

Summary of the Lake County Cabernet Sauvignon Extended Ripening Trial, 2005

Prepared by Erica Lundquist, Ph.D.
Lake County Winegrape Commission Viticulturist

Introduction

A trial to compare the effects of harvest date on yield and juice components was initiated in the Red Hills Lake County Appellation. The study was carried out on Cabernet Sauvignon because it is the most commonly planted red winegrape variety in Lake County. The season was unusually cool. Degree day accumulation at the site (base 50°F between April 1 and October 31) was 550 degrees lower than for the average of the previous three years. Harvest of the block used in the study was four weeks later in 2005 than in 2004.

Materials and Methods

The trial is located in a hillside Cabernet Sauvignon vineyard at an elevation of 2,000 feet in the Red Hills Lake County Appellation. The soil map unit is Glenview-Arrowhead complex. These soils are well drained, very gravelly, and are formed on material weathered from obsidian. Vines were planted 7 feet apart in the row with 8 feet between rows on a vertical shoot position trellis. The vineyard block is on a 20% percent slope with a NE aspect, and the rows run directly N-S. The vineyard was planted in 2000, and the clone is FPS 04 on Kober 5BB rootstock. Vines are drip irrigated with two, 2 liter emitters per vine, located between the vines. Weather information for the site is from the Red Hills Weather Station on the Lake County Pest Cast Weather Network. It is a Campbell Scientific CR-10X weather station located approximately 100 feet from the trial.



Figure 1. View of the experimental site, August 15, 2005.

The trial was set up as a randomized complete block design with five replications and seven treatments, the treatments being sample date. Each experimental plot was four vines long, one row wide. Leaf water potential was measured using a pressure chamber once a week 12 rows from the experimental rows starting July 6, 2005. Irrigation was initiated on July 8, 2005 when leaf water potential in the block was approximately -10 bars. Beginning August 16, 2005 leaf water potential was measured on the rows on either side of the experimental area on a weekly basis. Bud break, bloom, veraison, and harvest of this block were April 17, June 13, August 24, and November 2, 2005, respectively.

Sampling was initiated at approximately 23 °Brix. Due to the late start of sampling and gradual ripening under cool weather conditions, fruit was sampled on only five dates over a six week period. On each sample date a visual estimate of the percentage of yellow, desiccated, or missing leaves on both sides of each four vine plot was made. The number and weight of clusters on each vine was measured. Twenty-five berries were taken at random from the fruit harvested from each vine and combined to give a 100 berry sample for each plot. These berries were used for berry weight measurements. The fruit from all four vines of each plot was crushed and a juice sample was taken.

For each juice sample Brix, titratable acidity (T.A.), and pH were measured at a lab at the vineyard site within an hour after crushing the fruit. Degrees Brix were measured using an Atago ATC refractometer which was checked daily against standards, pH was measured with an Orion 720A+ pH meter and Ross electrode, and T.A. by titration to a pH of 8.2. Reagents for refractometer calibration and T.A. were from Vinqury, Windsor, California. Approximately 60 mls of juice were microwaved just to the boiling point to stabilize the samples and were sent to ETS Labs in St. Helena for analysis of potassium, and L-malic acid. Usually ETS Labs received and analyzed the samples within 24 hours.

On the final sample date, the juice was microwaved as usual, and in addition fresh juice samples were saved for analysis of T.A., potassium and L-malic acid at ETS Labs. The fresh and microwaved samples were stored over night at room temperature and delivered to ETS Labs and analyzed approximately 24 hours after the field sample. Potassium and L-malic acid were measured on both the fresh and microwaved samples. Titratable acidity was measured on two fresh and two microwaved samples to compare the results from the on-site titration and ETS Labs.

Results

Irrigation, rainfall, and vine water demand and the calculated percentage of full vine water use that was applied are shown in Table 1. Irrigation began July 8, 2005, and canopy growth continued until August. The calculated weekly percentage of full vine water use (ETc) applied ranged from 12 to 88%, and the average over the season was 43.5% . In addition, the soil contributed an unknown amount of water to meet vine water demand.

Table 1. Applied irrigation water, rainfall, potential evapotranspiration (ETo), full vine water use (ETc), and the percentage of full vine water use.

Time Period	Applied water (hours)	Applied water (inches)	ETo (inches)	ETc* (inches)	% ETc applied
7/8-10/27/05	185	5.6	21.3	12.8	43.5%
10/27-11/9/2005		Rainfall (inches)	ETo (inches)	ETc* (inches)	
		2.22	0.75	0.45	

*A Kc of 0.6 was used to convert ETo to Etc.

Leaf water potential measured for the irrigation block was -9.8 bars at the time when irrigation was initiated. Leaf water potential measured adjacent to the experimental plots reached about -13 bars before vine water stress declined in October (Figure 2.)

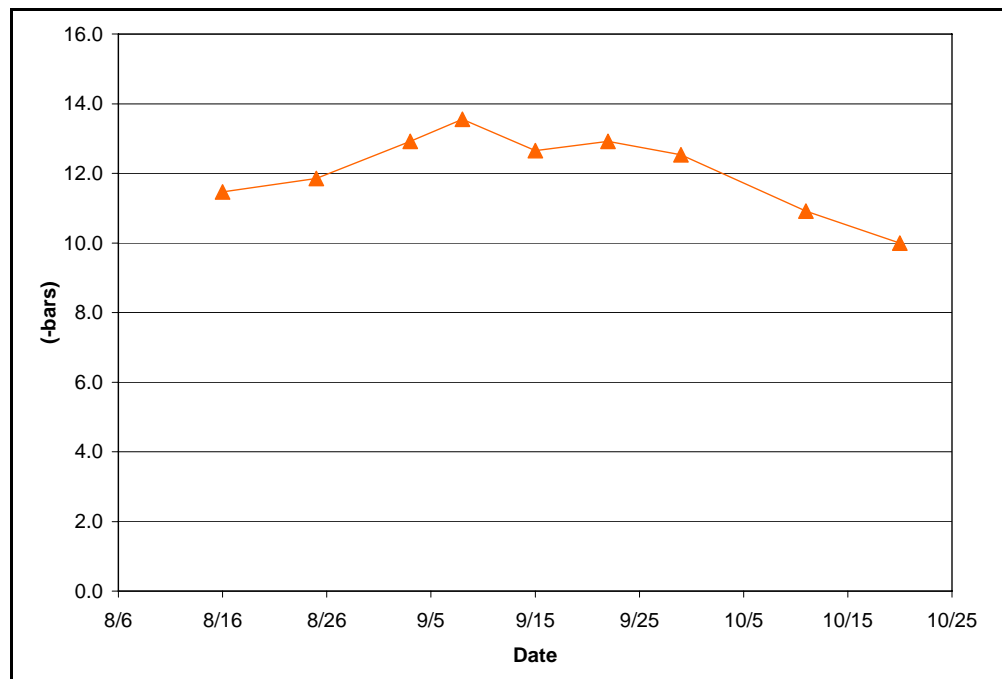


Figure 2. Leaf water potential in rows immediately outside the experimental area.

Yield, cluster number, cluster weight, and berry weight did not change significantly during the six week sampling period (Figure 3, Table 2). Visual observations of berries corroborated the lack of dehydration with the average percentage of berry shrivel ranging from 0-0.3%. The visual estimate of the percentage of missing, yellow, or dessicated leaves increased from 2.7 to 50% over the sampling time period, primarily due to an increase in yellow leaves. Because of the late ripening period this year, it is likely that the yellowing leaves were due to senescence and not to vine water stress.

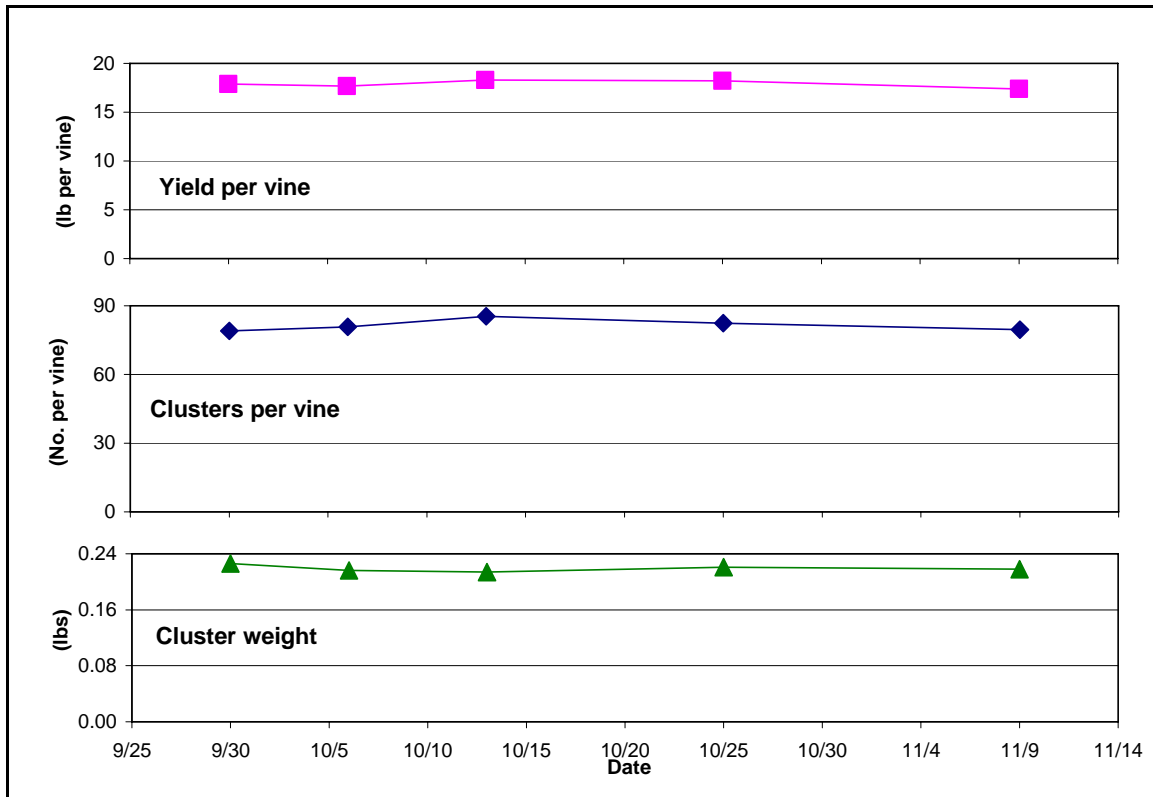


Figure 3. Components of yield during the ripening period.

As expected, soluble solids climbed during the harvest period (Table 2). They did not climb between the penultimate and final sample dates, possibly because of substantial rainfall between these two sample dates. Other juice components followed expected trends with pH climbing, and T.A. and malic acid dropping. Potassium dropped from the first to fourth sample dates, after which it climbed substantially. Potassium in microwaved samples was substantially higher than in fresh samples, 2490 and 1398 mg/liter, respectively. T.A. levels measured on fresh juice at the vineyard laboratory immediately after the field sample, and at ETS Labs 24 hours later with and without microwaving were 6.1, 9.1 and 7.1 g/liter, respectively.

Table 2. Juice components and berry weights for the Lake County 2005 Cabernet Sauvignon Extended Ripening Trial.

Sample Date	Soluble Solids (°Brix)	pH	T.A. (g/L)	Potassium (mg/L)	L-malic acid (g/L)	Berry weights (g/100 berries)
9/30/2005	23.3	3.23	9.22	2366	3.57	109
10/6/2005	24.0	3.25	8.72	2192	2.81	110
10/13/2005	24.4	3.30	8.19	2234	2.93	107
10/25/2005	25.8	3.37	6.65	1826	2.58	110
11/9/2005	25.7	3.39	6.05	2490	2.60	110
RCB Anova	***	***	***	***	*	NS
LSD 0.05	0.9	0.05	0.54	166	0.60	

*, **, *** Indicate significance at P<0.05, 0.01, and 0.005, respectively.

Conclusions

Contrary to expectations, yield did not decline with time after the fruit had reached 23 °Brix although soluble solids levels continued to rise to approximately 26 °Brix. The lack of decline in yield may have occurred because fruit maturity occurred very late in the season following cool spring and summer conditions. The “hang time” period for this trial was the month of October into early November. In most years, this stage of fruit maturation would occur one month earlier. For comparison, the average high and low temperatures in September at the vineyard site were 81.0 and 51.3 °F, respectively, and in October were 72.1 and 46.3 °F, respectively.

It is likely that changes in juice composition were not as great as would be observed during typical years with warmer conditions. Under warmer temperatures dehydration would be more likely, which would lead to increased concentrations of many soluble constituents. Metabolic processes (both anabolism and catabolism of juice constituents) would also be more rapid under warmer conditions.

Acid levels, and in particular malic acid, may have been elevated this year compared to warmer years. At another Cabernet Sauvignon vineyard in the Red Hills Appellation of Lake County, 2005 malic acid levels were 50-60% higher than 2004 levels (E. Lundquist, personal communication.)

This year’s trial provided an example of the effects of extended ripening during a cool year. It will be important to repeat this trial during a year with typical, warmer growing conditions.

Acknowledgements

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