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Short communication

Aroma compounds in Bay Leaf: a culinary spice analysis

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Introduction

Laurus nobilis L. (Lauraceae), commonly known as bay laurel, is recognized both as a culinary spice and as a medicinal plant with a long history of traditional use. Its leaves have been used to improve digestion, stimulate appetite, and relieve respiratory and rheumatic complaints, while the pleasant aroma has made them especially valuable in food preparation and herbal remedies. The phytochemical profile of *L. nobilis* is dominated by volatile terpenoids with 1,8-cineole, *α*-pinene, *β*-pinene, sabinene, and linalool consistently reported as main constituents across numerous studies (Caputo et al., 2017; Karadağ et al., 2025). These compounds are responsible for the plant's distinctive fragrance and also for its antimicrobial, antioxidant, and anti-inflammatory activities (Caputo et al., 2017; Dammak et al., 2024). Notably, the chemical composition of *L. nobilis* volatile oil shows considerable regional variability, driven by differences in geographical origin, climate, altitude, and post-harvest conditions (Guedri et al., 2020; Tabet Aoul et al., 2026), making comparative studies of geographically distinct populations scientifically valuable.

Although the essential oil composition of *Laurus nobilis* has been extensively studied, less attention has been given to the direct analysis of volatile aroma compounds. Therefore, headspace gas chromatography coupled with mass spectrometry (HS-GC/MS) was used to characterize the aroma profile of *Laurus nobilis* leaves and provide a better understanding of their volatile composition.

Materials and methods

Plant material

Commercially available dry leaves of *Laurus nobilis* L. were used for volatile aroma analysis.

Head space method (GC/HS/MS analysis)

The analysis of aroma components was made on small amounts (0.3 g) of plant samples which were directly put in sealed vials and incubated for 5 min on 80°C. For that purpose, agitator speed was adjusted at 500rpm while syringe temperature was 85 °C. Only the gas phase (1 mL of highly volatile compounds) was injected and then investigated on an Agilent GC/FID/MS system.

GC/FID/MS analysis

The chemical composition of the aroma components was analyzed on Agilent 7890A Gas Chromatography system equipped with FID detector as well as Agilent 5975C mass quadripole detector. For that purpose, HP-5 ms capillary column (30 m × 0.25 mm, film thick-ness 0.25 μm) was used. Analytical conditions were as follows: initial oven temperature 60 °C (0 min) increased at a rate of 3

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°C/min to 240 °C (1 min) and to 280 °C at a rate of 10 °C/min (1min); helium as carrier gas at a flow rate of 1 mL/min; injector temperature 220 °C and that of the FID detector 270 °C. Each sample was injected at a split ratio of 1:1. The mass spectrometry conditions were: ionization voltage 70 eV, ion source temperature 230 °C, transfer line temperature 280 °C and mass range from 50-550 Da. The MS was operated in scan mode.

Results and discussion

HS-GC/MS analysis of dry *L. nobilis* leaves identified 22 volatile compounds representing 99.26% of the total volatile fraction. The profile was dominated by oxygenated monoterpenes, especially with 1,8-cineole (61.42%), which is commonly reported as the main compound in leaves (Caputo et al., 2017; Tabet Aoul et al., 2026). The 1,8-cineole content recorded here is among the highest in the literature, exceeding values from Southern Italy (31.9%) (Caputo et al., 2017), Morocco (30.41%) (Dammak et al., 2024), and France (45.8%) (Guedri et al., 2020), and is comparable to Northern Cyprus (58.59%) and Turkey (54.33%) (Yalçin et al., 2007; Karadağ et al., 2025). The monoterpene hydrocarbons *α*-pinene (12.75%), *β*-pinene (10.51%), and sabinene (8.67%) followed as the next major constituents, together accounting for ~32% of the volatile fraction. Both *α*-pinene and *β*-pinene were higher than in Italian (5.8% and 1.4%) and Moroccan samples (Caputo et al., 2017; Dammak et al., 2024), while sabinene is within the range reported across Mediterranean populations (Caputo et al., 2017; Karadağ et al., 2025). Linalool and methyl eugenol, major constituents in Italian, Austrian, and Palestinian populations alongside *α*-terpinyl acetate (5–13%) (Caputo et al., 2017; Guedri et al., 2020; Jaradat et al., 2024) were entirely absent further distinguishing the Balkan chemotype. Smaller amounts of *p*-cymene (2.016%), *α*-thujene (0.750%), camphene (0.657%), *β*-myrcene (0.393%), terpinen-4-ol (0.273%), sabinene hydrate (0.216%), *γ*-terpinene (0.136%), and *α*-terpineol (0.115%) were also detected.

Conclusion

The HS-GC/MS analysis of commercially available dry *L. nobilis* leaves revealed a volatile profile strongly dominated by 1,8-cineole (61.42%), with *α*-pinene, *β*-pinene, and sabinene as secondary constituents. The exceptionally high 1,8-cineole content places this Balkan sample among the most cineole-rich populations reported to date, distinguishing it clearly from Italian, Moroccan, and Tunisian chemotypes, and aligning it more closely with Eastern Mediterranean populations from Cyprus and Turkey. Future work combining volatile profiling with biological activity assays would further strengthen the chemotypic characterization of this regionally important population.

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