

Development and Validation of a Fast GC/FID Method for the Simultaneous Determination of Terpenes and CBD in Hemp (*Cannabis sativa L.*)

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Hemp (*C. sativa L.*) is widely used in food formulations, in particular the consumption of seeds, oil and flour has gradually expanded into the natural product market sold for nutritional and health benefit. Until now, literature reports just few applications of leaves, since they represent one of the main by-products. However, leaves contain bioactive compounds such as terpenes, flavonoids, cannabidiol (CBD), cannabidiolic acid (CBDA) and other antioxidant compounds which could be used as flavors, antimicrobial compounds or preservatives. Terpenes are the major components of essential oils responsible for the distinctive aromas and flavors. Up to date, the terpenes are mostly studied in inflorescences by expensive techniques such as solid phase micro-extraction technique coupled to mass spectrometry (SPME-GC/MS). On the other hand, CBD is widely determined by GC/MS and LC/DAD or LC/MS. Thus, a routine method for simultaneous determination of terpenes and CBD in hemp based on Fast gas chromatography coupled to flame ionization detector (Fast GC/FID) was developed and validated. The extraction of terpenes and CBD from apical fresh leaves (*C. sativa* cv. Henola) and inflorescences (*C. sativa* cv Carmagnola) by pure ethanol was carried out. The study resulted in a fast detection of 29 different terpenes and CBD (total analysis time <16 min) without derivatization, with a satisfactory sensitivity (LOD=0.03 – 0.27 $\mu\text{g/mL}$, LOQ=0.10 – 0.89 $\mu\text{g/mL}$) and repeatability (interday RSD was <7.82 %, whereas the intraday RSD was <3.59 %). The recoveries on both apical leaves (78.55 – 101.52 %) and inflorescences (77.52 - 107.10 %) at two levels were determined with a reproducibility (RSD) lower than 5.5 %. On the basis of above-mentioned results, the developed routine Fast GC/FID method could be an alternative for a fast, robust and high sensitive determination of main terpenes and total CBD present in hemp.

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