oak powder and application rates

Beaulieu Vineyard

OAK SOLUTIONS group

evOAK Forward Thinking Oak Products

OBJECTIVE

The objective is two-fold: 1) To test the effect of oak powder addition during the fermentation of Cabernet Sauvignon grapes, and 2) to test the effects of different addition levels and the impact on flavor profile.

SYNOPSIS

It has been established that addition of toasted oak powder to wine fermentation reduces vegetal character and may increase the complexity of a wine without adding any oak flavor. Fruit intensity may also be increased.

Cabernet Sauvignon grapes were harvested and crushed evenly into five fermenters. The fruit was randomized in the field to ensure the same composition in each fermenter. Toasted oak powder was added at the crush stage in 20#/1000, 30#/1000, and 60#/1000 levels. A fourth treatment was 20#/1000 oak powder addition, 2/3 of which was toasted, 1/3 untoasted. The final tank was a control with no powder. The wines were drained separately post-fermentation, and kept separate through malolactic fermentation and ageing.

SALES OFFICES
www.oaksolutionsgroup.com

AUSTRALIA
Tanunda
South Australia
Tel: 04 0920 0737

EUROPE
Bordeaux
France
Tel: 06 72 14 24 00

Las Rozas(Madrid)
Spain
tel 34 916403542

NORTH AMERICA
Napa
USA
Tel: 707 259 4988

SOUTH AFRICA
Paarl
South Africa
Tel: 021 873 6969

SOUTH AMERICA
Santiago
Chile
Tel: 56 8 361 4939

beaulieu vineyard

THE WINE

Producer:	Beaulieu Vineyard
Year:	2003
Variety:	Cabernet Sauvignon
Vineyard:	Rutherford
Crush Date:	November 1, 2003

Harvest Data

Total Acidity:	0.71 g/mL of tartaric acid
Brix:	21.8
pH:	3.54
Prior to fermentation added:	1#/1000 Fermaid K, 3oz metabisulfite/ton
Days of fermentation:	10
Fermented with:	Fermivin yeast
During fermentation added:	1#/1000 Fermaid K

Wine Analysis as of April 28, 2004

Alcohol:	12.50% by volume
Total Acidity:	0.54 g/100 mL of tartaric acid
Volatile Acidity:	0.040 g/100 mL of acetic acid
Free Sulfur Dioxide:	40 mg/L of SO_2
Total Sulfur Dioxide:	85 mg/L of SO_2
pH:	3.93
Residual Sugar:	dry

OAK DATA

Source:	French oak
Wood Age:	24 months

TRIAL EXECUTION

Sample Size:	1 of each variable
Oak Contact Time:	6 months
Bottling Date:	April 2004

THE TRIAL

Control
20#/1000 Toasted Oak Powder
30#/1000 Toasted Oak Powder
60#/1000 Toasted Oak Powder
20#/1000 Mixed Oak Powder (2/3 toasted, 1/3 untoasted)

RESULTS AND DISCUSSION

The analysis that was undertaken included 25 oak extractives. As well as this analysis, the wines were screened for organosulfur compounds. Results for oak extractives are shown in Table 1.

Table 1. Analysis of 25 extractives in the wine (in mgL-1, i.e. parts per million)

	Oak powder 30lb/1000gal	Oak powder 20lb/1000gal	Control no oak	Oak powder Mix at 20lb/1000*	Oak powder 60lb/1000gal
Tannnin breakdown					
Gallic Acid	22.20	18.51	23.91	25.18	22.83
Ellagic Acid **	NA	NA	NA	NA	NA
Hemicellulose breakdown					
HMF	0.24	0.35	0.29	0.30	0.07
5-methyl furfural	0.12	0.13	0.11	0.11	0.08
Furfural	0.00	0.00	0.00	0.00	0.00
Wine phenolics					
Protcatechuic acid	9.35	9.56	7.11	8.18	10.91
Catechin	59.65	66.76	74.91	90.78	82.21
Epicatechin	6.62	7.93	8.01	10.68	10.36
Chlorogenic acid	0.15	0.15	0.25	0.27	0.20
Caffeic acid	3.69	3.30	3.16	5.28	3.94
Myricetin	1.31	1.49	1.77	1.54	1.16
Quercetin	5.88	6.37	7.69	6.83	5.16
Lignin degradation compounds					
Vanillic acid	0.27	0.31	0.30	0.31	0.33
Syringic acid	2.82	3.27	3.01	2.92	3.31
Vanillin	0.37	0.47	0.57	0.45	0.48
Syringaldehyde	1.79	1.78	1.86	1.82	2.19
Coniferaldehyde	0.23	0.09	0.04	0.23	0.17
Sinapaldehyde	0.14	0.08	0.16	0.05	0.09
'Smoke' phenols					
Phenol	0.12	0.11	0.16	0.12	0.14
Guaiacol	0.29	0.91	0.14	0.24	0.59
o-Cresol	0.01	0.01	0.02	0.00	0.01
4-methyl guaiacol	0.30	0.27	0.23	0.67	0.23
4-ethyl phenol	0.07	0.03	0.00	0.03	0.05
4-ethyl guaiacol	0.03	0.05	0.13	0.12	0.11
Oak Lactones					
trans lactone	0.033	0.025	0.025	0.016	0.032
cis lactone	0.035	0.036	0.02	0.016	0.059

* Note: This mix consisted of 2/3 toasted oak + 1/3 untoasted, seasoned only

** Ellagic acid measurement was not possible due to co-elution with another unidentified wine compound

In addition to the analyses reported above, an analysis of organosulfur compounds was undertaken on all of the samples. There was no significant difference in the organosulfur findings between the samples, i.e. only dimethyl sulphide was found in very low levels (parts per billion) and there were no other organosulfur compounds detected. This applied to all of the samples.

Inspection of Table 1 shows a notable feature which is the absence of furfural in all of the samples. Furfural is a major component of the toasting process and its total absence, even at the addition rate of 60lb per 1000 gallons (7.2 grams per litre) indicates that toasty oak compounds are not picked up into wine during fermentation with oak powder.

When oak comes in contact with wine there are three major effects. These are:

- Extractives such as toasty compounds (from hemicellulose caramelization) and vanillin are released into the wine
- Barrel-driven oxidation occurs; oak tannins are involved in this activity
- Polar compounds such as organosulfur compounds and pyrazines are removed from the wine into the wood, i.e. there is subtraction of some wine compounds.

Accordingly, it is evident that the first of these reactions does not occur. In previous studies using oak powder in fermentation there has been no evidence of the second reaction either. Previous studies have also shown that the third reaction, i.e. removal of polar compounds such as organosulfur and pyrazine compounds, does occur. A previous example is shown in Figure 1.

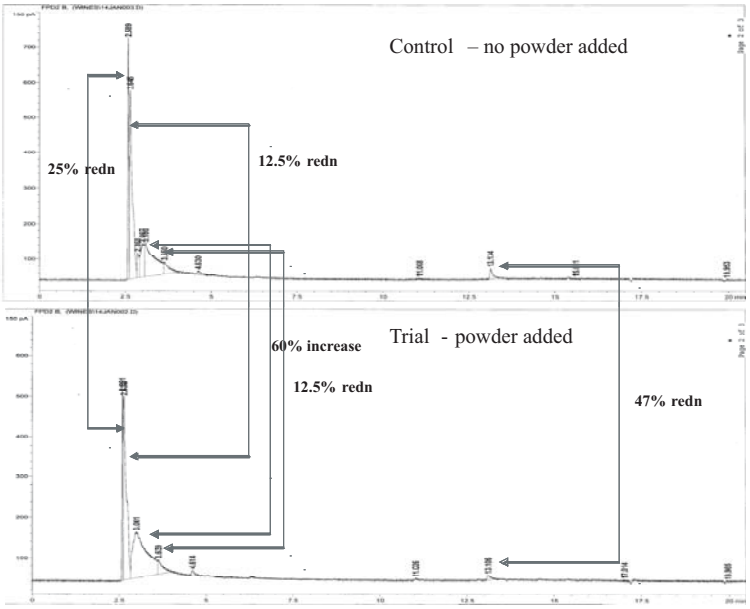

Figure 1. Removal of organosulfur compounds from wine during fermentation

CONCLUSIONS

The role of oak powder during fermentation is quite different from the interaction of oak and wine in the later stages of production. Its ability appears to be one of enhancing flavor and reducing herbaceous character. It offers a new use for oak and the opportunity for winemakers to use greater amounts of wines that would otherwise create herbaceous flavors.