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Trained Panel Evaluation of Wine

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THE SENSORY EVALUATION TOOLBOX

Sensory evaluation is a scientific discipline involved in evoking, measuring, analyzing, and interpreting responses to properties of foods and materials as perceived by sight, smell, taste, touch and hearing. Historically, sensory evaluation test methods have been divided into two basic types, affective and discriminative. Affective tests involve acceptance tests, usually involving some type of scale or response (for example, a scale ranging from like extremely to dislike extremely) or preferences, where two products are presented and a person is to select which one is preferred. This affective type of test method is known to be "subjective" or to reflect a person's personal reaction to a food or material.

Discriminative methods are analytical in nature and should be thought of as "objective" sensory methods. Discriminative methods fall into two main types: The first is where simple differences between samples are observed. This could be overall differences such as a difference in overall taste intensity or it could be specific to an individual attribute such as difference in sweetness or sourness (acidity). The other main type of discriminative sensory test is descriptive. Descriptive testing, or descriptive analysis, utilizes a highly-trained panel so that each panelist can be thought of as an analytical instrument. Because of the high degree of training, results from a descriptive analysis panel are very reproducible.

DESCRIPTIVE ANALYSIS

Historical perspective

Perfumers have been describing fragrances for centuries. The description of the odor and flavor characteristics of food and beverages, however, is so difficult that it has been neglected for many years. It was revived with the Flavor Profile test, a specific type of descriptive analysis, and has now been applied to many, many different types of foods and beverage systems.

The Arthur D. Little (ADL) Company in the 1950's developed the Flavor Profile Method in order to attack a project involving monosodium glutamate. ADL's flavor specialists were asked by an American company to describe what happens when MSG is added to food. This problem could not be solved with quality grading methods, difference tests or preference ratings. The Flavor Profile test, however, provided satisfactory results. It was shown that MSG enhanced, for example, saltiness (less salt could be added to a product) and also has a mouth feeling effect.

At the Sensory Science Laboratory at Oregon State University, we use descriptive analysis because it represents the most sophisticated of the available sensory methodologies, compared with discrimination

and acceptance test methods. Descriptive analysis results include a complete sensory description of the test products. It provides a basis for determining the sensory characteristics important to acceptance as well as an aid in identifying underlying ingredient and process variables. That is, it allows one to relate specific ingredient or process variables to specific changes in the sensory characteristics of a food.

The value of descriptive analysis was appreciated by its earliest practitioners, the brewmasters, perfumers and others. They described products and made recommendations about the purchase of specific raw materials. They evaluated the effect of process variables on product quality, including the determinations regarding a particular product meeting the criteria for manufacture and sale to the consumer.

Methodology

Descriptive analysis involves the detection and description of a product's sensory characteristics by a welltrained panel of six to ten people. It involves two major steps: (1) discriminative, involving the detection of flavor, aroma or texture (mouthfeel in wine) characteristics, and the detection of differences and the amount of each characteristic present; (2) descriptive, involving the qualification of the sensory characteristic and then quantification of it by stating the amount of each characteristic present.

In the food industry, descriptive analysis has been used to provide a sensory picture or fingerprint of the aroma, flavor and/or texture of a food product. Its many uses include: (1) supporting or interpreting other sensory tests, (2) research guidance, (3) quality control, quality assurance and (4) support or interpretation of instrumental results.

The components of descriptive analysis involve not only qualitative and quantitative work but also determination of the order of appearance of perceived sensory characteristics. For example, different aroma and flavor characteristics may appear quickly or develop slowly and linger as an aftertaste. In texture evaluation of foods, one would want to know if the characteristic appeared on the surface of the tongue, after partial compression, after full compression or the first bite during chewing, or as a residual.

Training

Training of a descriptive panel can be done to varying degrees. The original flavor profile method developed by the Arthur D. Little Company in the early 1950's, involved a training period that took up to six months. More recent methods, such as the QDA method developed by Stone and Sidel at Tragon, involved a much shorter period of training, specific to the particular product with which one is working. It is this type of training that we have used for the evaluations of wine in our Sensory Science Laboratory.

Training of a descriptive panel can be very time consuming. It must be well-planned and conscientiously carried out. The panel needs to be screened for basic taste acuity and aroma descriptive ability, selected on the basis of their acuity, motivation and availability, and then trained to do the task at hand. Training usually involves the actual products involved in the test as well as other samples deemed necessary by the sensory analyst. In order to develop a good frame of reference and to facilitate specific training, many reference standards must be used. Subjects who are selected to participate in the panel must be extensively trained in the test methodology and in the product's attributes.

Language development

The descriptive method requires that the subjects verbalize their perceptions. That is, they develop a set of terms or words that form the basis for their scorecard. Subjects must agree as to the meaning of those words and in a quantitative test indicate the intensity of each sensory quality perceived. Assuming all subjects have the same meaning for a word and associate it with a particular perception can be quite

risky. It should be apparent that the sensory language is the key element in a descriptive test and there are many different ideas as to the language development process.

Language development is the most difficult part of training a sensory panel. The language is developed through careful training and practice by the panel. It requires panelists to develop a common vocabulary, an aroma, taste and texture mental "library" which catalogs various sensory stimuli with appropriate names. Descriptive analysis is a complex cognitive process which requires more mental acuity than sharp tastes or olfactory senses. Discrimination amongst stimuli is only part of the qualitative process. Describing each of the characteristics is the more difficult part.

The parameters which are detectable and define a product are called the characteristics, attributes or descriptors. These qualitative factors such as chocolate, buttery, sweet, hard, gritty, astringent are examples of terms which may define the sensory qualities of a product. Aroma includes the olfactory sensations, perceived by the olfactory nerve, such as vanilla, fruity, floral, sulfury. Nasal feelings are perceived by tactile nerves in the nose and include such attributes as cool or pungent. The components of flavor as perceived in the mouth (what we often call flavor by mouth) include olfactory sensations perceived by the olfactory nerve, such as vanilla, fruity, floral plus taste sensations perceived by the taste buds sweet, sour, salt and bitter. Also important are mouthfeel sensations such as cool, astringent, metallic and aftertaste sensations or any feelings left after swallowing.

Primary consideration in establishing any analytical descriptive panel is that all of the panel members are welltrained in the terminology used to describe the particular product being evaluated. This training involves demonstrating, by presentation of examples, the various products within a product type, along with as many components as possible. For example, if a panel were to evaluate the flavor and aroma of peanut butter, it would be necessary to gather the following samples as references: (1) as many brands of peanut butter as there are commercially available; (2) samples of the important peanut types used in commercial peanut butters, including degrees of roasting; and (3) chemicals which are associated with peanut flavor or aroma. This same approach would serve well for the evaluation of wine or any other food or beverage.

DESCRIPTIVE ANALYSIS OF WINE

Panel training

In order to become familiar with the aroma of a wine such as Pinot noir and to practice describing it, the panel might spend several sessions evaluating a selection of commercially available Oregon Pinot noir wines. In order to refine the vocabulary of descriptive terms for Pinot noir, the Wine Aroma Wheel (8) would be used. The wine aroma wheel is divided into sections so that terms which describe similar aroma characters are grouped together. The main groups (first tier terms) are further divided into specific characters (second and third tier terms). For example: Fruity, a first tier term, is broken down into citrus, berry, tree, tropical, estery and dried, second tier terms. Specific or third tier terms would then be lemon, raspberry, prunes, etc.

Working with a section or group of sections of the wine aroma wheel, standards (Table 1) would be presented to the panel along with a commercial sample of Pinot noir. The panel would evaluate the wine sample by comparing its aroma to the aromas of the standards. By limiting the standards available, the panelists would be able to concentrate on specific characters in the wine samples and familiarize themselves with those sensations.

Table 1. Training standards developed for Pinot noir aroma description training.

TERM	STANDARD
grapefruit	fresh grapefruit segments
orange	fresh orange segments
blackberry	canned blackberries in heavy syrup frozen blackberries blackberry jam
raspberries	frozen raspberries raspberry jam
strawberry	frozen strawberries canned strawberries in heavy syrup strawberry jam
cherry	canned dark sweet cherries in heavy syrup canned sour pie cherries in water frozen cherries
apricot	canned apricots in heavy syrup
peach	canned peaches in heavy syrup
pear	fresh, sliced canned in heavy syrup
apple	fresh, sliced canned, juice
pineapple	canned tidbits in its own juice
melon	cantalope, fresh honeydew, fresh
banana	fresh, slices
estery	Hi-C fruit drink artificial strawberry artificial raspberry artificial blackberry artificial blueberry
strawberry jam	strawberry jam (Smuckers)
raisins	Sun Maid raisins
prune	dried prunes stewed prunes
fig	Mission, dried figs Mission, stewed figs Kalamara, dried figs Kalamara, stewed figs

Several sessions would then be held where panelists would be presented with actual test samples. During these sessions, panelist generated attributes would be rated on a nine-point intensity scale (1 = none, 9 = extreme). The experimenters would then use these results to develop a final set of descriptors. It is not necessary for all panelists to agree that each of the aroma descriptors is useful. For example, several of the panel members may feel the berry note present is raspberry, while others feel it is blackberry. Both raspberry and blackberry would be included on the final ballot. The final ballot would be tested over several sessions to give the panelist practice in using it, and to further refine the descriptive terms.

ANALYSIS AND INTERPRETATION OF RESULTS

Results from descriptive analysis panels may be analyzed using routine statistical procedures to determine which treatments (viticulture, processing, etc.) are significantly different from each other. The

statistical design includes several replications to give a measure of panel reproducibility. Analysis is always conducted on an individual attribute basis. A statement can therefore be made about every attribute on the ballot. For example, "sample A was significantly higher in raspberry character than sample B."

A more detailed example of the results of descriptive analysis of wine is given in the next article in this newsletter. The article describes an untrained winemaker panel evaluation of selected wines and contrasts the results with those from a highly trained descriptive analysis panel (McDaniel et al. 1987). Because of the degree of language development by the trained panel, small differences among wines can be pinpointed. It should be emphasized here that at no time is any "quality" judgment made. A trained panel describes what is there and makes no judgment as to whether or not it is positive or negative. It is left for the winemakers to decide which characteristics are desirable for the style of wine they wish to create.

REFERENCES

McDaniel, M. R., L. A. Henderson, B. T. Watson, D. A. Heatherbell. 1987. Sensory Panel Training and Screening for Descriptive Analysis of the Aroma of Pinot Noir Wine Fermented by Several Strains of Malolactic Bacteria. Submitted.