.02	< 0.02		Y
CBL	< 0.2	< 0.02	< 0.02		Y
CBC	< 0.2	< 0.02	0.02487	0.00089	Y
THCA	1.4717	0.1471	0.1371	0.0018	Y
CBCA	1.6472	0.1647	0.2064	0.0034	Y

Table 25. UHPLC-DAD cannabinoid repeatability of LOM 7.1c method – Viridis Analyst and Independent Laboratory Analyst (1)

Test Portion	Analyst 1 Results (mg/g)						Analyst 2 Results (mg/g)					
	CBDA	CBGA	CBG	THC	THCA	CBCA	CBDA	CBGA	CBG	THC	THCA	CBCA
Composite Sample 1												
1A	0.56507	8.25969	1.56564	10.36892	229.19421	2.54229	0.55164	7.90825	1.57077	10.14170	219.01816	2.47453
1B	0.50964	7.53835	1.38812	9.52836	211.40423	2.37356	0.51467	7.82306	1.39063	10.10400	215.61130	2.35178
1C	0.53263	7.53844	1.42993	9.26246	210.74617	2.18984	0.51438	7.74725	1.42194	10.09071	215.25667	2.43010
1D	0.49804	7.51687	1.36765	9.47890	210.26273	2.39274	0.52901	7.79065	1.41222	10.05156	216.73779	2.37361
1E	0.52098	7.39853	1.47160	9.35000	205.96145	2.14225	0.50528	7.86904	1.40109	10.05895	218.75454	2.51432
Mean	0.52527	7.65038	1.44459	9.59773	213.51376	2.32814	0.52300	7.82765	1.43933	10.08938	217.07569	2.42887
RSD _r , %	4.89	4.52	5.44	4.62	4.23	6.98	3.47	0.81	5.17	0.36	0.80	2.79
Composite Sample 2												
2A	0.56301	9.31826	1.60327	9.68042	230.76799	2.49790	0.56755	9.28736	1.61342	9.97044	231.32297	2.43897
2B	0.54772	9.04857	1.45430	9.56517	225.97407	2.46017	0.54825	9.10382	1.46029	9.86315	228.79162	2.48380
2C	0.53047	8.96787	1.44700	9.55559	224.93451	2.41907	0.56415	9.28281	1.64966	10.00176	232.00276	2.61011
2D	0.54054	8.79109	1.52116	9.14486	216.80974	2.36254	0.59482	9.51885	1.65528	10.50503	239.03400	2.57750
2E	0.57638	9.19699	1.53776	9.51238	226.26248	2.36153	0.54364	9.21459	1.48049	10.06362	232.44204	2.58742
Mean	0.55162	9.06456	1.51270	9.49168	224.94976	2.42024	0.56368	9.28149	1.57183	10.08080	232.71868	2.53956
RSD _r , %	3.30	2.25	4.26	2.15	2.25	2.48	3.58	1.64	6.00	2.46	1.63	2.92
Composite Sample 3												
3A	0.52474	8.13411	1.46656	10.63684	212.00641	2.38475	0.53913	8.02460	1.43386	9.92643	221.32086	2.35350
3B	0.52343	7.99665	1.36002	10.78298	210.86329	2.25215	0.53091	8.04125	1.41093	9.82532	220.54343	2.35132
3C	0.55302	8.50327	1.54848	11.49823	223.82211	2.48406	0.54428	8.04066	1.54746	9.79791	220.25677	2.41975
3D	0.53914	8.36620	1.51533	11.04336	220.03032	2.43884	0.56500	7.96303	1.51674	9.94607	219.31126	2.24798
3E	0.54447	8.20066	1.48119	11.07658	215.34025	2.21725	0.51747	7.94512	1.35506	9.61631	217.84106	2.36598
Mean	0.53696	8.24018	1.47432	11.00760	216.41248	2.35541	0.53936	8.00293	1.45281	9.82241	219.85468	2.34771
RSD _r , %	2.38	2.41	4.84	2.99	2.52	4.94	3.25	0.57	5.41	1.34	0.61	2.65

Table 28. Method Performance compared to SMPR 2017.002 requirements. Percent recovery and RSD were calculated using QC samples, which consisted of analyte spiked into blank matrix extract (n=10). **(1)**

Compound	LOQ, % 0.5 g @1500x dilution	LOQ, % 1 g @1500x dilution	Anal. Range (%) 0.5 g @1500x dilution	Anal. Range (%) 1.0 g @1500x dilution	% Recov 0.667 ppm	% Recov 6.67 ppm	% Recov 66.7 ppm	% Recov 150 ppm	RSD _r , % 0.667 ppm	RSD _r , % 6.67 ppm	RSD _r , % 66.7 ppm	RSD _r , % 150 ppm
CBC	0.06	0.03	0.06 - 60	0.03 - 30	98.38	100.59	101.83	102.42	3.37	1.39	1.03	0.42
CBCA	0.06	0.03	0.06 - 60	0.03 - 30	99.31	98.34	102.91	103.44	2.72	1.88	1.12	0.62
CBD	0.06	0.03	0.06 - 60	0.03 - 30	97.99	98.77	100.16	102.57	3.00	2.28	1.52	0.48
CBDA	0.06	0.03	0.06 - 60	0.03 - 30	94.64	97.31	98.70	98.12	4.38	3.51	1.33	0.50
CBDV	0.06	0.03	0.06 - 60	0.03 - 30	95.95	103.89	101.67	104.18	2.86	6.09	1.01	0.75
CBDVA	0.06	0.03	0.06 - 60	0.03 - 30	95.08	99.52	100.35	102.15	0.69	0.95	0.85	0.59
CBG	0.06	0.03	0.06 - 60	0.03 - 30	104.27	103.15	102.87	102.59	1.27	1.53	2.37	0.72
CBGA	0.06	0.03	0.06 - 60	0.03 - 30	103.86	102.59	103.51	102.80	1.80	1.54	1.07	0.39
CBL	0.06	0.03	0.06 - 60	0.03 - 30	99.50	97.29	98.03	101.39	3.07	1.16	0.87	0.49
CBN	0.06	0.03	0.06 - 60	0.03 - 30	104.91	102.27	102.65	104.28	2.42	1.72	0.46	0.49
Delta 8 THC	0.06	0.03	0.06 - 60	0.03 - 30	96.77	99.53	101.15	103.17	4.60	1.21	1.29	0.32
Delta 9 THC	0.06	0.03	0.06 - 60	0.03 - 30	101.81	103.86	102.92	102.94	5.13	1.36	1.24	0.62
THCA	0.06	0.03	0.06 - 60	0.03 - 30	99.30	99.51	102.99	104.99	4.88	1.48	1.01	0.41
THCV	0.06	0.03	0.06 - 60	0.03 - 30	101.58	98.98	98.81	103.84	2.28	0.97	0.95	0.71
THCVA	0.06	0.03	0.06 - 60	0.03 - 30	95.13	97.29	99.83	102.80	1.82	1.29	0.58	0.55
SMPR 2017.002 Requirements:	< 0.1%	< 0.1%	0.1 - ~50	0.1 - ~50	95-105 (0.1-1 ppm)	97 - 103 (1-25 ppm)	98 - 102 (25-50 ppm)	Not defined	<5 (0.1 - 1 ppm)	<4 (1-25 ppm)	<3 (25-50 ppm)	Not defined

REFERENCES CITED

- Glinn, M., Fristik, D., LaFramboise, M., and Feighner, B., Validation of the Viridis Laboratories LOM – 7.1c Cannabinoid Analysis by UHPLC-DAD Method for the Determination of 15 Cannabinoids in Dried Cannabis Flower: AOAC Reviewed and RecognizedSM 102201. Approved October 7, 2022.
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