

# FIRST SCIENTIFIC STUDIES of BEEHIVE AIR COMPOSITION



Recklies K., Kuhn F., Speer K.

Dresden University of Technology,  
Chair of Food Chemistry and Food Production, Dresden, Germany



## Introduction

Within the last few years, "beehive air inhalation" has become more and more popular in api-therapy. Especially, respiratory illnesses such as COPD, bronchitis, and asthma, seem to improve from "beehive air treatment". So far, clinical and scientific studies are hardly available. Therefore "beehive air therapy" is not recognized as an alternative cure in Germany. Reputable scientific investigations are required.

In August 2017, volatile organic components (VOCs) of beehive air were analyzed at the Dresden University of Technology using various "air sampling" techniques. Hereby, an adaptation of the established GC-MS method for the analysis of honey-flavoring substances to the new matrix "beehive air" proved to be successful [1, 2]. To measure the air composition of the beehive, a self-built part was constructed based on the commercially available Beecura system in Germany (Figure 1) [3].



Figure 1: Beehive air inhalation system by German patent (left) and self-built system (right)

## Methods and materials

Mobile Solid Phase Micro-Extraction (mSPME) and Thermal Desorption Tubes (TD) qualified as suitable systems for sampling the VOCs from beehive air were optimized for the matrix "beehive air". The mSPME was used for the screening of the VOCs and TD for the quantification (Figure 2).

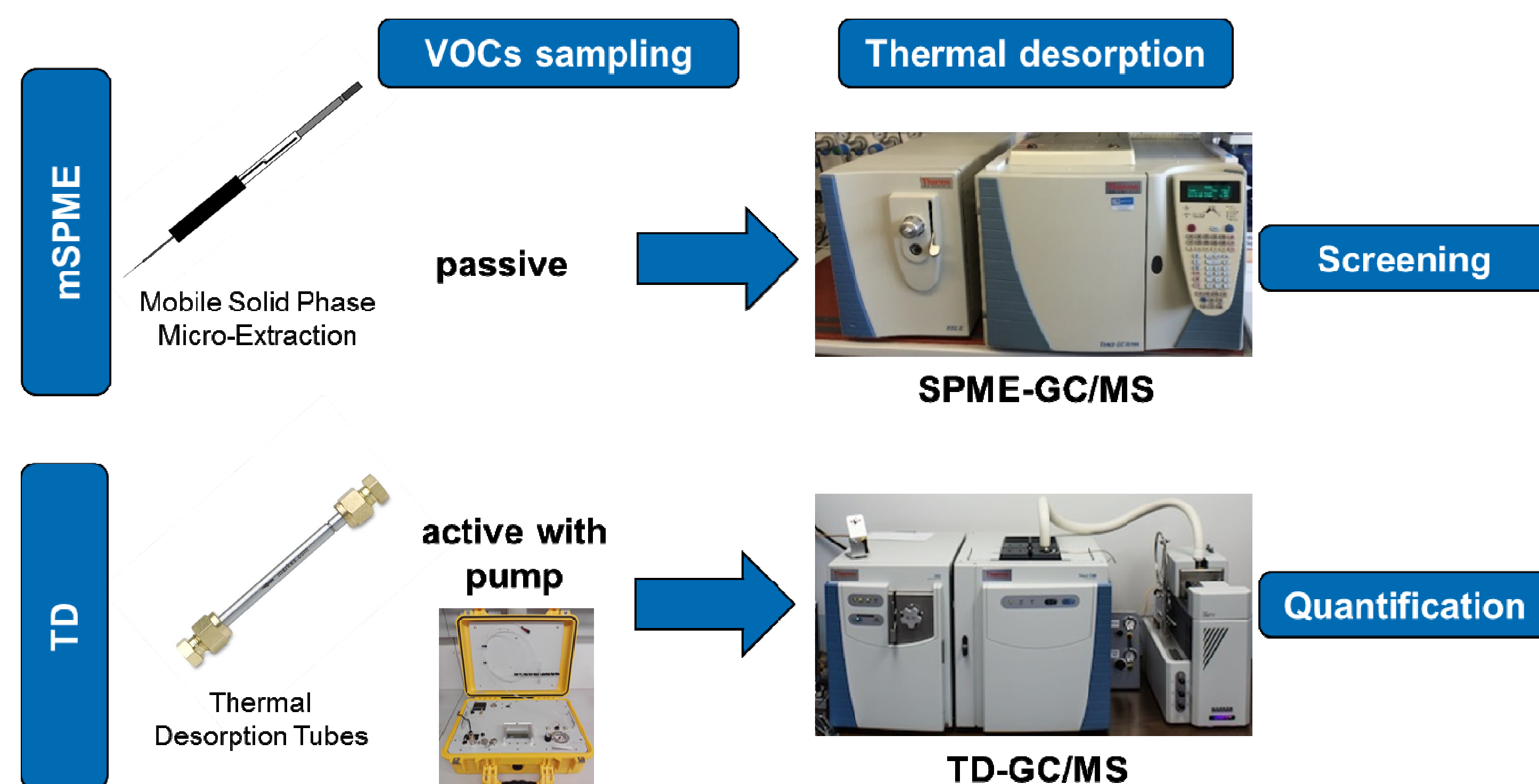


Figure 2: Screening & quantification of VOCs by SPME- and TD-GC/MS

## Results

### ❖ Screening by Solid Phase Micro-Extraction (SPME)

The assignment of the VOCs showed that the substances identified in the beehive air originated predominantly from propolis and beeswax. On the other hand, the lowest number of VOCs was detected in pollen, honey, drone maggots, and royal jelly (examples shown in Figure 3).

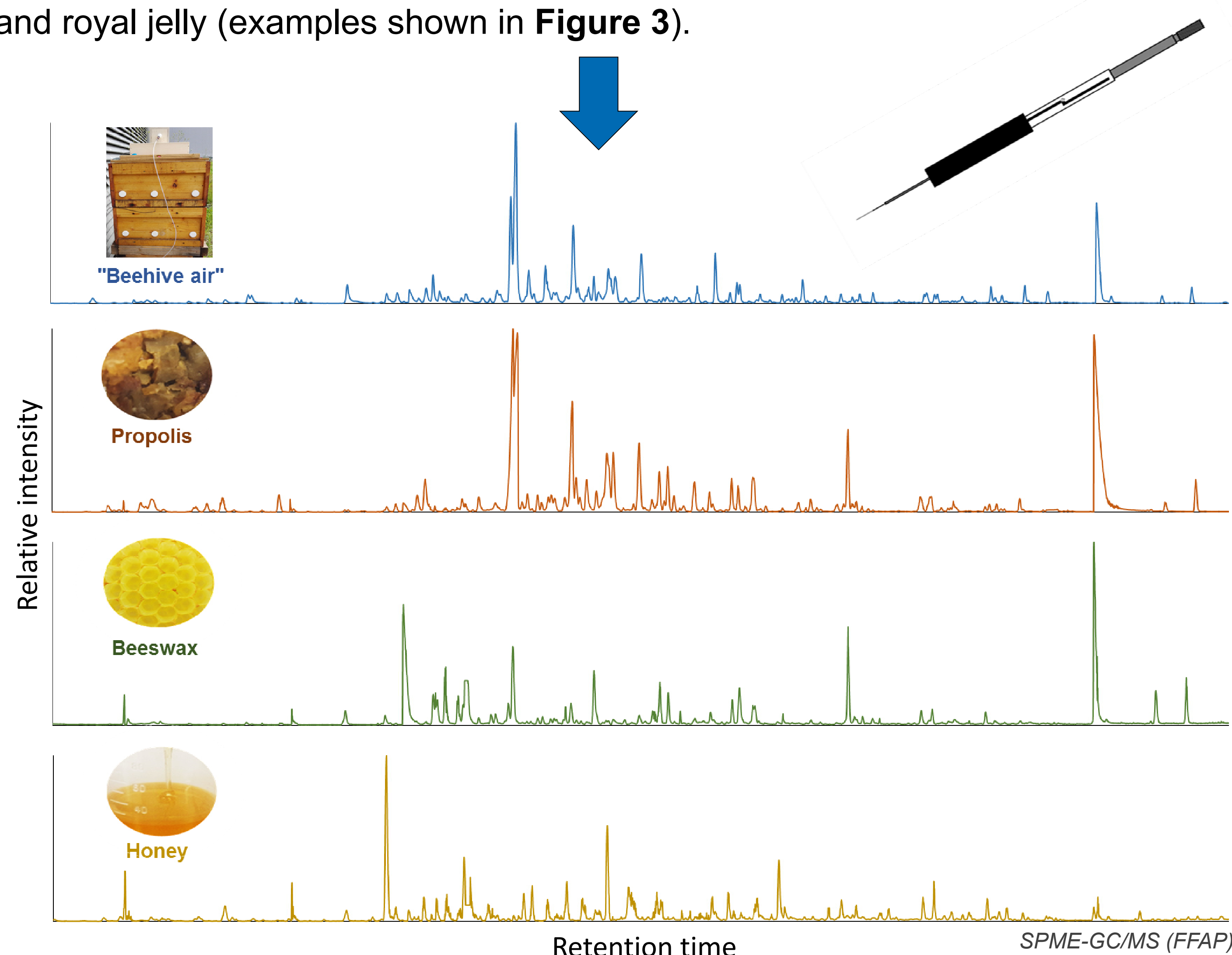


Figure 3: TIC profiles of bee products in comparison to the "beehive air" by SPME-GC/MS

### ❖ Quantification by Thermal Desorption Tubes (TD)

More than fifty VOCs were detected both with SPME and TD in the beehive air. 42 of these substances could be identified by standards or retention time indices (Figure 4). A first quantification of ten VOCs using TD-GC/MS revealed very low concentrations ranging from 0.08 to 4.57 ng/L beehive air.

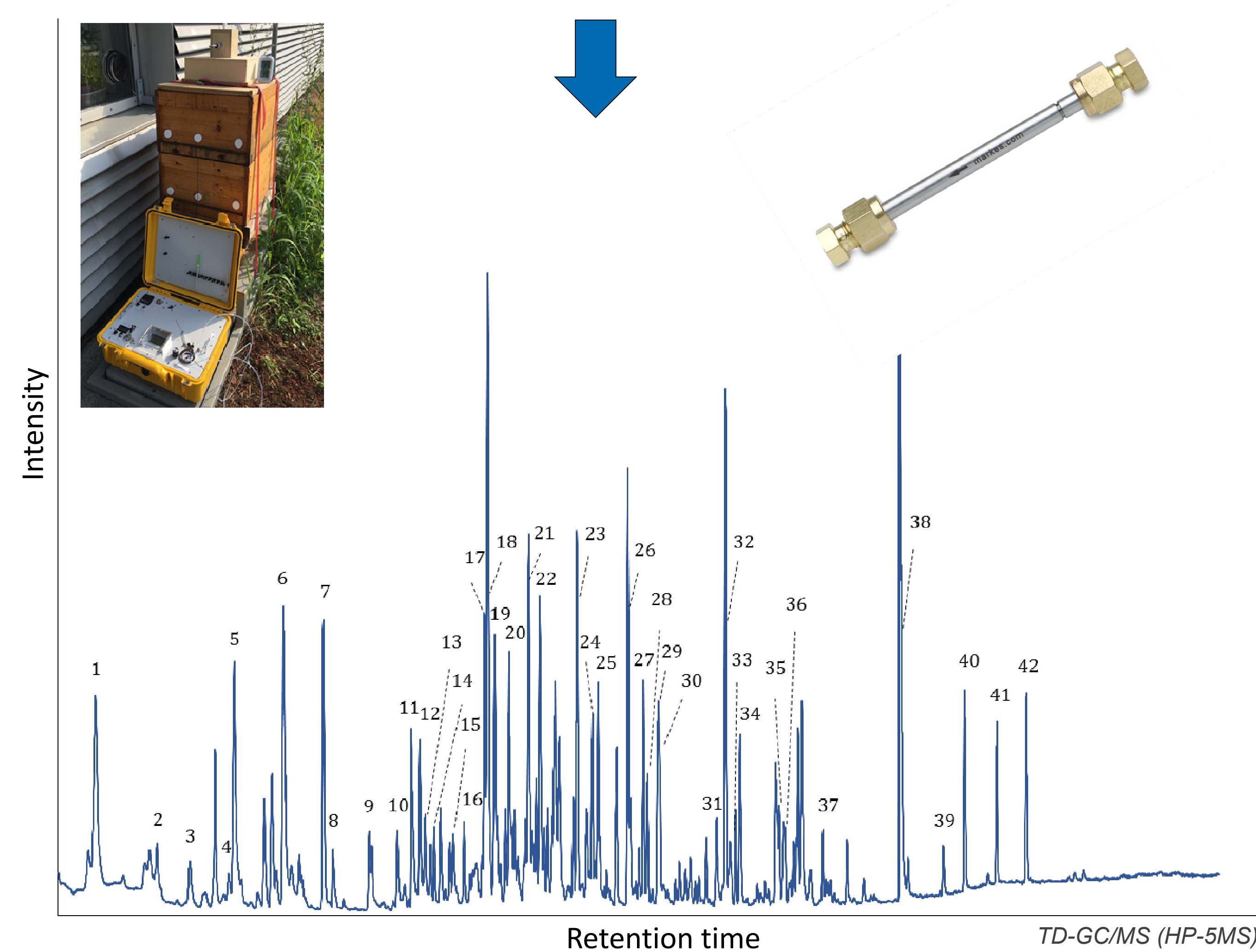


Figure 4: TIC profile of the "beehive air" by TD-GC/MS, identification of 42 VOCs

## Summary

Solid Phase Micro-Extraction (SPME) and Thermal Desorption (TD) are suitable for analyzing VOCs. The majority of the more than fifty VOCs detected have their origin in propolis and beeswax, followed by honey and pollen. A first quantification revealed only low levels of VOCs in the nanogram per liter range.

## References

- [1] Oelschlaegel S. (2011), Characterization of unifloral honeys using HS-SPME/GC/MS, 42nd APIMONDIA, Buenos Aires, Argentina.
- [2] Smith et al. (2002), Volatile and semi-volatile organic compounds in beehive atmospheres, in book: Honey Bees, pp.12-41.
- [3] Schmiedgen J. (2016), Patent No. DE202015008332 U1.

karl.speer@chemie.tu-dresden.de

## Acknowledgement

Many thanks to the Imkerverein Dresden e. V. and the Landesuntersuchungsanstalt Chemnitz (LUA) for their support with the measurements.