Comparative Analysis of Tobacco and Cannabis Particulate Matter using SPME-GC×GC-TOFMS

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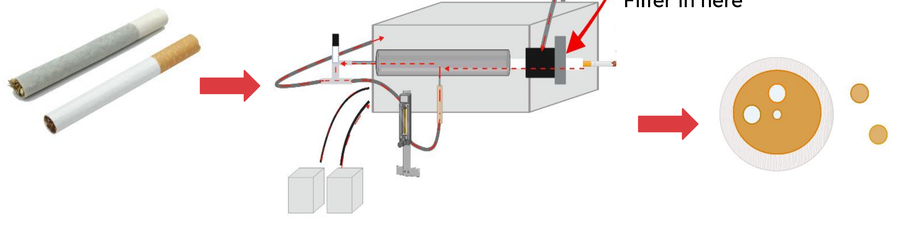
Introduction and Objectives

Despite tobacco cigarette smoking being a well-known and extensively studied health hazard, the understanding of cannabis smoke and its potential health hazards remains lacking, highlighting the need for further investigation. To bridge that information gap, solid-phase microextraction (SPME) was chosen as the technique to extract cannabis and tobacco smoke particulate. This technique offers significant advantages such as simplicity, reduced solvent consumption, versatility across sample matrices, enhanced sensitivity, and low cost, making it a valuable technique high-throughput analysis of volatile organic compounds (VOCs). The analysis utilized small 2mm punches of smoked quartz filters placed into an empty 20 mL screw cap vial. The extracts were analyzed by two-dimensional gas chromatography-time of flight mass spectrometry (GC×GC-TOFMS).

Materials and Methods

Sampling Process

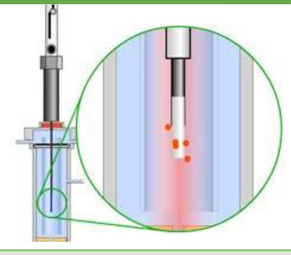


Tobacco cigarettes and cannabis joints

Smoking Machine Profile: Health Canada Intense (10 puffs)

Smoked quartz filter and 2 mm punch

Extraction Technique: SPME



5 min incubation 70 °C; 15 min extraction at 70°C; 2 min desorption at 250°C

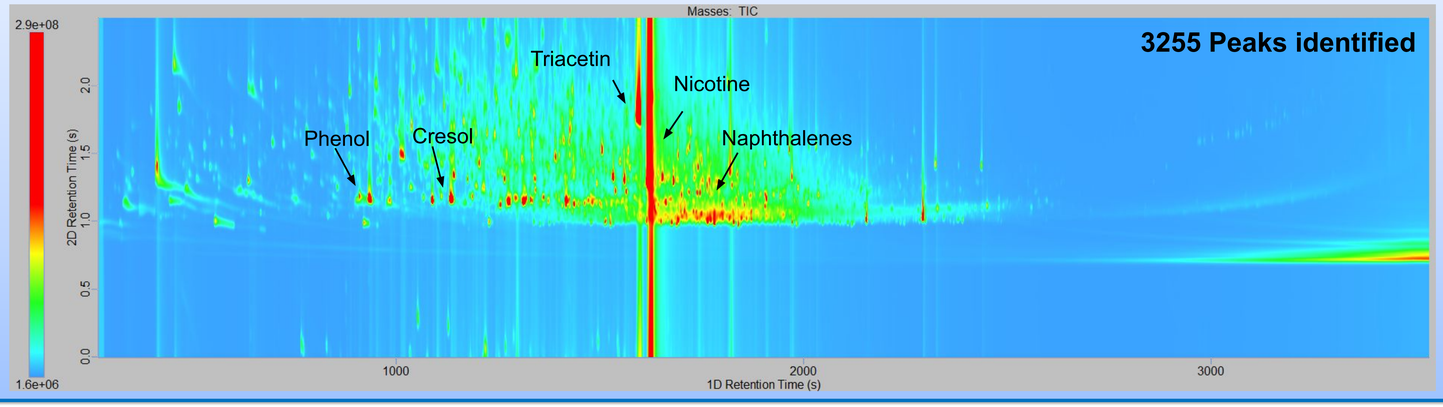
Analysis by GC×GC-TOFMS

59 min GC×GC run time 2.5 s PM
60 m × 0.25 mm; 0.25µm Rxi-5SilMS for 1D
1.4 m × 0.25 mm; 0.25µm Rtx-200MS for 2D

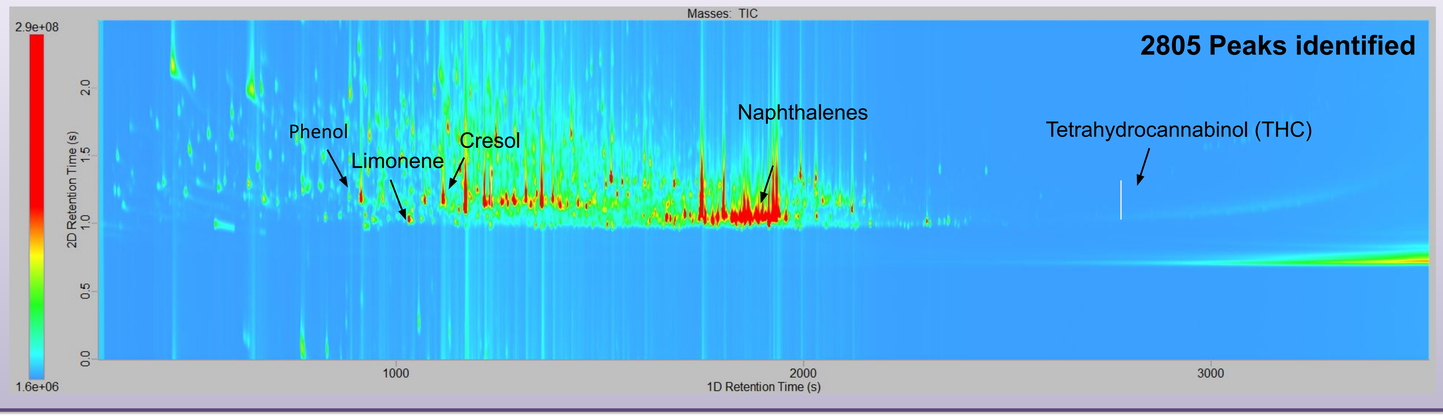
Oven temperature program: 50°C to 300 °C (ramp of 5 °C per min)

Results

Tobacco



Cannabis



Conclusions

SPME offers the extraction of a myriad of VOCs compounds present in smoke particulate. Several known carcinogenic and health hazard compounds from pyrolysis reactions are present in both cannabis and tobacco smoke, such as PAHs, aldehydes, phenols, cresols, etc.

Tobacco: specific nitrosamines were not found in this analysis.
Cannabis: cannabinols were not predominant using this extraction technique.

Future studies should look at identifying specific relevant compounds to contribute to the understanding of cannabis and tobacco smoke chemistry.

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