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Stability study of lavender essential oil and hydrolate by 3D spectrofluorimetry

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Stability studies of natural origin products are essential for quality control and shelf life monitoring. Essential oil (EO) stability is widely studied in literature due to their high added value, with their photosensitivity been well-established (1). However, this topic remain scarcely addressed for hydrolates, a co-product of the EO obtention process (2,3). Once considered waste, hydrolates now possess economic and environmental value (2), what justifies investments in more studies regarding this topic. Given the wide popularity and previously studied fluorescent properties of *Lavandula dentata* hydrolate and EO, this work aimed to evaluate the stability of these samples over time and under different storage conditions. A simple approach based on 3D spectrofluorimetry was employed to obtain fluorescence fingerprint profiles, offering a less complex alternative to conventional separation methods. Pure hydrolate and pure EO were analyzed to understand how different storage influence the product's integrity. For this experiment, systematic study was performed considering the influence of three variables: i) container type (samples stored at 23ºC, under natural daylight in amber or transparent flasks), ii) temperature (samples kept in transparent flasks, with no direct light exposure at -18ºC or 40ºC) and iii) light exposure (samples stored at 23ºC in transparent flasks with no direct light, controlled UV-light and the same natural daylight condition as container type evaluation). Samples were weekly analyzed (using a Perkin-Elmer, LS 55 luminescence spectrometer) for ten weeks at previously selected $\lambda_{exc}/\lambda_{em}$ (excitation and emission wavelength pairs): 330/394, 310/403 and 278/310 nm for hydrolate, and 395/438 nm for EO. Additionally, 3D spectrofluorimetric measurements (λ_{exc}: 250-450 nm and λ_{em}: 250-600 nm) were performed weekly for light exposed samples and on the first and last days for all conditions. Results indicated that except for the light exposure conditions, no significant fluorescence decrease, or fingerprint change was observed for any of the samples. Comparing both light exposed conditions, a lower fluorescence intensity was observed for the samples stored under daylight. Both hydrolate samples produced less than 5% of their initial (original) fluorescent intensity at 330/390 nm with 3D data showing a gradual increase of fluorescence at 278/310 nm throughout the weeks. Fluorescence of EO, stored under UV (365 nm), decreased down to nearly 20% of its initial value at 395/438 nm. However, it still exhibited almost three times the intensity of the daylight exposed one, suggesting that differences in radiance and radiation spectral profile are relevant in contributing for EO degradation. Besides, the two EO samples stored under these conditions exhibited a lighter color compared to the others, also suggesting degradation. These findings provide relevant insights for scientific and industrial applications of hydrolates and EOs, while also highlighting the importance of developing methods focused on the stability of natural products to enhance knowledge for consumers and academic community.

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