Affect Of Essence Yield Rate On Relative Volatile Concentrations

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ABSTRACT

When processing samples, one can vary the essence yield rate ("strip rate") of the equipment which produces an essence of varying strength. This produces a rough concentration factor, but it is unclear how accurate that is on a volatile-by-volatile basis. By comparing two tea essences, where one should be twice as concentrated as the other, it is possible to determine how the concentration factor affects various volatile compounds. The average concentration factor of 8 compounds was 1.9, matching the processing parameter fairly well. However, the range of concentration factors was 1.3 to 2.5, which is likely due to chemical differences such as boiling point, solubility, polarity, etc.

INTRODUCTION

One of the processing parameters available to Sensus is the "strip rate" which is the ratio of the essence collected at the condenser to the amount of slurry material going into the equipment. By varying the strip rate, the concentrations of compounds in the essences are varied. In order to get an idea of how the strip rate affects individual compounds, a comparison was made between tea essence #1 and tea essence #2 where the only difference is the strip.

MATERIALS AND METHODS

A Gerstel MultiPurposeSampler (MPS-2) (Baltimore, MD) was used with a 1-cm 3-phase (divinylbenene, Carboxen, Polydimethylsiloxane) for sample preparation. A 10-min incubation followed by a 40-min exposure was used to capture the volatiles on the fiber for injection into the GC. The sample was stirred using a 3x12mm stirbar in the 20mL vial. The fiber was desorbed for 5-min in the GC injector for 5 min. An Agilent 7890A gas chromatograph (Palo Alto, CA) was used for the analysis. Analysis was performed in the splitless mode with a helium flow rate of 1.25mL/min through a 60mx0.25mmx0.25μm RTX-5ms column. The initial oven temperature was 50°C immediately followed by a 4°C/min temperature ramp to 170°C which was followed by a 100°C/min ramp to 250°C and help for 5min in order to ensure no sample to sample contamination. The transfer line to the Leco TruTOF MS (St. Joseph, MN) was held at 240°C. Data was collected for 30-250 *m/z* at an acquisition rate of 10 spectra per sec. Identification was based on a combination of MS library matching along with reported retention indices.
The essences (#1 and #2) were prepared for analysis by pipetting 50μL into 4.9mL of water along with 50μL of internal standard (phenol-D6, 100 ppm and pyridine-D5, 100ppm).

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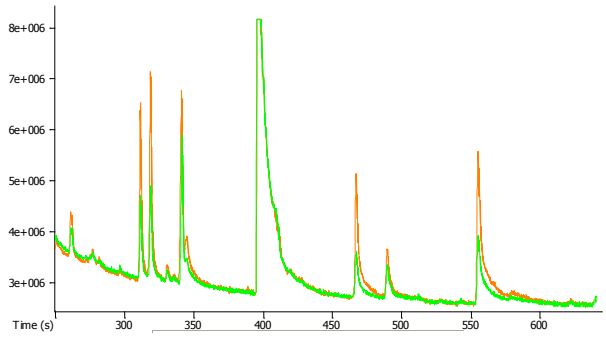
RESULTS AND DISCUSSION

Table 1 is a preliminary list of compounds and the relative concentration factor comparing the two essences. As can be seen, in general the concentration factor is about 2x which is what would be expected by the two strip rates. This has several implications. First is that while the strip rate is roughly directly proportional to the concentrations of various compounds, it is, by no means, the case for every compound. This is the likely reason that different strip rates have different aromas, even when diluted to the same final strength. There is also a strong indication that the concentration of some compounds could be used as a verification of the strip rate such as 3-methyl butanal, 2-hexenal, or benzaldyehyde.

Figures

Figure 1. Finger print of essence #1 (orange) compared to essence #2 (green)



Tables

Table 1. Compound concentration ratios for select compounds from tea essence #1 as compared to tea essence #2.

Peak #	Name	Ret. Index	Conc. Factor
1	Propanal, 2-methyl-	570.94	1.7
2	2-Butanone	593.24	1.3
3	Butanal, 3-methyl-	642.59	2.0
4	Butanal, 2-methyl-	652.95	2.2
5	1-Penten-3-ol	670.5	1.4
6	Pyridine-D5-	736.93	IS
7	Hexanal	795.47	2.5
8	2-Hexenal	847.53	1.9
9	Benzaldehyde	962.12	2.0
10	Phenol-d6-	974.62	IS
	Average		1.9

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