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Livin' the High Life - Detection, Differentiation, and Quantification of Cannabinoids in Edible and Non-Edible Complex Matrices by Ambient Ionization Mass Spectrometry

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Abstract: The growing Cannabis industry has contributed to the rise in the recreational use of Cannabis sativa, as well as products derived from or prepared with cannabinoids. The demand for new analytical methods for testing CBD (cannabidiol)- and THC (Δ9-tetrahydrocannabinol)-infused products has also increased due to the ever-changing complex matrices and the inadequate conventional chromatography techniques that are resource-intensive to perform and require extensive sample preparation. Therefore, to address these difficulties, this study focused on the application of direct analysis in real time – high-resolution mass spectrometry (DART-HRMS) for the rapid detection, differentiation, and quantification of CBD and THC in complex matrix samples, such as edibles and personal-care products. When analyzed by ambient mass spectrometry under soft ionization conditions, THC and CBD are indistinguishable because they are isomers with a protonated monoisotopic mass of 315.2324. Thus, a means by which to differentiate between them is of importance to this approach. Previous findings demonstrated that derivatization using N-methyl-N-(trimethylsilyl)trifluoroacetamide (MSTFA) can reveal the presence of the cannabinoids within a complex matrix. Engagement of the one -OH group in THC and the two -OH groups in CBD by MSTFA results in the differentiation of the two compounds due to the protonated mass disparities: m/z 387.2719 and 459.3114 for THC and CBD, respectively. Gummy candies, chocolates, marshmallows, and body balms infused with CBD and THC were treated with MSTFA and analyzed by DART-HRMS to determine the cannabinoid concentration(s). In summary, the detection, differentiation, and quantification of cannabinoids by DART-HRMS can be readily and rapidly accomplished.