

Rapid determination of cannabinoids in edibles by thermal desorption-GC/MS (1)

[Background] For a variety of reasons, the analysis of cannabinoids, in a diverse array of substances, is of interest on a global scale. One of the more difficult substances to work with are food products which are often referred to as 'edibles'. 'Edibles' can be solids or liquids. Currently, elaborate sample preparation procedures are necessary to isolate the cannabinoids from very complex matrices. This note describes the analysis of cannabinoids in 'edibles', by thermal desorption (TD)-GC/MS which eliminates the drawbacks inherent in all conventional solvent extraction techniques.

[Experimental] The TD-GC/MS system consists of a Multi-Shot Pyrolyzer (Frontier Labs) directly interfaced to the injector of a GC/MS system. First, evolved gas analysis (EGA) measurement was done on a Δ^9 -tetrahydrocannabinol (THC) standard solution (100 ppm) with the furnace temperature from 100 to 800 °C (20 °C/min), to determine the optimal TD temperature zone. The determined temperature zone for TD-GC/MS was 100 to 300 °C (20 °C/min). 0.1 - 0.4 mg of commercial cannabis-infused chocolate brownie (labeled as 100 mg THC/100 g brownie, Fig. 1) was placed in a sample cup for analysis. Using a standard mixture (methanol solution) containing 100 ppm each of cannabidiol (CBD), THC, and cannabinol (CBN), the concentration of each cannabinoid contained in the brownie was determined using the standard addition method.

[Results] TD-GC/MS results are shown in Figs. 2 and 3 for the brownie sample spiked with 0, 100, and 300 ng of the standard mixture. From the peak area of THC, a standard addition calibration curve was constructed (Fig. 4), and the THC concentration in the sample was determined to be 0.996 mg/g which is in excellent agreement with the concentration printed on the product label, with a reproducibility (RSD) of 4.6 % (n=3).



Fig. 1 Cannabis-infused chocolate brownie

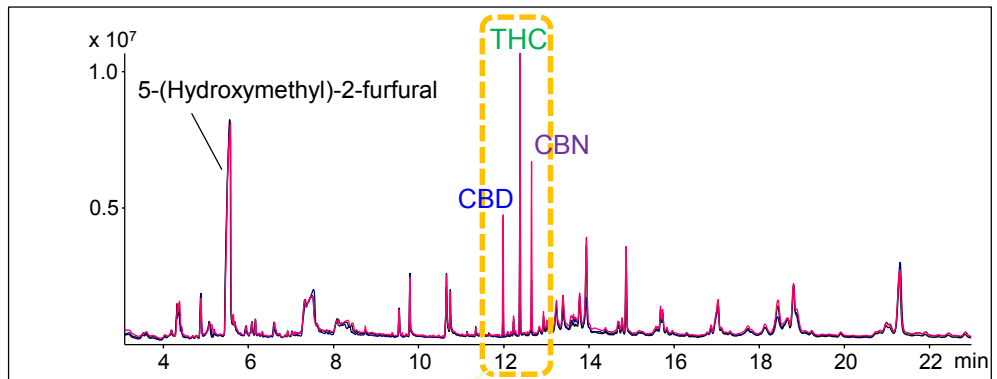


Fig. 2 Overlaid TD chromatograms of the sample spiked with 0, 100, and 300 ng of the standard mixture.

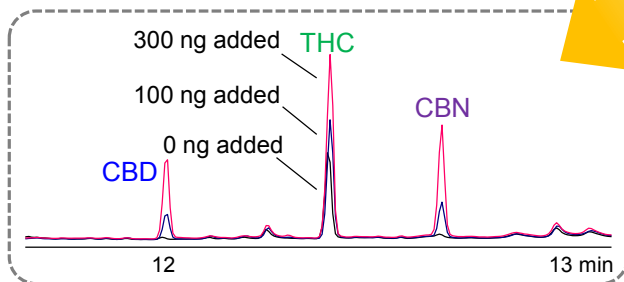


Fig. 3 Expanded TD chromatograms of the above traces designated by orange-colored rectangular area

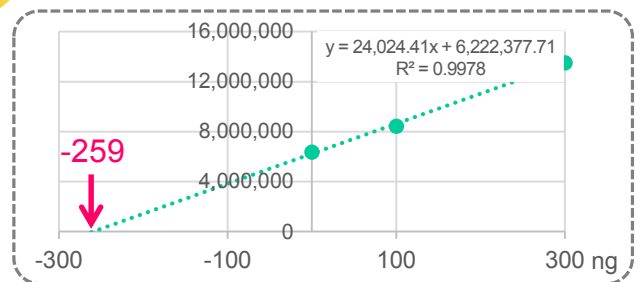


Fig. 4 Standard addition calibration curve for THC
X intercept: -0.259 µg, Sample amount: 0.260 mg

Product label: 1 mg/g
THC concentration: 0.996 mg/g

[EGA-MS] Furnace temp. : 100 - 800 °C (20 °C/min), EGA tube : UADTM-2.5N (L=2.5 m, i.d.=0.15 mm), Flow rate : 1.0 mL/min (helium), Split ratio : 1/20, GC oven temp. : 300 °C, Scan range : m/z 29 - 600, Scan rate : 0.2 scan/s, Sample amount : ca. 0.4 mg
[TD-GC/MS] Furnace temp. : 100 - 300 °C (100 °C/min), 1 min hold, GC oven temp. : 80 °C (2 min hold) - 20 °C/min - 320 °C (10 min hold), Separation column : UA5-30M-0.25F (L=30 m, i.d.=0.25 mm, df=0.25 mm), Flow rate : 1.0 mL/min, Split ratio : 1/20, Scan range : m/z 29 - 600, Scan rate : 3 scan/s, Sample amount : ca. 0.260 mg.

Keywords : Edible, Cannabinoids, THC, CBD, CBN, EGA, TD-GC/MS, Brownie, Standard addition, Calibration curve

Products used : Multi-functional pyrolyzer, UADTM-2.5N, UA-5+, Vent-free GC/MS adapter

Applications : Additives analysis

Related technical notes :

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