Grain Trial Experiment

Purpose: To identify and quantify effects in a commercial Chardonnay wine, of attributes resulting from grain width selection in American oak barrels.

Method: In May 2004, Barrel Associates International directed our Coopers to sort sufficient stavewood onto three trolleys, to make 4 barrels of each type: Wide grain would have 12 or fewer growth rings per inch, Medium grain would have 13-19 growth rings per inch, and Tight grain would have 20+ growth rings per inch. Staves cut by Perryville Stave Co within days of one another in January 2001 were chosen for uniformity of seasoning, age and source material.

Barrel toasting was monitored for elapsed time, and measurements taken of the maximum temperature reached by the barrel shell. This is normal Cooperage procedure, and the results were normal and uniformly within range for Water Bent barrels at Medium Toast.

The barrels were delivered to R.H. Phillips Winery in July 2004, and staged for use. A control unoaked wine, from the same vineyard lot, was sampled simultaneously with the barrel fermented Chardonnay groups, now designated Wide, Medium, and Tight.

Chardonnay fruit was harvested on 24 August 2004, from the Laugenauer Vineyard at R.H. Phillips' Esparto, California home ranch. Harvest Brix 23.9, pH 3.96, and TA .55g/100ml were recorded. The fruit was cold-settled for 2 days, racked off the lees on 26 August 2004, received nutrient and other adjustments, then inoculated in-tank with Epernay 2 yeast, on the same day. The barrel-ferment portion of wine went in barrel on 29 August 2004. Normal Winery practice for this Laugenauer fruit would be 0% ML fermentation, so no further inoculation was performed, and there was an SO2 addition after conclusion of primary fermentation.

Sampling of barrel lots was timed to coincide with the first Winemaker evaluations of the new wines, and then at alternate stirrings. R.H. Phillips drew samples, via glass siphon, aggregating 4 barrel samples of each grain designation, into glass bottles. These were shipped to the independent Australian Wine Research Institute for standard oak profile assay. The samples were blind labeled, and randomized, to hide the unoaked control sample within each lot.

On one occasion, an individual sample arrived broken. Two replacement samples were sent, these are reported under Stir 9A. In this sample set, the Control sample was recorded with trace amounts of oak compounds. This reading was ultimately verified by the Winery, as an inadvertent cellar transfer of oak-influenced wine into the control lot, prior to obtaining the sample. The Winemaker viewed this as further validation of the oak profile assay.

Over roughly 7.5 months, the wine received 10 stirrings, the final stir just before pumping out of barrel, and bottling on 19 April 2005. Final Wine chemistry reports 14.5% Alcohol, pH 3.75 and TA .7g/100ml.

The experiment was conceived to isolate, in 2 parts, the effects of barrel grain selection in a production wine environment, and to possibly identify the benefits of such grain selection for commercial purposes, i.e. what is the additional worth of a fine grain barrel?

The extraction data are summarized in a following table. Part 2 of the discovery involved engaging respected winemakers throughout the world to review the bottled wines in blind tastings of the three grain selections, tight, medium, wide, and the unoaked control sample. These tasting results are also compiled for review in a following table.

Conclusion: Despite our best efforts to discover the effects of grain width, by tracking the extractable oak compounds during fermentation, we could not find any statistically significant differences in either the rates of extraction, nor in the amounts of oak compounds extracted, over the 7.5 month fermentation course. The tight grain barrels, the wide and medium grain width barrels, all delivered similar amounts of oak compounds, at the same rate of speed. We were unable, therefore, in Part 1 of the discovery, to establish any empirical reason to conclude that grain selection had any effect on the rate or amount of oak compounds extracted to this wine.

Despite our initial thinking that perhaps tight or "fine" grain barrels would always rise to the top in blind tastings, we could not find any basis to conclude in Part 2 of the discovery, our worldwide tasting panel of professional winemakers, that there was any clear preference among the three grain selections. Moreover, after tabulating the tasting results from four continents, in the year after bottling, the wide grain barrel sample produced more top scores than either the tight or medium grain selections or the unoaked control wine. Such a possibility of preference runs counter to many prevailing assumptions, indeed a number of winemakers were unsettled when the blind tasting samples were unmasked.

Barrel Associates International Wine Extract Results (°)

BAI Bending Method	Control			Sample		
AWRI No.	KE3061	AF0416	BF1460	CF1527		EF1145
BAI No.	BAIRHP1	BAIRHP8	BAIRHP14	BAIRHP18		BAIRHP26
Analysis Date	Dec-04	Jan-05	Feb-05	Mar-05		May-05
Measure	µg/L	µg/L	µg/L	µg/L		µg/L
Cis-Oak Lactone	ND	ND	ND	17		13
Trans-Oak Lactone	ND	ND	ND	ND		ND
Eugenol	ND	ND	ND	ND		ND
Vanillin	ND	ND	ND	37		12
Guaiacol	ND	ND	ND	2		ND
4-Methylguaiacol	ND	ND	ND	1		ND
4EP	ND	ND	ND	ND		ND
4EG	ND	ND	ND	ND		ND
Stir#	3	5	7	9		10

BAI Bending Method	Water Bent			Wide Grain		
AWRI No.	KE3062	AF0417	BF1458	CF1529		EF1142
BAI No.	BAIRHP2	BAIRHP9	BAIRHP12	BAIRHP20		BAIRHP23
Analysis Date	Dec-04	Jan-05	Feb-05	Mar-05		May-05
Measure	µg/L	µg/L	µg/L	µg/L		µg/L
Cis-Oak Lactone	135	164	222	238		284
Trans-Oak Lactone	23	19	30	30		35
Eugenol	20	21	30	29		31
Vanillin	108	93	154	165		152
Guaiacol	12	12	16	16		17
4-Methylguaiacol	7	6	8	8		8
4EP	ND	ND	ND	ND		ND
4EG	ND	ND	ND	ND		ND
Stir#	3	5	7	9		10

BAI Bending Method	Water Bent				Medium Grain	
AWRI No.	KE3063	AF0415	BF1459		CF2151	EF1144
BAI No.	BAIRHP3	BAIRHP7	BAIRHP13		BAIRHP21	BAIRHP25
Analysis Date	Dec-04	Jan-05	Feb-05		Mar-05	May-05
Measure	µg/L	µg/L	µg/L		µg/L	µg/L
Cis-Oak Lactone	141	176	256		278	287
Trans-Oak Lactone	18	18	28		23	28
Eugenol	20	24	34		37	36
Vanillin	113	111	162		179	162
Guaiacol	11	11	15		14	16
4-Methylguaiacol	6	6	8		7	8
4EP	ND	ND	ND		ND	ND
4EG	ND	ND	ND		ND	ND
Stir#	3	5	7		9A	10

BAI Bending Method	Water Bent			Tight Grain		
AWRI No.	KE3064	AF0414	BF1461	CF1526	CF2152	EF1143
BAI No.	BAIRHP4	BAIRHP6	BAIRHP15	BAIRHP17	BAIRHP22	BAIRHP24
Analysis Date	Dec-04	Jan-05	Feb-05	Mar-05	Mar-05	May-05
Measure	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Cis-Oak Lactone	123	153	223	231	261	296
Trans-Oak Lactone	20	17	31	29	28	32
Eugenol	19	20	32	28	30	36
Vanillin	109	115	149	178	176	144
Guaiacol	12	13	16	16	15	17
4-Methylguaiacol	6	6	7	8	7	8
4EP	ND	ND	ND	ND	ND	ND
4EG	ND	ND	ND	ND	ND	ND
Stir#	3	5	7	9	9A	10

	Detection Limit µg/L	Quantitation Limit µg/L	Uncertainty %	Aromas and flavors often associated with these compounds
Cis-Oak Lactone	10	10	10%	Raw or fresh oak, oak tannin, woody character
Eugenol	10	10	10%	Spiciness, especially clove. Can be cinnamon, nutmeg or chocolate-like
Vanillin	10	10	10%	Primary aroma compound of natural vanilla
Guaiacol	1	1	1 or 10%	Char character and smokiness; artifact of barrel toasting
4-Methylguaiacol	1	1	1 or 10%	Char, smoke and spice character; artifact of barrel toasting
4EP	10	10	10%	Leather, barnyard, sweaty horse; byproduct/(can be) indicator of Brettanomyces
4EG	10	10	10%	Leather, barnyard, sweaty horse; byproduct/(can be) indicator of Brettanomyces

Note: Detection limit is the lowest value that can be positively identified as present by the instrumentation
Quantitation limit is the lowest level at which a result can be confidently cited in matrix
Uncertainty is the uncertainty in the reported result expressed at +/- % of the result
* whichever is greater.

Compilation: (°) Excerpts compiled from data reported in multiple Analytical Service Reports dated 9 December 2004, 7 January 2005, 18 February 2005, 21 March 2005, 19 May 2005, all performed by the independent Australian Wine Research Institute, Urrbrae, SA
Full report copies are on file and available by request. Please inquire.

Wine: Chardonnay samples provided by Greg Winter and RH Phillips Winery, Esparto, CA

Tasting results, Flagstone Winery, Somerset West, South Africa, November 2, 2005
Grain trial, Tasted Blind

	Tasting Order	WM 1	WM2	WM3	WM 4	WM 5	WM 6	Total	Ranking	Result
Medium	a	3	3	4	3	4	2	19	4	least favorite
Control	b	4	2	1	4	2	3	16	3	third choice
Wide	c	1	1	2	1	3	4	12	1	close to 2nd
Tight	d	2	4	3	2	1	1	13	2	close to 1st

Tasting results, Flagstone Winery, Somerset West, South Africa, November 3, 2005
Grain trial, tasted blind

	Tasting Order	WM 1	WM2	WM3	WM 4	WM 5	WM 6	WM 7	Total	Ranking	Result
Wide	a	1	2	1	1	3	2	1	11	1	clear favorite
Control	b	3	4	4	3	4	1	4	23	3	least favorite
Tight	c	2	1	2	4	2	4	2	17	4	close to 3rd
Medium	d	4	3	3	2	1	3	3	19	2	close to 2nd

Tasting results, Fountaingrove Inn, Santa Rosa, March 22, 2006
Grain trial, Tasted Blind

	Tasting Order	WM 1	WM2	WM3	WM 4	WM 5	WM 6	WM 7	WM 8	WM 9	WM 10	Total	Ranking	Result
Medium	a	1	2	2	1	1	2	3	2	1	3	18	1	clear favorite
Wide	b	4	1	3	3	2	1	4	4	2	2	26	3	close to 2nd
Control	c	2	4	1	4	3	4	2	3	4	4	31	4	least favorite
Tight	d	3	3	4	2	4	3	1	1	3	1	25	2	close to 3rd

Tasting results, Hotel Santa Cruz, Santa Cruz, Chile, October 19, 2005,
Tasted Blind

		WM 1	WM 2	WM 3	WM 4	WM 5	Total	Ranking	Result
Tight	a	3	2	1	4	2	12	3	3rd
Control	b	4	4	4	3	4	19	4	least favorite
Medium	c	1	3	3	2	1	10	2	close to first
Wide	d	2	1	2	1	3	9	1	close to 2nd

Tasting results, Barossa Valley, Australia, September 9, 2005,
Tasted Blind

		WM 1	WM 2	WM 3	WM 4	Total	Rank	Result
Medium	a	3	2	1	1	7	1-2	tied 1st & 2nd
Control	b	4	4	3	4	15	4	least favorite
Tight	c	2	3	4	2	11	3	3rd
Wide	d	1	1	2	3	7	1-2	tied 1st & 2nd

		Calif	Chile	Austr	SA 1	SA 2		Worldwide Rank
Compiled totals	Wide	26	9	7	12	11	65	1
	Medium	18	10	7	19	19	73	2
	Tight	25	12	11	13	17	78	3
	Control	31	19	15	16	23	104	4