

Standard Method Performance Requirements (SMPRs®) for Determination of Heavy Metals in a Variety of Cannabis and Cannabis-Derived Products

Intended Use: Surveillance Methods for Routine Monitoring

1 Purpose

AOAC SMPRs describe the minimum recommended performance characteristics and suggested inclusivity/exclusivity organisms to be used during the evaluation of a method. The evaluation may be an on-site verification, a single-laboratory validation, or a multi-site collaborative study. SMPRs are written by AOAC working groups which are composed of representatives from industry, regulatory organizations, contract laboratories, test kit manufacturers, and academic institutions. AOAC SMPRs may be used for method development and optimization. Additionally, AOAC SMPRs are used by AOAC expert review panels in their evaluation of validation study data for methods being considered for *Performance Tested Methods*SM or AOAC *Official Methods of Analysis*SM and can be used as acceptance criteria for verification at user laboratories.

2 Applicability

Determination of total cadmium (CAS No. 7440-43-9), total arsenic (CAS No. 7440-38-2), total lead (CAS No. 7439-92-1), and total mercury (CAS No. 7439-97-6). Additional elements in Table 1 may be included.

3 Analytical Technique

Inductively coupled plasma-based instrumentation or alternative methodology that meets performance requirements.

4 Definitions

Limit of quantitation (LOQ).—Minimum concentration or mass of analyte in a given matrix that can be reported as a quantitative result.

Recovery.—Fraction or percentage of spiked analyte that is recovered when test sample is analyzed using the entire method.

Repeatability.—Variation arising when all efforts are made to keep conditions constant by using the same instrument and operator, and repeating during a short time period. Expressed as the repeatability standard deviation (SD_r); or % repeatability relative standard deviation (%RSD_r).

Reproducibility.—Standard deviation or relative standard deviation calculated from among-laboratory data. Expressed as the reproducibility standard deviation (SD_R); or % reproducibility relative standard deviation (%RSD_R).

5 Method Performance Requirements

See Table 2.

6 System Suitability Tests and/or Analytical Quality Control

Suitable methods will include blank check samples, and check standards at the lowest point and midrange point of the analytical range.

7 Reference Material(s)

A certified reference material should be used when available. Internally produced reference materials may be used for a variety of cannabis products, such as plant material, concentrates, and finished products until a reference material is made available by an internationally recognized organization, such as Institute for Reference Materials and Measurements (IRMM) or United States National Institute of Standards and Technology (NIST).

8 Validation Guidance and References

Recommended level of validation:

*Official Methods of Analysis*SM

USP <233>

9 Maximum Time-to-Result

No maximum time.

Approved by stakeholders of the AOAC Cannabis Analytical Science Program (CASP) on April 7, 2020.

Posted: April 28, 2020

Table 1. Optional elements not frequently required

Element	CAS No.
Antimony	744-36-0
Barium	744-39-3
Chromium	18540-29-9
Copper	744-50-8
Nickel	7440-02-0
Silver	7440-22-4
Selenium	7782-49-2
Zinc	7440-66-6

Table 2. Method Performance Requirements

Limit of quantitation (LOQ)	≤10 ppb, µg/kg		
	Repeatability (RSD _r), %	Reproducibility (RSD _R), %	Recovery, %
Range			
≥10 ppb to 100 ppb	15	32	60–115
>100 ppb to 1 ppm	11	16	80–115
>1 ppm to 10 ppm	7.3	8	80–115