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Effects of Harvest Time on the Aroma of White Wines Made from Cold-Hardy Brianna and Frontenac Gris Grapes Using Headspace Solid-Phase Microextraction and Gas Chromatography-Mass Spectrometry-Olfactometry

Somchai Rice [1,2,3], Madina Tursumbayeva [3], Matthew Clark [4], David Greenlee [5], Murlidhar Dharmadhikari [1], Anne Fennell [6] and Jacek A. Koziel [3,*]

1 Midwest Grape and Wine Industry Institute, Iowa State University, Ames, IA 50011, USA; somchai@iastate.edu (S.R.); murli@iastate.edu (M.D.)
2 Interdepartmental Toxicology Graduate Program, Iowa State University, Ames, IA 50011, USA
3 Department of Agricultural and Biosystems Engineering, Iowa State University, Ames, IA 50011, USA; madina@iastate.edu
4 Department for Horticultural Science, University of Minnesota, St. Paul, MN 55108, USA; clark776@umn.edu
5 Tucker's Walk Vineyard and Winery, Garretson, SD 57030, USA; dave@tuckerswalk.com
6 Department of Agronomy, Horticulture and Plant Science, BioSNTR, South Dakota State University, Brookings, SD 57006, USA; anne.fennell@sdstate.edu
* Correspondence: koziel@iastate.edu; Tel.: +1-515-294-4206

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Abstract: The Midwest wine industry has shown a marked increase in growers, hectares planted, wineries, and wine production. This growth coincides with the release of cold-hardy cultivars such as Brianna and Frontenac gris, in 2001 and 2003, respectively. These white grape varieties account for one-third of the total area grown in the state of Iowa. It is generally accepted that the wine aroma profile plays a crucial role in developing a local, sustainable brand. However, the identity of Brianna/Frontenac Gris-based wine aromas and their link to the grape berry chemistry at harvest is unknown. This study aims to preliminarily characterize key odor-active compounds that can influence the aroma profile in wines made from Brianna and Frontenac gris grapes harvested at different stages of ripening. Brianna and Frontenac gris grapes were harvested approximately 7 days apart, starting at 15.4 °Brix (3.09 pH) and 19.5 °Brix (3.00 pH), respectively. Small batch fermentations were made for each time point with all juices adjusted to the same °Brix prior to fermentation. Odor-active compounds were extracted from wine headspace using solid-phase microextraction (SPME) and analyzed by gas chromatography-mass spectrometry (GC-MS) and simultaneous olfactometry (O). Over 30 odor-active compounds were detected. Aromas in Brianna wines developed from "cotton candy" and "floral", to "banana" and "butterscotch", then finally to "honey", "caramel" and an unknown neutral aroma. Frontenac gris wines changed from an unknown neutral aroma to "fruity" and "rose". Results from the lay audiences' flavor and aroma descriptors also indicate a shift with harvest date and associated °Brix. To date, this is the first report of wine aromas from Brianna and Frontenac gris by GC-MS-O. Findings from this research support the hypothesis that aroma profiles of Brianna and Frontenac gris wines can be influenced by harvesting the grapes at different stages of ripening.

Keywords: Frontenac gris; Brianna; wine aroma; SPME-GC-MS; olfactometry; cold-hardy grapes