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Pharmaceutical and biomedical analysis of cannabis extracts: a critical review

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Highlights

- Sample preparation strategies for the extraction of cannabinoids are described for plant and biological matrices
- Techniques for cannabinoids analysis are described with advantages and drawbacks
- Chromatographic methods are compared in terms of selectivity and sensitivity
- Detection methods are presented based on the specific aim of the cannabinoids analysis

Abstract

Cannabis products have recently regained much attention due to the high pharmacological potential of their cannabinoid content. In this review, the most widely used sample preparation strategies for the extraction of cannabinoids are described for the specific application to either plant materials or biological matrices. Several analytical techniques are described pointing out their respective advantages and drawbacks. In particular, chromatographic methods, such as TLC, GC and HPLC, are discussed and compared in terms of selectivity and sensitivity. Various detection methods are also presented based on the specific aim of the cannabinoids analysis. Lastly, critical considerations are mentioned with the aim to deliver useful suggestions for the selection of the optimal and most suitable method of analysis of cannabinoids in either biomedical or cannabis derived samples.

Keywords*: cannabis, cannabinoids, liquid chromatography, gas chromatography.*

Abbreviations: AcOH, acetic acid; ACN, acetonitrile; APCI, atmospheric pressure chemical ionization; BSTFA, *N*,*O*-bis(trimethylsilyl)trifluoroacetamide; CBCA, cannabichromenic acid; CBC, cannabichromene; CBDA, cannabidiolic acid; CBD, cannabidiol; CBDVA, cannabidivarinic acid; CBDV, cannabidivarin; CBE, cannabielsoin; CBGA, cannabigerolic acid; CBGAM, CBGA monomethyl ether; CBG, cannabigerol; CBGM, CBG monomethyl ether; CBGV, cannabigerovarin; CBLA, cannabicyclolic acid; CBL, cannabicyclol; CBLV, cannabicyclolvarin; CBNA, cannabinolic acid; CBN, cannabinol; CBT, cannabitriol; CBV, cannabivarin; CFL-A, cannaflavin A; CFL-B, cannaflavin B; $CHCl_3$, chloroform; Chex: cyclohexane; CL, chemiluminescence; CPE, cloud point extraction; DAD, diode array detector; DCM, dichloromethane; EI, electron impact; ESI, electrospray ionization; EtOAc, ethyl acetate; EtOH, ethanol; Et_2O, diethyl ether; FA, formic acid; FID, flame ionization detector; FLD, fluorescence detector; FT-IR, Fourier Transform infrared spectroscopy;

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