TERPENE ANALYSIS IN CANNABIS

Headspace Analysis of Terpenes using Gas Chromatography-Ion Mobility Spectrometry

INTRODUCTION

Terpenes are a diverse class of organic compounds produced by various plants, including cannabis. They play a crucial role in aroma and flavor profiles of cannabis strains and are believed to contribute to the therapeutic effects of the plant.[1] Accurate analysis of terpenes is essential for quality control, strain differentiation, and research into the pharmacological properties of cannabis. This application note outlines the use of a headspace analyzer for the quantification and identification of terpenes in cannabis samples.

Headspace analysis is a highly effective technique for analysis of the volatile compounds present in solid or liquid samples. By analyzing the gas phase above a sample, this method minimizes the influence of the sample matrix and therefore can optimize the detection of volatile compounds. It is particularly suitable for terpene analysis due to the volatile nature of these compounds.

The analysis typically targets a range of terpenes commonly found in cannabis, including: Myrcene, Limonene, Pinene, Linalool or Caryophyllene, e.g.

FlavourSpec®25: Automated Headspace Sampler coupled with Gaschromatograph-Ion-Mobility-Spectrometer.

Terpene Analysis in Cannabis

Methodology

Sample Preparation:

1. *Sample Collection*: Fresh or dried cannabis samples should be collected and stored in airtight containers to prevent degradation of volatile compounds.

2. *Weighing*: Approximately 1-2 grams of the sample is weighed and placed in a headspace vial.

3. *Sealing*: The vial is sealed with a crimp cap to maintain a closed system during analysis.

Analytical Procedure:

1. *Vial Conditioning*: The sealed vial is heated (typically between 60-80°C) for a predetermined time to allow terpenes to equilibrate within the headspace.

2. *Sampling*: A portion of the headspace gas is injected into the GC system for analysis.

3. *Separation and Detection*: The terpenes are separated in the GC column and identified using the IMS. Retention times and drift times within the GC-IMS Library (part of the VOCal software) are compared with standard libraries for identification.

Data Analysis:

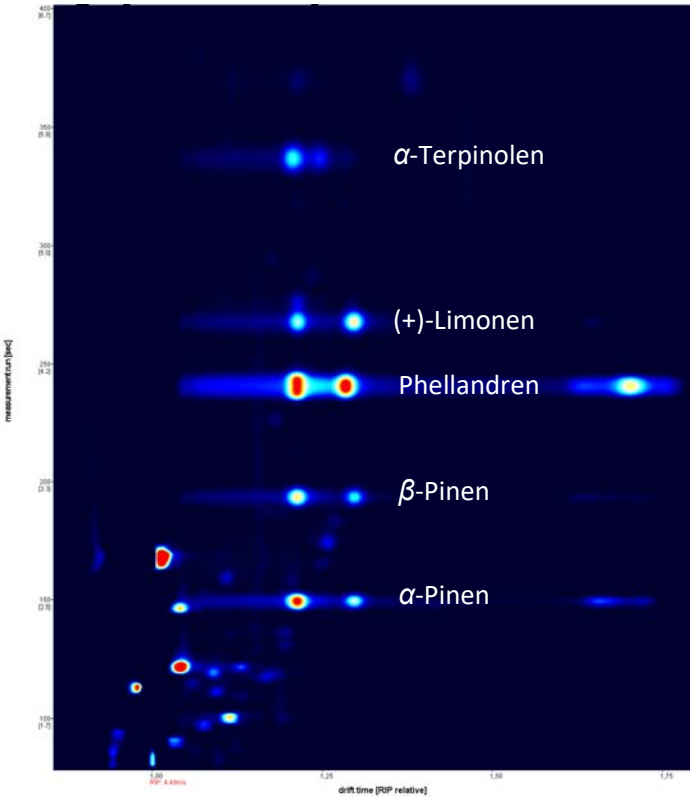
Qualitative analysis relies on library matching and retention times. Additionally, GC-IMS technology offers 3-dimensional data exhibiting extraordinary possibilities with regards to analysis methods.

Tailor-Made Device Setup

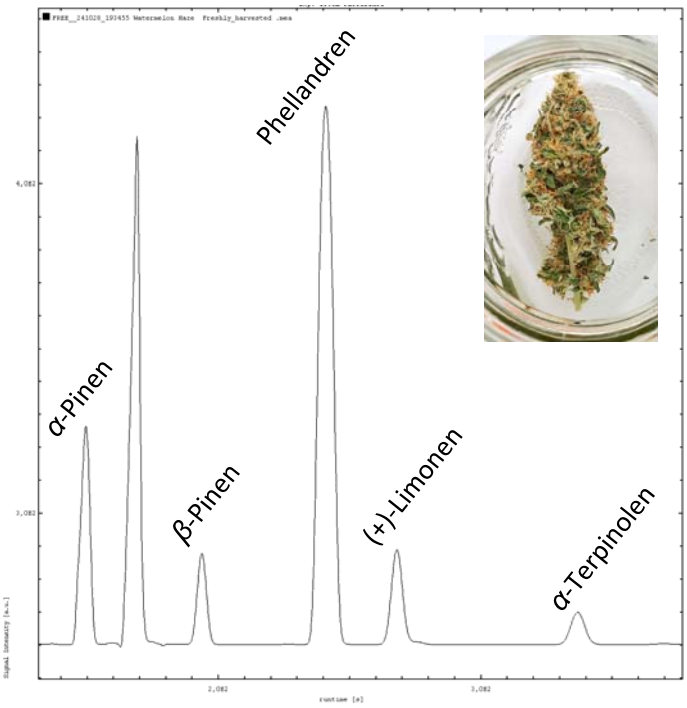
The FlavourSpec®25 can be delivered in a prepared setup including pre-evaluated GC column, GC program and also pre-evaluated terpene area sets. The pre-evaluated area sets will specify the unique retention and drift time of a certain terpene.

Conclusion

Headspace analysis is a robust and reliable method for the quantification and identification of terpenes in cannabis. With its ability to provide valuable insights into the aromatic and therapeutic properties of different strains, this analytical approach is essential for breeders, producers, and researchers in the cannabis industry. Utilizing a headspace analyzer can enhance product quality, support regulatory compliance, and advance scientific understanding of cannabis compounds.



GC-IMS data of freshly harvested cannabis. The unique fragmentation pattern of terpenes can be clearly seen. GC run time: ~ 6min.



Corresponding chromatogram of freshly harvested cannabis “Strawberry Haze”. GC run time: ~ 6min.

[1] Sommano SR, Chittasupho C, Ruksiriwanich W, Jantrawut P. The Cannabis Terpenes. Molecules. 2020 Dec 8;25(24):5792. doi: 10.3390/molecules25245792. PMID: 33302574; PMCID: PMC7763918.

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