



EVOO Research's Got Talent 2020

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Individual variability in the perception of extra-virgin olive oil: relations between critical oral sensations and flavor determinants

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Objectives

The perception of oral sensations critical for product acceptability show individual variability, generating different sensory sensations among different individuals. Extravirgin olive oil (EVOO) induces three of the most critical oral sensations: bitter, pungent and astringent. A different individual sensitivity to these sensations suggests a different perception of EVOO during consumption, with a possible effect on flavour perception.

In this context, the release kinetics of volatile organic compounds (VOCs) from EVOO matrix within the oral cavity should be accounted for considering the complex processes influencing the evolution of sensory attributes detected by tasters. These effects are typically considered in sensory and instrumental analyses in a static point of view, suggesting the adoption of methods that allow a measure during consumption, in order to better understand EVOO perception processes. Among sensory methods, Temporal Check-All-That-Apply (TCATA) is an affirmed and robust technique to measure the perception of multiple attributes during consumption. Regarding instrumental analysis, Proton Transfer Reaction-Mass Spectrometry coupled to Time-of-Flight (PTR-ToF-MS) analyser offers the possibility to follow the VOCs release in the mouth in real time.

Considering these assumptions, the aim of the study was to investigate individual differences in temporal perception of sensation that are critical for EVOO acceptability and explore if the perceived differences for critical sensations have an effect on the temporal perception of flavor attributes, in relation to the contribution of VOCs released.

Methods

Nine samples of Italian EVOO P.D.O. were selected on the base of their sensory variability and absence of sensory defects. The individual sensitivity of 19 subjects (mean age: 45.2, 9 women) for bitterness, pungency and astringency was measured with a suprathreshold intensity test evaluating for each attribute the intensity on LMS of 5 water solutions (10ml) at increasing concentration and in double reply.

Subsequently, in the first phase of evaluation, all subjects familiarized themselves with the sensory properties of EVOO samples and were trained to the T-CATA method. After evaluation of panel performances on the use of 7 descriptors (bitter, pungent, astringent, almond, artichoke, grass and tomato), the panel evaluated 6 of the 9 samples (3 g) for 90 seconds in triple reply., presented in a randomized order in sensory booths under red light.

In the second phase of evaluation, a subgroup of 10 subjects (mean age: 41.5, 5 women) differing for individual sensitivity toward critical sensation was involved in a T-CATA with the remaining 3 samples, following the same tasting procedure of the previous phase.

In parallel with tasting, VOCs released during consumption were collected fitting a single-usage ergonomic nose-piece rubber tube into the nostrils of the assessors. The nose-piece was connected to the PTR-ToF-MS in order to perform in vivo the VOCs analysis.

Results

Hierarchical cluster analyses on intensity ratings in water solutions allowed to obtain two clusters for each critical sensation. Bitterness and astringency were the attributes with the higher variability among clusters. Considering the entity of the variability and cluster size, two clusters of subjects varying for the sensitivity toward bitterness were selected: high bitter taster (HBT) (8 subjects, mean age: 47.8, 3 females) and low bitter taster (LBT) (11 subjects, mean age: 43.2, 6 females).

For each attribute, temporal curves for the 6 samples from the first phase were compared among LBT and HBT clusters, highlighting an effect on the critical sensation during the evaluation. Compared to LBT, HBT selected with a higher frequency the attributes bitter (mean area: LBT = 4137, HBT = 5379, p-value = 0.002; max citation proportion: LBT = 73, HBT = 88, p-value = 0.001) and astringent (mean area: LBT = 1732, HBT = 3963, p-value < 0.001; max citation proportion: LBT = 73, HBT = 88, p-value < 0.001). In the case of pungency, HBT resulted higher than LBT in term of mean area of the curves (LBT = 4079, HBT = 4999, p-value = 0.002), while the maximum of citation proportion resulted not significantly different (LBT = 79, HBT = 81, p-value = 0.661).

The arbitrary time frame of maximum global impact of critical attributes was identified after visual inspection of the TCATA curves (20 to 50 seconds). Within this time interval, flavor attributes resulted to be influenced differently on the base of the cluster: while tomato, almond and grassy attributes tend to be suppressed in intensity by a higher perception of critical attributes, the artichoke attribute tends to be exalted.

Results on the relation between VOCs and sensory perception are currently under analyses at this stage of the study and will be reported in next communications.

Conclusions

In the current state, the study highlighted that the oral sensations critical for acceptability may be perceived differently during consumption on the base of individual sensitivity toward critical oral sensations, with a notable variability in term of bitterness and astringency. This effects resulted to have a role in the temporal perception of specific flavour attributes (e.g. tomato) and consequently on the consumption experience, aspect to be considered in order to interpret and meet consumers' preferences.

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