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The chemistry behind the coffee flavour evolution over time: an omicapproach

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Rationale:
Coffee quality is a multidimensional attribute influenced by a series of genetic precursors, environmental factors and especially post-harvest processes such as roasting and storage conditions that affect sensory and chemical properties [1,2,3]. Storage is strongly influenced by various environmental conditions: moisture, temperature and oxygen are the basic dynamic forces that play a fundamental role in a number of deterioration processes, such as volatilisation of odour molecules (VOCs), the release of CO_2, oxidative reactions with the formation of off-notes and the development of rancidity [2,4-6]. This work deals with the investigation of a flavoromics approach to study the chemistry behind the changes in coffee flavour during storage.

Methods:
The chemical data of the investigated coffee samples were obtained by analysing both volatile and non-volatile profiles (i.e. lipids and phenolic fractions including alkaloids) using HS-SPME-GC-MS and HPLC-UV/DAD. Different commercial coffee capsules in different packaging, namely standard (multilayer foil with aluminium barrier) (and eco-capsules, batches (3 batches each) and blends (P and B, 100% Arabica and I 50/50% Arabica/Robusta) were analysed. Samples were stored under stress conditions (65% RH and 45°C) and monitored over a period from T0 to T180 days for the standard caps and from T0 to T90 days for the eco caps. Acidity, peroxide value and p-anisidine were evaluated by spectrophotometric analysis. In parallel, the sensory tests were carried out by an expert panel.

Results:
A series of volatile compounds were detected in the oxidized samples, including 3 VOCs exhibiting pungent, rancid and acidic notes and appearing in sensory unacceptable samples independently from blends, batches and packaging. The phenolic fraction and alkaloids do not vary significantly ($p > 0.05$). The fraction is very stable over time regardless of packaging and mixture. The evolution of the free fatty acids (FFAs) was correlated with the peroxides, p-anisidine and acidity values, the pH and UR % measurements and the VOCs.

Conclusions & Perspectives:
The results show that the different blends behave differently over time in the standard packaging with respect to Eco-caps the latter presenting a shorter shelf-life.

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