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GC APPLICATION FOR β-CARYOPHYLLENE QUANTITATIVE ANALYSIS

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Aim of the study: It is widely known that insect pests are attracted not only by sex pheromones, but also by the odor of volatile compounds emitted by different plant parts. One of the classes of such compounds are terpene hydrocarbons, which have a specific smell and aroma.

The content of one of the terpenes, namely β-caryophyllene, was determined in extracts from three different plant species. To achieve this goal, a powerful analytical instrument — the Agilent 8860 gas chromatograph — was used. Quantitative determination was performed using the external standard calibration method with construction of a calibration curve.

Subsequently, the obtained plant extracts were added as attractants to enhance pest capture using pheromone traps.

Materials and methods: to achieve the stated objective, the continuous solid-liquid extraction method was employed using a Soxhlet apparatus. This technique combines dissolution and repeated washing with hot solvent, ensuring a high extraction efficiency with economical reagent consumption. Since the target terpenes are non-polar compounds (containing only carbon and hydrogen atoms), hexane was selected as the extraction solvent.

It should be noted that the content of β-caryophyllene remains unchanged in both concentrated and diluted extracts. The following plant materials were used for extraction: clove *(Syzygium aromaticum)*, dried apples *(Malus domestica)*, and dried hops *(Humulus lupulus).*

For the construction of the calibration curve, a commercial standard of β-caryophyllene (Sigma-Aldrich) was used. A stock solution was prepared in hexane at a concentration of 9 mg/mL. From this, five solutions with known concentrations ranging from 0.09 to 1.8 mg/mL of caryophyllene in hexane were prepared.

The injection of these five standard solutions for analysis using the Agilent 8860 gas chromatograph was performed on the same day. This was necessary to pre-

vent degradation of the solutions, since terpenes contain double bonds and are prone to polymerization and photodegradation under sunlight.

Using the specialized OpenLab CDS software, the retention time of β-caryophyllene was determined to be 14.8 minutes. The cycle time was 22 minutes. Subsequently, the Data Analysis program was used to construct a calibration curve for the analysis of plant extracts. The data processing method was saved.

Results: the peak heights of β-caryophyllene (FID detector response, in picoamperes) were recorded. The correlation coefficient was $R^2 = 0.98435$. Based on these data, a calibration curve of peak area versus concentration was constructed. It should be noted that the shape of the calibration curve is not necessarily linear — this parameter is adjustable in the data processing software.

Subsequently, this data processing method was applied to the plant extracts, and the quantitative content of β-caryophyllene was determined in each of the samples.

Conclusions: The highest content of β-caryophyllene was found in apple extract — 238 mg/L, followed by clove extract — 195 mg/L, while the lowest was in hop extract — 20 mg/L (in this sample, caryophyllene is not the major component). The low content of β-caryophyllene in the hop extract can be attributed to the fact that the extract was diluted, and the hexane was not removed by simple distillation.

A similar approach, with appropriate modifications, can be applied for the analysis of other essential oil components in plant extracts.

Keywords: GC analysis, terpenes, plant extracts, external standard calibration, β-caryophyllene

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