

# Rapid determination of cannabinoids in edibles by thermal desorption-GC/MS (2)

**[Background]** The quantitative analysis of cannabinoids in edibles is a challenging task because of their very complex matrices. A previous technical note (PYA1-99E) described the determination of cannabinoids in brownies. This note describes the analysis of cannabinoids in a chocolate bar using thermal desorption (TD)-GC/MS.

**[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  $\Delta^9$ -tetrahydrocannabinol (THC) standard solution (100 ppm), the optimal temperature zone for the subsequent TD-GC/MS analysis was determined to be 100 to 300 °C (20 °C/min). Approximately 0.1 mg of a commercial cannabis-infused chocolate bar (labeled as 100 mg THC/50 g chocolate, 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 chocolate was determined using the standard addition method.

**[Results]** TD-GC/MS results are shown in Figs. 2 and 3 for the chocolate sample spiked with 0, 100, and 300 ng of the standard mixture. Using the THC peak area, a standard addition calibration curve was constructed (Fig. 4), and the THC concentration in the sample was determined to be 2.10 mg/g with RSD of 4.6 % ( $n=3$ ), which is in excellent agreement with the concentration printed on the product label.



Fig. 1 Cannabis-infused chocolate bar

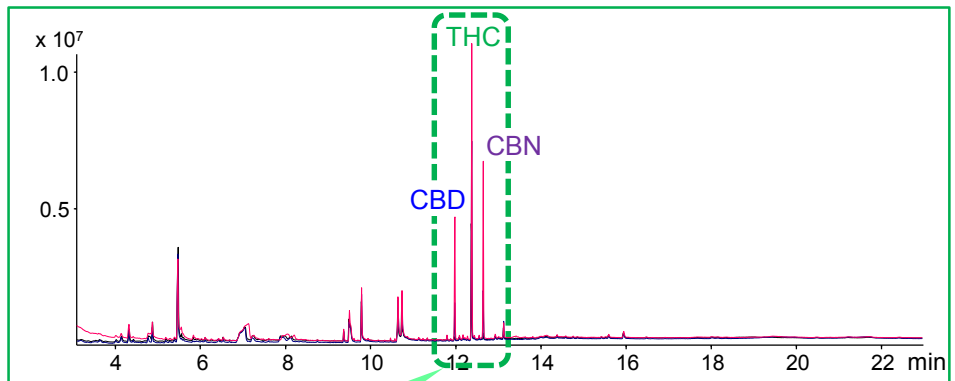


Fig. 2 Overlaid TD chromatograms of the sample spiked with 0, 100, and 300 ng of the standard mixture.

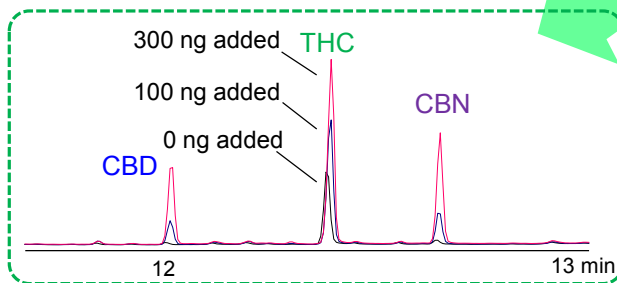


Fig. 3 Expanded TD chromatograms shown in Fig. 2

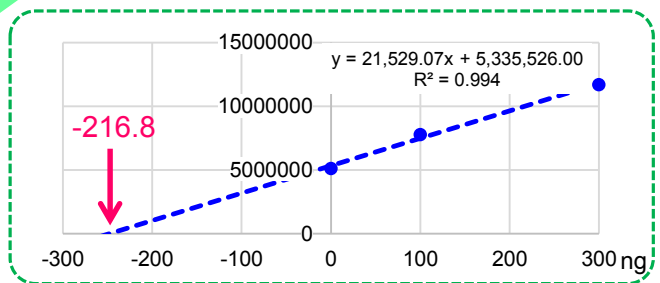


Fig. 4 Standard addition calibration curve for THC

X intercept: -0.217  $\mu$ g, Sample weight: 0.105 mg

THC on label: 2 mg/g  
 THC concentration: 2.10 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 weight : ca. 0.1 mg.

**Keywords :** Edible, Cannabinoids, THC, CBD, CBN, EGA, TD-GC/MS, Chocolate bar, 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 :** [PYA1-099E](#)

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