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ANALYSIS OF VOLATILE ORGANIC COMPOUNDS CONCENTRATION USING GC-MS TECHNIQUE FOR SOME TYPES OF CONCENTRATED PERFUMES IN THE BAGHDAD'S LOCAL SHOPS

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ABSTRACT : Concentrated perfumes are widely spread in the Baghdad's local shops. They consist of a wide range of natural and synthetic compounds. Due to their complex composition, the determination of their ingredients, mostly volatile, is a difficult task. In this study, gas chromatography coupled with mass spectrometry (GC–MS) has been applied for the direct analysis of the concentrated perfume composition. In total, 77 different odorant compounds were identified. By combining the obtained results with the information available on PubChem database, the identified odorant compounds were classified into categories: terpenes, aromatic compounds, esters and others (aldehydes, ketones and alcohols). The major identified odorant compounds were terpenes: cedrol (26.65%), dihydro-alpha-terpineol (19.6%), ledene oxide-II (11.46%), citronellol (9.87%), germacrene D-4-ol (8.22%) and linalool (7.56%). Ester: methyl dihydrojasmonate (16.93%, 10.53% and 6.44%), diethyl phthalate (30.05% and 14.7%) and dihydromyrcenol (18.22%). Aromatic compounds: musk (12.83%), galoxolide (11.74%), lilial (7.27%) and toluene (6.13%). Ketone: alpha. Isomethyl ionone (8.14%). Besides, the comparative analysis of odorant compound categories between the concentrated perfume samples shows that terpenes and esters were the major and the abundant components of the concentrated perfumes.

Key words : Concentrated perfumes, GC-MS technique, odorant compounds, terpenes, esters, aromatic compounds, ketones.

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INTRODUCTION

Perfumes and fragrances are seen as an essential part of life in many economies, and an increasing number of men and women wear perfume on a daily basis (International Fragrance Association, 2012). Given that perfumes are complex mixtures of various compounds, determining their composition is a difficult task. As a result, advanced and hyphenated techniques are required for their analysis (Van Asten, 2002). The most important tool for qualitative and quantitative analyses of perfume ingredients is gas chromatography coupled with mass spectrometry (GC–MS) (Mondello *et al*, 2005), and it is by far the most commonly used analytical technique in the perfume industry (Snow and Bullock, 2010).

A perfume is a one-of-a-kind combination of top, middle and base notes that are extracted from plant material and fruits to create a specific harmony of scents (Vankar, 2004). A fragrance composition typically contains 30 to 50 (and sometimes up to 200) synthetically manufactured ingredients as well as natural extracts or essences (Curtis and Williams, 2001). Perfume is a blend of ingredients such as essential oils, solvents, fixatives, and modifiers that allow for a long-lasting, pleasant, and desirable scent (Gebicki *et al*, 2015). Essential oils are derived from natural plant extracts and can be found in the plant's roots, flowers, leaves, fruit, seeds, or bark (Vankar, 2004 and Herts, 2011) and the solvent, which is typically 98 percent ethanol and 2% water, is the liquid used to dissolve the perfume oil (Herz, 2011). Natural floral essential oils are used as perfume and fragrance ingredients. As a result, knowledge about specific components in floral fragrances can be applied to the creation of natural and synthetic perfumes (Li *et al*, 2006).

Perfumes, cosmetics and food all make extensive use of odorant molecules (Braga *et al*, 2018 and Armanino *et al*, 2020). Currently, approximately 7000 odorant molecules have been reported (Dinu *et al*, 2020), while the number of odors capable of being perceived is unknown, but could

Comparing the results in figure 3 of this study, the peak area (%) of the terpenes (45.69% in Al-Qima and 54.63% in Havook) were higher than the peak area % of esters (36.97% in Al-Qima and 22.05% in Havook), aromatic compounds (13.01% in Al-Qima and 12.78% in Havook) and others (1.11% in Al-Qima and 10.36% in Havook). While the peak area % of esters (49.38% in 309 and 50.18% in Channel) were higher than the peak area % of terpenes (3.27% in 309 and 41.1% in Channel), aromatic compounds (40.55% in 309 and 4.68 in Channel) and others (1.92% in 309 and 2.71% in Channel).

As a result, terpenes and esters were the most abundant odorant compounds with the highest proportions as compared to the other categories. The above study results obtained is in accordance with the results of the study done by Villatoro *et al* (2016), which shows that terpenes and esters were identified with the highest concentration in perfume A and B via GCO -ToFMS analyses. Also terpenes and esters were among the five major types of substances that were detected using headspace solid-phase microextraction (HS-SPME) coupled with gas chromatography-mass spectrometry-gas chromatography-olfactometry (GC-MS-O) techniques in the study done by Liu *et al* (2020) that shows the characteristic aromatic components of five Chinese mango varieties.

CONCLUSION

In this study, the components of the different concentrated perfumes, selected from the local shops of the Baghdad city, were identified using GCMS technique. A total of 77 different odorant compounds were identified, belonging to the categories terpenes, aromatic compounds, esters and others (aldehydes, ketones and alcohols) by combining obtained the results with the information available on PubChem database. The major odorant compounds of the concentrated perfumes are terpenes: cedrol, dihydro-alpha-terpineol, ledene oxide-II, citronellol, germacrene D-4-ol and linalool. Ester: methyl dihydrojasmonate, diethyl phthalate and dihydromyrcenol. Aromatic compounds: musk, galoxolide, lilial and toluene. Ketone: alpha. Isomethyl ionone. In addition, the comparative analysis of odorant compound categories between the concentrated perfume samples shows that terpenes and esters are the major and the abundant components of the concentrated perfumes.

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