



Agricultural Marketing Report

Colorado
State
University

Extension

Department of Agricultural and Resource Economics, Fort Collins, CO 80523-1172

<http://dare.colostate.edu/pubs>

THE WINE HEADACHE: CONSUMER PERCEPTIONS, MARKETING, AND PRICING IMPLICATIONS FOR NON-SULFITED WINES ¹

Christopher Appleby, Marco Costanigro, and Dawn Thilmany-McFadden ²

Key Points for the Wine Industry:

- A considerable share of consumers believes that sulfites in wine cause headaches
- Consumers reporting headaches after moderate wine consumption are particularly receptive to low-sulfite wine marketing assurances.
- Consumers are willing to pay a small premium for low-sulfite wines, but only if it does not compromise quality levels.
- Marketing opportunities may be particularly attractive to smaller producers if they determine small batch production methods result in reduced wine spoilage risks.

The United States is the largest wine market by sales revenue in the world, representing nearly \$32 billion in total retail value (Wine Institute, 2012). In the last 15 years, American wine production has increased 55%, and both total and per-capita wine consumption has expanded every year since 2001 (Wine Institute, 2011a; Wine Institute, 2011b). Though wine remains a highly diversified beverage category, the growing domestic demand for U.S. wines has incentivized industry consolidation (Goodhue, Hein, Green & Martin, 2008) and a greater degree of uniform produc-

tion practices within well-known geographical areas (e.g. Napa Valley). Countering this trend, some producers have begun differentiating their products by focusing on natural and sustainable production practices (see Goode & Harrop, 2011), including wine with differentiated sulfite content.

Problem: How do consumers perceive sulfites?

Sulfites are typically added to wine in quantities ranging from 30 to 90 parts per million (ppm) (Burgstahler & Robinson, 1997) to prevent spoilage stemming from oxidation and microbial growth. While sulfite sensitivity is relatively uncommon, reported symptoms have included trouble breathing, skin rashes, and stomach pain (Vally & Thompson, 2001; Grotheer, Marshall, & Simonne, 2005). As a direct result of the allergic reactions experienced by some, no wine marketed in the U.S. may contain greater than 350 ppm of sulfites, and wine containing greater than 10 ppm must contain a statement on the label (Alcohol and Tobacco Tax and Trade Bureau [TTB], 2012).

Even though the population of sulfite-sensitive consumers is relatively small, the perception that sulfites may cause negative health effects appears to be more common. Anecdotal evidence and articles in the

¹ This project was funded by a research grant from SurePure (South Africa) and an in-kind discount for survey participation vouchers from Wilbur's Total Beverage (Fort Collins, CO).

² Graduate student, Assistant Professor, and Professor, respectively, in the Department of Agricultural and Research Economics; Colorado State University; Fort Collins, CO 80523-1172. Contact Dr. Dawn Thilmany-McFadden; dawn.thilmany@colostate.edu or (970) 491-7220 for more information.

popular press suggest that some consumers report experiencing headaches and migraines after consuming small amounts of certain wines, particularly red varieties (Robin, 2010; Gaiter & Brecher, 2000). Even though the scientific debate regarding what exactly may cause these adverse effects is ongoing (several chemicals have been identified as plausible triggers, see Mauskop & Sun-Edelson, 2009 and Millichap & Yee, 2003), consumers were reported as associating migraines and headaches to the presence of sulfites (Gaiter & Brecher, 2000).

Low-sulfite winemaking in the United States is predominantly synonymous with organic production, at least thus far, as sulfites are forbidden by the organic wine production protocol (Alcohol and Tobacco Tax and Trade Bureau, 2012). Unfortunately, the few studies examining consumers' attitudes towards organic wines (e.g. Olsen, Thach, & Hemphill, 2012) provide scarce information regarding perceptions of sulfites. If consumers do in fact worry about sulfites, a key aspect for entrepreneurs and winemakers is how much consumers value a minimized sulfite level (independently of the other standards imposed by organic production), and what share, type and typical characteristics of consumers would consider such a trait important in their buying decisions.

Study Design

Despite the widespread use of sulfites in the food and beverage industry, this is the first study to:

- Formally quantify consumer perceptions and beliefs toward sulfites in wine;
- Quantify willingness to pay (WTP) for non-sulfited wines; and
- Identify consumer segments particularly receptive to low-sulfite wine marketing.

To address the objectives, subscribers (older than 21 years of age) to the email list of a large beer, wine, and spirits retailer in northern Colorado were contacted via email to participate in an online survey. The survey was conducted between March 8, 2012 and March 31, 2012,³ with a total of 223 participants. Key information collected from the survey included:

- ***Participants' demographic characteristics and purchasing habits.***

- ***Subjective headache experiences after drinking moderate amounts of certain types of wines.***
- ***Consumer tradeoffs of wine attributes, including a "low-sulfite" component.***

Participants were directed through a series of 12 choice sets, where each choice set contained 3 hypothetical wine labels. Participants were asked to select their "most preferred" and "least preferred" option in each choice set (following the methodology of Louviere & Woodworth, 1990; Scarpa et al., 2010). After each choice, participants were also asked if they would actually be willing to purchase the wine selected as "most preferred." A screenshot of a choice set is presented in Figure 1.



Table 1 summarizes the attributes that were included on each hypothetical wine label. To test for differences in consumer behavior across price and varietal market segments, participants were randomly assigned to a pricing block (\$10-\$15, \$20-\$25, or \$30-\$35) as well as to a varietal block (red wine or white wine), which remained consistent throughout the experiment (see Costanigro, McCluskey, & Mittelhammer, 2007). To minimize the number of choice sets (to reduce fatigue) while still maintaining statistically significant results, the attributes shown on each hypothetical wine label were pre-determined using the optimal in the differences orthogonal design (OOD) (see Street, Burgess and Louviere, 2005).

Headache Experiences and Perceptions Toward Sulfites

More than a third of the total sample (34.08%), reported experiencing headaches after consuming even moderate amounts of certain wines. Table 2 presents a partial summary of the demographics, and with the addition of headache experiences, illustrates how such experiences vary across different demographic and market involvement segments. Two results are worth noting: first, the perception becomes less common as education level increases. Second, the data suggest that some alcohol consumers may refrain from buying wine altogether as a direct consequence of their headache experience, as 60% of the participants who do not buy wine in a typical month report experiencing headaches. Additionally, the perception that sulfites are the main culprit for the reported headaches is rather widespread (see Figure 2): 63.16% of participants reporting

³ The research was approved on January 20, 2012 by the IRB Coordinator of the Research Integrity & Compliance Review Office, Colorado State University. IRB ID: 131-12H.

Based on this choice set only, select one wine that you most prefer. Then select another wine that you least prefer.

	<u>WINE A</u>	<u>WINE B</u>	<u>WINE C</u>
	Quality Score 80	Quality Score 88	Quality Score 84
	\$10.49	\$13.49	\$14.99
			
Most prefer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Least prefer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Would you actually be willing to purchase the wine you selected as "most preferred" in real life?

☐ Yes

☐ No

Figure 1: Screenshot of a choice set in the \$10.49 to \$14.99 price block

Table 1: Attributes and levels shown in the choice experiment

Wine Attribute	Possible Scenarios			
"USDA-Certified Organic" seal	On Wine Label	Not on Wine Label		
"No Sulfites Added" seal	On Wine Label	Not on Wine Label		
<i>Wine Spectator</i> quality score ⁴	80	84	88	92
Price ⁵	\$10.49 or \$20.49 or \$30.49	\$11.99 or \$21.99 or \$31.99	\$13.49 or \$23.49 or \$33.99	\$14.99 or \$24.99 or \$34.99

⁴ Definitions of scores were communicated (according to Wine Spectator's own descriptions) as follow: 95-100, Classic. A great wine. 90-94, Outstanding: a wine of superior character and style. 85-89: Very good: a wine with special qualities. 80-84: good: a solid, well-made wine. 75-79: mediocre: a drinkable wine that may have minor flaws. 50-74: not recommended.

⁵ Price shown depends on the random block assignment

Table 2: Summary statistics (demographics) and incidence of Headaches Syndrome

Characteristic		% of Sample	% Experiencing Headache
Gender	Male	47.98%	32.71%
	Female	52.02%	35.34%
Education	Less than High School	0.00%	0.00%
	High School	1.35%	66.67%
	Some College	15.70%	42.86%
	Bachelor's Degree	43.95%	34.69%
	Master's Degree	25.56%	33.33%
	Doctorate/Professional Degree	13.45%	20.00%
Purchases per month	0 bottles	2.24%	60.00%
	1 to 3 bottles	27.80%	33.87%
	4 to 6 bottles	32.29%	33.33%
	7 to 9 bottles	17.49%	38.46%
	10 or more bottles	20.18%	28.89%
Bottles of wine currently at home	0 bottles	2.69%	50.00%
	1 to 3 bottles	24.22%	37.04%
	4 to 6 bottles	14.35%	40.63%
	7 to 9 bottles	8.97%	25.00%
	10 or more bottles	49.78%	31.53%

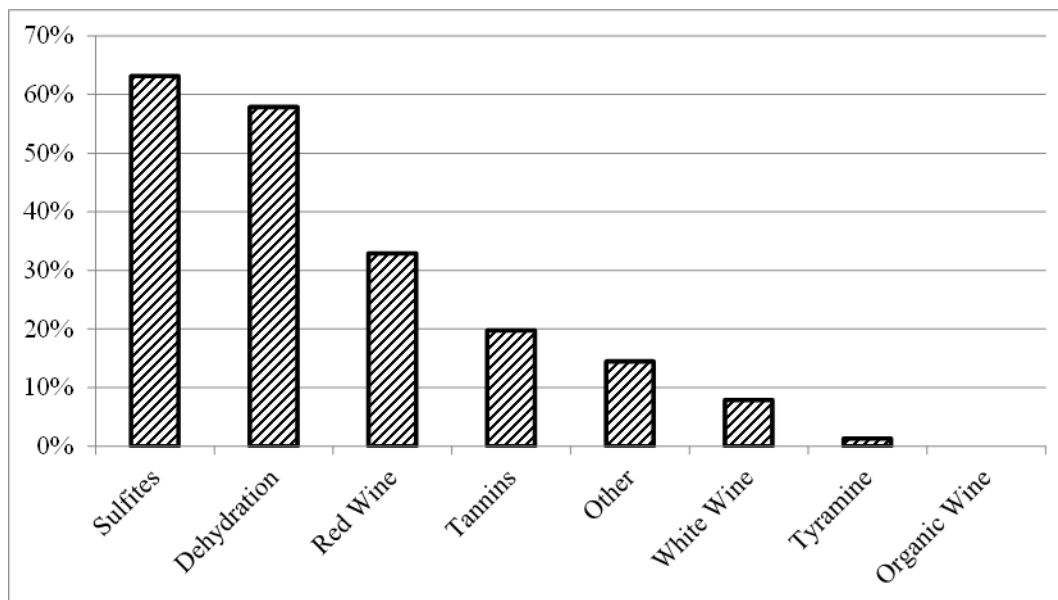


Figure 2: Perceived causes of wine-related headaches ⁶

⁶ We reference only consumers reporting a headache after moderate wine consumption. Participants could select more than one perceived cause, so the percentage totals are greater than 100%.

Headaches mentioned sulfites as one of the principal triggers, followed by dehydration (57.89%) and red wine (32.89%).

Price Premiums for Low-sulfite Wine

Participants as a whole, and especially headache sufferers, expressed significant (albeit small) price premiums that they would be willing to pay for a wine without added sulfites. Based on the aggregate estimates, the per bottle premium for non-sulfited wine is \$0.64 for consumers overall, compared to a \$1.23 premium for headache sufferers (Table 3). However, we also find significant evidence that consumers value quality considerably more than a lower sulfite content. This indicates that, all else equal, participants (including headache sufferers) are not willing to compromise quality for a low-sulfite wine.

Table 3: Summary of expressed price premiums by attribute⁷

Wine Attribute	Consumers Overall	Headache Sufferers
Wine marketed as organic	\$1.22	\$0.98
Wine marketed as non-sulfited	\$0.64	\$1.23
A 4-point increase in quality score	\$2.84	\$2.83

In addition, we also extensively investigated whether other demographic variables, price ranges, or wine varieties had an impact on how attributes were valued, but our findings do not support the use of other segmenting factors when marketing wine.

How Do Sulfites Influence the Actual Purchase Decision?

While the price premium that consumers are willing to pay is marginal, a wine differentiated by a lower sulfite content may push consumers from a “do not purchase” decision into a “purchase” decision. Using data collected from the survey on whether a participant would actually be willing to purchase the wine selected as “most preferred,” our results show that

consumers are indeed more likely to select a wine because of its reduced sulfite content (Table 4). However, quality is considerably more important. In fact, headache sufferers are more drawn to higher-quality wine than non-headache sufferers, indicating that quality may also be associated with negating the wine headache.

Not surprisingly, participants are highly price-sensitive, as those assigned to the \$20-\$25 price range were 22% less likely to say they would actually purchase a wine compared to respondents in the lowest price category. Participants assigned to the \$30-\$35 price group indicate a 33% decrease in actually making a purchase.

Table 4: Impact that label changes have on the likelihood of a purchase⁸

Wine Attribute	Consumers Overall	Headache Sufferers
Wine marketed as organic	1.86%	2.18%
Wine marketed as non-sulfited	1.72%	3.41%
A 4-point increase in quality score	5.71%	6.41%
A \$1.50 increase in price	-5.10%	-5.55%

Lessons for the Wine Industry

Thirty-four percent of a sample of 223 participants reported experiencing headaches after consuming moderate amounts of certain wines, with the majority attributing blame to sulfites. Results from the survey show that headache sufferers are willing to pay a premium of \$1.23 to avoid added sulfites in wine. However, we also find that the same group is only slightly (3.4%) more likely to purchase a wine if it does not contain added sulfites. More generally, the decision to purchase a wine is largely determined by price range and quality, with a lesser influence from organic and sulfites labeling. Based on these findings, consumers’ wine selection process may be represented as a two-step decision where desired quality and price range are

⁷ All estimates in Table 3 are statistically significant at conventional levels.

⁸ For headache sufferers, the p-value for the organic coefficient is 0.257, which may indicate a lack of statistical significance. All other coefficients are significant at conventional levels.

established first, and then tradeoffs between more marginal attributes (such as organics and/or no added sulfites) are considered.

The results provide several key implications for the wine industry. First, non-sulfited wines will be unlikely to succeed if the production method somehow compromises quality. In fact, consumers may be actively deterred from purchasing a low-sulfite wine if they associate it with lower quality. Offering a money-back guarantee would reassure consumers, but it would also shift the risk to the producer and/or marketer. In light of this, stakeholders should consider the additional costs (if any) involved with producing and marketing low-sulfite wine, and compare it with the small premium that could be elicited. Another long-term factor to consider is that valuation of non-sulfited wines is, based on our results, conditional on attributing negative health effects to sulfite residues. If sulfites are not at the root of the problem, the premium for non-sulfited wines may vanish, at least in the long run.

Based on these considerations, “no sulfites added” marketing may be more appropriate for wines that do not require extended aging (which increases the chances of spoilage), or for winemakers whose production techniques already minimize the risk of a diminished quality. This may imply particular benefits for wineries with an on-site supply chain and small batch processes to monitor, since imported grapes can experience stress and microbial contact during transport, and may not be harvested at the optimal ripeness. Furthermore, emerging wine regions known for smaller-scale production may be able to better carve out a regional identity by exploiting the low-sulfite market. Perhaps more importantly, our results indicate clear evidence that good quality wines with lower potential to induce headaches will grant access to a substantial niche of consumers.

References

- Alcohol and Tobacco Tax and Trade Bureau. (2012, May 16). Wine labeling resources. Last accessed June 2, 2012 from <http://www.ttb.gov/wine/wine-labeling.shtml>.
- Burgstahler, A.W. & Robinson, M.A. (1997). Fluoride in California wines and raisins. *Fluoride*, 30(3), 142-146.
- Costanigro, M., McCluskey J. & Mittelhammer, R. (2007). Segmenting the wine market based on price: Hedonic regression when different prices mean different products. *Journal of Agricultural Economics*, 58(3), 454-466.
- Gaiter, D.J. & Brecher, J. (2000, Oct). Why do I get headaches from wine? *Wall Street Journal*. Last accessed June 2, 2012 from <http://guides.wsj.com/wine/wine-tips-and-tricks/why-do-i-get-headaches-from-wine/>.
- Goode, J., & Harrop, S. (2011). *Authentic Wine: Toward natural and sustainable winemaking*. Berkeley, CA: The Regents of the University of California.
- Goodhue, R., Hein, D., Green, R. & Martin, P. (2008). California wine industry evolving to compete in 21st century. *California Agriculture*, 62 (1): 12.
- Grotheer, P., Marshall, M., & Simonne, A. (2005). Sulfites: Separating fact from fiction. *Department of Family, Youth, and Community Sciences, University of Florida*, publication number FCS8787. Last accessed June 2, 2012 from <http://edis.ifas.ufl.edu/fy731>.
- Louviere, J. & Woodworth, G. (1990). Best-worst scaling: A model for largest difference judgments. Working paper, Faculty of Business, University of Alberta.
- Mauskop, A. & Sun-Edelstein, C. (2009). Food and supplements in the management of migraine headaches. *The Clinical Journal of Pain*, 25(5), 446-452.
- Millichap, J.G. & Yee, M.M. (2003). The diet factor in pediatric and adolescent migraine. *Pediatric Neurology*, 28(1), 9-15.
- Olsen, J., Thach, L., & Hemphill, L. (2012). The impact of environmental protection and hedonistic values on organic wine purchases in the US. *International Journal of Wine Business Research*, 24 (1), 47-67.
- Robin, S. (2010). What are the causes of a wine headache? *Livestrong*. Last accessed July 21, 2012 from <http://www.livestrong.com>.

- Scarpa, R., Notaro, S., Louviere, J. and Raffaelli, R. 2010. "Exploring Scale Effects of Best/Worst Rank Ordered Choice Data to Estimate Benefits of Tourism in Alpine Grazing Commons." *American Journal of Agricultural Economics*. 93(3): 813-828.
- Street, D.J., Burgess, L., & Louviere, J.J. (2005). Quick and easy choice sets: Constructing optimal and nearly optimal stated choice experiments. *International Journal of Research in Marketing*, 22 (4) (December): 459–470.
- Vally, H. & Thompson, P.J. (2001). Role of sulfite additives in wine induced asthma: Single dose and cumulative dose studies. *Thorax*, 56, 763-769.
- Wine Institute. (2011a, Dec 16). US/California wine production. Last accessed June 2, 2012 from <http://www.wineinstitute.org/resources/statistics/article83>.
- Wine Institute. (2011b, Apr 19). Wine consumption in the U.S. Last accessed June 2, 2012 from <http://www.wineinstitute.org/resources/statistics/article86>.
- Wine Institute. (2012, Mar 22). 2011 California wine shipments within U.S. reach all-time high: U.S. is world's largest wine market. Last accessed June 2, 2012 from <http://www.wineinstitute.org/resources/pressroom/03222012>.