

Research Article

Research on the Sensory Design and Evaluation System for Food Shape and Color

Zhuo Yang

Chongqing College of Electronic Engineering, Shapingba District, Chongqing 401331, China

Abstract: Food sensory analysis technology is an important branch of Food Science, it is significant in new products development and innovation in food industry. In this study, food sensory analysis and evaluation technologies were studied based on the development and characters of food science. The results showed that sensory analysis could not only help in grasping characters of different food products, but also provide physicochemical and practice basis for food production management and process control.

Keywords: Description analysis, food, food science, sensory analysis

INTRODUCTION

The food sensory science is the most distinctive branch in modern food science, which is a discipline systematically researching the interactive form and rule between human sense and food through the application of the intersection means of modern multidisciplinary theory and technology (Zhang and Sheng, 2006). The core manifestation of food sensory science is food sensory quality, the basic scientific method is food sensory evaluation and the basic content includes the connotation of food sensory quality (Han *et al.*, 2005), analysis and evaluation theory and method, physicochemical measurement technology, process formation, consumption habit and other basic questions of food science and consumer science; The food sensory science is an important foundation for modern food science and technology and food industrial development with the theoretical, practical and skill features. The food sensory evaluation is a kind of scientific methods to evoke, measure, analyze and interpret the feature or nature of food and other materials perceived through the sight, smell, taste and hearing (Li and Qing-Yi, 2014). The definition was proposed by IFT Sensory Evaluation Group in 1975 as follows: "Sensory evaluation is a scientific discipline used to evoke, measure, analyze and interpret reactions to those characteristics of food and materials as they perceived by the senses of vision, smell, taste, touch and hearing" (Bellisle *et al.*, 1998). Seen from the definition, the food sensory evaluation makes people become an objective tool to detect the food sensory quality with scientific method. At that time, the definition of food sensory evaluation is limited in the food field. Along with the application of the technology in the production process, US food technologist Herbert Stone and Joel Sidel expanded the food in the definition to the products in 1993, such as the cosmetics, detergent, textile or printing material and

other articles of daily use stimulating the five sense organs, therefore, simply speaking, the sensory evaluation refers to collect the product's sensory response on human stimulation through the objective methods with the tool of human to obtain or calculate consumers' response on the product. Based on the above feature, the sensory science is the most distinctive discipline branch in the modern science, which is a discipline researching the interactive form and rule between human sense and product integrating the food science (or cosmetics, textile, print and other professional sciences), physiology, psychology, statistics and other modern multi-disciplinary theories and techniques and it has a wide range of applications (Katz and Labuza, 1981).

Food sensory analysis technology has existed for long time (Fei *et al.*, 2014). It is an essential way especially in modern food industry. In that technology, people's sensory organs are used in product perception and analytical evaluation is made. That increases working efficiency greatly and solves complex physical-sensation problems which cannot be solved by common physical and chemical analysis. Sensory analysis not only can understand and master kinds of performance of product well, but also can offer physical-chemistry basis and practical basis for management and control of product. An excellent food enterprise must be permitted by the national quality system certification to produce and market. So the control of food quality is especially important. Many aspects are included in food quality and sensory quality is one crucial point among them. Sensory quality of food includes color, aroma, taste, appearance form, density degree etc. It is the most sensitive part of food quality. When every consumer faces one product, the sensory qualities go into eyes of the consumer firstly. And then they will feel whether they like it and buy it or not. So the sensory quality of product directly relates to market sales situation of

product. In order to guarantee product quality, as for every batch of product produced by food enterprise, it must be tested by quality-control staffs who have been well trained and have certain sensory evaluation ability. After it is tested to be qualified, it can be put into market. Sensory analysis can quickly know abnormal color or smell of product and any medicine or instrument is not needed. The high speed and sensitivity cannot be exceeded by any instrument. In addition, description method and triangle experiment method in sensory analysis can be used to monitor the stability of product and analyze whether fluctuation of product quality exists or not. In a word, if sensory analysis technology is effectively used in control process of product quality, the first hand of information can be got quickly. It will make it convenient to take corresponding measures to deal with the existing problems and minimize damages.

This article studies and builds analysis system and methods of evaluating food sense by food appearance and color. Sensory analysis not only can understand and master kinds of performance of food product well, but also can offer physical-chemistry basis and practical basis for management and control of food product.

MATERIALS AND METHODS

Materials: Sample preparation room is a preparation site which is used for sensory analysis experiment. It can be used to select corresponding experimental tools and preparation samples and code the samples and tools. Sample preparation room should border upon quality evaluation room and it is not the only way for quality-evaluation persons to go into quality evaluation room. Sample preparation room should be ventilated well and have proper up-down watering devices. Construction and decoration materials with smell cannot be used. Experimental tools, equipments and indoors facilities must be made by none-smell or restraint-smell materials. The common-prepared facilities in preparation room are heater, scale, refrigerator, thermostat, drying oven, micro-wave oven, ventilation system etc.

Environment: Sensory analysis should be operated in special and quiet test room which is not disturbed. Test room should be kept with comfortable temperature and ventilation. It should be separated from sample preparation room to avoid that test environment is polluted by irrelevant smell. The space of test room cannot be too small and seats should be comfortable. That will avoid depressive sense of evaluation persons. In the test room, sound should be limited and color and intensity of light should be controlled. Talk and other disturbance that can divert the attention of evaluation persons should be particularly avoided.

Instruments and water usage: As for the containers which contact with sample, they should be suitable for

the sample. The surface of containers shouldn't have absorption and influence to test result. The stipulated and standard containers should be used to the greatest extent. In addition, water supply quality should be guaranteed. For some special purposes, distilled water, mineral water, filtering water and cool boiling-water can be used.

Methods:

Description analysis: It means that evaluation persons qualitatively and quantitatively analyze all the quality features of product. That not only needs evaluation persons to own good memorial ability and language expression ability, but also needs them to have certain professional knowledge. For example, when evaluating a group of products belonging to the same kind, they need to describe and conclude the same points and otherness in aspects such as appearance, color, aroma, taste, texture etc. which affect quality of product. When doing sensory analysis to products, the above two methods are used at the same time. In addition, kinds of detailed experimental methods and processing means are cross-utilized in order to get ideal analysis result.

Otherness test: It is to recognize the difference of products' color, aroma and taste by sensory organs of people.

Threshold value test: It is mainly used to decide sensitivity ability of learners' gestation and smell. The determination of threshold value is commonly divided into "stimulating threshold" (a threshold which strongly stimulates gestation and smell), "recognition threshold" (a threshold which has obvious features for a certain kind of food), "difference threshold" (a threshold of different concentration for the same substance) and "minimum threshold" (a threshold of minimum concentration that individual can perceive for one certain substance).

Dilution test: It is used to decide minimum amount of other substances which are mixed into food and perceived by learners.

Recurrence memory test: It is used to decide learners' capture ability to features of test products. Learners should find two or more than two samples which are same in a group of very similar samples.

Resurgence memory test: It is used to decide learners' capture ability and memorial ability to features of test products. A certain test sample is taken out again after 24-72 h and the learners are reminded that it is a sample in a certain group of samples. And the learners are requested to find the group.

Characteristic substance discrimination test: It is used to test learners' generalization ability and

description ability to food characteristics. One certain representative product is chose to make learners describe its type, features, characteristics, production enterprise etc.

When making sensory analysis to products, the above methods are used at the same time. In addition, kinds of detailed experimental methods and processing means are cross-utilized in order to get ideal analysis result.

Sensory analysis: (Or sensory evaluation) is a scientific discipline that applies principles of experimental design and statistical analysis to the use of human senses (sight, smell, taste, touch and hearing) for the purposes of evaluating consumer products. The discipline requires panels of human assessors, on whom the products are tested and recording the responses made by them. By applying statistical techniques to the results it is possible to make inferences and insights about the products under test. Most large consumer goods companies have departments dedicated to sensory analysis. Sensory analysis can mainly be broken down into three sub-sections:

- Effective testing (dealing with objective facts about products)
- Affective testing (dealing with subjective facts such as preferences)
- Perception (the biochemical and psychological aspects of sensation)

RESULTS AND DISCUSSION

Every method has its own advantages and disadvantages. So different units can choose proper methods according to their own needs. But they are supposed to abide by a principle: test method should be suitable for test purpose. Sensory test is almost operated on the basis of blind label. It means that product identity is commonly fuzzy (Zi, 2014). People don't offer the minimum information that is used to evaluate products in a certain scope. Then people are requested to select proper methods and design corresponding sensory investigation table according to experimental purpose.

The design of sensory test not only includes selection of proper methods, but also includes selection of statistics methods. Statistics analysis software is the main tool for data analysis. Integrated data analysis process includes data collection, data arrangement and data analysis. Statistics offers a set of integrated and scientific methodology for data analysis process. Statistics software offers realization methods for data analysis. At present, in sensory analysis, the kinds of software which are used widely are EXCEL, SAS and SPSS. Variance analysis and factor test of sensory data can be achieved by computer operation.

CONCLUSION

Sensory evaluation uses test methods that provide information on how products are perceived through the senses. The importance of sensory perception to food quality is widely appreciated in the food industry, providing a demand for such specialists.

Like other quantitative disciplines, sensory evaluation attempts to provide precise and accurate measurements. Yet, because the data are collected from human beings, who are notoriously variable, sensory evaluation studies pose a special challenge and statistical techniques are necessary. Basic principles of human judgment and perception are also important and students are encouraged to take courses in the behavioral sciences. Cornell offers a unique range of courses and research opportunities in sensory evaluation.

Research projects are conducted in three main areas. Methods research is aimed at providing improvements in the reliability and validity of sensory tests. Product-focused research uses sensory analysis to measure the success of variations in product processing or ingredients. Basic research on perception and human judgment advances our understanding of sensory function.

Following the changes of market and consumers' consumption habits and intensifying competition in food industry, using the means of sensory evaluation to improve products, product quality and service will become the key link of food enterprises. Sensory evaluation can know market trend and consumption tendency of consumers, build database which is related to consumers and offer data support for research and development of food product. At the same time, sensory evaluation can be used to build corresponding correlation between market & consumer and food research and development sample. Sensory evaluation can be used to formulate product property and lay basis for deciding final products and future market operation. In a word, sensory evaluation technology is used more and more widely in food industry. And the effects are increasingly obvious.

REFERENCES

- Bellisle, F., J.E. Blundell, L. Dye, M. Fantino, E. Fern, R.J. Fletcher *et al.*, 1998. Functional food science and behaviour and psychological functions. Brit. J. Nutr., 80(S1): S173-S193.
- Fei, L., C. Yuqin, H. Chengyun, L. Jia and L. Bo, 2014. Sensory evaluation and textural properties of mushroom sausages. Adv. J. Food Sci. Technol., 6(6): 792-796.
- Han, C., C. Lederer, M. McDaniel and Y. Zhao, 2005. Sensory evaluation of fresh strawberries (*Fragaria ananassa*) coated with chitosan-based edible coatings. J. Food Sci., 70(3): S172-S178.

- Katz, E.E. and T.P. Labuza, 1981. Effect of water activity on the sensory crispness and mechanical deformation of snack food products. *J. Food Sci.*, 46(2): 403-409.
- Li, Z. and C. Qing-Yi, 2014. Quantitative analysis of financial support and social credit system impact on food processing enterprise. *Adv. J. Food Sci. Technol.*, 6(9): 1095-1099.
- Zhang, A.X. and Q.H. Sheng, 2006. Analyzing on the factors of composing the food sensory evaluation. *China Dairy Ind.*, 34(12): 51.
- Zi, T., 2014. Influencing factors of catering and food service industry based on principal component analysis. *Adv. J. Food Sci. Technol.*, 6(2): 191-197.