

REVIEWING OPTIMUM WOOD AGE FOR AMERICAN OAK:

The Influence of Air Seasoning Time on Flavor Development

Dennis Hill, Codera Wine Group, Blackstone Winery



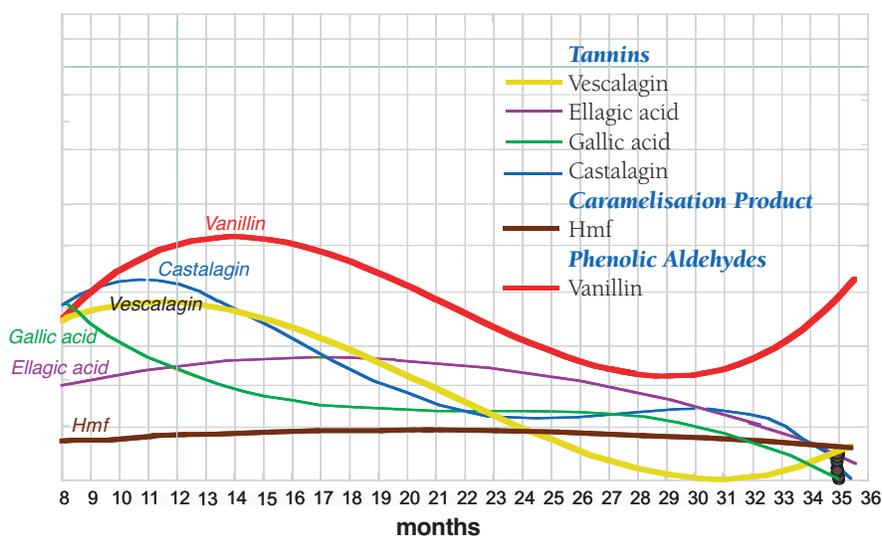
World Cooperage

INTRODUCTION

The assumption that “older wood is better wood” developed from the traditional European cooperages using French oak. Historically, French oak aged for long periods because of primitive conditions such as lengthy transportation and lack of technology for drying. These delayed the coopering of barrels. On average, it required two years from cutting to coopering. Winemakers also liked the resulting flavors.

By default, the standard of 24 months air seasoning time has been adopted by our cooperages for American oak. However, there are some fundamental physiological differences between American and French oak. The environmental conditions for air seasoning American wood is also different from French elements. With Codera, we are further examining five different wood ages (6, 12, 18, 24, and 36 months) and reviewing the optimum time period for seasoning American oak.

Changes in American Oak During Seasoning 9 - 35 Months



OBJECTIVE

The objective is to observe the differences the seasoning time of the oak has on the style, composition and general quality of red wine (Merlot) aged in barrels.

SYNOPSIS

Production scale normal red winemaking procedures were used to produce Merlot varietal wine. The wine produced was one homogeneous lot. It was then aged for 13 months in World Cooperage American oak barrels constructed from wood aged 6, 12, 18, 24, and 36 months. Composites of each barrel type were collected for analysis, then blended, protein-fined, and bottled for further analysis and evaluation.

THE WINE

Producer: Codera Wine Group, Blackstone Winery
Vintage: 1999
Varietal: Merlot
Vineyards: 75% Lone Oak, 25% Hidden Springs
Appellation: Russian River Valley, Alexander Valley
Crush Date: 10-18-99, 10-5-99

Harvest Data

Total Acidity: 0.64 g/100ml, 0.56 g/100 ml
Brix: 23.8, 23.2
pH: 3.65, 3.28
Pre-fermentation: Cold soak 3 days
Fermented with: M-2 yeast
Must temperature: 84-87°F
Brix at pressing: 2.0 to 0, 0 to -1.0
Days on skins: 10 days, 9 days
Blend date: 01/28/2000
Barreling date: 02/03/2000
M-L completion date: 02/10/2000

Wine Analysis as of 02/13/01

Alcohol: 13.7%
Total Acidity: 0.57 g/100 ml (3/2000)
Volatile Acidity: 0.058 g/100 ml (2/2001)
Free Sulfur Dioxide: 29-32 ppm (adj. 2/28/01)
Total Sulfur Dioxide: 70-74 ppm (2/28/01)
pH: 3.68 (3/2000)
Enz. Fruc + Gluc: 0.015 g/100 ml
Finishing: Racked from barrels 2/28/01
Fining: 1 lbs/1000 gal egg white and 1/2 lbs/1000 gal Gelatin 2/28/01
Returned to neutral barrels: 2/28/01
Bottled: 3/21/01

OAK DATA

Source: American oak
Wood Age: 6, 12, 18, 24, and 36 months
Toast Level: Medium Plus
Size: 59 gallon

TRIAL EXECUTION

6 barrels of each variable
Oak Contact Time: 13 months
First fill: 2/3/2000
Bottling Date: 3/21/2001

TRIAL

06 months
12 months
18 months
24 months
36 months

The wines were tasted at the Pre-Symposium in March 2001 and the scores follow:

<i>Sample</i>	<i>Overall</i>
06 months	1
12 months	1
18 months	2
24 months	8
36 months	3

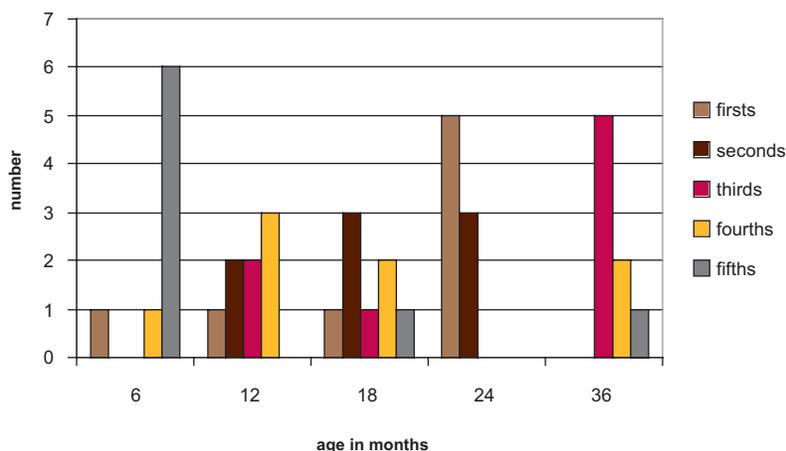
RESULTS AND DISCUSSION

Sensory analysis

In March 2001 winemakers tasted the wines and ranked them for preference. The 24 month aged wood was markedly the preferred sample (see Figure 1). The six and 36 month samples received the most poor scores, whereas there was not a clear preference between the wines made with 12 and 18 month wood. The wine made with 24 month old wood was described as toasty oak, caramel, complex, and well integrated. The oldest wood made wine with less direct oak character. It was described as slightly earthy. The six month sample showed raw green wood character.

The results of the sensory evaluation indicated that the six month sample was the most astringent, while the 18 month samples had the highest total intensity of aroma. By contrast the 24 month, followed closely by the 36 month sample, had the highest level of complexity and fruit character.

Figure 1: Preference ratings for wine made in barrels of various wood ages



Chemical analysis

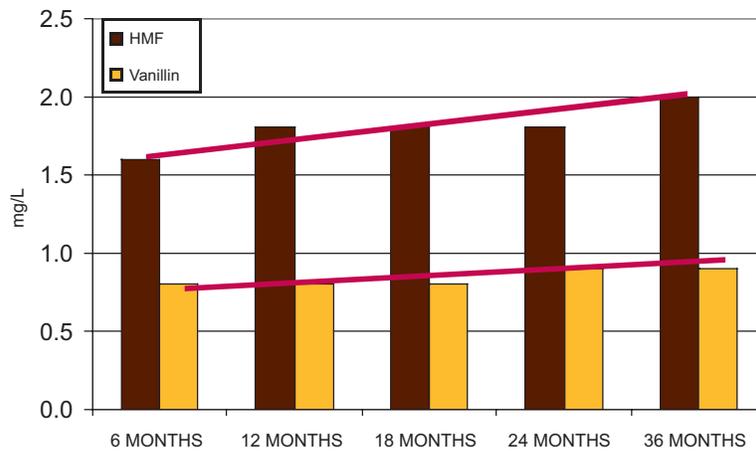
The wine was analyzed for wood extractives, smoke components, and wine phenolics. Since oak lactones are an important feature of American white oak, the flavor-active cis and trans isomers were included. The results are shown in Table 1.

Table 1: Analysis of wine made in barrels of various wood ages (mg/L)

	6 month	12 month	24 month	36 month	48 month
Tannin derivative					
Gallic acid	35.6	34.8	34.9	35.6	35.0
Ellagic acid	3.6	3.5	3.3	3.6	3.1
Toastiness					
Hydroxy methyl furfural	1.6	1.8	1.8	1.8	2.0
Furfural	0.3	0.4	0.4	0.4	0.4
5-methyl furfural	0.7	0.7	0.6	0.7	0.7
Wine Phenolic					
Protocatechuic acid	2.0	1.8	1.6	2.3	2.1
Catechin	134.4	131.5	138.9	143.3	139.9
Epicatechin	85.0	87.0	83.3	70.8	90.1
Caffeic acid	12.9	12.9	13.0	12.9	13.3
Myricetin	7.7	7.6	6.9	6.7	6.8
Quercetin	5.2	5.0	4.8	4.7	4.9
Lignin Breakdown					
Syringic acid	4.4	4.7	4.8	5.0	4.9
Vanillin	0.8	0.8	0.8	0.9	0.9
Syringaldehyde	5.9	5.9	5.9	6.1	6.1
Coniferaldehyde	0.5	0.5	0.5	0.5	0.5
Sinapaldehyde	0.3	0.3	0.3	0.2	0.3
Smoke Compounds					
O-cresol	0.23	0.19	0.25	0.27	0.26
4-methyl guaiacol	1.54	1.68	1.34	1.83	1.99
4-ethyl phenol	0.06	0.01	0.03	0.11	0.07
4-ethyl guaiacol	0.01	0.01	0	0.03	0.03
Oak Lactones					
Trans-lactone	0.15	0.19	0.29	0.25	0.45
Cis-lactone	1.90	1.47	1.91	2.23	2.44

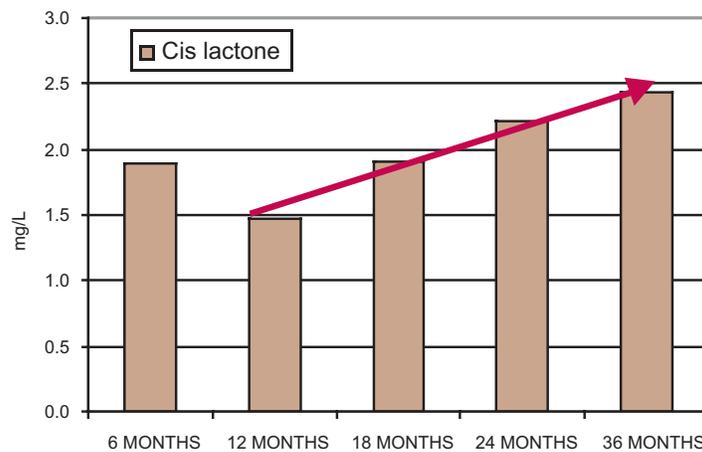
Figure 2 shows a bar chart for Hmf (hydroxymethyl furfural—a good ‘marker’ for toastiness) and vanillin (see Figure 2). Both tend to increase with increasing wood age.

Figure 2: Trends in hydroxymethyl furfural and vanillin content



Another effect of increasing stave age included an increase in oak lactones (see Figure 3). The upward trend in cis oak lactone is shown below.

Figure 3: Trends in cis oak lactone with increasing barrel age



CONCLUSIONS

The availability of wood extractives such as vanillin and the ‘toasty’ compounds appears to increase with increasing wood age. The differences are not very large in magnitude, but are noticeable at 24 and 36 months stave age.

TASTING RESULTS

1st Choice	<i>Winemaker</i>	<i>Other</i>	<i>Overall</i>
18 months	19%	24%	22%
12 months	20%	16%	16%
06 months	15%	16%	14%
24 months	30%	22%	25%
36 months	17%	24%	20%

2nd Choice

18 months	23%	31%	24%
12 months	21%	20%	19%
06 months	20%	12%	15%
24 months	14%	24%	20%
36 months	21%	14%	19%