Multivariate analysis of essential oils from the leaves of *Osteophloeum platyspermum*

Sinária R. N. de Sousa[1], Ivana B. Suffredini[1,2], Sergio A. Frana[1,2], Hugo B. Suffredini[3], Ingrit E. C. Díaz[2], Mateus L. B. Paciencia[2]

[1] Pós-Graduação em Patologia Ambiental e Experimental, Universidade Paulista, SP, Brazil.
[2] Núcleo de Pesquisas em Biodiversidade, Universidade Paulista, São Paulo, Brazil.
[3] Centro de Ciências Naturais e Humanas, Universidade Federal do ABC, Santo André, Brazil.
ibsuffredini@yahoo.com.br

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The present study evaluated variations in terpene composition of essential oils obtained from the leaves of a single adult individual of *Osteophloeum platyspermum*. The leaves were collected 13 separate times over a 2-year period. Correlations between terpenes and environmental changes as seasonal variations, the presence of El Niño and La Niña global phenomena, and climate variables as max temperature, relative humidity, total daily irradiation, and total daily precipitation were assessed. GC/MS analyses were made and compounds were identified by comparison of IRL to literature (1). Analyses resulted in the identification of 50 terpenes that were quali and quantitatively heterogeneously distributed in the 13 collections, with predominance of hydrocarbon monoterpenes and oxygenated monoterpenes. Set theory let to the identification of the constant presence of 17 terpenes as β-pinene (≈ 29-37 %), α-pinene (≈ 5-11 %), limonene (≈14-23 %), α-terpineol (≈ 2-8 %), terpinen-4-ol (≈ 0.4-1.3 %), myrcene (≈ 5-8 %), linalool (≈ 0.5-1.8 %), elemol (≈ 0.1-0.5 %), β-elemene (≈ 0.3-1.5 %), γ-elemene (≈ 0.2-1.3 %), neo-intermedeol (≈ 0.3-1.3 %), α-cadinol (≈ 0.6-2.2 %), 1-epi-cubenol (≈ 0.4-1.2 %), spathulenol (≈ 1-5.5 %), isospathulenol (≈ 0.6-2.4 %), viridiflorol (≈ 0.9-1.5 %), and ledol (≈ 0.3-1.5 %) in all oils, and these findings indicate that whatever the external conditions are, the species needs to sustain the production of the 17 terpenes. Cluster analysis in association to non-metric multidimensional scaling (NMDS) done with the percentage of each terpene in the oils resulted in the separation of the 13 essential oils in two distinct group: a dry season (DS) group and a rainy season (RS) group. The quantitative composition of the essential oils that were analyzed was significantly different among the samples that were obtained in the RS and the samples that were obtained in the DS according to the global analysis of similarities (ANOSIM) test (R = 0.242, p = 0.019). Thus, samples that were obtained in the same season (RS or DS) had a tendency toward showing similar amounts of the 17 terpenes, supporting the notion that terpene production may be influenced by climatic conditions. So, a canonic correspondence analysis (CCA) was performed as a direct analysis of gradients. In this analysis, terpinen-4-ol and α-terpineol (minor compounds) and myrcene and limonene (major compounds) may be associated with a warm environment and an environment that is exposed to more intense solar irradiation. Spathulenol, neo-intermedeol, and elemol (minor compounds) may be associated with environments that are exposed to higher humidity and higher precipitation. Our findings suggest that the constant presence of the 17 terpenes is important as a set of fundamental compounds that are required for protection against microorganisms and as an expression of its relationship to the environment. Terpene variations clearly occurred, depending on the dry or rainy seasons.

1. Adams, R.P. Identification of Essential Oil Components by Gas Chromatography/Mass Spectrometry, Allured Publishing Corporation, 2007.

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