Quality control of medicinal and aromatic plants and related herbal teas: quantitative determination of volatile bioactive secondary metabolites

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Aromatic plants are appreciated for their pleasant aroma characterized by several volatile components, some of them characterized by relevant biological activities. Generally aromatic plants are employed to prepare herbal teas, therefore quality control of both raw plant materials and herbal teas is fundamental to guarantee their effective and, mainly, safe use.

Quantitative analysis of herbal teas aims at evaluating the concentration of key-markers responsible for both aroma and biological activities, thus assessing a safe use of an herbal tea containing components limited by law or for which EMA (European Medicinal Agency) gives recommendation on the maximum quantities to be consumed [1].

One of the most relevant issue related to the analysis of aqueous samples is their not full compatibility with conventional stationary phases, causing stationary phase degradation or problems in stability of column performance. To overcome this drawback, an appropriate sample preparation procedure should be used. Conventional extraction techniques (i.e. solvent extraction) are well established, but they are also time-consuming and often require a large volume of solvent; conversely, solvent-free sample preparation techniques (i.e. Solid Phase Micro Extraction both in solution and in headspace modes) make possible a direct sampling of aqueous samples (e.g. herbal teas), by adopting a fully automatic approach (TAS: Total Analysis System). To speed up quality control, a new generation of gas chromatography columns, coated on ionic liquid based stationary phases (Watercol^{TM}), compatible with aqueous samples, have been recently introduced [2] to bypass completely the sample preparation step.

The present work is focused on the quantification of biologically active secondary metabolites (e.g. menthol, alfa- and beta-thujone, estragole, etc…) present in several aromatic plants most commonly used for herbal teas preparation (i.e. wormwood, peppermint, sage, fennel, aniseed). Both approaches gave comparable results, together with a high repeatability, linearity and accuracy.

References *(Calibri 10)*

1. European Medicinal Agency website, http://www.ema.europa.eu/ema/

2. Cagliero et al., 2018. Anal. Bioanal. Chem. 410 (2018) 4657-4668

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