Sensory profile analysis: Preliminary characterization of juice and wine aroma profiles using solid phase microextraction and simultaneous chemical and sensory analyses

Iowa State University and South Dakota State University
Ames, IA

Somchai Rice, Jacek Koziel*, Devin Maurer*, Anne Fennell***
**Department of Agricultural and Biosystems Engineering, Iowa State University*
***Department of Plant Science, South Dakota State University*

Background and Rationale: *Sensory profile analysis* (iv) is part of *Obj. 1a Evaluate cold climate cultivar performance under a wide range of climates throughout the Upper Midwest and Northeast to match cultivar with site*. Wine aroma profiles from one wine variety (St. Croix, 2012 Iowa) were characterized. Results will be compared with the development of volatiles in crushed berries, and volatiles emitted by maturing grapes to inform how grape growing and processing can affect wine aroma.

Treatments/Methods:
Wine and juice aroma profiles from a selection of the sites will be characterized using solid phase microextraction coupled with multidimensional gas chromatography-mass spectrometry-olfactometry for simultaneously chemical and sensory analysis. This method couples identification of flavor and aroma-active compounds with detection and description by humans. Preliminary work has been completed with 2012 St. Croix wine in anticipation of the major effort with juice and wine aroma analyses in years 2 to 4.

An aromagram was recorded by a panelist utilizing the human trained panelist using nose as a detector. Aroma events resulting from separated compounds eluting from the gas chromatography column were characterized for aroma descriptor with a 64-descriptor panel and aroma intensity with Aromatrax software (Microanalytics, Round rock, TX). The olfactory responses of a panelist were recorded using AromaTrax software by applying an aroma tag to a peak or a region of the chromatographic separation. The aroma tag consisted of editable odor character descriptors, and aroma event time span (aroma duration) and perceived aroma intensity.

Results:
Five compounds found in wine made from St. Croix fruit was common with volatiles found in crushed berries. Example of simultaneous chemical and sensory analyses of St. Croix wine is presented in **Figure 1.**

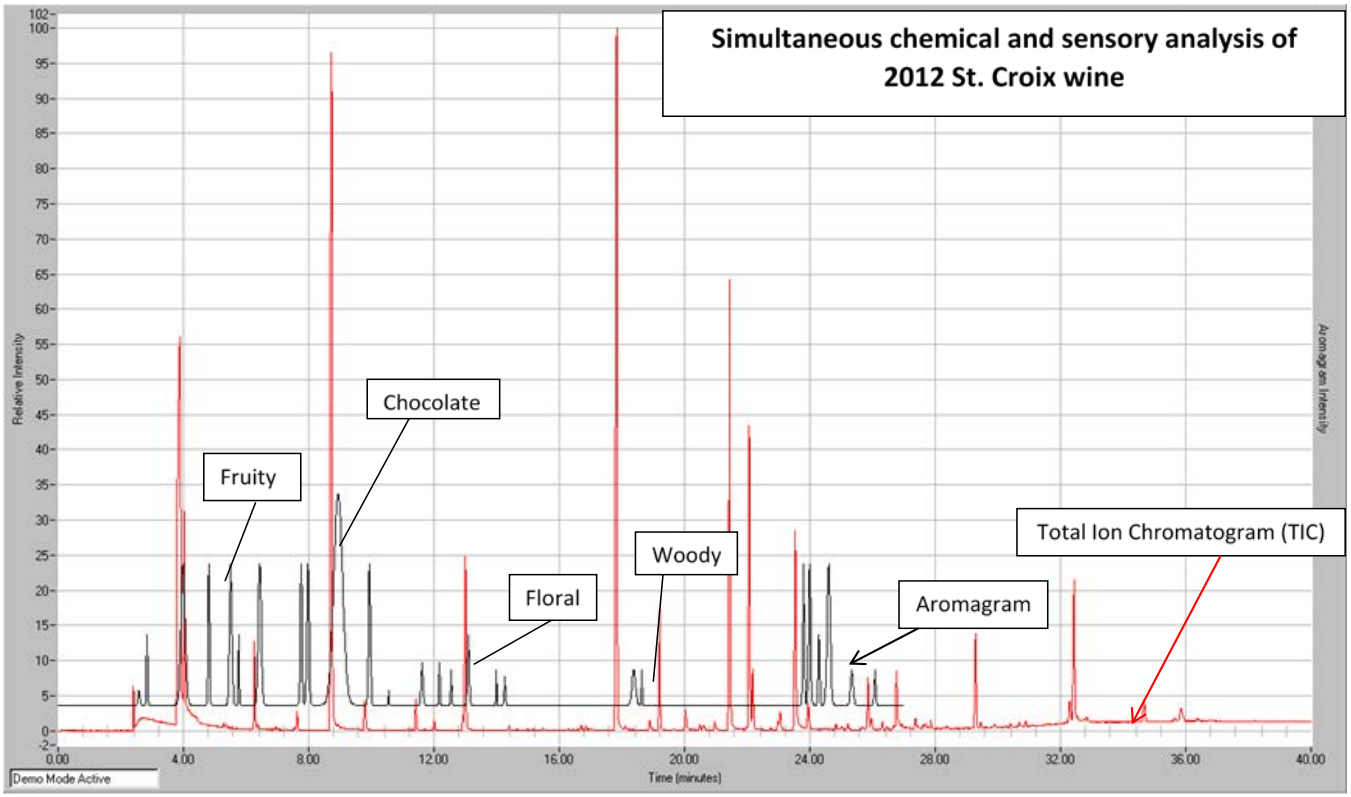

Figure 1. Simultaneous chemical and sensory analysis of St. Croix wine. The total ion chromatogram (TIC) and aromagram are overlaid. Aromagram is generated by trained human panelist scoring the aroma character, duration, intensity and pleasantness. TIC is red trace, aromagram is black trace. TIC is generated during chemical analysis by a mass spectrometer.

Table 1 summarizes typical aroma flavor compounds found by a panelist in St. Croix wine. More than 25 aromas were detected.

Table 1. Summary of identified aromas in St. Croix wine from simultaneous chemical and sensory analyses using multidimensional gas chromatography – mass spectrometry - olfactometry.

Event#	Aroma Descriptor	Intensity	Start Time (s)	Duration	Aroma Peak Area (intensity * duration*100)
1	Sweet	2	2.52	0.14	27
2	Unpleasant -1	10	2.8	0.09	89
3	Alcoholic Sweet	20	3.83	0.33	658
4	Buttery	20	4.75	0.12	239
5	Fruity	20	5.42	0.19	379

6	Body Odor	10	5.74	0.07	69
7	Pleasant +1 Unpleasant -1 Fruity	20	6.33	0.23	459
8	Strawberry	20	7.7	0.14	279
9	Spicy	20	7.9	0.17	339
10	Body Odor Woody Body Odor Chocolate Cherry	30	8.6	0.7	2096
11	Strawberry Jam	20	9.87	0.15	299
12	Sweet	2	10.53	0.05	9
13	Unpleasant -1 Medicinal	6	11.55	0.15	89
14	Fruity	6	12.13	0.09	53
15	Nutty	5	12.51	0.09	44
16	Floral Fruity	10	13.04	0.14	139
17	Spicy	5	13.97	0.05	24
18	Taco Shell	4	14.21	0.11	43
19	Rusty Metallic Medicinal	5	18.25	0.27	134
20	Woody	5	18.61	0.06	29
21	Sweet	20	23.74	0.12	239
22	Sweet Floral	20	23.91	0.17	339
23	Honey Pear	10	24.24	0.12	119
24	Sweet Strawberry	20	24.48	0.25	499
25	Fruity	5	25.25	0.2	99
26	Woody	5	26.03	0.12	59

What the results mean:

- Preliminary simultaneous chemical and sensory analysis of St. Croix wine shows 80+ chemical compounds of which more than 25 produce distinct flavor aroma.
- Many of the aromas are desirable for enhanced wine aroma.
- There is no data comparing cold climate wine aromas with wines currently marketed.
- Comparisons and benchmarking of aromas in wines made from cold hardy grapes is warranted.