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Descriptive Analysis: Winemaker Evaluation of Experimental Wines

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INTRODUCTION

Training descriptive analysis panels can be very costly, taking months to select and train panelists, develop descriptors and standards, and finally collect and analyze the data. Recently, the Oregon State University wine program has utilized industry winemakers to gather descriptive data on experimental wines. From 10-20 winemakers visit the university for a one-day testing session, where they are taught to use free-choice profiling to describe wine appearance, aroma, flavor, and mouthfeel characteristics. Throughout this session, winemakers develop their own individual set of descriptors using practice wines, then evaluate various experimental wines. This testing provides scientists with feedback on sensory qualities of experimental wines, while also giving industry winemakers an opportunity to evaluate experimental samples.

MATERIALS AND METHODS

Panel

The panel consisted of 12 winemakers (2 female, 10 male) from across Oregon. The amount of winemaking experience varied considerably throughout the group but consisted of a representative cross-section of winemaker experience in the Oregon wine industry. Winemakers volunteered by responding to an open invitation sent to wineries throughout Oregon

Samples

Samples are described in Table 1. Wines were produced as part of the experimental wine program at Oregon State University. Wines were bottled and corked in 750ml green glass bottles. Upon opening each bottle, a small amount of wine was discarded to remove any cork particles that may have entered the bottle. Samples (60 ml/glass) were measured by pouring into a measuring cup and then into 240n-d INAO clearwine glasses (St. George Crystal, Inc., Jeannette, PA) labeled with random three-digit codes. Wines were evaluated at room temperature (22-C) under white light shortly (5-20 minutes) after pouring.

Table 1. Pinot Noir Sample Codes and Descriptions

Sample Code	Sample[a,b] Description
8 Day M	Control 1 - 8 day maceration
4 Day M	4 day maceration
PreM	Pre-fermentation maceration
PostM	Post-fermentation maceration
ExPostM	Extended post-ferm. maceration
WCl	Whole cluster maceration
WBr	Whole berry maceration
Enzyme 1	Enzyme treatment 1
Enzyme 2	Enzyme treatment 2

[a]all samples had 50ppm added SO2, except where noted
[b]all samples fermented with Lalvin RC 212 yeast, except where noted

Training

For training purposes, each panelist received three samples which had been selected to cover the range of all attributes expected in the experimental wines. Panelists used these wines to develop their language for describing the wines. These descriptors were then discussed among the group in an effort to expose all panelists to possible attributes, particularly those winemakers with less experience. After discussion, panelists developed their final ballot. Finally, to become familiar with the 16-point intensity scale (0 = none, 3 = slight, 7 = moderate, 11 = large, 15 = extreme), panelists evaluated the practice wines in terms of their chosen attributes,

Ballots

To eliminate the possibility of inconsistent use of descriptors throughout replications, a predetermined set of descriptors was already included on the ballot. These terms are listed in Table 2. Although panelists were asked to use these general attributes, they were also permitted to add their own individual descriptors if desired. After each panelist finalized their ballot, it was photocopied for future evaluations.

Table 2. Predetermined Descriptors with Indication of Panelists' Ability to Saparate Samples Using These Terms

	Panelist										
Descriptor	1	2	3	4	5	6	8	9	10	11	12
Aroma											
Overall Intensity	X			X	X	X	X	X	X	X	X
Overall Fruity	X	X	X	X	X	X	X	X	X	X	X
Overall Floral		X	X	X		X		X	X	X	X
Overall Spicy	X	X	X						X	X	X
Overall Vegetal	X		X	X		X	X		X	X	X
Earthy/Musty	X	X	X			X				X	X
Flavor											
Overall Intensity	X			X		X	X	X	X	X	X
Overall Fruity	X	X	X	X	X	X	X	X	X	X	X
Overall Spicy			X			X			X	X	
Overall Vegetal	X		X	X				X		X	
Acid/Tart	X				X		X			X	
Bitter		X			X			X	X	X	X
Astringent	X	X			X			X		X	X
Body/viscosity		X			X			X	X	X	

X denotes attributes used to separate samples for each panelist

Testing Panelists were presented with nine samples, served in random order, and evaluated each according to their own individual ballot using the 16-point intensity scale. Expectoration cups and water were provided for rinsing purposes. Upon completion of the first set of samples, panelists were given a 15 minute break before evaluating the second replication of the same nine wines. Panelists were instructed to rate every wine for every attribute (use zero if appropriate) to ensure consistency throughout replications.

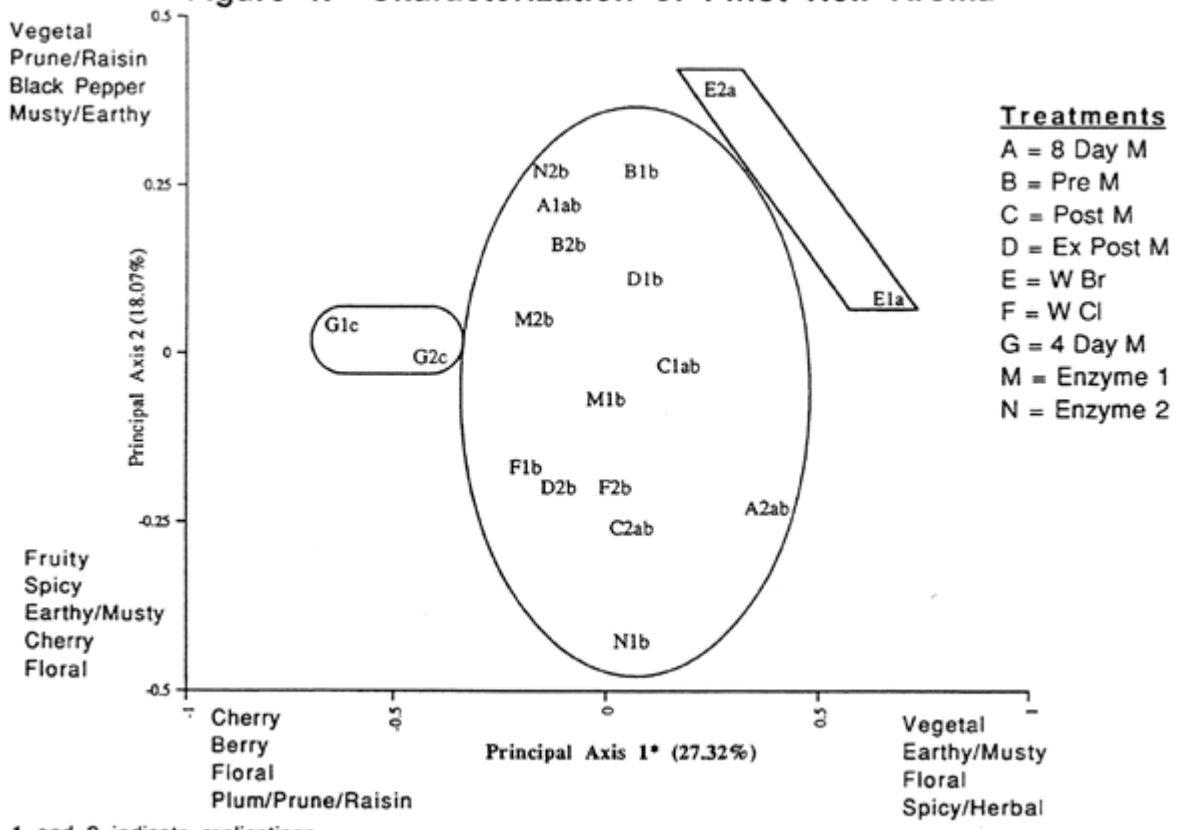
Data Analysis

One panelist failed to use descriptors consistently and was not included in the overall data analysis. Responses of the eleven remaining panelists were combined and broken into three parts: aroma, flavor and mouthfeel, and appearance. Each part was analyzed using Generalized Procrustes Analysis (GPA) to obtain a mapping of the wines.

RESULTS AND DISCUSSION

Analysis of data using GPA allows samples to be grouped according to similar sensory characteristics. For example, cherry, raspberry, and berry can be classified as fruity, while violet and lilac could be categorized as floral. These groupings result in a mapping of samples, with those mapped closer together being more similar in sensory attributes than those farther apart. In Figures 1-3, treatments are identified as capital letters and plotted according to where they fall on principal component axes. Principal axis I accounts for most data variation and therefore, best separates treatments. Percent variation for which each axis is accountable is indicated in each figure. Treatments were also analyzed statistically to identify significant differences among treatments on principal component axes. Significant differences are indicated by lower case letters next to the treatment letter (see Figures 1-3). Treatments with the same letter are not significantly different (piO.05). Terms that best describe sensory variability among treatments are included at each end of the principal axes.

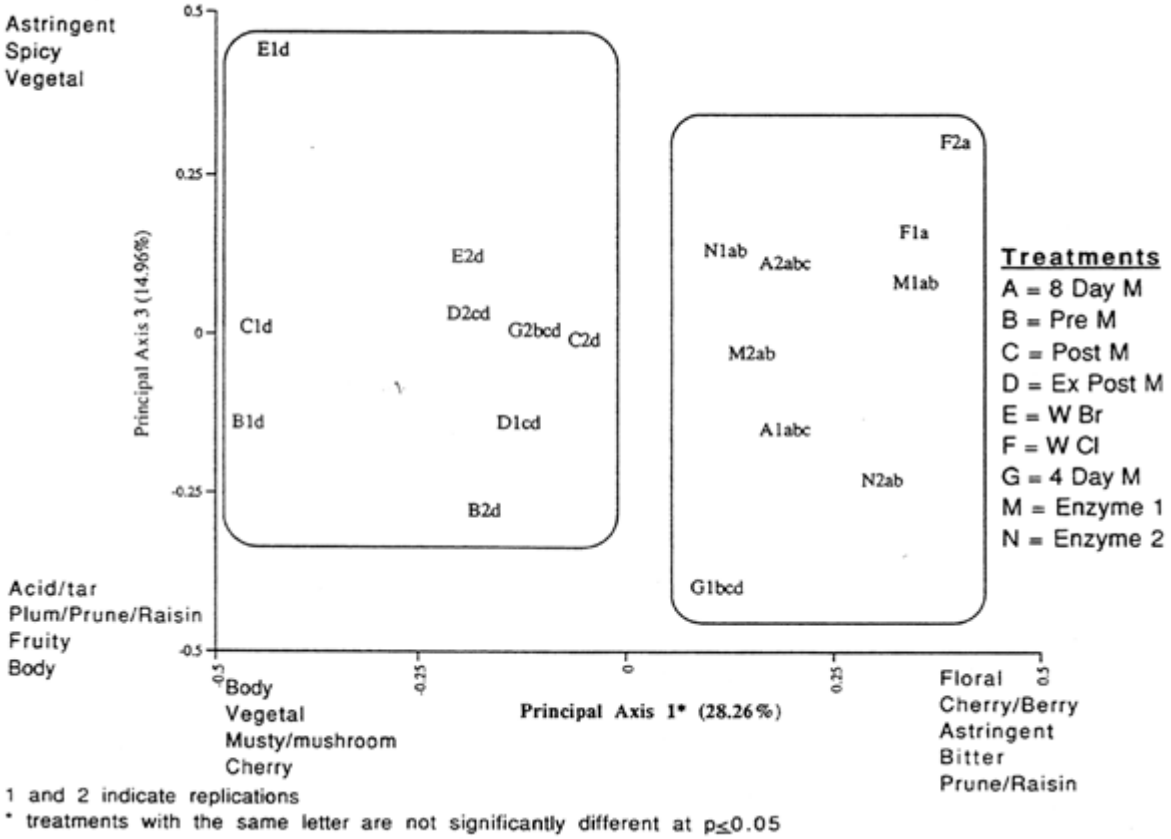
Figure 1. Characterization of Pinot Noir Aroma



1 and 2 indicate replications

* treatments with the same letter are not significantly different at $p \leq 0.05$

Figure 2. Characterization of Pinot Noir Flavor and Mouthfeel



1 and 2 indicate replications

* treatments with the same letter are not significantly different at $p \leq 0.05$

Figure 3. Characterization/Replication Effect of Pinot Noir Color

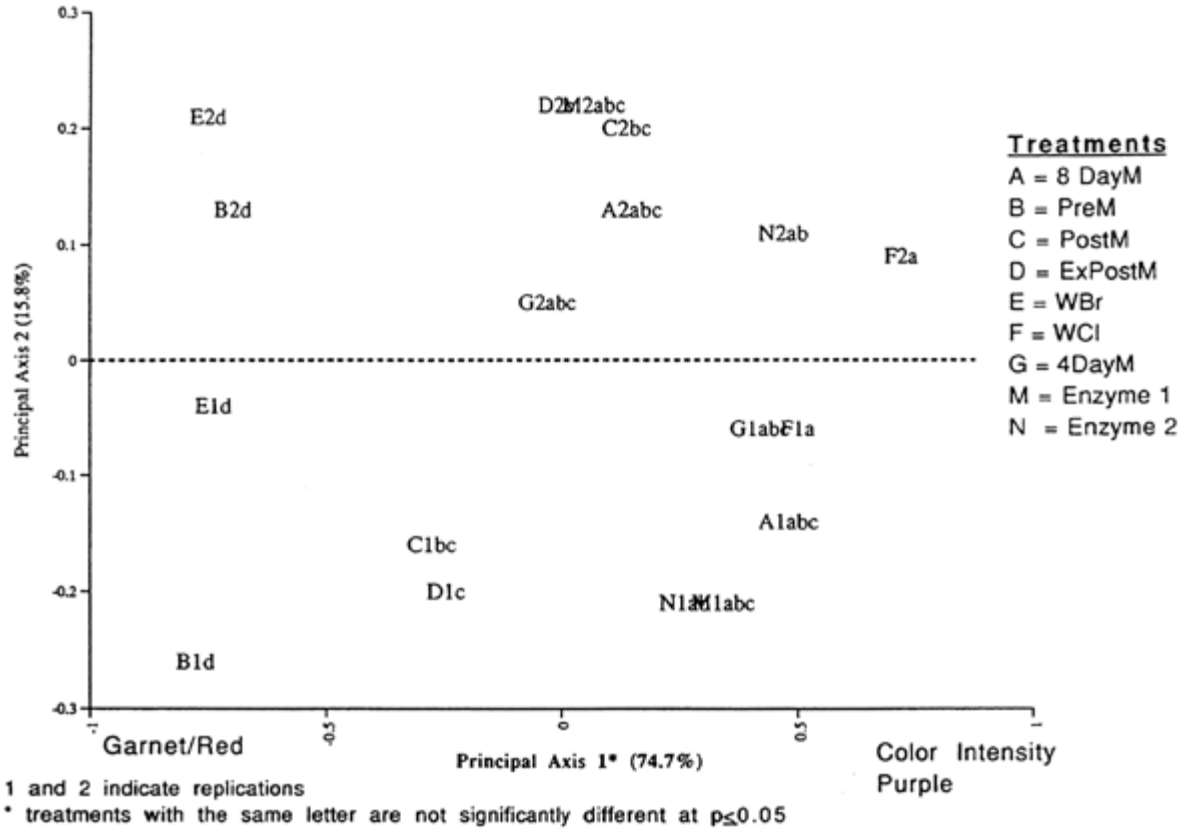


Figure 1 illustrates separation of samples in terms of their aroma attributes, indicating the 4 day maceration (early press/G) sample was significantly different ($p<0.05$) than all other samples. The early press wines were more pronounced in cherry, berry, floral and plum character. At the opposite end of axis 1, the whole berry wines were more pronounced in vegetal, earthy/musty, floral, spicy/herbal characters.

In terms of flavor and moutlifeel, Figure 2 shows separation into two broad groups. The premaceration (B), post-maceration (C), and extended post-maceration (D) samples fell into one group, exhibiting musty and vegetal attributes in addition to more body and moutlifeel. A second group contained the control (A), whole cluster (F), and enzyme-treated (M and N) wines. These samples were more pronounced in floral, cherrylberry, and prune/raisin attributes, while the whole cluster fermentation sample (F) was particularly high in bitter and astringent characteristics.

Figure 3 illustrates color differences among samples. VVhile the control (A), whole cluster (F), and enzyme-treated (M and N) wines had higher color intensities and purple hues, the premaceration (B) and whole berry (E) wines had lower color intensifies and gamet/red hues. This figure also shows a replication effect of color ratings with the first replication being vertically separated from the second replication for all samples. Since color attributes are not subject to the effects of fatigue, it is unlikely that this effect was due to panelist performance. Panelists required more time than anticipated to evaluate the first replication of samples, causing the second set of wines to set for a longer period of time. Therefore, it is believed this replication effect was the result of differences in exposure to air before evaluation, since wine is subject to distinct color changes under these conditions.

Table 2 includes the list of descriptors which panelists were requested to use. The table illustrates which

descriptors were used successfully by panelists, as determined by conducting GPA on each panelist's data. All panelists performed well in these general overall categories with panelist I I separating samples on all attributes.

CONCLUSION

The results of this study illustrate that free-choice profiling is an effective tool in evaluating wines with experienced winemakers. The method proved to be powerful enough to overcome inherent variation present in wine (i.e. within fruit variation, bottle to bottle variation, variation due to exposure time to air, etc.) and separate experimental wines into several groups. Although this method may be more appropriate for less complex products, freechoice profiling by industry winemakers was very helpful and beneficial in evaluating experimental wines by requiring little training time. Hence, the project was time-effective, cost-effective, and provided crucial information for Oregon winemakers and Oregon State University researchers.