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International Scientific Conference**MODERN APPROACH TO ASSESSING COMPETITIVE  
ABILITIES OF PRODUCTS**Anna Vershinina (a)\*, Lyudmila Fedorovna Stepuleva (b)  
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**Abstract**

The assessment of a company's competitive ability is a key problem of its successful development, the identification of market positions, and making rational management decisions. Quality is the main criterion in the assessment of product competitive abilities. Consumers currently play a key role in the product quality assessment because they select products based on two parameters: quality and price. In this research, we analyzed the samples of coffee beans sold in Vladivostok and focused on merchandise quality parameters (descriptors). We reviewed the key approaches to the assessment of flavor product quality. The results of the analysis and the review of regulatory documents show that quality control and safety procedures for the product in question (coffee) in Russia rely on a solid methodological framework. The authors analyzed the point-based method of quality assessment and identified its drawbacks. We suggested a profile-descriptor method that stipulates developing descriptors and respective quality grades. The descriptors of flavor profile may include the following: fruity, citrusy, berry, burnt wood aroma, dried fruit flavor, sweetness, acidity, bitterness, taste harmony, aroma harmony, body, watery, aftertaste duration, aftertaste amenity, groundiness, mustiness. To understand these parameters, it is necessary to develop a ranking of grades for each of the descriptors to be used by consumers and tasters. The data obtained in this assessment can help select a range of products that would best satisfy the customers of retail companies and thus improve their market positions against competitors.

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*Keywords:* Quality, assessment methods, analysis, coffee beans, descriptors, organoleptic parameters

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## **1. Introduction**

When assessing the quality of consumer parameters and indicators that describe them, it is necessary to have methods and approaches that would take into account the desires and preferences of the end-user, i.e., the consumer. The consumer is the principal assessor of quality and the key party in purchasing a product that would comply with their desires and latent needs. Product manufacturers have to comply with the requirements for product quality and safety expressed in regulatory documents in their activities. There is a number of documents regulating the quality of coffee in Russia that set out compulsory requirements: On Packaging Safety, On Food Safety, Food Products and their Labeling, Safety Requirements for Food Additives, Flavor Agents, and Technical Aids. Besides, there are standards for technical conditions that determine the requirements for organoleptic, physical, and chemical parameters of coffee, as well as its safety indicators, and there are additional standards for specific physical and chemical properties of coffee and the methods of their assessment. The main content presents the data on sample preparation and selection, testing methods, and result processing procedures, as well as the requirements for labeling and sales. The results of the analysis and the review of regulatory documents show that quality control and safety procedures for the product in question (coffee) in Russia rely on a solid methodological framework. However, the authors believe that the reviewed quality assessment methods are inadequate in the context of severe competition and increasing demand for flavor products. This calls for the development of new standards including the contemporary quality assessment methods for flavor goods.

## **2. Problem Statement**

To maintain and improve the competitive edge on the market, every business must try to maintain and improve the quality of its products. This requires on-going quality assessment to promptly identify counterfeit and popular products. Tasting methods are often used to assess the quality of flavor goods. They are based on the analysis of parameter perceptions by sensory organs. The organoleptic properties of products influence the consumers' choice and thus increase the demand more than the physical and chemical parameters (Chugunova, 2016). When assessing flavor goods, it is necessary to develop a descriptive database on merchandise properties. This makes the topic of this research relevant.

## **3. Research Questions**

When consumers select products, they focus on their sensory perceptions. Therefore, we deal with the organoleptic quality parameters of coffee beans and methods for their assessment in this research (Zolotin & Shakhailo, 2016).

## **4. Purpose of the Study**

The goal of this research work is to rationalize the use of the descriptor-profile method as the key one in product quality assessment and determining its competitive abilities (as exemplified by coffee beans).

## 5. Research Methods

Nowadays, there are many methods of product quality assessment. One of the most easily available and reproduced methods is the one based on sensory organs. This method has some advantages compared to the laboratory methods but it is necessary to consider specific conditions and rules when performing the organoleptic analysis to obtain accurate results. Parameter assessment results can be subjective and non-reproducible if tasters' individual features are not taken into account when selecting them. The professionalism of test operators might not comply with the contemporary requirements, and rules and conditions for organoleptic parameter assessment can be breached. The organoleptic assessment of food products includes such aspects as taste, smell, texture, and appearance. There are many types of organoleptic analysis: the preference method, the paired-comparisons method, the triangular-comparisons method, the sample dilution method, the rating scale method, the profile method, and the quantitative description method (Popova & Chemisova, 2020).

We established that the progenitors of organoleptic analysis, apart from foreign researchers like D. E. Tilgner, and N. B. Barilko-Pikelna, include Russian researchers like G. L. Solnceva, R. V. Golovnja, T. M. Safronova, etc. The main focus in the scientific works of the mentioned researchers is on the development of principles and methods used in taster selection. When selecting taster, great attention must be paid to their sensor perception abilities. Tilgner's research of 1957 resulted in the notion of the sensory minimum, which he coined in his *Organoleptic Analysis of Food Products*. The academic communities in some of the European countries, such as Germany, Denmark, France, Spain, Poland, Czech Republic, Slovakia, Estonia, etc., developed national standards for the taster and laboratory equipment selection, uniform professional term interpretation, and the use of contemporary scientific methods. Along with the development of standards, fundamental research laboratories were established at sectoral research institutes in some countries like the USA, Britain, and Canada. The main goal behind laboratory establishment was the improvement of the existing food quality assessment methods, the development of taster selection criteria, their training, and testing new sensory analysis approaches (Zavorokhina, 2016).

In Russia, the first experiences of improving tasters' gustation were obtained in the experiments carried out by Barysheva in 1924, and the basis of the olfactory analyzer training methods was built by the research of I. M. Kiselevskiy. G. L. Solnceva was the first to develop taster selection methods for the meat-processing industry. A 9-point scale was developed to grade the quality of meat products and it became the basis of the existing GOST standards. T. M. Safronova developed the terminology for the assessment of fish product quality, which became the basis for the *Fish-Processing Industry Taster Handbook*. The selection and training of tasters methods for the milk industry were supported by the research work of A. I. Chebotareva. The authors work on the improvement of the organoleptic assessment for the development of new bakery products (Smertina et al., 2016).

One of the most popular methods is the descriptor (profile) one based on aggregating various stimulations, taste, olfactory, etc., for a whole new perception of product flavor. The descriptor-profile method produces the quantitative representation of the combination of the most significant organoleptic properties of the food product: aroma, taste, and texture as graphic profilograms using the preset descriptors. A descriptor is an individual parameter of a food product that is the best in reflecting its desired properties

and helps differentiate between competing products. The most significant descriptors for taste, aroma, texture, etc form a panel that reflects the integral sensory perception of the product. The suggested descriptor-profile method is a modification of the profile method of tasting analysis (Chugunova, 2016).

## 6. Findings

We selected coffee for our research due to its high popularity in the Russian market and its resulting growth. The main suppliers of raw and processed coffee include Brazil, Vietnam, and Italy. The main varieties of coffee and their subtypes are well-known. They differ in both chemical composition and flavor parameters, which calls for a description of these distinctive features (Hoffmann, 2018). There are new approaches to forming the taste and aroma of coffee and coffee products that produce unique aroma release parameters for various varieties and types of coffee (Ayseli et al., 2021; Zanin et al., 2020).

One of the professional tasting methods, cupping, is used to assess the taste properties of coffee beans. Cupping is a professional tasting procedure that allows determining the taste and small characteristics of coffee beans: bitterness, sweetness, acidity, body, balance, and aftertaste. The taste and the aroma are checked for the purity and complexity of descriptors, i.e., the parameters you can feel. They can be fruity, flowery, grassy, spicy, nutty, etc.

Acidity is assessed in terms of intensity and quality. It must be sweet and pleasant. The acidity assessment first produces the quality characteristic (wine, apple, lemon) and then its description, e.g. even, tingling, or bright. Intensity reflects sample freshness, i.e. how long ago the coffee was roasted.

The body is assessed in terms of density and quality. It must leave a nice tactile feeling in the mouth. To assess the content of oils in coffee, the parameters of oiliness and lubricity perception are used. Since coffee contains food fibers and protein, their content is measured through the descriptor of thickness or viscosity. The combination of these perceptions determines the coffee quality assessment indicator referred to as the body. It is necessary to consider this parameter and describe it for all of the three cooling stages. It is the key quality component for coffee tasting.

Balance is assessed using the overall impression of coffee being balanced and complex. It is characterized by the combination of two taste parameters: sweetness and acidity. Well-balanced coffee does not have a clear taste, i.e., it cannot be sweet only or acidic only. All of the parameters must complement each other and comply with the required group of aromas during brewing.

The aftertaste, like the taste, is assessed in terms of purity, duration, and descriptor complexity. In theory, the aftertaste must be as good as the taste. Coffee bouquet allows linking the olfactory assessment of coffee with its taste. When the taste inhales, coffee is aerated and some of the diluted organic substances turn into gases. Energetic sniffing directs these gases into the nasal cavity. Each of the samples has a unique bouquet, and to experience it, it is necessary to simultaneously assess the taste and the organic substances in the coffee steam. The bouquet of medium-roast coffee often features taste parameters typical of burnt sugar side-products, while dark-roast coffee has the taste parameters of sublimation or distillation products.

Defects are understood as unpleasant off-flavors in the cup. These can be groundy, musty, grassy, woody, chemical, etc (Stepanova & Semenova, 2019). They can be assessed using the following principle: the same coffee is brewed in five cups and tasters try each of them. If none of the cups have defects, the coffee received the highest grade in this criterion. If there are some defects, the grade is significantly

reduced for every cup that has them. To check consumers' ability to understand the quality of coffee beans, we carried out a tasting like this together with coffee experts and general consumers.

During this tasting, we assessed the taste properties of coffee beans and drew up taste profiles for each of the varieties that came from Brazil, Costa Rica, Nicaragua, Kenia, and Italy. The results of the tasting are presented in Table 1.

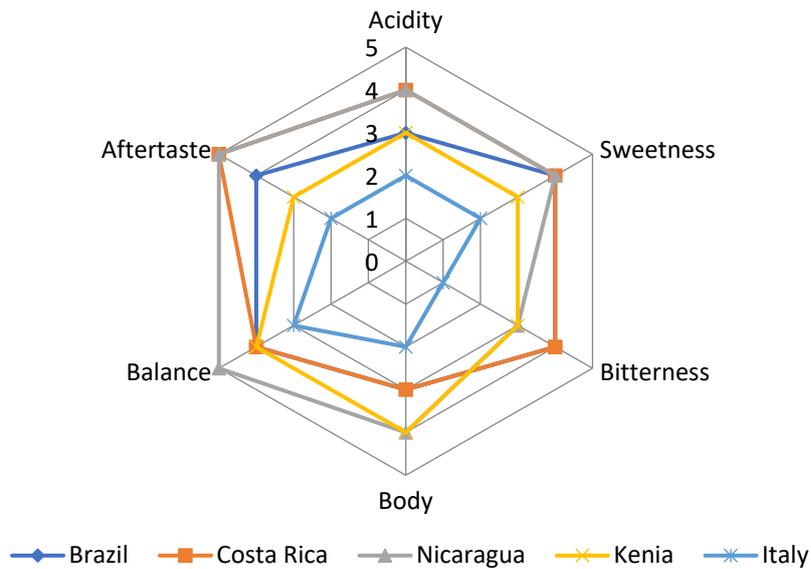
**Table 1.** The results of the taste property assessment for coffee beans

Grading scale	Taste parameters						Total score
	Bitterness	Sweetness	Acidity	Body	Balance	Aftertaste	
Italian							
1	+	++	+++		+	+	
2	++	++	++	+++	+	+	
3	+			+	+	++	47
4					+		
5							
Bouquet: charcoal, burnt sugar, weak body, watery, subtle taste.							
Brazilian							
1							
2							
3		++	++++	++++	+	++	91
4	++++						
5		++			+++	++	
Bouquet: rye bread, nuts (hazel, almond, pignolia), medium body.							
Nicaraguan							
1							100
2							
3	+			+			
4	+++	+++	++++	++	+	+	
5		+		+	+++	+++	
Bouquet: dry fruit (apricot, prunes, dark raisins), thick enveloping body, good harmonic balance, with the aftertaste of raisin buns.							
Costa Rican							
1							89
2				+			
3	+	++	+	+++	+		
4	+++	++	++		+++	++	
5			+			++	
Bouquet: sweet lime, red orange, lemon, red berries, light tea-like body, long citrus aftertaste.							
Kenyan							
1					+		71
2				++	++	+	
3	+++	++	++	++	+	++	
4	+	++	++			+	
5							
Bouquet: lingonberry, cranberry, grapefruit bitterness, light body, tomato-like aftertaste.							

As we can see from the descriptions of every sample, there are terms like fruit, bread, burnt wood, etc. Currently, there are some research works concerning the development of a uniform catalog of quality and safety parameters but they deal with green (raw) coffee (Dobrovolskiy et al., 2016). However, all these developments are designed for a professional assessment.

Therefore, it is argued whether general consumers can feel such nuances. Perhaps they can but there must be descriptions for these parameters to compare personal perceptions and the grades.

Some specific terms like body, balance, and acidity can be also misunderstood. The results of the assessment allowed us to construct a profilogram of coffee beans taste properties shown in Figure 1.



**Figure 1.** The coffee bean taste property profilogram

## 7. Conclusion

The authors used the point-based method used by professional tasters to assess the quality of coffee to suggest using the profile-descriptor method that stipulates developing descriptors and respective quality grades. We suggest using the following descriptors of flavor profile: fruity, citrusy, berry, burnt wood, dried fruit, sweetness, acidity, bitterness, taste harmony, aroma harmony, body, watery, aftertaste duration, aftertaste amenity, groundiness, mustiness.

To understand these parameters, it is necessary to develop a ranking of grades for each of the descriptors to be used by consumer-tasters. The suggested criteria form the basis for further research and experiments, and they will be reviewed in the following publications.

## References

- Ayseli, M. T., Kelebek, H., & Selli, S. (2021). Elucidation of aroma-active compounds and chlorogenic acids of Turkish coffee brewed from medium and dark roasted *Coffea arabica* beans. *Food Chemistry*, 338, 127821.
- Chugunova, O. V. (2016). Nauchnyi obzor: sensoryni analiz i ego znachenie v ocenke kachestva i bezopasnosti pishchevykh produktov [Academic review: sensory analysis and its significance in food product quality and safety assessment]. *Nauchnoe Obozrenie. Tekhnicheskie Nauki*, 3, 118-129. [in Russ.].
- Dobrovolskiy, V. F., Kambarov, A. O., & Lognivchuk, T. M. (2016). Issledovaniya po razrabotke unificirovannoy nomenklatury pokazately kachestva i bezopasnosti zelenogo (syrogo) kofe [The studies on the development of a uniform catalog of quality and safety parameters for green (raw) coffee]. *Problems of Nutrition*, 85(S2), 137-138. [in Russ.].
- Hoffmann, J. (2018). *Vsemirnyy atlas kofe. Ot zerna do chashki. Polnyy putevoditel' po stranam-proizvoditelyam, sortam i sposobam [The World Atlas of Coffee: From Beans to Brewing. Coffees Explored, Explained, and Enjoyed]*. Palmira. [in Russ.].
- Popova, A. V., & Chemisova, L. E. (2020). Sensorny analiz kak instrument povysheniya kachestva pishchevykh produktov [Sensory analysis as a food product quality improvement tool]. *Fruit Growing and Viticulture of South Russia*, 64(4), 334-352. [in Russ.].
- Smertina, E. S., Fedyanina, L. N., Lyakh, V. A., Chadova, T. V., & Vershinina, A. G. (2016). Modern tendencies and prospects of using algae as an ingredient for bakery products. *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, 7(2), 989-997.
- Stepanova, M. A., & Semenova, E. E. (2019). Klassifikatsiya assortimenta i ekspertiza kachestva kofe [Product range classification and quality assessment for coffee]. *Bulletin of OrelGI*, 3(49), 165-171. [in Russ.].
- Zanin, R. C., Smrke, S., Kurozawa, L. E., Yamashita, F., & Yeretian, C. (2020). Modulation of aroma release of instant coffees through microparticles of roasted coffee oil. *Food chemistry*, 341, 128193.
- Zavorokhina, N. V. (2016). *Sensorny analiz prodovolstvennykh tovarov na predpriyatijakh pishchevoy promyshlennosti, trgovli i obshchestvennogo pitaniya [The sensory analysis of food products for food industry, retail, and catering companies]*. INFRA. [in Russ.].
- Zolotin, A. Yu., & Shakhailo, N. A. (2016). K voprosu issledovaniya organolepticheskogo vospriyatija pishchevykh produktov [Concerning the study of organoleptic perception of food products]. *Problems of Nutrition*, 85(S2), 25-26. [in Russ.].