

AMERICAN VINEYARD FOUNDATION

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FINAL REPORT

Title: The Extraction of Condensed Tannins in Red Wine Production

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Summary

Over 25 wines were fermented on ~20 scale using Cabernet Sauvignon grapes from four different vineyards in California.. For each vineyard, a control fermentation was compared with treatments employing maceration treatments including oak extract addition, extended maceration, heat at the end, color enzyme addition, and rotary fermentation. All wines were analyzed for phenolic composition by several different assays. Many of the treatments had small or variable effects, but heat at the end appears to consistently increase phenolic levels. Wines from this and the previous years' experiment will be offered for tasting at an event in the winter of 2001.

Objectives

1. In collaboration with cooperating wineries, conduct production scale fermentations designed to determine the effects of specific winemaking variables on phenolic composition.
2. Measure the chemical differences between the wines and the grapes used to make the wine, measuring the basic parameters, such as sugar and acid, but in particular the phenolic by total and specific composition, looking at the monomers, the polymer distribution and the polymer composition.

3. Informal sensory assessment

Experiments conducted to meet stated objectives

Description of Production Scale Fermentation Carried Out to Meet Objective 1

Grape Sources: Wente: Lodi , LO (Ripken), Paso Robles (PR) (J. Lohr); Sebastiani: Sonoma (SO), Monterey (MO), J. Lohr: Paso Robles (same vineyard as Wente-PR)

Sampling Randomization-split each shipment of fruit into all treatment fermentors. Minimize uneven juice or seed distribution, i.e. from receiving hopper (24 hr delay only)

Treatments (Wente, Sebastiani and Lohr)
Additional treatments welcome

Control (CL)	No SO ₂ at crush unless fruit is rotted, adj must temp to 65±5°F, Fermivin yeast 2#/M at crusher, adjust pH 3.5-3.6 after 24 hr, (nitrogen to 150 mg/L) Crush and destem to 6000 gal fermentor. Maintain Fermentation temp below 85°F Pumpovers-2 x daily. Racking Valve, 100 gal/min, 15 min ML-innoculate at dryness, if needed, with Viniflora, keep above 60EF. (Ex HE) Press: At dryness, 0 °Brix, or by 7 days, at 2 bar in tank/bladder press, to tank, finish sugar ferment, rack before ML After 1 week or post ML, rack off gross lees. Adjust free SO ₂ to 30 mg/L and pH to 3.6 Barrel into four clean, uniform (same lot) 4+ year barrels. Rack at 7 months, check SO ₂ After 14 months total aging, blend 4 barrel lots, bottle 10+ cases of each
Ext Mac (EM)	20 days. Wet cap every 4 da for 2-3 min, add SO ₂ gas and CO ₂ chips to exclude oxygen and prevent spoilage. (Sample each time the cap is wetted.)
Heat at End (HE)	After fermentation is dry, carry out a pumpover with a heat exchanger to bring pumped wine to 105-120 EF. Continue pumpover until tank reaches 90EF. Pump over 2 x daily and press after 48 hrs. Innoculate for ML after pressing.
Oak Extract (OE)	Add 1.5 lb/1000 gal VR Supra at Crush, Split lot at barrelling and add an additional 0.5 lb when barrelling, split again and add another 0.25 lb after 7 months in barrel. Three wines, OT1, OT2, OT3
Rotary (RT)	Wente only, ferment for 4 da, rotate two turns in each direction every 3

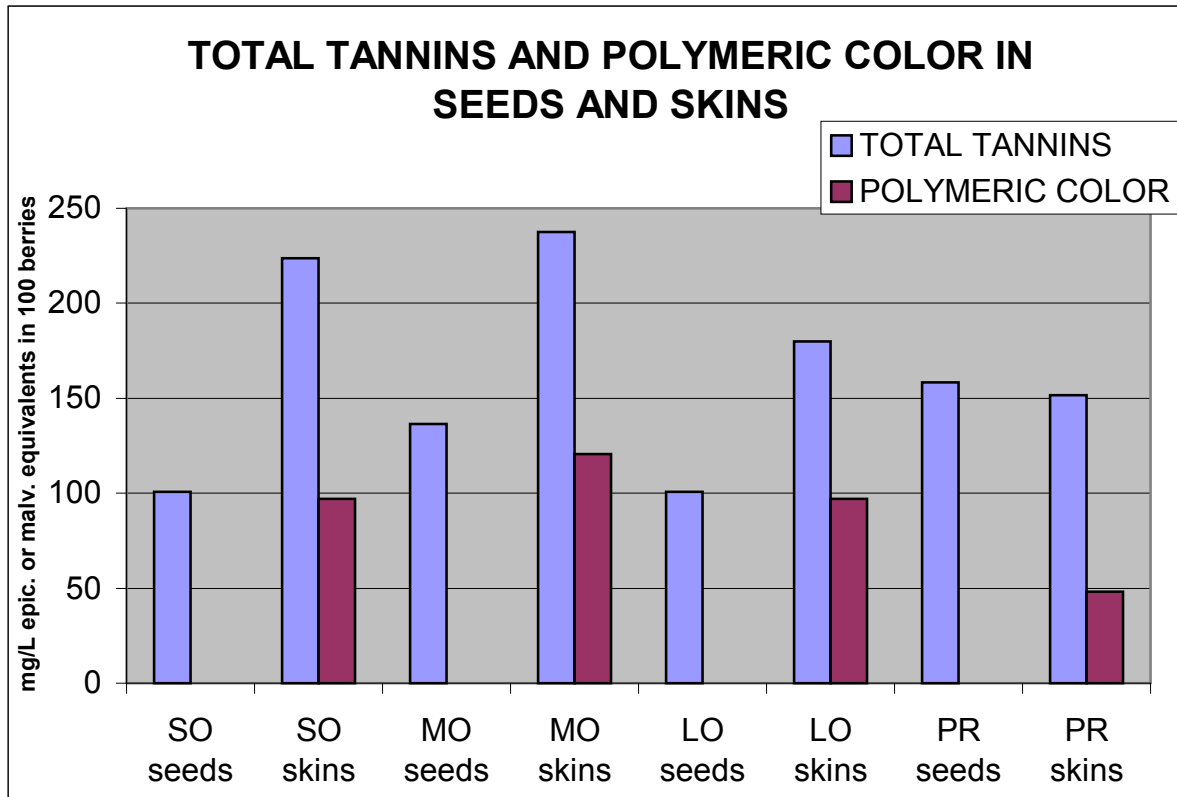
hrs.

Color Enzyme (CE) Sebastiani only, add as proscribed to control procedure at high treatment rate, press at dryness or by 7 days.

Data Collected to Date to Meet Objective 2

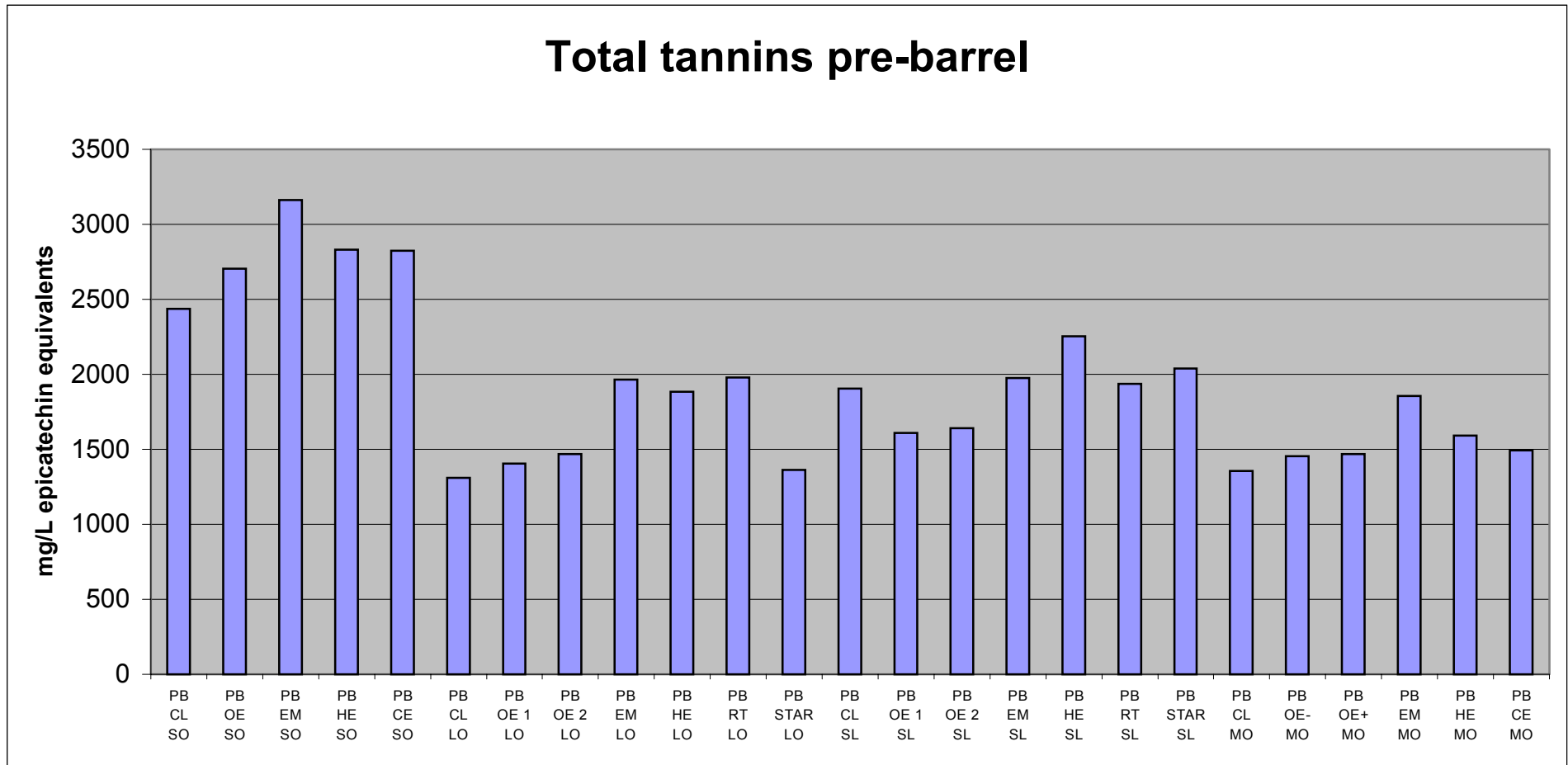
SKINS AND SEED-SAMPLING DATA				
VINEYARD	BERRIES (ml)	WEIGH (gr)	# SEEDS	DATE
LO MIDDLE	110	118.3	138	10/7/1999
LO SOUTH	102	109.4	117	
LO NORTH	114	123.9	115	
SO 3,16,29	89	97.8	132	10/11/1999
SO 35,42,49	88	98.2	126	
SO 57,64,71	81	91.1	131	
P. ROBLES A	88	93.2	138	10/19/1999
P. ROBLES B	89	93.6	137	
P. ROBLES C	92	101.5	138	
MO 10-16	88	98.4	128	11/8/1999
MO 42-48	85	96.3	127	
MO 26-32	86	99.6	124	

Normal Phase HPLC Analysis of the grapes seeds and skins revealed that there were differences between the fruit samples in terms of the polymeric flavan-3-ols or tannins and in the content of pigmented tannin or polymeric color. It is apparent that the cooler climate fruit from Sonoma and Monterey have higher level of tannin in the skins, but not significantly



higher level in the seeds. But the levels of polymeric color in the skins is only different in the Paso Robles fruit, where it is much lower.

Total Tannin from 1999 pre-barrel samples by normal phase HPLC. On the X-axis, the top line is the stage (pre barrel), the second line is the treatment, and the third line is the vineyard. This data shows that the extended maceration treatments have higher levels of tannin, different from previous years, and that heat at the end had a consistent effect of increasing tannin content.



Summary of Major Research Accomplishments and Results

These results, in combination with the data from the previous two years of experimentation will demonstrate the real effect of conducting the stated treatments on red grapes in terms of the phenolic content of the resulting wine. Data is still being collected on wine from the 1997 and 1998 vintages. A complete analysis of the effects observed in these treatments will require comparing data from all three vintages of the experiment.

While the data is still being analyzed at this point, it appears that many of these maceration treatments do not actually increase phenolic content much. The reported difference in wines so treated may be due to other factors aside from phenolic content.

One important treatment, used only in the last year, heat at the end, appears to have a significant effect on phenolic extraction. It should be included as a treatment in winery trials designed to enhance phenolic levels.

Outside Presentation of Research

A presentation is scheduled for the June 2000 ASEV annual meeting in Seattle. Each year data from the experiment has been presented at the ASEV meeting.

Winemakers and growers who support AVF will get a chance early next year to taste the results themselves of all three years of experimentation.

Research Significance and Success

Winemakers are currently very interested in manipulating the levels and character of the phenolic components of red wine. These experiments have shown the effects of specific treatments, in a controlled manner, comparing different grapes sources and over a period of 3 vintages. This data will help winemakers decide which treatments are worth the effort to test in their own operation if their objective is to alter the levels of wine phenolics. However, these tests cannot address the “characteristics” of the phenolic compounds. To date such differences can only be observed by taste, and it has been difficult to quantify those differences in sensory panels. Our solution was to bottle enough of the wine to be able to offer it for tasting to large numbers of practicing winemakers.

Budget

As I am out of the country at this time, it is not feasible for me to do an accounting.