



SOP-CH-001
Revision: 2
Effective Date: August 1, 2022

Drug Enforcement Administration

Office of Forensic Sciences

SOP-CH-001

STANDARD OPERATING PROCEDURE

for the

ANALYSIS OF SUSPECTED CANNABIS PLANT MATERIAL



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1.0 Introduction

SOP-CH-001 supplements the Analysis of Drugs Manual (ADM) and outlines procedures to distinguish between potential hemp and marijuana as defined in the Agricultural Improvement Act of 2018, H.R. 2, 115th Cong. (2018). Reference the ADM for evidence analysis policy.

The analytical scheme requires use of system-wide validated methods. Reference the appropriate validation packet for preparations and procedures. A Decision Limit (DL) value for total Δ^9 -tetrahydrocannabinol (THC) present at 1% is established for field laboratory reporting purposes. (NOTE: Total THC = Δ^9 -tetrahydrocannabinolic acid (THCA) + Δ^9 -THC)

2.0 Scope

This procedure:

- A. Identifies marijuana.
- B. Applies to plant material units with individual net weights above 100 mg.
- C. Does not apply to seeds, liquids (e.g. oils, creams), edibles, and roots.
 1. See [Appendix C](#) for instructions on the germination of seeds

3.0 Analytical Scheme

- A. For plant material samples that do not contain cystolithic hairs the SOP no longer applies and analysis should proceed via the ADM or other SOP if applicable.
- B. Do not dry plant material, sample from buds and leaves of the plant material, and do not sample from seeds, stalks, stems, or roots.

3.1 Qualitative Analysis

- A. Macroscopic and microscopic examination of plant material: Conduct a macroscopic and microscopic examination of each unit.

NOTE: Effervescence of the calcium carbonate crystal (i.e., cystolith at the base of the hair) in dilute acid may be performed.

1. Acceptance criteria: Observation that the gross form of the substance is plant material and microscopic observation of cystolithic hairs.
- B. Color test: Analyze each selected unit using the 4-aminophenol (4-AP) color test.
 1. Use approximately 5 mg of sample from each unit.
- C. Gas chromatography-mass spectrometry (GC-MS):
 1. Analyze one working THC positive control solution ([Appendix A](#)) prior to each sample sequence using THCSRN_MS01.



NOTE: The data from the positive control may be used for all exhibits run during a sequence.

- a. Acceptance criteria for THC:IS ratio: THC:IS ratio > 1
 - b. Use the macro associated with THCSRN_MS01 to ensure the peak heights of THC, CBD, and IS as well as the THC:IS ratio are recorded on the data.
2. Analyze each selected unit using THCSRN_MS01.
- a. Weigh 40-50 mg of sample from each selected unit using an appropriate weighing method. The bud/leaf sample may be broken-up or crumbled with gloved fingers.
 - b. Add 5 mL of internal standard solution (ISS) to test tube.
 - c. Extract for 10 minutes; vortex/mix for 10-15 seconds at least twice during extraction period.
 - d. Filter each sample solution through a cotton plugged pipette or syringe filter into new auto sampler vial.
3. Acceptance criteria for THC:IS ratio: THC:IS ratio > 1
4. Use the macro associated with THCSRN_MS01 to ensure the peak heights of THC, CBD, and IS as well as the THC:IS ratio are recorded on the data.
5. Document ratio results in the *Remarks* finding of the *GC-MS Analysis* test in LIMS (e.g., "THC ≥1%").
- D. Perform additional qualitative testing as needed.

4.0 Reporting

Include reporting statements per [Appendix B](#) in the Exhibit Analysis section of DEA-113.

4.1 Positive Results in All Units Tested

- A. Report "Marijuana" on DEA-113 when the following results are obtained in all units tested:
1. Cystolithic hairs observed
 2. Blue color test results
 3. THC ≥1% in GC-MS test

4.2 Inconclusive Results in all Units Tested

- A. Report "Inconclusive" on the DEA-113 when any one of the following results are obtained for one or any of the units tested:
1. Pink color test result



OR

2. THC <1% in GC-MS test

B. Add Remark: *"Inconclusive marijuana/hemp; pending further analysis upon request"* in the Remarks section of DEA-113.

4.3 Positive and Inconclusive Results

A. Report "Marijuana" and "Inconclusive" if:

1. Some of the units tested fulfill the criteria in Section 4.1 and some of the units tested fulfill the criteria in Section 4.2.

B. Add Remark: *"Inconclusive marijuana/hemp; pending further analysis upon request"* in the Remarks section of DEA-113.

4.4 Residue plant material

A. If acceptable data exists, report THC on the DEA-113.

B. Add Remark: *"Insufficient sample to determine level of total delta 9-THC."*



Appendix A – THC Positive Control Preparation

- A. Prepare a 0.1 mg/mL working positive control solution of THC.
1. Using Class-A volumetric glassware, prepare a 1-1.5 mg/mL THC Stock A solution by transferring 1 mL from the THC reference material (~10 mg/mL) into a tared flask or beaker.
 2. Evaporate to dryness and weigh the amount of residue remaining.
 3. Dilute using the appropriate volume of ISS. For example, if 9.6 mg of residue remain, dilute using 9 mL of ISS.
 4. Prepare the working THC positive control solution by performing a 1:10 dilution of the THC Stock A solution using ISS.
- NOTE:** Class-A glassware may be used for the preparation of the working THC solution, but it is not required.
5. Both stock and working solutions of the positive control can be used until they no longer meet the acceptance criteria.
 6. Store all solutions in the refrigerator.



Appendix B – Reporting Statements

| Scenario: All Units Positive (Blue, >1% THC) | |
|--|--|
| Substance Identified | Marijuana |
| Sampling Statement | |
| Non-Exemplar | <ul style="list-style-type: none"> Marijuana identified in all unit(s) received. <i>(1-9 units)</i> Marijuana identified in 9 units tested of [#] units received indicating, to at least a 95% level of confidence, that at least 70% of the units in the population contain the substance(s). <i>(10 or more units)</i> |
| Exemplar | <ul style="list-style-type: none"> Marijuana identified in all unit(s) received. <i>(1-9 units and non-statistical exemplars)</i> Marijuana identified in all unit(s) received. Based on the reported total seizure unit count, this indicates to at least a 95% level of confidence, that at least 90% of the units in the population contain the substance(s). Total seizure unit count not conducted by laboratory personnel. <i>(10 or more units)</i> |

| Scenario: All Units Inconclusive (Blue, <1% THC; Pink, >1% THC; Pink, <1% THC) | |
|--|--|
| Substance Identified | Inconclusive |
| Remark | Inconclusive Marijuana/Hemp; pending further analysis upon request. |
| Sampling Statement | |
| Non-Exemplar | <ul style="list-style-type: none"> 1 unit tested of 1 unit received. [#] units tested of [#] units received. |
| Exemplar | <ul style="list-style-type: none"> [#] units tested of [#] units received. |



| Scenario: Mixture of Results | |
|-------------------------------------|--|
| Substances Identified | Marijuana and Inconclusive |
| Remarks | Inconclusive Marijuana/Hemp; pending further analysis upon request. |
| Sampling Statement | |
| Non-Exemplar | <ul style="list-style-type: none">• [#] units tested of [#] units received. Marijuana identified in [#] of the [#] units tested. |
| Exemplar | <ul style="list-style-type: none">• [#] units tested of [#] units received. Marijuana identified in [#] of the [#] units tested. |



Appendix C – Procedures for the Germination and Analysis of Cannabis Seeds

1 Sampling

1. Visually evaluate the seeds to determine if more than one population is present (i.e., multiple seed types). Sub-exhibit populations accordingly.
2. Determine the total number of seeds present in the population either by direct count or by unit count extrapolation.
3. Randomly select half of the seeds from each population (up to 29 seeds) for germination. No attempt should be made to purposefully exclude damaged seeds.
4. Retain the remaining seeds.

2 Germination and Transplantation

1. Germinate and grow the seeds in a secure locker in the in-process vault or other secured area with controlled access.
2. Use the following supplies during the germination of the seeds:
 - a. Seeds (half of the seeds in the exhibit up to a maximum of 29)
 - b. Water (room temperature)
 - c. Sealable plastic container or bag
 - d. Paper towels
 - e. Aluminum foil
 - f. Transplant/growth supplies:
 - i. Forceps
 - ii. Seed starting soil
 - iii. Small plant pots with drainage (e.g., 3" size)
 - iv. Water
 - v. Fertilizer
 - vi. Artificial light source (e.g., 400 W high pressure sodium lamp)
3. Germination Procedure:
 - a. Place the selected seeds on a damp paper towel and seal the folded paper towel in a plastic container.
 - b. Place the container in a dark environment.



- c. The container should be kept in the dark for 3-5 days. Monitor the seeds to ensure they do not dry out. Once a root has emerged from the seed, the seed is considered to have germinated.
4. Transfer all germinated seed(s) (using forceps) to small pots containing soil, planting one seed per pot.
5. Keep the soil moist.
6. Plant fertilizer may be added to the water to encourage growth.
7. Use an artificial light source. Place the light at least two feet above the plants to avoid excess heating.
8. Grow the plants to a sufficient height to obtain enough plant material for testing.

3 Identification

1. Cannabis is a single stem plant, and each stalk supported by its own root system will be considered one plant.
2. At minimum, two samples are removed from each plant for testing.

NOTE: Retain remaining plant material as reserve evidence in a manner to prevent degradation.

3. The identification of marijuana is completed in accordance with SOP-CH-001.



Effective Date/Revision History

| Revision No. | Effective Date | Summary of Changes |
|--------------|----------------|--|
| 0 | 09/09/2019 | Original document issued. |
| 1 | 3/29/2021 | <ul style="list-style-type: none">• Reporting statement for residues added• Identification statements separated into Appendix A• Appendix B – Procedures for the Germination and Analysis of Cannabis Seeds added• Document reformatted and reorganized• ADM references updated |
| 2 | 08/01/2022 | Re-issued to replace SOP-CH-001 Revision 1. Major changes include: <ul style="list-style-type: none">• Reorganization to include only information pertaining to the analytical scheme• Relocation of THC positive control preparation instructions to Appendix A and renumbering of appendices• Updating of the reporting statements |



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