Sensory Science in Viticulture and Enology Research at UC Davis

Hildegarde Heymann
hheymann@ucdavis.edu
Extended Ripening Project Objectives

- Identify grape sensory attributes that change reproducibly as fruit maturity increases.
- Investigate ability of grape sensory data to predict wine sensory attributes.
- Explore how winemakers evaluate fruit maturity and the wines made from those fruit.
Extended Ripening

- Cabernet sauvignon; Paso Robles
- Clone 8 on 1103
- 7’ x 8’ spacing with 788 vines / acre
- Bilateral cordons
- Pruned to 40 – 50 buds / vine
- Yield about 4 ton/acre
  - Except H6 in 2007 (3.3 tons/a)
Harvest Brix: 2006

- 06H1 (22.4)
- 06H2 (23.1)
- 06H3 (24.7)
- 06H4 (26)
- 06H5 (27.8)
- 06H6 (30.7)
Harvest Brix: 2006, 2007
2006: 11 judges; 8 replications
2007: 10 judges; 6 replications
Grape Attributes evaluated

1. Berry and pulp (P)
   Squishy  Dissolvable
   Sweet    Sour

2. Skin (Sk)
   Bitter  Sour  Veg.  Fruity
   Raisin  Astringent  Thick

3. Seed (Sd)
   Green  Brown  Crunchy
   Hard   Nutty   Bitter
   Astringent
Principal component analysis (PCA): Grape Descriptive analysis attributes

PC1 (73.4 %)

PC2 (18.8 %)
Principal component analysis (PCA): Grape Descriptive analysis harvest scores
Conclusions

- Trained panels were able to detect significant attribute differences among the harvests in both years.
- There were vintage differences among the years.
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2006: 13 judges, 3 field reps, 3 bottle reps
2007: 12 judges, 3 field reps, 3 bottle reps
Significant attributes across both years for the six harvests

**Aroma:**
*RedFruit*  *DarkFruit*  *DryFruit*  *FreshVeg*  *CookedVeg*  *Spicy*

**Taste:**
*Sweet*  *Sour*  *Bitter*

**MouthFeel**
*Astringent*  *Hot*  *Viscosity*
Canonical Variate Analysis: Wine attributes

CV1(53.78%)

CV2(28.20%)

- Sour
- Spicy
- Dry Fruit
- Sweet
- Visc MF
- Astringent
- Cooked Veg
- Dark Fruit
- Hot
- Red Fruit
- Bitter
- Fresh Veg
Canonical Variate Analysis:
Harvest wine scores

2007H1
- Sour
- Spicy
- DryFruit
- ViscMF
- Sweet

2006H1
- RedFruit
- Astringent
- CookedVeg
- DarkFruit
- FreshVeg
- Bitter
- Hot

CV1(53.78%)
CV2(28.20%)
Canonical Variate Analysis: Harvest wine scores

CV1(53.78%)

CV2(28.20%)

2006H1  2006H2
RedFruit

2007H1  2007H2
Sour

Spicy

DryFruit  ViscMF

Sour  Spicy

CV1

CV2

Sweet

Spicy

Hot  Bitter

FreshVeg  DarkFruit  CookedVeg

2006H1  2006H2
RedFruit

2007H1  2007H2
Sour
Canonical Variate Analysis: Harvest wine scores

The graph shows the scores for different harvest seasons: 2006H1, 2006H2, 2006H3, 2007H1, 2007H2, and 2007H3. The axes represent CV1 (53.78%) and CV2 (28.20%).

The categories included in the analysis are:
- RedFruit
- DarkFruit
- FreshVeg
- CookedVeg
- Bitter
- Sweet
- Sour
- Spicy
- Astringent
- DryFruit
- ViscMF
- Hot

The graph visually represents the distribution of these categories across the different harvest seasons.
Canonical Variate Analysis: Harvest wine scores

CV1 (53.78%) vs CV2 (28.20%)

- 2007H1
- 2007H2
- 2007H3
- 2007H4
- 2006H1
- 2006H2
- 2006H3
- 2006H4

Fruit and Vegetables:
- Red Fruit
- Fresh Fruit
- Dark Fruit
- Cooked Vegetables
- Fresh Vegetables
- Bitter
- Spicy
- Sour
- Sweet
- Astringent

Other Attributes:
- Dry Fruit
- Visc MF
- Hot

Years:
- 2006 H1
- 2007 H1
- 2006 H2
- 2007 H2
- 2006 H3
- 2007 H3
- 2006 H4
- 2007 H4

CV1 and CV2 explanatory percentages are 53.78% and 28.20%, respectively.
Canonical Variate Analysis:
Harvest wine scores

CV1(53.78%)

CV2(28.20%)
Canonical Variate Analysis: Harvest wine scores

CV1 (53.78%)

CV2 (28.20%)

-10 -5 0 5 10 15 20

-8 -4 0 4 8

RedFruit
DarkFruit
DryFruit
ViscMF
Spicy
Sour
Astringent
CookedVeg
Bitter
Sour
FreshVeg
Hot

2006H1
2006H2
2006H3
2006H4
2006H5
2006H6
2007H1
2007H2
2007H3
2007H4
2007H5
2007H6
There were significant sensory attribute differences among wines from different harvests.

There was a vintage effect on the wine sensory attributes.
Project Objectives

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Multifactor Analysis (MFA) of Grape and Wine descriptive data
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PC1 (65.17 %)
Multifactor Analysis (MFA) of Grape and Wine descriptive data
Multifactor Analysis (MFA) of Grape and Wine descriptive data

PC2 (20.87 %) vs. PC1 (65.17 %)
Conclusions

- Sensory attributes of the grapes were variable at predicting the wine sensory attributes
  - good for 2006 harvests 1 through 4
  - good for 2007 harvests 3 through 6
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Winemaker fruit maturity analysis

Napa Valley winemakers:
12 winemakers; 8 reps in 2006
13 winemakers; 6 reps in 2007

Are the grapes ready to be harvested?
1 = No, Sure. 4 = Yes, Sure

What is the quality of the grapes?
1 = Low 4 = Premium
Why the winemakers decided grapes were ready to harvest or not.
How the winemakers decided the grape quality.
PLS: Grape sensory data used to predict winemaker scores
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Dim1 (59.8; 57.2)

Dim2 (30.4; 13.7)
PLS: Grape sensory data used to predict winemaker scores
Now, from grapes to wine:

- Do the winemaker ready and/or quality scores relate to the wine sensory data?
PLS: Winemaker grape scores used to predict wine descriptive data
PLS: Winemaker grape scores used to predict wine descriptive data

Dim1 (80.9; 28.1)
Dim2(19.1; 14.3)
PLS: Winemaker grape scores used to predict wine descriptive data

Dim2(19.1; 14.3)

Dim1 (80.9; 28.1)
Conclusions

- In general, winemakers thought riper grapes were more ready to harvest and had higher quality.
- The winemakers ready and quality scores were not very predictive of the wine sensory scores.
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