Comprehensive Evaluation of Food based on the Fuzzy Mathematics

Beibei Huang
Sanmenxia Polytechnic, Sanmenxia Henan, 472000, China
Email: 316887518@qq.com

Abstract---Nowadays, the evaluation of all kinds of food depends on the senses. So it is important to seek a suitable method to the comprehensive evaluation of food efficiently. The article uses the method of fuzzy mathematics to choose potato pork as evaluation objects. With quality, color, taste, aroma and shape, etc, to evaluate the elements. Through the calculation to determine the weights of various factors and evaluate the four potatoes shredded meat. Through the calculation of fuzzy matrix, we sort for four shredded meat potatoes. It is thus obvious that the fuzzy mathematics in all kinds of food of the comprehensive evaluation has good maneuverability and reliability.

Keywords-Fuzzy mathematics; The fuzzy matrix; Food; Evaluation

I. INTRODUCTION

In real life, our assessment of all kinds of things will be affected by various elements of different reasons. Among these elements tend to some elements are vague and uncertain. The fuzzy comprehensive evaluation method is a kind of based on the relevant theories of fuzzy mathematics and the integration of other elements of the comprehensive evaluation. The method is based on the theory of the fuzzy membership degree to transform qualitative evaluation for quantitative evaluation. It is to make an evaluation of a unified whole on the theory of fuzzy mathematics and the method to be affected by a variety of different elements of things and objects. It has some strong systemic and clear advantages and so on. It can solve various problems with vague concepts which they are hard to quantify.

There is now the evaluation of various types of food is still in the sensory stage, if there is no suitable method if often not scientifically accurate. In real life applications, we found that compared with other evaluation method based on fuzzy mathematics comprehensive evaluation method has some excellent food Sensory Evaluation and scientific process. We will be verified by the following design. In this design, with a representative for the evaluation of the object pork potato dishes, choose the color, smell, taste, shape, quality and other factors, by calculating the weight of each factor to determine a reasonable weight, and the same test group 7 shredded potatoes blur comprehensive evaluation Mathematics，To verify that the sensory evaluation based on fuzzy mathematics and in all kinds of food sensory evaluation method.

II. THE THEORY OF FUZZY COMPREHENSIVE EVALUATION

The fuzzy comprehensive evaluation method is a kind of based on the relevant theories of fuzzy mathematics and the integration of other elements of the comprehensive evaluation. The method is based on the theory of the fuzzy membership degree to transform qualitative evaluation for quantitative evaluation.Fuzzy comprehensive evaluation is based on the fuzzy mathematics theory. It is clear and systematic. It is suitable for widely used in all kinds of factors affecting target of uncertainty in the study.

Calculation method:

(1) Selecting a certain evaluation object set Y

$$Y = (y_1, y_2, ..., y_n)$$

(2)Construction of fuzzy comprehensive evaluation index:

Choosing the different elements of the major constraints to the objective evaluation, determining the evaluation factor set U

$$U = (u_1, u_2, ..., u_n)$$

(3)Building an evaluation matrix, the evaluation matrix Rj

$$R_j = u * y_j$$

(4)The proportion of different factors have allocated properly by building good weight vector: determine the weight assembly of evaluation A

$$A = (a_1, a_2, ..., a_n)$$

(5) The synthesis of evaluation matrix and weight. Comprehensive evaluation of Yj

$$Y_j = A * R_j$$

(6) Statistical analysis conclusion and discussion

III. THE EVALUATION PROCESS

Raw materials: Fresh pork, potatoes, cooking oil, mono-sodium glutamate, soy sauce and other condiments.

Abstract Flow: Select fresh high quality fresh meat and potatoes, Use different methods to get four samples, Select and invite ten related professional team composed of scoring, Score party members should be filtered through certain procedures and training, Score party members grade respectively for color, fragrance, taste, shape, etc of potato shredded meat, Scoring criteria are as follows: very poor-one point; poor-two points; very bad- three points; bad-four points; well-five points; good-six points; very good-seven points; great-eight points; excellent-nine points.

TABLE I. SENSORY EVALUATION SCORE OF SAMPLES 1

Judges Element	Color	Aroma	Taste	Shape	Quality
No.1	6	7	6	5	6
No.2	6	5	5	6	6
No.3	6	7	6	6	6
No.4	6	6	3	6	6
No.5	6	7	6	7	8
No.6	7	6	6	6	5
No.7	6	5	7	5	6
No.8	6	6	7	6	5
No.9	6	5	6	7	6
No.10	6	7	7	6	6

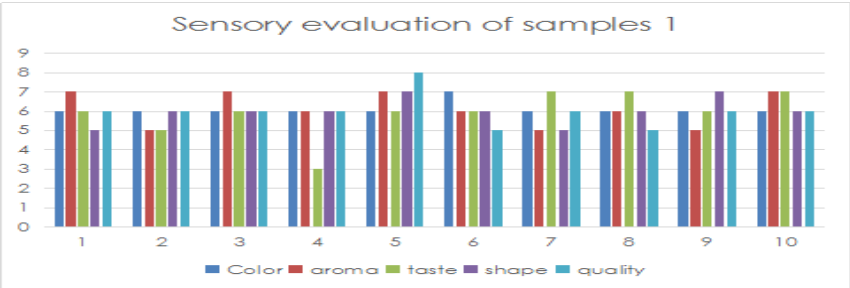

Figure 1. Sensory evaluation of samples 1

TABLE II. SENSORY EVALUATION SCORE OF SAMPLES 2

Judges Element	Color	Aroma	Taste	Shape	Quality
No.1	7	7	6	5	6
No.2	6	5	5	6	6
No.3	7	7	6	6	6
No.4	6	6	3	6	6
No.5	7	7	6	7	6
No.6	7	6	6	6	5
No.7	6	5	7	5	8
No.8	7	6	7	6	5
No.9	7	5	6	7	6
No.10	6	7	7	6	6

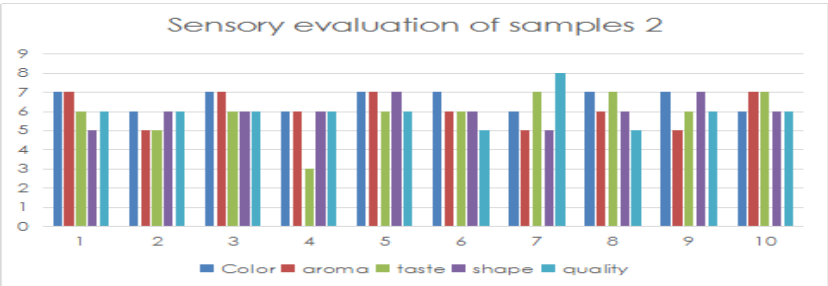

Figure 2. Sensory evaluation of samples2

TABLE III. SENSORY EVALUATION SCORE OF SAMPLES 3

Judges Element	Color	Aroma	Taste	Shape	Quality
No.1	6	9	6	5	6
No.2	6	5	5	6	6
No.3	7	7	6	6	6
No.4	6	6	3	6	6
No.5	6	7	6	7	8
No.6	7	8	7	6	5
No.7	6	5	7	5	6
No.8	8	6	6	8	6
No.9	6	5	6	7	5
No.10	6	7	7	6	6

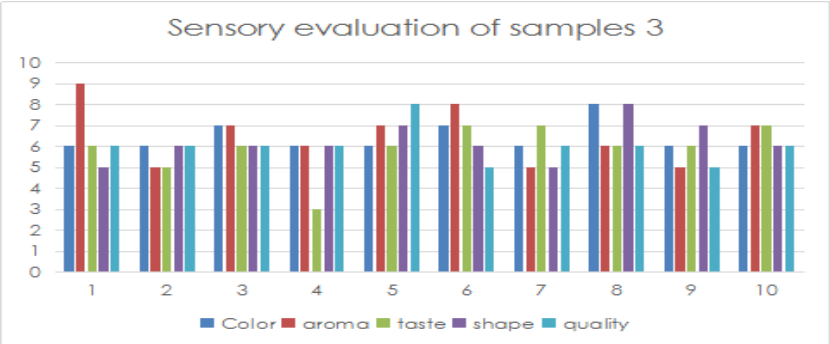

Figure 3. Sensory evaluation of samples 3

TABLE IV. SENSORY EVALUATION SCORE OF SAMPLES 4

Judges Element	Color	Aroma	Taste	Shape	Quality
No.1	6	8	6	5	6
No.2	6	5	5	6	6
No.3	8	6	5	5	5
No.4	6	5	4	7	6
No.5	6	7	6	7	8
No.6	5	6	8	6	5
No.7	6	5	7	6	7
No.8	7	8	7	9	6
No.9	6	6	6	6	5
No.10	6	7	7	7	7

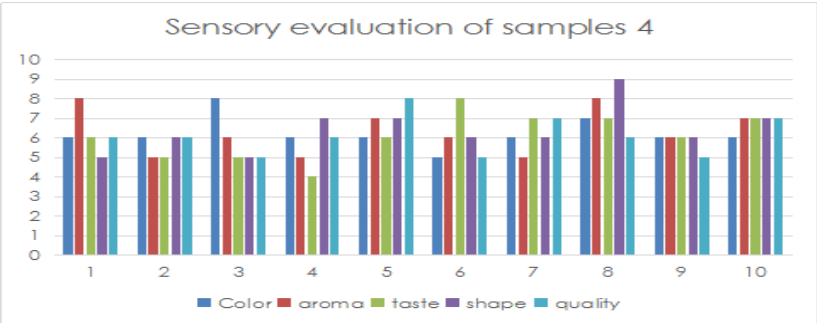

Figure 4. Sensory evaluation of samples 4

With intuitive evaluation method we can get: sample1 in terms of color is close to everyone's evaluation, and other aspects have bigger difference; sample 1 in terms of shape close to sample, everyone's evaluation, and other aspects have bigger difference; sample 3 in terms of Color close to everyone's evaluation, and other aspects have bigger difference; Sample 4 in terms of quality close to everyone's evaluation,and other aspects have bigger difference, the score of 4 samples as shown in figure 5.

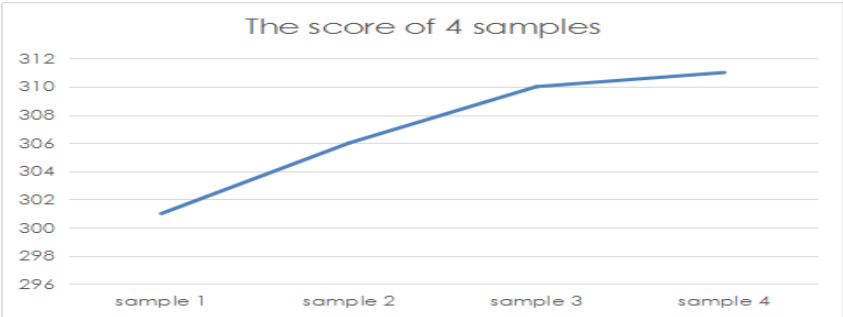

Figure 5. The score of 4 samples

TABLE V. THE SAMPLE OF SENSORY EVALUATION OF THE WEIGHT OF THE VARIOUS FACTORS

Element	Color	aroma	taste	shape	quality
The weight of the various factors	0.1	0.3	0.3	0.2	0.2

IV. CONCLUSIONS

Through the calculation of fuzzy matrix, we can obtain the set of Judge result as shown in table 6, the results show that the sample 4 the most stable which is the same as the previous survey results.

TABLE VI. THE SET OF JUDGE RESULT

Sample 1	(0.02, 0.05, 0.07, 0.03, 0.04)
Sample 2	(0.01, 0.07, 0.08, 0.03, 0.04)
Sample 3	(0.03, 0.08, 0.05, 0.05, 0.04)
Sample 4	(0.04, 0.1, 0.1, 0.09, 0.08)

This design experiments is to use numbers to quantify various sensory evaluation of score group and transfer the qualitative evaluation into quantitative score, Based on the theory of fuzzy mathematics to have a variety of different elements affecting the thing or object, it can make a comparison of the overall objective evaluation. Compared with other evaluation, this method is clear objective and strong systemic. On solving the ambiguity problem, it has certain feasibility and superiority. Based on the fuzzy mathematics comprehensive sensory evaluation, it can be scientific and accurate to identify the type of food what is relatively good samples and provide valuable data for this kind of food standards.

REFERENCES

[1] L. Liu. Application of fuzzy mathematics: Shaanxi science and technology press, 1996.

[2] S.Y.Jia, X.Y.Ji: The mathematical model and application in the field of economic practice, Vol.5(2011), p.79-81.

[3] R. Cai, C. M Jiang, Y. D Zhen and Y.M Zhang, Establishment of Mathematical Model of National Fitness Composite Index, Vol.25(2005), No.3, p.30-32.

[4] C. F Cai, Mathematical model of the modeling analysis: Science press, Beijing, 1995.

[5] M. Pan, Y.C. Yu: Application of Fuzzy Integrated Evaluation to Sensory Evaluation of Sichuan Pickles, Journal of Sichuan University of Science&Engineering, Vol.26(2013), No.2, p.11-14.

[6] Hu, T., Axation of luxury goods and luxury consumption study. Tax,Vol. 9(2009), No.3, p.9-10.

[7] Jiang, W., Discussion and exploration on Chinese luxury consumption status. Moderniz. Shopping Centre,Vol.32(2010), No.16, p.4-5.

[8] Li, D. and M. Wang, Analysis of luxury tax based on consumption behavior. J. Zhongnan Univ., Vol.1(2009), No.172, p. 44-48.

[9] Liu, S. and H. Zhao, Several thoughts on luxury consumption tax. J. Shandong Textile Econ., Vol.5(2006), No.163, p.42-45.

[10] Silverstein, M. and N. Fiske, 2003. Luxury for the masses. Harvard Bus. Rev., Vol.81(2003), No.4, p.48-57.