

NORTH CAROLINA SENSORY EVALUATION WORKSHOP

T.E. STEINER

DEPT. of Horticulture and Crop Sciences

The Ohio State University/OARDC

Wooster, Ohio 44691



THANK YOU!

- North Carolina Sensory Analysis Workshop
- Surry Community College
- Dr. Rick Donley – Director, ASU Enology & Viticulture Program
- Molly Kelly, Dr. Seth Cohen and Dr. Trevor Phister for presentations of wine faults
- Workshop Organizing Committee

OUTLINE

- Introduction to sensory Evaluation
- Sensory evaluation in the winery
 - Commercial Applications
 - Setting up a sensory lab
 - Sensory evaluation tests
- Critical aspects in preventing wine flaws
 - Oxygen and headspace
 - The use of SO₂
 - Fruit Quality – Microbial concerns
 - Sterile bottling Issues including sorbate and DMDC

INTRODUCTION TO SENSORY EVALUATION



SENSORY EVALUATION

- Sensory evaluation is a scientific discipline used to evoke, measure, analyze and interpret reactions to stimuli from wine using our five senses.
- It is important in the grape and wine industry since there is no instrumentation or analytical method that can reliably assess
 - Wine flavor
 - Wine quality
 - Consumer preference

SENSORY EVALUATION

- Important for the commercial wine industry from harvest to bottling
 - Evaluation of juice samples for maturity and off aromas
 - Evaluating the fermentation process
 - Post fermentation during
 - Wine aging
 - Fining trials
 - Blending trials
 - Post bottle storage and aging quality

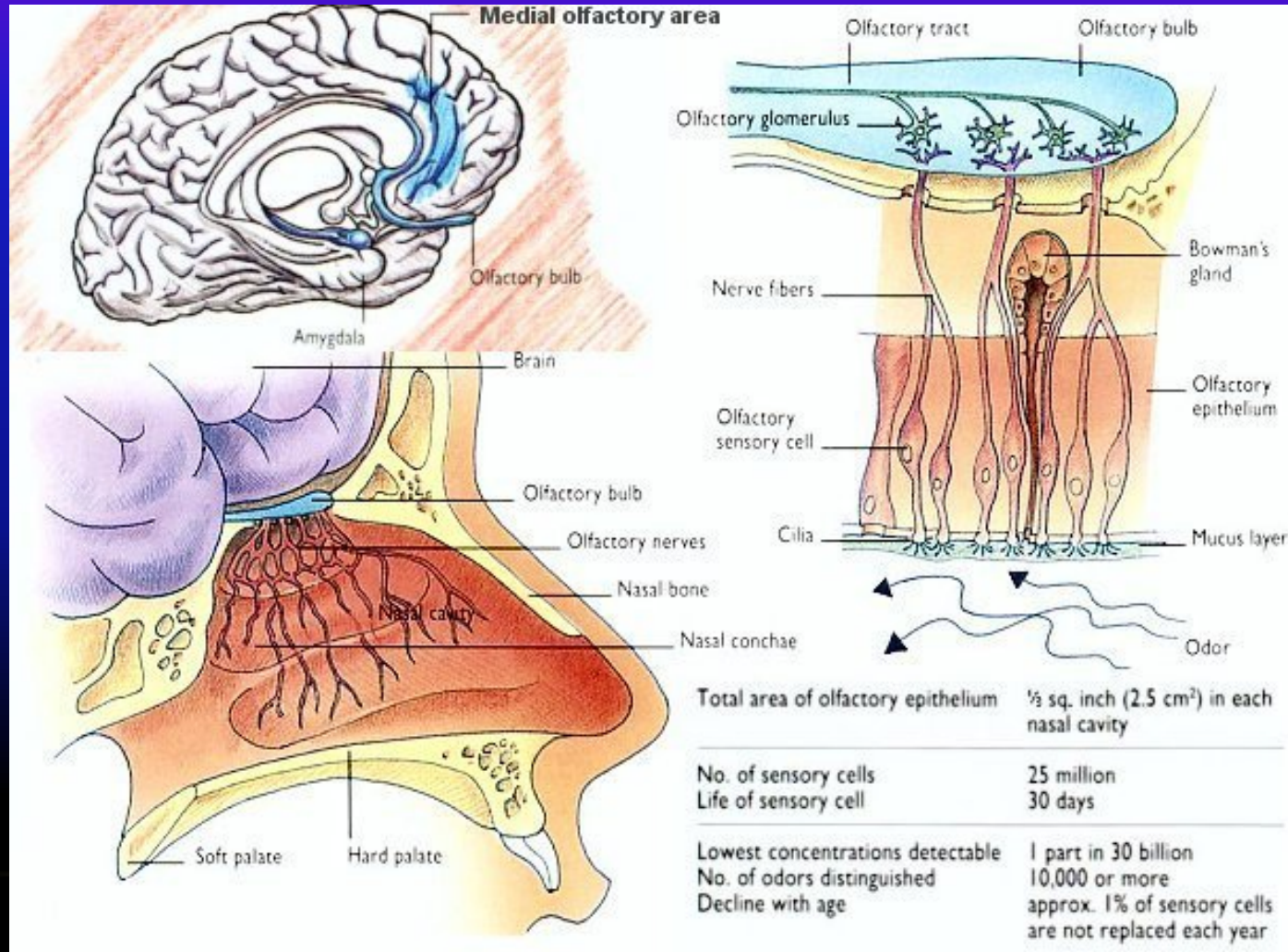
SENSES USED IN TASTING WINE

- Sight: Used in determining a wine's appearance of color and clarity
- Smell: Used in identifying wine aroma and bouquet (very complex)
- Taste: Used in determining sweetness, sourness, bitterness and saltiness in addition to helping perceive balance (sugar/acid ratio)
- Touch: temperature, pain, tactile sensations of astringency (tannin), viscosity (sugar & alcohol)

SENSES USED IN TASTING WINE

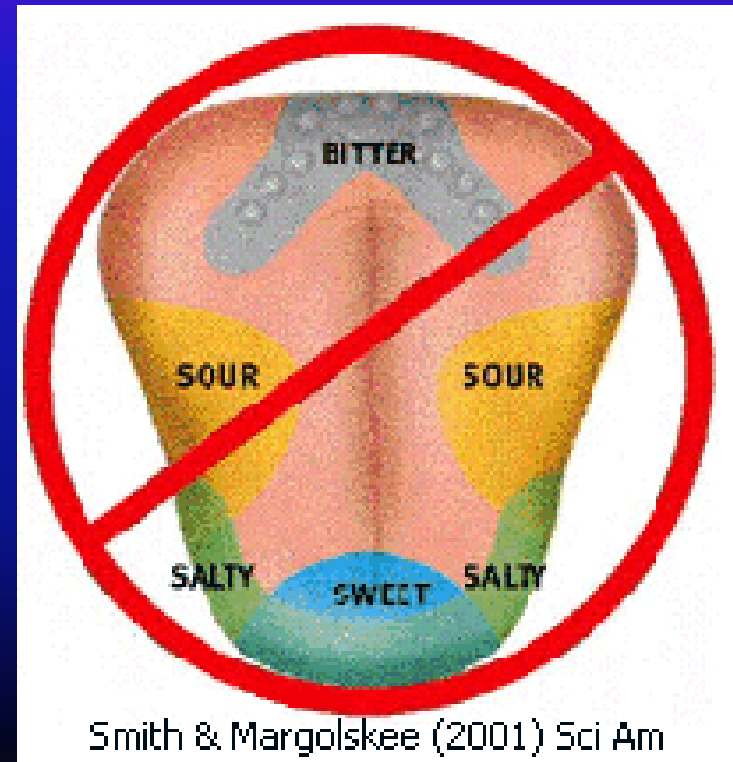
- Of the senses used in tasting wine, smell is arguably the most important attribute
- Retro-nasally
 - Wine warms up in the mouth and releases further aromatic compounds/molecules which reach the olfactory region by diffusion and through exhalation
- Specialists express “flavor” as utilizing the sense of smell and taste of wine component’s together

SENSE OF AROMA



Sense of Taste

- Sweet taste is provided by alcohol and sugars
- Sour taste comes from free organic acids
- Bitter comes from wine phenolics (mainly tannin)
- Salty not as pronounced in sensory evaluation of wines but can be present (Cations: K, Na, Ca, Mg and Anions: phosphate, sulfate, tartrate, malate and lactate along with excess fermentation nutrients)



SENSORY EVALUATION

- Many wines exhibit an interrelation of the senses when performing sensory evaluation of wine descriptors
 - A cloudy wine will most likely have a less pleasant, less distinctive or off aroma
 - An recent vintage white wine with brown hues may have an oxidized aroma
 - A wine with distinct varietal aroma is less likely to express taste deficiencies on the palate

PERFORMING SENSORY EVALUATION

- When performing sensory evaluation, evaluate the following sensory descriptors often utilized in most national and international wine competitions:
- Appearance:
 - Color and Clarity
 - Color: Should be representative of variety, vintage, style and blend composition
 - Clarity: Should be free of any amorphous haze or deposit and brilliant in color

PERFORMING SENSORY EVALUATION

- Aroma and Bouquet:
 - The aroma is derived from the grape itself (varietal character)
 - The Bouquet is derived from the cellar through fermentation, processing, or aging
- The winemaker's desire should be to perfect an unmistakable characteristic aroma of the grape variety or wine type in addition to an outstanding and complex bouquet

PERFORMING SENSORY EVALUATION

- Taste:
 - Flavors should carry nicely from the aroma onto the palate
 - The wine should be balanced in regards to the fruit present, sugar/acid ratio, tannin, alcohol and other processing attributes such as oak and lees perception
 - These all add up to form the body/mouthfeel of the wine
- The key to a balanced wine is that one of these attributes should not mask another excessively

PERFORMING SENSORY EVALUATION

- Aftertaste:
 - All of the aromas, flavors and tactile sensations of the wine should be balanced in a way to provide a pleasing, lingering aftertaste or finish
- Overall Impression:
 - Taking all sensory descriptors being evaluated in mind, what is the overall impression of the wine being evaluated

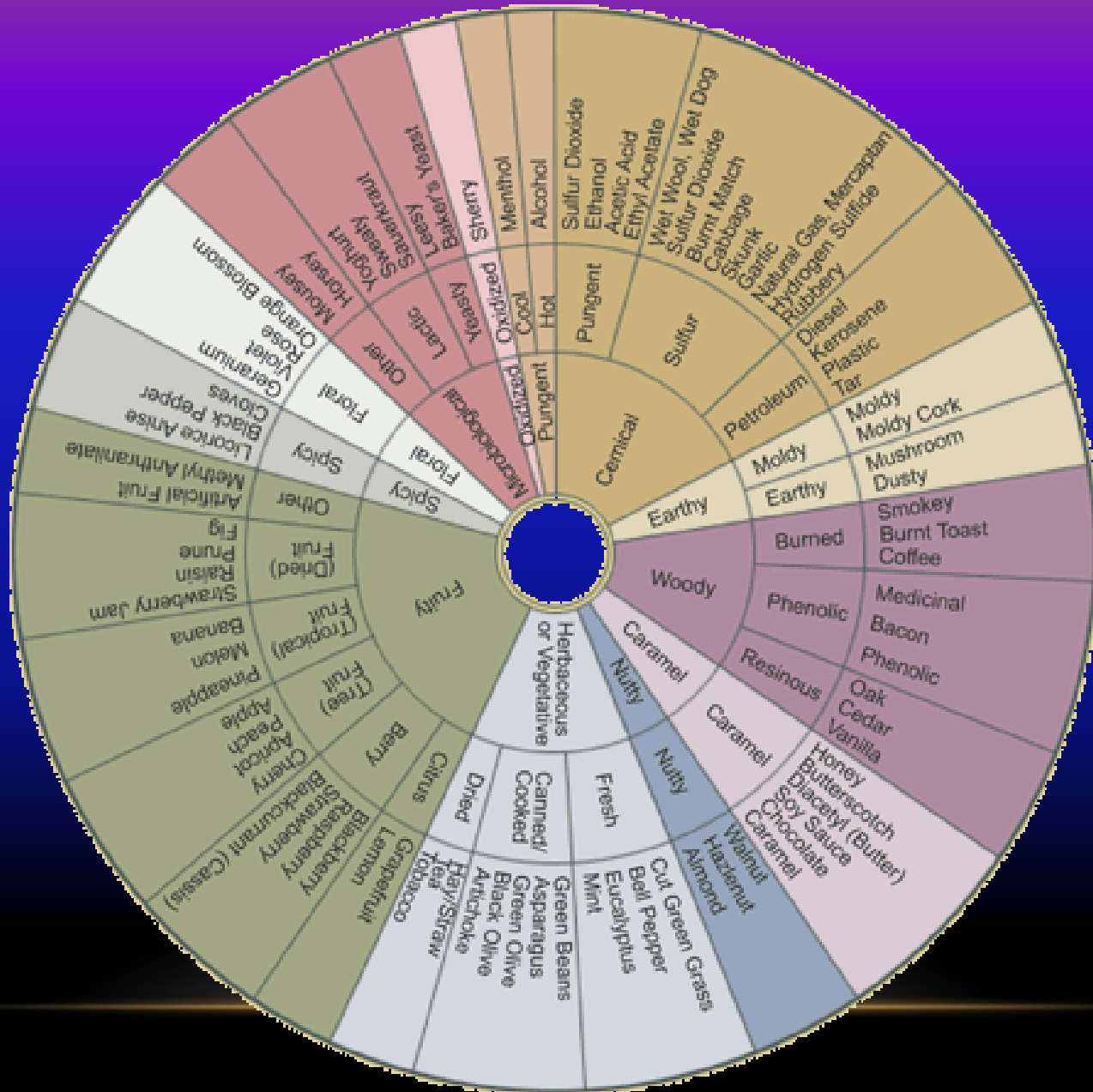
SENSORY EVALUATION

- In light of this, it is vital to become familiar with varietal characteristics, wine styles and **wine flaws**
- This can be accomplished through increased tasting of all wines on a personal basis
 - Taste, Taste, Taste
 - Avoid varietal racism
 - Avoid cellar palate
- Participate in educational tastings including wine flaw recognition
 - Kits are also available in both varietal characteristics and wine flaws

SENSORY EVALUATION

- It is advisable to become familiar with sensory descriptors to help aid the process
 - The Wine Aroma Wheel provides an excellent tool for this process
 - Develop standards for training winery personnel on these descriptors
 - Nobel, A. C., R. A. Arnold, J. Buechsenstein, E.J. Leach, J. O. Schmidt, and P.M. Stern, Modification of a Standardized System of Wine Aroma Terminology. *Am. J. Enol. Vitc.* 38: 143-146 (1987)
- When working with wine flaws, it is important to use a control base wine when comparing the flaw in the same wine matrix

The Wine Aroma Wheel



SENSORY EVALUATION

- According to Paynaud (1996) “the role of tasting expertise is not the identification of anonymous wines, but the exercise of quality control. Its function is to judge whether a wine is free of fault which might lessen its value or render it unfit for consumption and to see whether it has qualities required by its denomination.”

WOULDN'T IT BE GREAT!



SENSORY EVALUATION

- However, individual differences occur in picking up specific wine compounds/components relating to their thresholds in wine
- Consumer preference in addition to winery desires and goals must also be addressed



SENSORY EVALUATION: IN THE WINERY

- Research and Development
 - Introducing a new wine, Evaluating an essence or flavoring material, different oak sources
- Important for Quality Control
 - Test for off flavors, reformulation changes, quantifying effects of processing changes, blending and fining trials
- Sales & Marketing
 - Brand management, effectiveness of packaging etc.

SENSORY EVALUATION: COMMERCIAL APPLICATION

- A number of good wine glasses
- Wine "tufts" or sharpie
- Graduated cylinder's (100ml, 50ml, 25ml and 10ml)
 - For blending purposes in making a good wine great
- Graduated pipette (10ml)
- Several beakers - sample collection (250ml)
- Take a representative (homogenous) sample from each tank or barrel involved

SENSORY EVALUATION: COMMERCIAL APPLICATION

- Label tanks and barrels correctly on sample beakers and tasting sheet
- Use 200 mls of clarified wine for fining trials and use a control sample with no treatment (difference test)
- Use 100 mls in blending for easy calculations
- Laboratory scales (0.1g) – for sugar additions

SENSORY EVALUATION: COMMERCIAL APPLICATION

- Pencil, tasting notes and sheet
 - Write lots of detailed descriptive notes
- Laboratory markers
- In the case of trying to improve a slight wine flaw by blending, it is best to perform any fining trials required on the wine prior to performing any blending trials involving good wine

SENSORY EVALUATION: COMMERCIAL APPLICATION

- Tasting notes should include:
 - Appearance, Aroma, Taste, Aftertaste and Overall impression
- Tastings should all be performed blind
- Integrate other trusted (professional) palates into the sensory evaluation process

OARDC - SCORE SHEET

date: _____ name: _____

10 - 11 pts: average commercial wine; 12 pts: above average, quality wine;

13 - 14 pts: BRONZE 15 - 16 pts: SILVER 17 - 20 pts: GOLD

FLIGHT: _____ CODE: _____ SCORE: _____ WINE: _____

appearance: 0-3 pts: _____ comments: _____
 aroma + bouquet: 0-6 pts: _____
 taste: 0-6 pts: _____
 aftertaste: 0-3 pts: _____
 o.a. quality: 0-2 pts: _____

FLIGHT: _____ CODE: _____ SCORE: _____ WINE: _____

appearance: 0-3 pts: _____ comments: _____
 aroma + bouquet: 0-6 pts: _____
 taste: 0-6 pts: _____
 aftertaste: 0-3 pts: _____
 o.a. quality: 0-2 pts: _____

FLIGHT: _____ CODE: _____ SCORE: _____ WINE: _____

appearance: 0-3 pts: _____ comments: _____
 aroma + bouquet: 0-6 pts: _____
 taste: 0-6 pts: _____
 aftertaste: 0-3 pts: _____
 o.a. quality: 0-2 pts: _____

FLIGHT: _____ CODE: _____ SCORE: _____ WINE: _____

appearance: 0-3 pts: _____ comments: _____
 aroma + bouquet: 0-6 pts: _____
 taste: 0-6 pts: _____
 aftertaste: 0-3 pts: _____
 o.a. quality: 0-2 pts: _____



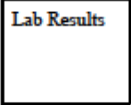



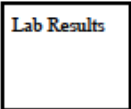



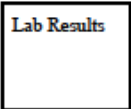



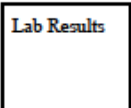
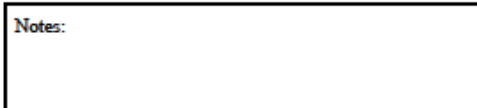


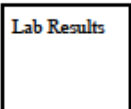



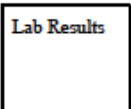


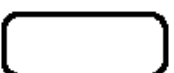
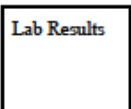
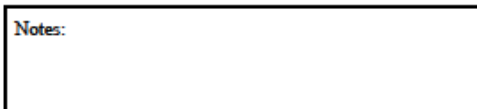
FLIGHT: _____ CODE: _____ SCORE: _____ WINE: _____

appearance: 0-3 pts: _____ comments: _____
 aroma + bouquet: 0-6 pts: _____
 taste: 0-6 pts: _____
 aftertaste: 0-3 pts: _____
 o.a. quality: 0-2 pts: _____

FLIGHT: _____ CODE: _____ SCORE: _____ WINE: _____

appearance: 0-3 pts: _____ comments: _____
 aroma + bouquet: 0-6 pts: _____
 taste: 0-6 pts: _____
 aftertaste: 0-3 pts: _____
 o.a. quality: 0-2 pts: _____

WINERY TASTING SHEET

glass # 	Wine/Treatment/Tank 	Lab Results 	Notes: 
glass # 	Wine/Treatment/Tank 	Lab Results 	Notes: 
glass # 	Wine/Treatment/Tank 	Lab Results 	Notes: 
glass # 	Wine/Treatment/Tank 	Lab Results 	Notes: 
glass # 	Wine/Treatment/Tank 	Lab Results 	Notes: 
glass # 	Wine/Treatment/Tank 	Lab Results 	Notes: 
glass # 	Wine/Treatment/Tank 	Lab Results 	Notes: 

SENSORY EVALUATION: COMMERCIAL APPLICATION

- May also include a target benchmark variety for comparison
 - Consist of Gold Medal or top Wine Spectator Rating
- Evaluate each variety, lot or tank in a sincere, concentrated focus on proper sensory evaluation
 - Designate a sensory evaluation area that is free from distractions and smells with good lighting

CHEMICAL ANALYSIS

- Many times chemical analysis will back up sensory results
- Help to isolate or troubleshoot problem areas for both fining and blending treatments

SENSORY EVALUATION TESTS IN THE COMMERCIAL WINERY

- Descriptive analysis
- Difference/Discrimination tests
- Intensity rating
- Hedonic tests
- Paired preference



DESCRIPTIVE ANALYSIS

- The goal is to identify the aroma and flavor profile of a wine
- Takes most time in development of panel and training on descriptors
- Using panel discussion decide upon flavor/aroma characters of wine
- Train tasters using standards (wine spiked with desired attribute)
- Blind tasting to determine if characters can be reproducibly recognized in wines

DIFFERENCE/DISCRIMINATION TEST

- Used to determine whether a difference exists between samples
- Require trained or experienced evaluators
- Can be most beneficial for commercial wineries
- Require statistics for validation
- Principle tests used:
 - Triangle, Duo-trio, Paired comparison

TRIANGLE TEST

- Judges are provided with three random coded samples
- Two are the same, and one is different
- They are asked to identify the odd sample
- Results are based on the probability of the odd sample being chosen $\frac{1}{3}$ of the time
- Tasting order needs to be randomized & repeated
 - AAB, BAA, ABA, ABB, BAB
- Require statistical evaluation for validation

DUO-TRIO TEST

- Involves comparison of two wines with a reference wine being provided
- The reference sample is provided first
- Evaluators are asked to identify the sample being the same as the reference wine
- No attribute is indicated and can be based on individuals sensory judgment
- Results based on probability of evaluator being able to pick the correct sample 50% of the time
- Require statistical analysis for validation

PAIRED COMPARISON

- Judges are evaluating a specific attribute
- The panelists are given two wine samples and asked to identify the sample with the highest concentration of the attribute in question
 - i.e.. astringency, oak, sweetness, alcohol etc...
- Results based on the probability of the evaluator being correct 50% of the time
- Require statistical analysis for validation

INTENSITY RATINGS

- Involves extensive training of judges on specific attributes
- Training involves recognition of differing concentrations of acidity or Brett for example
- The intensity is converted to a numerical scale typically from 1 to 10
- Requires more detailed statistical analysis for this test making it less attractive for commercial application

HEDONIC TESTS

- Can utilize untrained personnel or evaluators
- Identifies whether a taster likes or dislikes a particular wine
- Most commonly used scale in the food industry
- Can assess 2 or more samples
- 9 point scale most common practice
- Can use an in-house scale evaluation as well

HEDONIC SCALE EXAMPLES

9 Point Common Scale

1. Like Extremely
2. Like Very Much
3. Like Moderately
4. Like Slightly
5. Neither Like or Dislike
6. Dislike Slightly
7. Dislike Moderately
8. Dislike Very Much
9. Dislike Extremely

Overall (In-house) Scale

1. Excellent, I'll buy a case
2. Shure, I'll buy a bottle
3. Hey, I'll take a glass
4. It's alright
5. There is nothing else available
6. I've had better
7. There are some issues here
8. Is this wine
9. I'd rather die from dehydration

HEDONIC TESTS

- Since this is a popular test for consumer preference, make sure there is no pre - bias from the person organizing the evaluation
- Make sure there is a representative population for this test
- Be careful for any bias developed from an attractive phrase describing the wine if you choose to make your own scale descriptors

INTERPRETING THE RESULTS

- Nice Statistical tool from The Australian Wine Research Institute (AWRI) to help determine significance in your sensory evaluation tests found at the following site:
 - http://www.awri.com.au/industry_support/winemaking_resources/calculators/sensory-assessment/
- Further sensory evaluation information regarding sensory tests, procedures and statistical results:
 - Lawless, H.T., and Heymann. 1998 Sensory Evaluation of Food: Principles and Practices. Chapman & Hall, New York.
 - Lawless, H.T., and Heymann. 2010 Sensory Evaluation of Food: Principles and Practices. Second Edition. Springer Science + Business Media, New York.
 - Amerine, M.A., and Roessler, E.B. (1976). Wines: Their Sensory Evaluation. W. H. Freeman and Company, San Francisco

FURTHER RECOMMENDATIONS

- Be careful not to have too many samples (depending on test) causing palate fatigue
 - 5 to 10 samples at a time unless there are greater differences between samples
 - Several flights or repetitions of 5 to 10 samples can be evaluated successfully in a period of several hours
 - If simply eliminating poor or off samples, more can be evaluated
- Keep everything the same in respect to serving vessels, size, glassware, temperature and three digit random codes (No variables which may cause a bias)

FURTHER RECOMMENDATIONS

- Provide enough (minimal) information regarding test and be neutral as possible
- If looking at aroma and/or taste differences alone,
 - May be beneficial to use colored glasses (cobalt) to avoid bias from color
- Provide motivation for tasting
 - Judges become more efficient and reliable
 - Provide reports of their results
 - Assure them they are participating in something important
 - Either pay them or provide other award for their services

THE IDEAL SENSORY LABORATORY



THE IDEAL SENSORY LABORATORY

- Centrally located for winery staff and consumers
- **The sensory lab should be separated from the wine lab to reduce chemical smells that will interfere with the sensory evaluation**
- Separated from other areas producing odoriferous smells such as: fermentation, bottling, restaurant etc.
- Good ventilation system

THE IDEAL SENSORY LABORATORY

- White in color with natural or incandescent lighting
- Fairly soundproof to avoid distractions
 - Avoid music and conversation between judges
- Temperature control from 60 to 63°F
- Large conference area for discussion and group tastings

THE IDEAL SENSORY LABORATORY

- Separate wine preparation area away from judges access
- Separate booths (permanent or temporary) with serving port or separate tables for individual judges
- However it is designed, make sure a professional environment is created for importance of judging sincerity and efficiency

BUDGET COMPROMISED SENSORY LAB

- Quiet, enclosed environment
- Good lighting with white background to evaluate appearance (color and clarity) properly
- Away from potential sources of aromas that may effect sensory perception
- Have someone in charge of setting up tasting in a blind format

BUDGET COMPROMISED SENSORY LAB

- Include enough evaluators hopefully for statistical significance or to throw chance out of the equation
- Do not attempt to evaluate to many samples at once - 5 to 10 samples repeated 3 times (morning, afternoon evening)

THANK YOU!

Todd Steiner

**Enology Program Manager and
Outreach Specialist**

OARDC

**Dept. Of Horticulture & Crop
Science**

Phone: (330) 263-3881

E-mail: steiner.4@osu.edu