Scientific Letters

Poster Communication 46

Exploring cannabinoid profile changes during cannabis flower decarboxylation, extraction, and purification

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Abstract

Background: *Cannabis sativa* L. has become widely cultivated. The inflorescences, resins, and oils derived from this plant are employed for both medicinal and recreational purposes, primarily due to the effects associated with cannabinoids such as cannabidiol (CBD) and the psychoactive Δ^9-tetrahydrocannabinol (Δ^9-THC). However, cannabis plants biosynthesize these compounds in their acidic forms, necessitating a decarboxylation process during the extraction phase [1]. Moreover, depending on the final formulation, the extracts may undergo further purification before being incorporated into the final product. These steps enhance the quality of the end product and increase its attractiveness to consumers [2]. **Objective:** This research aims to understand the variations in Δ^9-tetrahydrocannabinolic acid (Δ^9-THCA), Δ^9-THC, and cannabinol (CBN) during the sample processing of the THC-rich cultivar Z-Face. The processing steps include the decarboxylation of acidic cannabinoids, Soxhlet extraction, and purification of extracts through winterization and activated charcoal treatment. **Methods:** Decarboxylation was performed at 120 ºC for 1 hour. This was followed by a 2-hour Soxhlet extraction with 96% ethanol to extract cannabinoids. The solution underwent winterization at -80 ºC for 24 hours to remove waxes and lipids. Finally, 50% (w/w) activated charcoal was added and mixed for 1 hour to remove chlorophyll and other pigments. Cannabinoid quantification was conducted using an Agilent 1260 Infinity II HPLC-DAD system, equipped with an InfinityLab Poroshell 120 EC-C18 column (3.0 x 150 mm, 2.7 µm) [3]. **Results:** Each step was refined by: (i) Conducting decarboxylation studies at varying temperatures and durations to effectively convert Δ^9-THCA into Δ^9-THC, while achieving minimal CBN formation; (ii) Optimizing Soxhlet extraction time and number of cycles; (iii) Determining the appropriate winterization temperature and duration; and (iv) Examining the percentage of activated charcoal used, along with the temperature and duration of treatment. **Conclusions:** The extraction and processing of THC-rich Z-Face flowers, initially containing 16.5% Δ^9-THCA (15.6% total Δ^9-THC), resulted in final extracts with 58.9% Δ^9-THC, corresponding to an 8.9% enrichment during the purification steps.

Keywords: cannabis; Δ^9-THC; Soxhlet extraction; THCA decarboxylation

Acknowledgments/Funding

This work was founded by Avextra Portugal SA. The authors also acknowledge financial support through the annual funding of 1H-TOXRUN of the University Institute of Health Sciences (IUCS-CESPU).

References

1. Silva, E.M.P. et al. Recent HPLC-UV Approaches for Cannabinoid Analysis: From Extraction to Method Validation and Quantification Compliance. *Pharmaceuticals* **2025**, *18*, 786–786, doi:10.3390/ph18060786.
2. López-Olmos, C. et al. Comprehensive Comparison of Industrial Cannabinoid Extraction Techniques: Evaluation of the Most Relevant Patents and Studies at Pilot Scale. *Front Nat Prod* **2022**, *1*, doi:10.3389/fntpr.2022.1043147.
3. Morais, A.F. et al. Optimization and validation of an HPLC-DAD Method for the Identification of 14 Cannabinoids: Application in *Cannabis sativa* L extracts. *Sci Lett* **2025**, *1* (Sup 1), doi:10.48797/sl.2025.319.