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Sensory analysis and quality index of different compounds obtained between avocado oil and olive oil

M. C. P. Fagundes[1], A. F. Oliveira[2], J. C. M. Rufini[1], N. V. Tostes[3], L. P. S. Brito[3], J. O. F. Melo[1]

[1] Universidade Federal de São João del Rei
[2] Empresa de Pesquisa Agropecuária de Minas Gerais
[3] Universidade Federal de Lavras

Author for correspondence: miria.agro@yahoo.com.br

Abstract: Recently avocado oil has emerged as an alternative to olive oil because of its physicochemical and nutritional characteristics. However, the research is still in the initial stages of testing, where countless evaluations are carried out in order to prove the viability of the oil. One of the main evaluation techniques is through sensory analysis that is of great importance for evaluating market acceptability and product quality, being an essential part of the quality control plan of any production chain that aims at a product that wins the preference the consumer.
Keywords: Attributes. Organoleptic characteristic. Methods. Quality

Introduction

The avocado oil is defined as the oil extracted from the pulp of the avocado fruits and in recent years, it is increasing the interest of companies to use this oil in human food, because until then it was widely used in the cosmetics industries. It is known that avocado oil is nutritionally similar to olive oil (imported product), presenting itself as an alternative to the annual expenditure that the country has with importation. However, in the development and launching of a new product is vitally important for the industries, that this product is competitively and widely accepted by the consumer. One of the ways to evaluate this competitiveness and acceptability is through sensory analysis.

Sensory analysis is a set of norms for evaluating the characteristics of a product, based on human senses, and the evaluation methods are differentiated, aiming to acquire more adequate responses to the researched profile of the product. Moreover, from the sensory analysis it is possible to define commercial classes (ABNT, 1993).

For avocado oil there is still no form or norms for classification, however, as it is a product with a composition similar to olive oil, some standards already established for this product can be applied to avocado.

In this article will be presented the sensory parameters that define the quality of olive oil, organoleptic evaluation, sampling for sensory analyses, standardization for test conditions, attributes and defects, forms and sample tasting and scoring end, in order to provide avocado growers with information on the criteria that assess the quality of olive oil and consumers, notions about the recognition of product quality and its benefits to human health.

Organoleptic evaluation

The entire chain in which a sensory analysis is constituted is based on organoleptic assessments, sensitive to the human sensory system: hearing, smell, taste, touch, vision. These assessments are formed of sensory properties inherent to the material that makes up the raw materials of the product, thus evaluating its attributes (Anzaldúa-Morales, 1994). They are considered sensory properties: color, odor, taste, texture and sound.

Color

It is a property that is evaluated by three distinct forms by the consumer, in relation to tone, intensity and brightness. The tone is defined by the wavelength of the light reflected by the product, the intensity is determined by the concentration of

colouring substances present in the product and the brightness is the amount of light reflected by the product compared to the amount of light that focuses. Influence on the consumer's acceptance or rejection. Since the visual contact is the first contact made by the consumer with the product (Teixeira et al., 1987; Huy, 1992; Anzaldúa-Morales, 1994).

Odor

Odor is defined as a property detected by smell, when certain volatile substances are aspirated (ABNT, 1993). These substances have different characteristic notes (floral, sweet, acidic) that compose the product, and which are easily identified by people who have olfactivy memory (Teixeira et al., 1987; Anzaldúa-Morales, 1994).

This sensory attribute still has characteristics such as intensity, persistence and saturation (Teixeira et al., 1987). Another factor influenced by the olfactory system is the aroma, which is defined as the ability to perceive aromatic substances in a food after it has been retronasally placed in the mouth. This factor is essential for composing the taste of food (Anzaldúa-Morales, 1994; ABNT, 1993).

Taste

It is a sensory attribute related to the palate, perceived by the mouth in the taste buds, where the primary tastes of food are identified, such as acidic, bitter, sweet or salty tastes (Teixeira et al., 1987; Huy, 1992; ABNT, 1993; Anzaldúa-Morales, 1994). Being perceived in different ways by different people (Anzaldúa-Morales, 1994).

The flavor is considered a complex attribute, since it is defined as sensory impressions that occur in the oral cavity, as a consequence of the odor and various sensory effects, such as cold, burnt, astringency and others (Geise, 1995). Being important to observe is the residual flavor, which is characterized by the time that remains in the mouth some time after the food is swallowed (Teixeira et al., 1987; Huy, 1992; ABNT, 1993; Anzaldúa-Morales, 1994).

Texture

The touch is responsible for the perception of the texture attribute, which is defined as a set of all the rheological and structural characteristics of a food, perceptible to the mechanical receptors, tactile and eventually by the visual and auditory receptors (ABNT , 1993). The texture can be divided into three categories: mechanical, geometric and composition, which in turn can be subdivided into primary and secondary, (Anzaldúa-Morales, 1994).

Sound

Sound is one of the attributes related to food texture, being recognized by the previous experience of the consumer when consumed and or prepared (Teixeira et al.,1987; Huy, 1992).

Sensory parameters for definition of oil quality

During the sensory analysis of an oil, human sensory receptors are stimulated by substances such as aldehydes, ketones, polyphenols and chlorophylls , and these substances interfere with the taste, aromatic and staining characteristics (Bertoncini & Testa, 2014).

Taste characteristics

The taste characteristics are influenced mainly by the bioactive substances present in avocado oils such as: vitamin E, carotenoids, sterols, phenolic compounds, among others. With emphasis on *β*-sitosterol, which has a high concentration in avocado oils and is responsible for the reduction of total cholesterol and LDL cholesterol (Lottenberg et al., 2002).

Olfactory characteristics

Volatile compounds are the main substances that influence both the aroma via retronasal and odor. For avocados the main volatile compounds found are aldehydes with emphasis on hexinal, trans-2-hexenal, 2.4-hexadienal (which present green grass aroma), acetaldehyde (with pugent aroma, solvent) and nonanal (with fat aroma, citric) (Obenland et al., 2012).

Visual characteristics

Of the visual aspects that most influence the acceptance of avocado oil, the color is the main. The green coloration of avocado oils is the result of the presence of chlorophyll, while the presence of carotenoids conferring yellow-green or yellowish coloration to the oils.

Currently there is no legal requirement of measuring color of edible oils or pigment content in the world. However, it is noteworthy that the colouring of oil does not concern its quality, however, from the point of view of marketing, this distinctive green color allows the avocado oil to be highlighted by other yellow oils.

Sample preparation and presentations

Before starting a sensory analysis The samples should be properly prepared in a restricted environment, away from the takers in order to avoid any psychological influence on them.

The environment for the preparation of samples, known as sample preparation room should be equipped in order to provide the necessary condition for the accomplishment of the work, possessing in its facilities basic equipment as

analytical balance, test tubes, thermometers, water distiller, water bath equipment, refrigerator, oven, stove, trays and sink are indispensable.

The sample containers vary according to the nature of the samples, however, it is generally recommended that the containers be cleaned, uniform and without odors or residual flavors so that there is no influence on the flavor.

In search of impartiality during the analyses, lights are used in the booths of blue, red and orange colors in order to minimize the influence of color on the sample. The environment should have adequate air circulation in order to avoid the saturation of odors.

When the sample presents residual flavor, it is indicated to "clean" the mouth with some foods, such as apple and biscuit without salt. In sensory analysis the practice of using water between one sample and another is optional, but if you choose to use water, this procedure should be done from the beginning to the end of the test (Monteiro, 1984; Teixeira et al., 1987; Moraes, 1988; Anzaldúa-Morales, 1994).

In relation to tact, for a good perception the sample should present a satisfactory size, so that it is possible to bite and move it inside the mouth, for some products are necessary vehicles for better realization of the tasting, this vehicle should not present flavor and be as inert as possible (Anzaldúa-Morales, 1994).

When the objective of the analysis is to evaluate the sound of a food the environment of the realization of the test must be noise-free, in order to avoid the influent of the perception of the takers. The takers should receive enough samples for appreciation and judgment, these are variables according to the nature of the sample (Monteiro, 1984; Moraes, 1988). These samples must be previously coded with three digits randomly (378, 690, 435) in order to prevent the induction of the classifications of the Samples (Monteiro, 1984; Moraes, 1988; Anzaldúa-Morales, 1994). Finally, the evaluative records should be specific for each type of analysis, being attractive and with space for information regarding the tester that can be used to elaborate the results.

General requirements for performing sensory analysis

A number of factors should be observed before the analysis, factors that may positively or negatively influence the results, such as: location of the analysis, time, omission or availability of information, stimulus, contrast, sample position, test planning, procedures and choice of takers.

The site for conducting the analyses should be individual cabins, with natural or fluorescent lights, temperatures (22 °C) and humidity (50-55%) Able to maintain the well-being of the tester, free of noise, with light or neutral wall colors. One should pay attention to the time when the tests are performed, as this may be influenced by the appetite (present or absent). Tests should be performed two hours before ou after meals (Monteiro, 1984; Teixeira et al., 1987; Moraes, 1988; Pedrero & Pangborn, 1989; Anzaldúa-Morales, 1994).

To avoid the error of expectation, it is necessary to omit information about the test itself, with only the information needed about the product and the procedure to be followed, as well as the participation of people involved in the development of the Project. Another common error is the stimulus, in which the tester is influenced by characteristics that are not important for the test, so the samples should be presented in a more homogeneous way. The global effect error occurs when a taster evaluates more than one characteristic in the sample, unduly comparing different characteristics (Teixeira, 2009).

When a taster is influenced by the face expressions of the others is known as a suggestion effect, so the analyses are done in individual cabins. It should be avoided the contrast between the samples (very good, then a very bad one or vice versa), which can induce an erroneous and more severe evaluation in relation to the second. As there are very homogeneous samples, if there is a tendency among the takers to elect the central sample as distinct, to mitigate this error known as position error, it is recommended to present the samples randomly (Teixeira, 2009).

Test planning must be done in advance in order to choose the best design that will result in the desired information. The design will consist of the type of test to be applied, the ideal number of takers and the statistical analysis to be performed (Monteiro, 1984; Teixeira et al., 1987; Anzaldúa-Morales, 1994).

During the test, the team responsible should know clearly and objectively, how the procedures of the tests will be performed, so that they are able to pass them to the takers. The takers should be selected in order to obtain the appropriate results, should be people who have good health and appetite, concentration ability, minimum median sensitivity, ability to reproduce the results and, especially, good will.

Sensory analysis of avocado oil

Considering that Brazil does not yet have specific legislation for avocado oil, some procedures for the realization of sensory analysis of olive oil can be extrapolated in order to perform the first studies.

For sensory analysis of olive oil It is recommended that no vehicles are used as breads, biscuits or other foods, using only the human senses.

The tasting should begin with the characterization of the smells identified in the sample, so that the olive oil should be heated in a

bath until it reaches the temperature of 28 °C, where the tester should breathe slowly, identifying positive and negative odors to his perception (Villa & Silva, 2017).

The second stage is done through the tasting, at this stage the taster places around 30 ml of olive oil in the mouth, where you can feel the attributes of the olive oil, aspirating it between the teeth in order to vaporize it so that the volatile compounds present are identified In the samples, via retronasal. Finally, olive oil can be judged by noting the sensations in the evaluation forms that are variable according to the proposed objective (Villa & Silva, 2017).

To not have interference between a sample and another it is recommended to drink water with gas at room temperature or chew a slice of green apple (Villa & Silva, 2017).

Positive and negative attributes

The positive and negative attributes of avocado oil are influenced by the variety, maturation stage and fruit health.

In a study carried out in Mexico, in which a sensory analysis of the avocado oil of the cultivar Hass was performed, several positive and negative attributes were identified, the positive ones being the fruity, spicy, sweet, ripe fruit, strawberry, pear, avocado, bitter, green, astringent and almond. And the negatives the taste of alpechín (fetid liquid that comes out during the extraction of olive oil), metallic, hay-wood, vinegar, mold, burnt, lubricant, mold and rancid (Castañeda-Antônio et al., 2015).

Final score for classification of avocado oil

The avocado oil does not yet have a final score established as olive oil that will result in the classification as extra virgin, virgin or lampante, depending on the score achieved in the evaluation.

As research on avocado oil for human consumption is still recent, different methods can be used to evaluate the quality and acceptance of the sample, depending on the purpose of the analysis. The most commonly used methods are affective methods, difference methods, analytical methods, and sensitivity methods.

- Affective methods: are used to demonstrate the acceptability of a product, however this method presents a wide variation in the results, thus hindering its interpretation.

- Difference methods: consists in pointing out a difference between the measures analyzed, they are mainly used in quality control and in the development of new products under test to point and precision of the tasters (Chaves, 2001).

- Analytical methods: are tests used to describe and quantify information about a particular characteristic that is being evaluated.

- Sensitivity methods: should be used when it is intended to detect flavor-related characteristics.

Each method contains specific test groups, which must be selected according to the purpose of the analysis (Table 1).

Table 1. Some sensory methods, their prerequisites and purposes.

METHOD	NUMBER OF SAMPLES		NUMBER OF TASTERS	FINALITY
	TESTED	SERVED		
SCALE				
Descriptive	1 - 6	1 – 6	1 - 15	Sample Selection.
Numerical	1 - 6	1 – 6	1 - 12	Sample Selection.
Composed	1 - 4	1 – 4	1 - 12	Comparative evaluation.
DIFFERENCE				
Triangular	1	3	6 - 25	Detect differences when variations between samples are small.
Duo-trio	1	3	6 - 25	Detect differences when there are variations between samples and also for training.
Paired comparison	2	8	5 - 12	Detect small differences when there is little variation between samples.
Multiple comparison	1 - 4	1 – 5	5 - 12	Detect differences in mean intensity when there is slight variation between the samples.
ANALYTICAL				
Single stimulus	1	1	6 - 25	Detect strange flavor.
Flavor Profile	1	1	4 - 6	Detect strange flavor or change flavor; Describe the flavor of new products, flavor analysis.

Source: Laboissière et al. (2001).

Quality score between avocado and olive oil

The quality indexes to verify the purity of an olive oil are characteristic for all. The main indexes were acidity, iodine, peroxide, refraction and saponification. In Brazil there is still no normative that advocates the permitted limits of these indices for avocado oils, however, the country has a normative for olive oils extracted from the olive Tree (BRAZIL, 2012). Table 2 shows the quality of olive oil and avocado.

Table 2. Quality parameters for olive oil and avocado.

Parameters	Limits *	Olive oil[1]	Avocado oil[1]
Acidity index (%)	3.3	1	0.5
Iodine index	75-90	84.5	109.8
Peroxide index (meq O_2 /Kg sample)	≤ 20	1,5	3.52
Refraction index	1.4677 – 1.4705	1.469	1.4657
Saponification index (mg KOH/g)	184 - 196	192.4	192.8

* Limits for the classification of olive oils, according to Normative Instruction n.1 of 30 January 2012.
[1]**Source:** Valdez Pantoja ;Untiveros Bermudéz (2010)

According to the table above the values of the parameters for avocado oil are very similar to that of olive oil, falling within the limits imposed by the legislation for olive oil in Brazil, except for the iodine index. This parameter relates to the insaturation of olive oil, that is, the higher the iodine index the higher the value of insaturation (Nielsen & Finkenzeller, 2009), and the unsaturated fatty acids are correlated positive actions to human health, a positive characteristic of avocado oil on the olive.

The acidity index is a measure of the content of free fatty acids present in fats and oils that relates to the purity of the raw material, as well as the degradation reactions that may have occurred during the treatment and storage of the oil (Matissek et al., 1998).

Another very important parameter in the quality control of olive oil is the peroxide index that relates to the oxygen linked to fats in the form of peroxide, providing information about the degree of oxidation of the sample and allowing, with certain limitations, a estimation of the amount of fat that was altered (Matissek et al., 1998).

In a practical way the increase in the amount of peroxides evidence the deterioration of the oil, presenting the characteristic odor of rancidity (Rivera et al., 2014).

The saponification index is not considered an index of quality or identity for the oils, however it is an index that is related to the purity of olive oil, because when higher the index of once a high saponification index higher the oxidation level of the oil (ICONTEC NTC 335, 1999).

The refraction index is related to the degree of saturation, as the refraction index decreases, the iodine rate also decreases, since these two parameters relate in a linear way (Nielsen & Finkenzeller, 2009). It is very useful for the purposes of identification, purity checking and observation of the progress of reactions such as catalytic hydrogenation (Lawson, 1999). However, the refraction index is influenced by several factors such as the content of free fatty acids, oxidation and heating of the oil (Nielsen & Finkenzeller, 2009).

The association between all these parameters, within their limits imposed by the legislation will result in high quality olive oils and acceptance by the consumer market.

Final considerations

Sensory analysis is a tool of great importance in the food chain since it adds value to the product and identifies the errors committed in the production chain, which may disqualify the product offered, besides being part of normative that define and regulate the use and classification of a particular product.

For avocado oil there is still no legislation defining the quality parameters, which results in a specific classification for marketing, however, due to the fact that it is very similar to olive oil mainly in the physicochemical and nutritional parameters, perhaps with minor occasional changes to existing olive oil legislation, it is possible to obtain parameters to guide avocado growers in this new production chain.

References

ANZALDÚA-MORALES, A. La evaluación sensorial de los alimentos en la teoría y la prática. Zaragoza: Acribia SA, 1994. 198 p.

ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS – ABNT. Análise sensorial dos alimentos e bebidas: terminologia. 1993. 8 p.

BERTONCINI, E. I.; TESTA, U. Análise sensorial de azeites de oliva. Informe Agropecuário, v. 35, n. 282, p. 58-65, 2014.

BRASIL. Instrução Normativa, n.1, de 30 de janeiro de 2012. Estabelecer o regulamento técnico do azeite de oliva e do óleo de bagaço de oliva na

forma da presente Instrução Normativa e os limites de tolerância constantes dos seus Anexos I, II, III e IV. Diário Oficial [da República Federativa do Brasil], Brasília, n.66, p.5, fev. 2012. Seção 1.

CASTAÑEDA-ANTONIO, D. et al. Caracterización oxidativa de aceite aguacate hass y aceite de aguacate criollo (*P. americana* Mill. Var. Drymifolia). VIII Congreso Mundial de la Palta, p. 423-429, 2015.

CHAVES, J. B. P. Métodos de diferença em avaliação sensorial de alimentos e bebidas. Viçosa: Editora UFV, 2001. 91p. (caderno 33).

GEISE, J. Developments in beverage additives. Food Technology, v. 49, n.9, p. 64-72, 1995.

HUI, Y. H. Sensory evaluation of dairy products. In: Dairy science and technology handbook. New York: VCH publishers, v. 1, 1992.

INSTITUTO COLOMBIANO DE NORMAS TÉCNICAS Y CERTIFICACIÓN – INCONTEC. Norma Técnica Colombiana 335. Grasas y aceites animales y vegetales. Método de determinación del índice de saponificación. 1999.

LABOISSIÈRE, L. H. E. S.; PEREIRA, A. J. G.; MOTTA, S. ; JUNQUEIRA, R. G. Análise Sensorial de Alimentos: tópicos em ciência de alimentos B. Apostilas do curso de pós-graduação em ciência de alimentos da Faculdade de Farmácia da UFMG, 2001.

LOTTENBERG, A. M. P.; NUNES, V. S.; NAKANDAKARE, E. R.; NEVES, M.; BERNIK, M.; SANTOS, J. E. Plant sterol ester efficiency on the plasma lipid reduction in moderate hipercholesterolemic subjects. Arquivos Brasileiros de Cardiologia, v.79, n.2, p. 139 – 142, 2002. dx.doi.org/10.1590/S0066-782X2002001100005

MATISSEK, R.; SCHNEPEL, F. M.; STEINER, G. Análisis de los alimentos. Fundamentos, métodos, aplicaciones. Acribia. Zaragoza. 1998.

MONTEIRO, C. L. B. Técnicas de Avaliação sensorial. 2. ed. Curitiba: Universidade Federal do Paraná, CEPPA, 1984. 101 p.

MORAES, M. A. C. Métodos para avaliação sensorial dos alimentos. 6. ed. Campinas: Editora da Unicamp, 1988. 93 p.

NIELSEN, S. S.; FINKENZELLER, M. U. Análisis de los alimentos. Zaragoza: Acribia, 2009. 657p.

OBENLAND, D.; COLLIN, S., SIEVERT, J.; NEGM, F.; ARPAIA, M. L Influence of maturity and ripening on aroma volatiles and flavor in 'Hass' avocado. Postharvest biology and technology, v. 71, p. 41-50, 2012.doi.org/10.1016/j.postharvbio.2012.03.006

PEDRERO F., D. L.; PANGBORN, R. M. Evaluación sensorial de los alimentos: métodos analíticos. México DF: Alhambra Mexicana. 1989. 251 p.

RIVERA, Y.; GUTIÉRREZ, C.; GÓMEZ, R.; MATUTE, M.; IZAGUIRRE, C. Cuantificación del deterioro de aceite vegetales usados en procesos de frituras en establecimientos ubicados en el Municipio Libertador de Estado Mérida. Revista Ciencia e Ingeniería, *v.* 35, n. 3, p. 157-164, 2014.

TEIXEIRA, E.; MEINERT, E. M.; BARBETTA, P. A. Análise sensorial de alimentos. Florianópolis: Ed. da UFSC, 1987. 180 p.

TEIXEIRA, L. V. Análise sensorial na indústria de alimentos. Revista do Instituto de Laticínios Cândido Tostes, v. 64, n. 366, p. 12-21, 2009.

VALDEZ PANTOJA, C.; UNTIVEROS BERMÚDEZ, G. Extracción y caracterización del aceite delas larvas del Tenebrio molitor. Revista de La Sociedad Química Del Perú, v. 76, n. 4, p. 407-414, 2010.

VILLA, F.; SILVA, D. F. Análise sensorial de azeite de oliva. Scientia Agraria Paranaenses, v. 16, n. 3, p. 270 - 278, 2017.