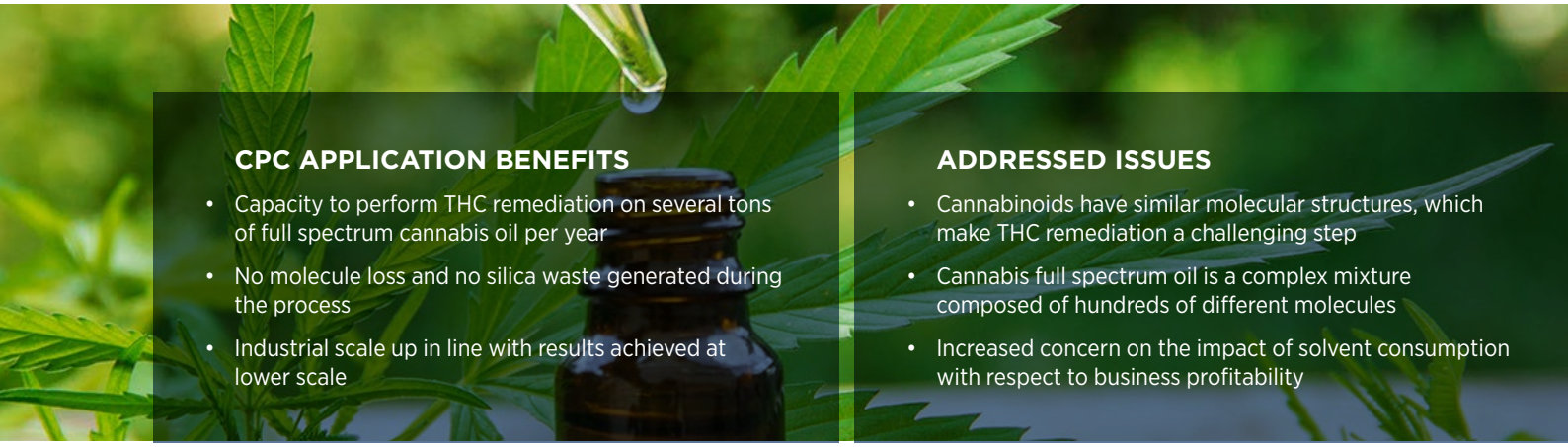
MULTI-TON PROCESSING OF FULL SPECTRUM CANNABIS OIL FOR THC REMEDIATION

BY CENTRIFUGAL PARTITION CHROMATOGRAPHY (CPC)

APPLICATION NOTE AN1040



CPC APPLICATION BENEFITS

- Capacity to perform THC remediation on several tons of full spectrum cannabis oil per year
- No molecule loss and no silica waste generated during the process
- Industrial scale up in line with results achieved at lower scale

ADDRESSED ISSUES

- Cannabinoids have similar molecular structures, which make THC remediation a challenging step
- Cannabis full spectrum oil is a complex mixture composed of hundreds of different molecules
- Increased concern on the impact of solvent consumption with respect to business profitability

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INTRODUCTION

Δ-9-tetrahydrocannabinol (THC) content in cannabis products, such as food supplements, vapes, or medicinal matrices, is strictly regulated in most countries worldwide.

This has fueled demand for **broad spectrum** THC-free oil, and spurred interest in THC remediation technologies applicable at industrial scale level.

CPC is a preferred technology with natural product purification due to its ability to extract, remove or purify a target compound without denaturing or losing other compounds present with it in the sample.

This application note demonstrates the added value of CPC for THC remediation of multiple tons of full spectrum oil.

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MATERIALS AND METHODS

Systems: A Gilson VERITY® CPC Process with a 5 L column connected to a VERITY® SKID LC system (Production LC system) (Figure 1) equipped with a 3 L/min elution pump, 1 L/min injection pump, UV/VIS detector, fraction collector, process control software, and an Ascending/Descending automated valve was used for the purification step. Waters *UPC²* system were used for the CPC purity fraction control.

Solvents : All organic solvents were technical or high-performance liquid chromatography (HPLC) reagent grade, stored in 208 L containers.

Sample: A decarboxylated, dewaxed and filtered, supercritical CO_2 extract from *Cannabis sativa* (Full spectrum oil) was processed. Composition of the full spectrum oil in terms of cannabinoid content is detailed in Table 1.

CPC Method: Multiple automated injections of 250 g of full spectrum oil, diluted in elution solvent, were performed by CPC Ascending mode. Extrusion started after 17 mins of elution for a total run time of 20 mins. Rotation speed was fixed at 1050 rpm.

Figure 1

Gilson VERITY® CPC Process connected to a VERITY® SKID LC system

Table 1

Cannabinoids composition of the processed Full Spectrum Oil Measured by *UPC²*.

Δ9-THC	CBD	CBG	CBC	CBN	Total Cannabinoids
2.42 %	56.12 %	0.63 %	1.77 %	0.30 %	61.24 %

RESULTS AND DISCUSSION

The initial full spectrum decarboxylated oil contained 2.42 % of Δ9-THC with a goal of decreasing the Δ9-THC content to less than 0.3 %.

The quantity injected per run was optimized to the system's limit of capacity in order to achieve the highest productivity for this extract. The limiting factor here was the loss of CBD in the final broad spectrum oil.

Figure 2 shows the content (Weight/Weight) of both CBD and THC in the different fractions obtained after a single CPC run. Three main groups are shown: Group 1 with THC and no CBD, Group 2 as an overlap of CBD and THC, and Group 3 as the CBD-rich broad spectrum oil without, or with a very limited amount, of THC.

Figures 3 and 4 show the UPC² analysis of Groups 2 and 3. Group 2 is a mix of THC (Rt 4.036 min) and CBD (Rt 3.694 min). The final composition of Group 3 (THC-free fraction) as a broad spectrum oil has less than 0.1 % of THC and more than 90 % of CBD.

The goal here was to focus on Group 3, but as a perspective Group 1 and 2 could also be used commercially for other purposes.

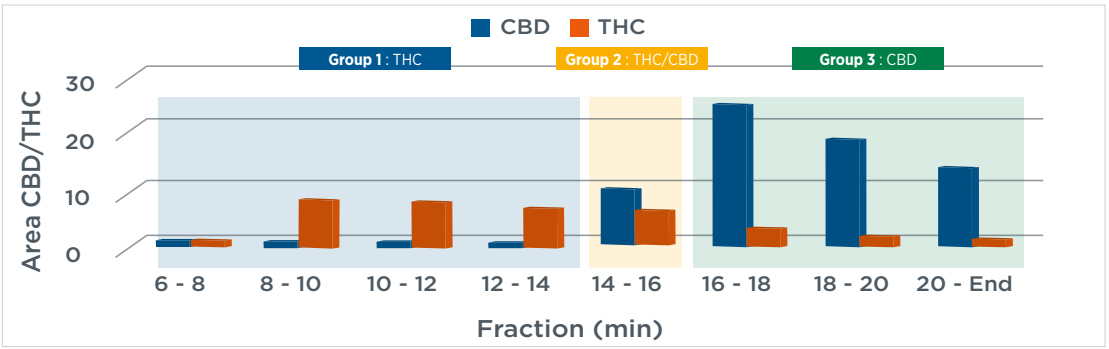

Figure 2

CBD and THC Content in CPC Fractions from the VERITY® SKID LC system

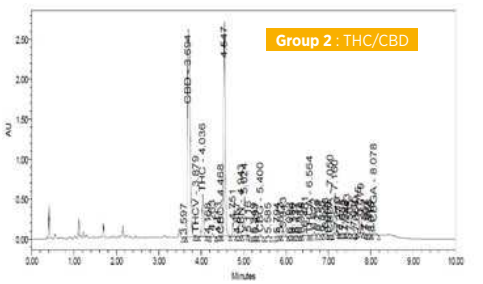

Figure 3

UPC² analysis group 2

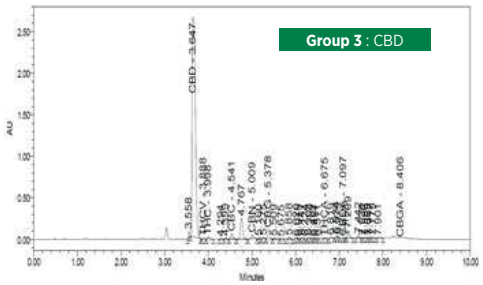

Figure 4

UPC² analysis group 3

The total run time is 20 min for each 250 g injected, which equates to 18 kg of full spectrum oil processed per day and 6.6 tons processed per year considering the system is fully automatic. Productivity and solvent consumption for THC remediation from full spectrum oil is detailed in Table 2.

Table 2

Productivity and Solvent Consumption for THC Remediation from Full Spectrum Oil

Injected Extract (g/run)	Injected Extract (kg/8hrs)	Productivity (t/year)	Solvent Consumed (L/run)	Solvent Consumed (L/kg injected)
250	6	6.6	11	44

Note: Result assuming the VERITY® CPC Process 24/7, fully automatic operating mode and solvent recycling >95 %.

CONCLUSIONS AND BENEFITS

Contrary to silica based chromatography, CPC implies no irreversible adsorption, loss, or denaturation of the injected extract. These features allow for recovery of all compounds processed by CPC. In this study, three goals were achieved:

- THC remediation to obtain a broad spectrum THC free oil containing less than 0.1 % THC.
- Scale up and optimization of the method for processing multi-tons of cannabis extract per year on a GMP compatible system.
- Containment of opex costs to perform at less than 10 € (44 L) in solvents consumed per kg of injected extract.

REFERENCES

1. Improving the Purification and Extraction of Natural Products with Centrifugal Partition Chromatography, LCGC eBook, February 2019.
2. Centrifugal partition chromatography's new use: medical marijuana (nature.com), (https://www.nature.com/articles/d42473-018-00066-4)