Efficient screening of odorants' taste dimensions by gas chromatography olfactometry associated taste (GC-OAT) and olfactoscan

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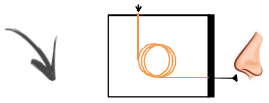
Introduction

- Many odorants are described with taste attributes [1] although these volatile molecules are not able to activate taste receptors.
- Odor-induced taste is the result of a cognitive process, which depends on individuals' experience and associative memory.
- Those odorants congruent with taste may increase sweet [2] or salty taste perception [3] in foods with respectively less sugar or salt added that is an interesting option for healthier food products formulation.

Materials and methods

GAS CHROMATOGRAPHY OLFACTOMETRY ASSOCIATED TO TASTE (GC-OAT)

- SAFE extract
- 1µL DB-Wax (30m x 0.32mm x 0.5µm)
- 12 trained judges
- Detection Frequency (DF)



Test 1: Odor descriptors

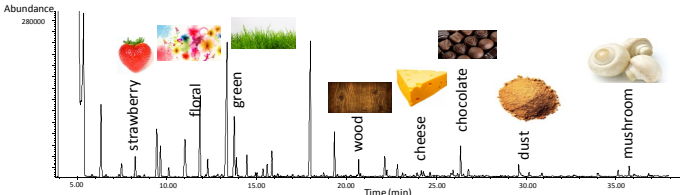


Figure 1: Chromatogram of multi-fruit juice for test 1

Test 2: Odor associated to taste

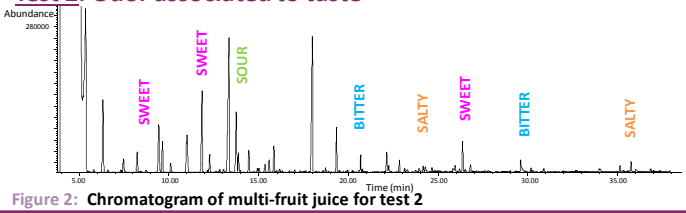


Figure 2: Chromatogram of multi-fruit juice for test 2

OLFACTOSCAN (OLFACTOMETER COUPLED TO GC-O)

- SAFE extract
- 1µL DB-Wax (30m x 0.32mm x 0.5µm)
- 12 trained judges
- Sweet intensity rating

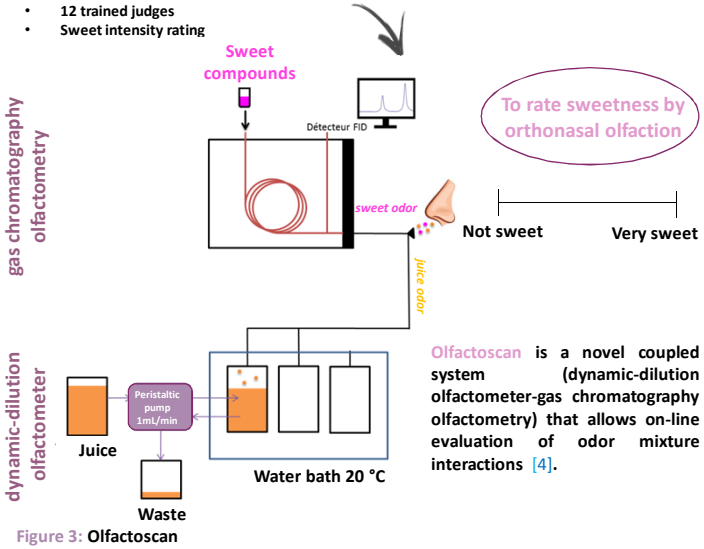


Figure 3: Olfactoscan

Olfactoscan is a novel coupled system (dynamic-dilution olfactometer-gas chromatography olfactometry) that allows on-line evaluation of odor mixture interactions [4].

Objectives

1. To develop a methodology to screen, select and identify odorants associated to taste by GAS CHROMATOGRAPHY OLFACTOMETRY ASSOCIATED TO TASTE (GC-OAT)
2. To verify the ability of odorants (previously identified) at two different concentrations to increase sweet odor perception in fruit juice by OLFACTOSCAN

Results

ODORANTS ASSOCIATED TO TASTE IN A JUICE EXTRACT

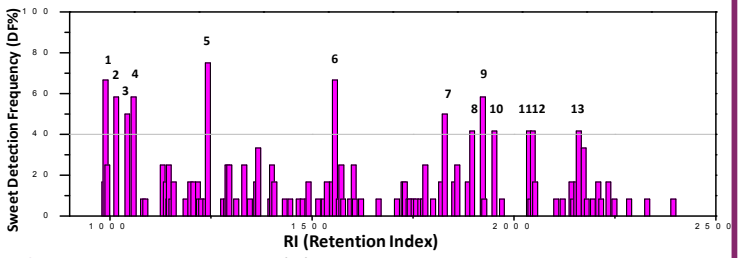


Figure 4: Aromagram sweet association

Among the 67 olfactive areas detected in an extract of a multi-fruit juice by classical GC-O with a panel of 12 trained judges, 13 were associated to SWEET, 3 to SALTY, 3 to BITTER and 4 to SOUR by GC-OAT.

Table 1: Identification of odor associated to sweetness compounds

SWEET COMPOUNDS					
N°	DF (%) TEST 1	DF (%) TEST 2	CHEMICAL NAME	ODOR ATTRIBUTES (TEST 1)	TASTE ATTRIBUTES (TEST 2)
1	83	67	n.d.	fruity, sweet	sweet (67%)
2	92	75	methyl 2-methyl butanoate	floral, fruity	sweet (58%) sour (17%)
3	100	75	ethyl butanoate	floral, fruity, sweet, cheese	sweet (50%) sour (17%) bitter (8%)
4	100	75	ethyl 2-methyl-butanoate	fruity, sweet	sweet (58%) bitter (8%) sour (8%)
5	67	75	(*E*)-β-o-cimene	floral, fruity	sweet (75%)
6	92	75	linalool	floral, fruity, sweet	sweet (67%) sour (8%)
7	75	50	β-damascenone	fruity, sweet	sweet (50%)
8	75	42	phenylmethanol	floral, fruity	sweet (42%)
9	67	67	2-phenylethanol	floral	sweet (58%) salty (8%)
10	58	92	(*E*)-β-ionone	floral, plastic, solvent	sweet (42%) salty (33%) sour (17%)
11	50	50	n.d.	candy, fruity	sweet (42%) bitter (8%)
12	75	42	furaneol	caramel, sweet	sweet (42%)
13	75	58	γ-decalactone	floral, fruity, sweet	sweet (42%) sour (8%) bitter (8%)

SWEET ENHANCEMENT IN ODOR JUICE

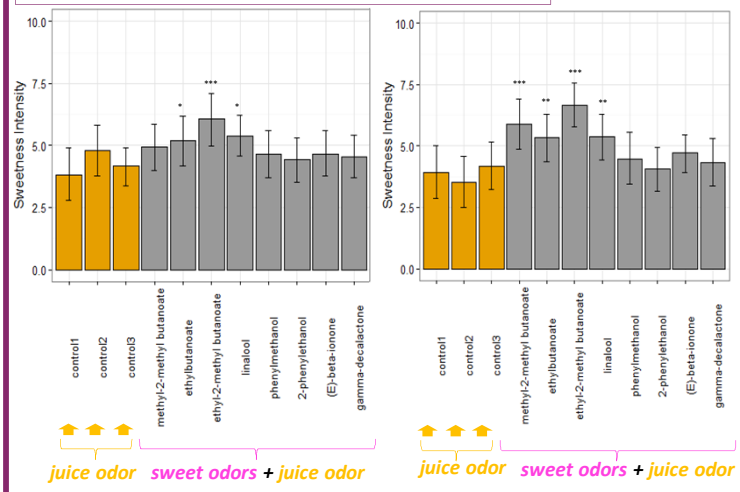


Figure 5: At low concentration 3 compounds: methyl 2-methyl -butanoate, ethyl butanoate and ethyl 2-methyl-butanoate are able to increase sweet perception.

Figure 6: At high concentration 4 compounds enhance sweetness in odor juice. Ethyl 2-methyl-butanoate increases sweetness at the two concentrations tested.

Conclusions

- GC-OAT analysis is an original and efficient approach for the selection of odor-inducing-taste compounds that may be used to modulate taste perception in food.
- Four odorants were found to increase odor sweet perception of multi-fruit juice ($p<0.01$). The sweetness enhancement in juice by odor is in the range of 20% to 70%.

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