Solvent extraction of cannabinoids
according to the Randall method

Reference: **VELP Internal Analytical Procedure**

Tested with **VELP Scientifica SER 158/6 Solvent AutoExtractor** (Code S303A0380)

Introduction

Cannabis sativa has a long history as a medicinal plant, likely dating back more than two millennia. The renewed interest in the therapeutic effects of cannabis emanates from the movement that began 20 years ago to make cannabinoids extracts available as a medicine to patients with a variety of conditions. For example, the most common conditions for which medical cannabis is used in Colorado and Oregon are pain, spasticity associated with multiple sclerosis, nausea, posttraumatic stress disorder, cancer, epilepsy, cachexia, glaucoma, HIV/AIDS, and degenerative neurological conditions.

THC and CBD are the two most common cannabinoids. It's important for consumers to know THC and CBD levels because these will have a strong influence on the effects of the product. For example, some medical patients may want a strain with a high CBD:THC ratio, while adult-use consumers may request the opposite. Other compounds, such as minor cannabinoids and terpenes, can be tested for as well, although these measurements are typically not required by law.

Solvent extraction in Cannabis

Hot solvent extraction in cannabis with SER 158 Series can be summed up in 4 steps, for a fully unattended operation:

STEP 1 IMMERSION	➡	STEP 2 REMOVING	➡	STEP 3 WASHING	➡	STEP 4 RECOVERY	➡	STEP 5 COOLING

During IMMERSION the sample is immersed in boiling solvent. Then the REMOVING step automatically lowers the level of the solvent to below the extraction thimble. During WASHING the condensed solvent flows over the sample and through the thimble to complete the extraction process. The fourth step involves solvent RECOVERY. Approximately 90% of the solvent used is collected in the internal recovery tank. The final step is the COOLING of the extraction cups containing the extracted matter. The cups are raised to prevent burning. The extraction cups containing the extract are placed in a drying oven, cooled in a desiccator and weighed for the extract percentage calculation.

Sample

3 samples of Cannabis leaf: ID 0772;07373; 0774

Chemicals and Equipment Required

- Analytical balance, min. 3 decimals
- Large extraction cups (Code A00000302)
- Large cellulose thimbles (Code A00000296)
- Butyl seals
- Ethanol as solvent

Sample Preparation

Fix the Extraction thimbles with the Extraction thimbles holders (Code A00000292).
Mix the sample and weigh about 10 g of homogenized sample (M_{sample}) in the cellulose thimble.

Glass Extraction Cups Preparation

Position the extraction thimbles in the extraction cups. The extraction cups containing the extraction thimble can now be placed on the ultra-fast heating plate of SER 158.

Extraction Procedure with SER 158

On the ControlPad™ select "Analysis", and then a customizable method including the following parameters:

- Immersion Time: 25 minutes
- Removing Time: 10 minutes
- Washing Time: 10 minutes
- Recovery Time 5 minutes
- Cooling Time: 2 minutes
- Ethanol, 120 ml

Set the parameter FFU First Finish Up to end the Recovery step when the first position dries.
Close the safety guard and add the solvent using the automatic solvent dispensing system **SolventXpress™** to minimize exposure to the solvent ensuring operator safety.
Press START to begin the extraction process.

Qualitative analysis

At the end of the analysis, remove the extraction cups from the unit. Tare the weight of the sterile sample receiving jar and then pour the cannabis oil sample into it from the extraction cups. The open sample jar is then placed in a vacuum oven for final evaporation of ethanol. All extracted cannabis oil samples were weighed, labeled and numbered for the qualitative analysis of cannabinoids potency, pesticide and heavy metals (pesticide and heavy metals analytical testing are mandatory by the state of California for testing cannabis samples).

Sample 0772 Potency Test Result Method HPLC-DAD American Herbal Pharmacopoeia			Potency Summary	
Target analyte	**% Test**	**mg/g**		
CBDA	ND	ND	Total Calculated Δ9-THC (%)*	4.80
CBGA	0.20	2.03	Total Calculated CBD	ND
CBG	ND	ND	Total cannabinoids (%)	5.61
CBD	ND	ND		
THCV	ND	ND		
CBN	ND	ND		
THCA	4.93	49.32		
Delta 9-THC (Δ9-THC)	0.48	4.76		
Delta 9-THC (Δ9-THC)	ND	ND		
CBC	ND	ND		

Sample 0773 Potency Test Result SOP: SLW-CC Method HPLC-DAD American Herbal Pharmacopoeia			Potency Summary	
Target analyte	**% Test**	**mg/g**		
CBDA	ND	ND	Total Calculated Δ9-THC (%)*	5.68
CBGA	0.22	2.20	Total Calculated CBD	ND
CBG	ND	ND	Total cannabinoids (%)	6.62
CBD	ND	ND		
THCV	ND	ND		
CBN	ND	ND		
THCA	5.89	58.89		
Delta 9-THC (Δ9-THC)	0.51	5.13		
Delta 9-THC (Δ9-THC)	ND	ND		
CBC	ND	ND		

Sample 0774 Potency Test Result SOP: SLW-CC Method HPLC-DAD American Herbal Pharmacopoeia		
Target analyte	% Test	mg/g
CBDA	ND	ND
CBGA	0.20	1.98
CBG	ND	ND
CBD	ND	ND
THCV	ND	ND
CBN	ND	ND
THCA	7.78	37.79
Delta 9-THC (Δ9-THC)	0.33	3.28
Delta 9-THC (Δ9-THC)	ND	ND
CBC	ND	ND

Potency Summary	
Total Calculated Δ9-THC (%)*	3.64
Total Calculated CBD	ND
Total cannabinoids (%)	4.30

*All cannabinoid results calculated in accordance with § 5724. of CA Code of Regulations Title 16
ND= not determined

Conclusion

SER 158, Automatic Solvent extractor, is the ideal solution for extracting cannabis samples matrices followed by HPLC analysis on extracted cannabis oil samples obtaining reliable results.

Benefits of hot solvent extraction (Randall) by using SER158 Automatic Solvent Extractor:

- up to 5 times faster than Soxhlet (hot solvent vs. cold solvent)
- low solvent consumption (high solvent recovery, approximately 90%) - limited cost per analysis
- no exposure to solvent
- worldwide official method
- full traceability with automatic result calculation and on-board archive
- Cloud connectivity to VELP Ermes ensuring software updates, real time monitoring and control, notifications and enhanced service support.

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