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SENSORY EVALUATION IN THE STANDARDIZATION OF TOMATO JUICE WITH VARIOUS FUNCTIONAL ADDITIVIES

Keywords: sensory evaluation, organoleptic analysis, tomato juice, standardization, functional food products.

This article is devoted for the research of organoleptic properties of new tomato juice with various functional additives. In research methods the modern sensory evaluation «Just-About-Right-Test» is applied, that allows identifying consumer estimation and correcting interpretation of the received results. The proposed methodology of product standardization, particularly of an original tomato juice, has a scientifically-practical value in the development of new foodstuff.

Ключевые слава: сенсорная оценка, органолептический анализ, томатный сок, стандартизация, функциональные пищевые продукты.

В статье исследуются расширенные органолептические свойства нового томатного сока с различными функциональными добавками. В методах исследований применяется современный сенсорная оценка «Just-About-Right-Test», позволяющий определить потребительскую оценку и правильную интерпретацию полученных результатов. Предлагаемая методика стандартизации продукции, в частности нового томатного сока, представляет научно-практическое значение в разработке новых продуктов питания.

Introduction

In a current human nutrition is observed a deficiency of vitamins, macro- and microelements. An incorrect nutrition and absence of essential nutrients can be reasons of the undesirable diseases. Due to the actual direction of the food industry is a development of new accessible recipes and technologies of preparation of functional juices for the whole year round usage [1,2].

Tomato juice contains required for a human body macro- and micronutrients [3]. Owing to the vitamin value, the high content of salts of potassium, iron, magnesium, cobalt and zinc tomatoes are considered useful for the balancing of exchange processes in an organism, nervous system activity and preventive maintenance of heart diseases [4]. As well as tomatoes contain: lycopene, polyphenols and carotenoids that possess antioxidant properties [5]. It is known that antioxidants neutralise free radicals that are one of the main reasons of ageing and set of degenerate illnesses. Presently there is a necessity of creation a complex system of an estimation of the content and activity of antioxidants [6].

In the process of adoption of new recipes and technologies the important value are qualitative assessments of consumers. Advanced organoleptic tests can determine the validity of the developed recipes of new food products and to analyze a consumer demand. There are different methods of organoleptic researches based on the sensory evaluation by testers and experts. Many of these methods correspond to the international standards ISO and interstate standards GOST (State Standard). Thus standardization has specific value in the methods of researches and nanotechnologies [7,8].

Sensory analysis is mainly focused on improvement of quality of manufactured products with the possibility to control the quality of raw materials, semi-finished products and technological process. Sensory evaluation that conducted by the human senses - a widespread approach to determine the quality of the food products and reliably gives a general evaluation studies, especially on such indicators as taste, odour and colour. For all sensory methods, the most critical are: accuracy and objectivity of organoleptic research and correct interpretation of the received results, excluding their arbitrary interpretation. Therefore, the main place in the sensory analysis is occupied an expert-taster, who should well understand research phases, characteristics and features of the analyzed products [9].

All methods in sensory evaluation conventionally divided into analytical and consumer's choice [10]. The analytical methods consist in three methods: distinctive, descriptive and the methods by using scales and categories. Distinctive methods apply in the case of required to find a distinction or preference between tested products. Descriptive way is usually for cases of define and assess the sensory characteristics of the product. At the consumer's evaluation, the test results are generally expressed in terms of likes and dislikes.

Considering that the sensory evaluation becomes the basic content of expanded organoleptic properties, the aim of the present work was standardization of new tomato juice with various additives. For achievement of this aim were solved the following tasks:

- Organoleptic analysis of all investigated recipes of tomato juice;
- Sensory evaluation of the selected samples by «Just-About-Right-Test» method [11].

Methodical part

In the present work it has used the following standards and methods of sensory analysis:

- GOST (State Standard) R (Russia) ISO 3972-2005 “Sensory analysis. Methodology. Research method of the taste sensitivity”.

- GOST (State Standard) R (Russia) 52182-2003 “Canned food. Production of juice. Juices, nectars, juice content, vegetable and vegetable-fruit drinks. General technical conditions”.

- GOST (State Standard) R (Russia) 52183-2003 “Canned food. Vegetable juices. Tomato juice”.

- GOST (State Standard) ISO 8588-2011 “Sensory analysis. Methodology. “A”-not “A” Test”.

- ISO 8587:2005 “Sensory analysis. Methodology. Classification”.

- GOST (State Standard) R (Russia) 53104-2008 “Catering services. Methods of organoleptic evaluation of the quality of public catering products”.

- GOST (State Standard) R (Russia) 53159-2008 (ISO 4120:2004) “Sensory analysis. Methodology. Triangle method”.

- GOST (State Standard) ISO 8586-1-2011. “Sensory analysis. General Guidelines for the selection, training and monitoring of assessors”.

- ISO 8587:2006 “Sensory analysis. Methodology. Ranking”.

- ISO 5495:2005 “Sensory analysis - Methodology - Paired comparison test”.

- ST (State Standard) RK (Republic of Kazakhstan) ISO 13301-2005 “General management measurement thresholds smell, taste and flavor by forcing three alternative choices”.

The modern sensory analysis consists of various research methods such as distinctive methods: Paired Comparison Test; Triangle test, “A”-not “A” test, “Duo-Trio” test of sensory analysis, 2-out-of-5-test, index method, scoring methods and etc.

In the present work, new compositions of tomato juice with various additives have studied under the methods of sensory analysis. The assessment of the quality of tomato juice was performed by using advanced organoleptic method [12] thereupon that has defined such indicators as the appearance and colour, consistency, smell and taste. Sensory evaluation was conducted on quality indicators - five point scale, and quantitative estimates of assessors “Just-About-Right-Test” [11, 13]. The greatest distribution in the practice of organoleptic evaluation obtains a five-point scale. Application of the five-point scales allows for the testers with average sensory sensitivity and experience obtains exact results. System of a five-point assessment can be recognized as a basic or standard, because it is on the basis of seven - and nine-point scale [14].

By 5-point scale were evaluated: a taste, a smell, a consistency and a color. During determining the taste and smell pay the specific attention for the purity of smells, absence of extraneous smells and odors, and how clearly pronounced taste. Consistency determines when filling the experimental glass. Color of juices determines by pouring into a glass and considering the spread light, paying attention to the lack of foreign shades [15].

In the universal system it is enough four levels of positive qualities and fifth - unsatisfactory. These requirements are met by a five-point scale that includes assessment of integers: 5 - excellent quality, 4 - good, 3 - quite satisfactory, 2 - satisfactory, 1 – unsatisfactory (table 1).

Table 1 - System of a five-point evaluation

Gradation	Score	Quality, %	Quality characteristic
5	5	80- 100	Excellent (top quality)
4	4	60- 80	Good
3	3	40- 60	Quite satisfactory (middle)
2	2	20- 40	Satisfactory
1	1	0- 20	Very bad (non acceptable)

Other method of investigation is a “Just-About-Right-Test” uses in the Sensory evaluation for:

- To establish a preference between two measured samples;

- To determine which of the samples may be more preferred among consumers;

- To eliminate of lacks if they are in the recipe.

This method allows for the obtaining more extended data by major categories, such as:

- Appearance;
- Smell;
- Taste;
- Consistency.

At the beginning of the investigation a questionnaire was prepared that includes all important assessment indicators. Further for the testers were presented the samples of the analyzed products. 15 respondents (in age 18-30 years old) were participated for providing this analysis.

Testers assessed the presented samples seriatim, and filled own opinions in the questionnaire.

For this method of analysis were selected the following samples: the first - with the addition of 1% greens, the second - with the addition of 1% greens (dill, parsley, celery) and 1% of mixed pectins (citrus and sugar beet). As the quality template of comparison was chosen a tomato juice “Pesnya leto” from the known manufacturer in the South Kazakhstan Region - JSC “Ecoproductgroup”.

Questions for assessors in the questionnaire were as follows:

You obtained three different kinds of tomato juices. Taste them and indicate your opinion about the following characteristics:

Questionnaire for testers

1. How do you feel about the greens’ taste in the tomato juice?
5) I would like it much more intensive
4) I would like it a bit more intensive
3) I like it. It’s just right
2) I would like it a bit less intensive
1**)** I would like it much less intensive

2. How do you like the colour of the tomato juice?
5) I like it very much

4) I like it fairly well
3) I like it. It's just right
2) Dislike fairly well
1) Dislike very much

3. How do you feel the odour of the tomato juice?
5) I would like it much more intensive
4) I would like it a bit more intensive
3) I like it. It's just right
2) I would like it a bit less intensive
1) I would like it much less intensive

4. How do you feel the texture or consistence of the tomato juice
5) It's far too thick
4) It's a bit too thick
3) I like it. It's just right
2) It's not thick enough
1) I would like it much more liquid

5. How do you like the taste of the product?
5) I like it very much
4) I like it fairly well
3) I like it. It's just right
2) Dislike fairly well
1) Dislike very much

6. How acceptable is the product?
5) I like it very much
4) I like it fairly well
3) I like it. It's just right
2) Dislike fairly well
1) Dislike very much

The results and discussion

We have developed five recipes of tomato juice with various additives. For the developing of the recipes of tomato juice were used greens in various conditions: juice of greenery, fresh chopped greens and dried chopped greens. By taking into account the organoleptic indicators for tomato juice it was considered the optimal matching of ingredients (table 2).

Table 2 - Organoleptic indicators of samples

Name of indicators	Samples					
	№1 Tomato juice	№2 Tomato juice with green's juices	№3 Tomato juice with fresh chopped greens	№4 Tomato juice with dry chopped greens	№5 Tomato juice with dry chopped greens and pectins	№6 Tomato juice "Pesnya leto" from JSC "Ecoproductgroup"
Appearance and colour	Red, specific colour for tomatoes	Natural, bright-red, pleasant	Brown, dark red, visible particles of greens	Pleasant orange-red, with small particles of greens	Dark-red, with small particles of greens	Pleasant, dark red, bordeaux
Taste	Natural, pleasant, sweet, specific for tomatoes	Natural, pleasant, sour-sweet taste of juice and greens	Sour, feels a taste of greens	Pleasant, fresh, characteristic to the taste of tomatoes with greens	Pleasant, grainy, characteristic to the taste of tomatoes with greens	Natural, salted
Odour	Natural, specific for tomatoes	Pure, tomatoes, pleasant unexpressed odour of greens	Greens exceeds the odour of tomatoes	Pleasant spicy aroma with greens	Pleasant, characteristic odour of tomatoes with greens	Pleasant, specific odour for tomatoes
Consistency	Liquid, with sediment on the bottom of a glass	Homogeneous liquid with sediments	Liquid, with sediment on the bottom of containers	Liquid with particles of greens	Homogeneous, thick	Homogeneous liquid, slightly thick

The presented samples were evaluated by 5-point scale according to the table 1. All comprehensive quality scores were completed in the figure in form of a hexahedron.

The results are shown in figure 1.

On the basis of organoleptic evaluation of the presented six samples, it was discovered that new compositions: sample #5 and sample #4, as well as a quality template - sample #6 have maximum scores.

In addition there were researched organoleptic properties according to the GOST (State Standard)

52183-2003 [16]. For that three samples of tomato juices which evaluated by sensory analysis were selected (table 3).

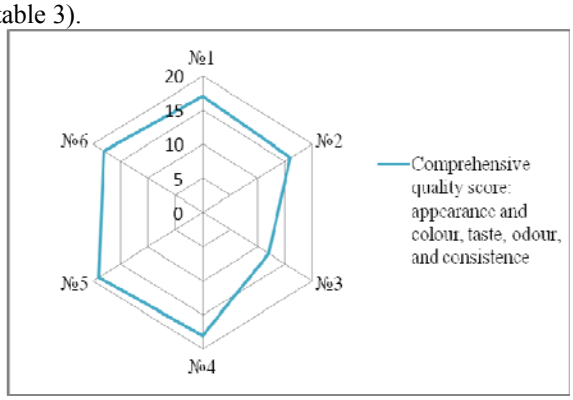

Figure 1 - General organoleptic evaluation of quality of samples, in scores

Table 3 - Organoleptic indicators of selective samples of tomato juice

Name of indicators	According to the requirements of GOST 52183-2003	Obtained data, description		
		№4 Tomato juice with 1% of greens	№5 Tomato juice with 1% of greens and 1 % pectin	№6 Tomato juice "Pesnya leto" from JSC "Ecoproductgroup"
Appearance and	Red or orange-red	Dark red, with small particles of greens	Dark red with small green's particles of dill, parsley and celery	Dark red, bordeaux
Taste	For tomato juice direct extraction - specific juice from fresh tomatoes For juice with additives specific for used ingredients External tastes are not allowed	Pleasant, grainy, characteristic to the taste of tomatoes with greens	Specific characteristic of fresh tomatoes, dill, parsley and celery, without external tastes	Natural, salted, without external taste
Odour	For tomato juice direct extraction - specific juice from fresh tomatoes For juice with additives specific for used ingredients External odours are not allowed	Pleasant, spicy, characteristic to the odour of tomatoes with greens	Specific characteristic of fresh tomatoes, dill, parsley and celery, without external odours	Natural, characteristic to the odour of tomatoes, without external odours
Consistency	Homogeneous liquid with evenly distributed a fine-grained pulp Allowed: - during the storage peeling of liquid	Homogeneous liquid with evenly distributed a fine-grained pulp	Homogeneous liquid with evenly distributed a fine-grained greens and pulp. When storing peeling of the liquid was not observed	Homogeneous liquid with evenly distributed a fine-grained pulp

Further in accordance with the GOST requirements physico-chemical properties of the selected three samples of tomato juice with various additives were studied (table 4).

Table 4 - Physico-chemical indicators of the new tomato juice

Name of parameters	According to the requirements of GOST (State Standard) 52183-2003	Obtained data		
		№4 Tomato juice with 1% of greens	№5 Tomato juice with 1% of greens and 1 % pectin	№6 Tomato juice "Pesnya leto" from JSC "Ecoproductgroup", %
Mass fraction of soluble dry substances,% not less: - for direct extraction tomato juice	4,5	5,0	5,0	4,7
Mass fraction of titration acids per citric acid,	0,6	0,50	0,56	0,49

%, not more				
Content of the pulp, %	12-20	21, 0	21, 5	21,0

It is identified that all investigated samples correspond to the requirements of GOST (State Standard) 52183-2003. Insignificant deviation in a mass fraction of pulp for the three samples can explain that a qualitative tomato juice is desirable should to have a thick consistence.

Results of the "Just-About-Right-Test" show that all three kinds of tomato juice have positive opinions and specific are preferred. All experimental data were processed and calculated answers for six questions in the questionnaire. Hereupon the sample # 4 has in average 78,78 scores; the sample #5 has 84,35% and the sample #6 has 81,00 scores. Hereby, the sample #5 [17] tomato juice with addition of 1 % mixed greens (dill, parsley, celery) and 1 % mixed pectin (citrus and sugar beet) is more preferable for all respondents.

Conclusion

Developed composition of tomato juice with various additives corresponds to the requirements of ISO and GOST (State Standards) for public catering products. The results of organoleptic evaluation and "Just-About-Right-Test" of the quality of juice show that the maximum scores have samples 4, 5, and 6. Physico-chemical parameters and sensory evaluation of three selected samples have confirmed that the most preferable juice is the sample # 5: tomato juice with addition of 1% mixed greens and 1% mixed pectin. The greens in particular: a mixture of dill, parsley and celery are very rich in vital macro - and trace elements. A mixture of apple and sugar beet pectin is improves the digestive system and are beneficial to the human body.

Thus, there conducted standardization of a new recipe of functional food product - tomato juice with addition of a mixture of dried greens (1%), and a mixture of pectins (1%). A synergistic effect of sugar beet and citrus pectins positively influences to the process of stabilization of the finished product. Research results show that the developed juice is quite refers to the tomato juice and juice contained drinks.

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