**Comparison of Odor-Active Compounds in Grapes and Wines from
Vitis vinifera and Non-Foxy American Grape Species**

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Background. Although native American grape species such as *Vitis riparia* and *V. cinerea* are valuable sources of disease resistance and cold hardiness, in hybrids with European wine grapes (*V. vinifera*) they can contribute genes for undesirable aromas. Aside from the “foxiness” of *V. labrusca* hybrids (e.g., Concord), the odorants responsible for the aroma of non-*vinifera* species have not been studied, which limits the prospects for enologists, viticulturists, and grape breeders to improve fruit chemistry and wine sensory attributes. Our goal was to identify the key odor-active volatiles in wine made with *V. riparia* and *V. cinerea*.

Experimental design. Wines were produced from *V. riparia* and *V. cinerea* from the USDA-Agricultural Research Service cold hardy grape collection in Geneva, N.Y., and from Cabernet franc and Lemberger grapes obtained from Sawmill Creek Vineyards in Hector, N.Y., using a standard winemaking protocol with skin contact. After cold stabilization, wines were screened for faults by a trained panel and bottled. Volatile compounds were collected using solid-phase microextraction (SPME) and those with a strong odor were identified using Gas Chromatography-Olfactometry/Mass Spectrometry (GC-O/MS) (Figure 1). Odorants responsible for “foxiness” in *labrusca* were measured quantitatively. In addition, levels of compounds contributing to “bell pepper” aromas were quantified in grapes of *riparia*, *cinerea*, and *rupestris*.

Figure 1. Qun Sun analysing aroma compounds in non-*vinifera* wines.

Results. Forty odor-active compounds were identified and assigned to one of three possible sources: yeast metabolism during fermentation, compounds present in or produced from precursors in the grapes, and unknown sources. The majority of the compounds (17/40) were likely derived solely from sugars and amino acids during fermentation. The grape-derived compounds would contribute to green, sulfurous, smoky, medicinal, fruity, and floral aromas. In the *vinifera* and native wines, there were few differences in the potency of compounds that contribute to fruity and floral character. However, five grape-derived compounds were at least four times more potent in non-*vinifera* wines compared to *vinifera* wines. These compounds had aromas in the “vegetal, earthy, minty” family. These five compounds were quantified, and all were present at higher levels in non-*vinifera* grapes, well above the threshold for sensory detection by humans (Table 1).

Aroma	Volatile	Odor threshold	<i>V. vinifera</i>	<i>V. riparia</i>	<i>V. cinerea</i>
Cloves	eugenol	6	4	16	328
eucalyptus	1,8-cineole	1.1	nd	1	4
leafy-grassy	cis-3-hexenol	400	75	205	3990
herbaceous	IBMP	10-15	16	56	57
herbaceous	IPMP	0.2-1.5	16	56	57

We surveyed a set of 10 *V. cinerea*, 14 *V. riparia*, and 7 *V. rupestris* accessions for the concentration of the methoxypyrazines IBMP and IPMP. Accessions of wild species varied widely in their levels of IBMP and IPMP, with a range from 13 to 353 pg/g. There were some accessions in which the MP levels were comparable to *vinifera*, but in most cases MPs were considerably higher in native species. “Foxy” compounds previously detected in *labrusca* were undetectable in the native species studied.

Conclusions:

- The terms “foxy” and “American grape aroma” should not be used interchangeably.
- Non-*vinifera* wines had more compounds with vegetative and earthy aromas, and five important compounds were identified.

The bottom line: Our results identify the major compounds in wild grape species that contribute to undesirable aromas, and ongoing work to identify genetic markers linked to their production will allow for screening of seedlings in breeding programs without the need to wait for them to mature and bear fruit.