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Development of a simple method to determine the fractions of sweet orange and lavender essential oil in commercial blends

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Sweet orange essential oil (EO) is widely used in aromatherapy due to its anxiolytic properties. One way to enhance this effect is through combining the use with lavender EO (1). The commercialization of blends containing both oils has gained attention, and to ensure their quality control, the development of new analytical methods is necessary. In the literature, there are few methods reported, however, they involve chromatographic separation processes and complex mathematical treatment (2). As a result, the objective of this work is to quantify sweet orange and lavender EOs in blends using synchronous fluorescence (with first derivative spectra) and surfactant-free microemulsion (SFME) systems for sample preparation (3). Previous studies demonstrated that the formation of weak micelle-like aggregates in pseudo-ternary liquid mixtures, composed of EO and octanol as the oily phase, along with water and propanol, resulted in a significant increase in the measured fluorescence intensity. The SFMEs preparation were made at the stablished conditions after univariate optimization using 50 µL of the oily phase (composed of EO diluted in octanol, 1:5, v/v), 2.0 mL of water and propanol until 5 mL final volume. Preliminary scans (Perkin-Elmer, LS 55 luminescence spectrometer) identified the pairs 336/436 nm and 330/388 nm as the optimal $\lambda_{exc}/\lambda_{em}$ (excitation and emission wavelengths) for sweet orange and lavender essential oils, respectively. Synchronous fluorescence measurements were performed at $\Delta\lambda$ of 100 and 58 nm, ranging from 200 to 500 nm. Absorbance data (Varian, Cary 100 UV-visible spectrophotometer) were also acquired, from 200 to 600 nm, aiming inner filter effect correction (4). Analytical curves were generated for each EO by varying concentration in the oily phase, starting from the initial condition of SFME preparation. Data were extracted at 316.8 nm ($\Delta\lambda$ = 100 nm) and at 352.0 nm ($\Delta\lambda$ = 58 nm) of the first derivative from the synchronous scanning spectrum for sweet orange and lavender EOs quantification, respectively. Correlation coefficients (R^2) of 0.9967 (sweet orange) and 0.9948 (lavender) were obtained. Homoscedasticity was evaluated by residual plot analysis. The limit of detection (LOD) and quantification (LOQ) were 2.39 µg mL^{-1} and 7.97 µg mL^{-1} for sweet orange EO and 19.77 µg mL^{-1} and 65.80 µg mL^{-1} for lavender EO. Results for LOQ indicate the possibility to determine a minimum of 0.47% of sweet orange and 3.69% of lavender EO in blends. This method was successfully applied in a blend containing both EOs (50:50 v/v). Recoveries of (103.1 ± 3.2)% and (97.0 ± 4.3)% were obtained for sweet orange and lavender EOs, with CV of 3.1% and 4.4% respectively (n=3). Other blend proportions (25:75 and 75:25 v/v) were also analyzed, with similar results. The method greenness was assessed using AGREE calculator with satisfactory score (0.79 out of 1.00) (5).

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