

SENSORY ANALYSIS AND ACCEPTANCE OF FEIJOA FRUIT

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ABSTRACT - The southern region of Brazil is home of a myriad of native species which have high organoleptic potential, and among those species the feijoa fruit (*Feijoa sellowiana*) stands out. This species has an incipient production chain; however, the promotion of the species to the consumers can increase the fruit's consumption, stimulate its production, in addition to its conservation. This study aims to perform sensory analysis and verify the preference for fruits of two cultivars and a selection of *F. sellowiana*. Fifty-seven tasters evaluated the fruits for sensory characteristics, taste and appearance. The evaluations included a questionnaire to characterize the taster's profile. The tasters' perception of the three samples did not differ in terms of sweetness, acidity, juiciness, pulp yield and overall impression. In general, the sensorial analysis showed that feijoa is a fruit with notorious acceptance by consumers. This result demonstrates the potential for promotion and use of the species, in order to make compatible the promotion of its cultivation and conservation.

Keywords: *Acca sellowiana* (O. Berg) Burret, sensory attributes, native fruit.

ANÁLISE SENSORIAL E ACEITAÇÃO DE FRUTOS DE GOIABEIRA-SERRANA

RESUMO - A região Sul do Brasil dispõe de inúmeras espécies nativas de elevado potencial organoléptico, e dentre elas destaca-se a goiabeira-serrana (*Feijoa sellowiana* O. Berg). A espécie tem cultivo incipiente, porém a maior divulgação junto aos consumidores poderá incrementar o consumo de frutos, estimular a produção, além da conservação da espécie. Esse estudo tem por objetivos avaliar aspectos sensoriais e verificar a preferência quanto a frutos de duas cultivares e de uma seleção de *F. sellowiana*. Os frutos foram avaliados quanto às características sensoriais, sabor e aparência, por 57 provadores. As avaliações foram acompanhadas de um questionário de caracterização do perfil dos provadores. A percepção dos provadores em relação às três amostras não diferiu quanto à doçura, acidez, suculência, rendimento em polpa e impressão geral. De uma maneira geral, a análise sensorial demonstrou que a goiabeira-serrana é uma fruta com notória aceitação pelo consumidor. Esse resultado, demonstra o potencial de promoção e utilização da espécie, de forma a compatibilizar a promoção de seu cultivo e conservação.

Palavras-chave: *Acca sellowiana* (O. Berg) Burret, atributos sensoriais, fruta nativa.

INTRODUCTION

Feijoa fruit (*Feijoa sellowiana* O. Berg) is a fruit tree belonging to the Myrtaceae family, with a natural range of occurrence in the mountainous regions of southern Brazil, northeastern Uruguay, and Argentina (DUCROQUET et al., 2000; KELLER; TRESSSENS, 2007). Although similar to the common guava (*Psidium guajava*) in some parameters, such as texture and size, the feijoa fruit has a distinctive flavor, with a very juicy pulp, which is the main part to be consumed along with a small portion of the mesocarp.

Although it is native to the Brazilian southern plateau, it is grown commercially almost exclusively in other countries, especially New Zealand and Colombia, which export fruits to Brazil (PARRA-CORONADO et al., 2015). In New Zealand, there are about 220 producers, growing approximately 240 hectares, with an average production of 4.2 t ha⁻¹ (THE NEW ZEALAND INSTITUTE FOR PLANT & FOOD RESEARCH, 2015). In 2014, the cultivated area in Colombia was 240 ha, and

the average yield was 6.9 t ha⁻¹ (AGRONET, 2017). In Brazil, studies and observations in the field demonstrate the existence of a promising market. There are reports of fruits being sold in markets in the Southeast region with prices ranging up to BRL 70.00 per kilo of fruit (SANTOS et al., 2018).

Although still little known in the Brazilian market, the species presents a great potential to be commercially cultivated in the country, especially because it is native, and consequently highly adapted to the regional soil and climate characteristics; in addition to the organoleptic potential of fruits (SANTOS et al., 2018) and the possibility of uses in jellies, liqueurs, ice cream, among others. The peel of feijoa fruit can be used in the preparation of flour, which in addition to the high acceptability also presents relevance in the nutritional enrichment of the product obtained (OLIVEIRA et al., 2021).

Given the potential use of the feijoa fruit and the existence of recommended cultivars, which favors the commercial cultivation of the species and encourages

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productive diversification in family farming in the southern region of Brazil, actions are justified in order to promote the use of the species, including a study of the acceptance of feijoa fruit. Acceptability tests are important in the search for product improvements, as well as knowledge of the product's market potential (RUIZ-CAPILLAS; HERRERO, 2021).

Thus, the purpose of this study was to evaluate sensory aspects and the acceptability of the fruit of two cultivars and a selection of feijoa fruit (*F. sellowiana*) grown in the mountainous region of Santa Catarina state.

MATERIAL AND METHODS

Fruits of *F. sellowiana* of the Helena and Nonante cultivars and a selection named '2316', without injuries and in ideal maturation stage were collected at the Estação Experimental de São Joaquim/Empresa de Pesquisa Agropecuária e Extensão Rural de Santa Catarina (Epagri), in São Joaquim, Santa Catarina State. The experimental orchard, from which the fruits were collected, was established in 2006 and cultivated at a 5 m spacing between rows and 3 m between plants. As for cultural treatments, the area receives correction and fertilization, and prevention and control treatments for possible harmful insects and diseases, according to the recommendations for the species (CIOTTA et al., 2018).

The cultivars Helena and Nonante, as well as the access '2316', are the result of selection among *seedlings* obtained by crossing pre-selected progenitors in a genetic improvement project conducted by Epagri and the Universidade Federal de Santa Catarina (UFSC). Helena's cv. has high productivity, a small dimension, precociousness of production, great size and appearance of fruits (DUCROQUET et al., 2007). The Nonante cultivar, as well as Helena, comes from a directed crossing that generated a genotype with high productivity, regularity of production, good fruit quality, late maturation, besides presenting the characteristic of being self-compatible (DUCROQUET et al., 2008). Access '2316' was obtained from the cross between access 458 (recipient plant) and access 50 (pollen donor), collected in Videira (SC), standing out for productivity, fruit shape and size, yield, flavor, and pulp juiciness.

The sensory analysis was conducted in two stages, the first at the Estação Experimental de São Joaquim-SC (EESJ), of Epagri, with the participation of 17 untrained tasters. The second stage was carried out at the Centro de Ciências Rurais/*Campus* Curitiba/UFSC, with 40 untrained testers. Whole fruits from each sample were displayed on the tables for the observation of their general appearance. To avoid recognition of the samples by the tasters, they were identified only with random numbering.

The samples were then served in containers containing the fruit at room temperature, cut in half still in its shell, in a sufficient quantity for sensory evaluation. The tasters were given water for cleaning the palate between sample evaluations. Each taster evaluated attributes of appearance, aroma, texture, flavor, and overall evaluation. For the evaluation, the sensory effective method was used

through the nine-point hedonic scale (DUTCOSKY, 2013) for all attributes: 1 - I really disliked it very much, 2 - I disliked it very much, 3 - I disliked it regularly, 4 - I disliked it slightly, 5 - Indifferent, 6 - I liked it slightly, 7 - I liked it regularly, 8 - I liked it very much, and 9 - I really liked it very much. In addition, the tasters were asked to leave general comments about each sample. Also, the profile of the tasters was surveyed and described regarding gender, age, income, education, fruit consumption, knowledge of the species, eating habits, and physical activities.

The tasters were instructed about the test procedures moments before the test, avoiding any distraction during the test. It is also noteworthy that the project on the use activities of *F. sellowiana*, was submitted for review to the ethics committee CEP/CONEP, on 08/13/2013, CAAE no. 16989113.5.0000.0121.

Data were subjected to descriptive analysis followed by inferential statistics of the results using the nonparametric Mann-Whitney test for comparison of medians between two classes and the Kruskal-Wallis test for comparison between variables with more than two classes (ZAMIATOVSKY; PICCOLI, 2020), adopting as significance value 5% ($p < 0.05$). All analyses were performed using R v. 4.0.4 software (R CORE TEAM, 2021).

RESULTS AND DISCUSSION

In general, the perception of the tasters regarding the three samples did not differ with respect to the parameters of sweetness, acidity, juiciness, pulp yield and overall impression (Table 1). The scores for these parameters ranged from: 7 - I liked it regularly to 8 - I liked it very much for sweetness, juiciness, pulp yield and overall impression. The acidity scored between 5 - indifferent and 6 - I liked it slightly. The parameters of appearance, size and shape ranged from 8 - I liked it very much to 9 - I really liked it very much. Different from the present study, Amaral et al. (2019) observed better performance of the Helena cultivar compared to the Alcântara cultivar, Mattos and wild materials of feijoa fruit, in sensory panel conducted with flavor, taste and texture parameters. Such differences between the studies may be linked to the perception of the tasters since these are subjective parameters. In addition, subtle differences in sensory attributes may be related to fruit ripeness and crop, which influence the analysis by tasters.

In contrast, for the parameters of appearance, size and shape, for this study the cultivar Nonante and the '2316' selection performed better. It should be noted that in the overall impression of the samples, when the overall analysis of the flavor and appearance impressions is considered, no significant variation was observed among them. Regarding the profile of the tasters, 57 untrained tasters participated in the research, with ages ranging from 19 to 65 years (average 35 years), of which 34 were men and 23 women. Most of the tasters (>70%) were educated at university or graduate level.

Considering the profile of the tasters and the performance of the evaluated selections, there was no

statistical difference between the selections regarding the profile in terms of smokers and non-smokers, frequency of consumption, age, or income. Regarding the profile categories that showed differences among the selections, it is worth noting that the fact of knowing or not knowing the species, having or not having dietary restriction, and the

gender category, highlighted differences regarding, especially, the appearance of the selections (Table 2). Female tasters tended to give higher scores than males for the parameters of appearance, size, shape and overall impression of the fruit.

TABLE 1 - Performance of *Feijoa sellowiana* fruit samples submitted to sensory panel regarding parameters of flavor and appearance evaluation.

Genotypes	Sweet	Acid	Juicy	Pulp Yield	Appearance	Size	Format	Overall impression
Helena	7 ^{ns}	5 ^{ns}	8 ^{ns}	7 ^{ns}	8 b	8 b	8 b	8 ^{ns}
Selection 2316	8*	5	8	7	9 a	9 a	9 a	8
Nonante	7	6	8	8	9 a	9 a	9 a	8

*Medians followed by the same lower-case letter in the column do not differ statistically at 5% probability by Kruskal-Wallis test. ns = not significant.

TABLE 2 - Attributes of appearance and flavor of the fruits of two cultivars and one accessory of feijoa fruit (*Feijoa sellowiana*) in relation to the profile of the evaluators, considering parameters categorized into two classes.

cv/attribute	Have you eaten?		Food restriction		Genre	
	Yes (n=48)	No (n=9)	Yes (n=6)	No (n=51)	Male (n=34)	Female (n=23)
	Acid					
Helena	5 ^{ns}	4*	5 ^{ns}	5	5 ^{ns}	5
'2316'	5 ^{ns}	3	3b	5a	5 ^{ns}	4
Nonante	6 ^{ns}	6	5 ^{ns}	6	6 ^{ns}	7
	Appearance					
Helena	8 ^{ns}	8	9 ^{ns}	8	8b	9a
'2316'	9 ^{ns}	8	7b	9a	8b	10a
Nonante	9 ^{ns}	9	9 ^{ns}	9	9	10
	Size					
Helena	8 ^{ns}	8	7 ^{ns}	8	7b	8a
'2316'	9 ^{ns}	8	8 ^{ns}	9	8b	9a
Nonante	9a	8 b	8b	9a	8 ^{ns}	9
	Format					
Helena	8 ^{ns}	9	8 ^{ns}	8	8b	9a
'2316'	9 ^{ns}	8	7 ^{ns}	9	8b	9a
Nonante	9 ^{ns}	8	7b	9a	9 ^{ns}	10
	Overall impression					
Helena	7 ^{ns}	8	7 ^{ns}	8	7 ^{ns}	8
'2316'	8 ^{ns}	7	7 ^{ns}	8	7b	8a
Nonante	8 ^{ns}	8	8 ^{ns}	8	7 ^{ns}	8

*Medians followed by the same lower-case letter in the row do not differ statistically, at 5% probability of error, by the Kruskal-Wallis test. ns = not significant.

The categories related to coffee consumption, physical activity practice, and education showed differences related to taste parameters (Table 3). However, to directly attribute the consumption preference of one or another sample, based on the categories listed, proved to be a challenge in view of the complexity involved in the perception of the tasters. This preference is "built" by a set of objective and subjective attributes (OLIVEIRA et al., 2015), but that reinforces the importance of research on sensory analysis, given its relevance to the development and

dissemination of new products (RUIZ-CAPILLAS; HERRERO, 2021).

In general, the sensory analysis showed that regardless of the material evaluated (cultivar or accessory) and the profile of the tasters, the feijoa fruit is a fruit with notorious acceptance by the consumer. Similar results for the performance of feijoa fruit have also been presented by Matias et al. (2020), in comparison with the regular guava (*Psidium guava* L.), star fruit (*Averrhoa carambola* L.), and kiwi (*Actinidia chinensis* Planch).

The organoleptic potential of the species, in addition to the results obtained in this research, has already been demonstrated by other authors, according to studies organized by Ciotta et al. (2018). Furthermore, cultivation

initiatives observed in different areas of southern Brazil, and neighboring countries such as Argentina, Uruguay, and Paraguay reinforce the need to expand market studies and strategies for publicizing the species.

TABLE 3 - Attributes of appearance and flavor of the fruits of two cultivars and one accessory of feijoa fruit (*Feijoa sellowiana*) in relation to the profile of the evaluators, considering parameters categorized in more than two classes.

cv/attribute	Coffee				Exercises				Education			
	No (n=7)	Occas.* ¹ (n=9)	1/day (n=14)	+1/day (n=27)	No (n=5)	Occas.* ¹ (n=30)	Week.* ² (n=10)	Daily (n=12)	Elementary or High School (n=3)	Hig. Incomp.* ³ (n=12)	Hig. Comp.* ⁴ (n=33)	Postgraduate (n=9)
	Acid											
Helena	3 ^{ns}	7	5	5	6b	5ab	2a	5b	3 ^{ns}	5	5	6
'2316'	5 ^{ns}	3	5	5	6a	5a	3a	6a	2a	6b	5b	5ab
Nonante	4 ^{ns}	6	7	6	4a	6a	4a	6a	5a	6a	6a	6a
	Juicy											
Helena	8 ^{ns}	7	8	7	7 ^{ns}	8	8	8	3 ^{ns}	8	8	7
'2316'	7 ^{ns}	8	7	8	7 ^{ns}	8	8	8	6 ^{ns}	8	8	7
Nonante	9b	7a	8ab	8ab	7 ^{ns}	8	8	9	8 ^{ns}	8	8	7
	Pulp Yield											
Helena	8 ^{ns}	7	7	7	6a	7ab	8b	8b	7 ^{ns}	8	7	7
'2316'	8 ^{ns}	7	6	7	6 ^{ns}	7	7	7	8 ^{ns}	7	7	6
Nonante	5 ^{ns}	8	8	8	5a	8b	6ab	8b	7 ^{ns}	7	8	8
	Appearance											
Helena	9 ^{ns}	9	8	8 ^{ns}	8 ^{ns}	8	8	9	8 ^{ns}	8	8	9
'2316'	9b	9ab	7a	9ab	7 ^{ns}	9	9	9	8 ^{ns}	9	8	9
Nonante	9 ^{ns}	10	9	9	9 ^{ns}	9	9	10	8 ^{ns}	10	9	9
	Format											
Helena	9 ^{ns}	9	8	8	7a	8ab	9b	9b	8 ^{ns}	9	8	9
'2316'	9b	10ab	8a	9ab	7 ^{ns}	9	9	9	10 ^{ns}	9	9	9
Nonante	9 ^{ns}	9	9	9	9 ^{ns}	9	9	9	9 ^{ns}	9	9	9

*1: Occasional; *2: Weekly; *3: Incomplete Higher Education; *4: Complete Higher Education. *Medians followed by the same lower-case letter in the column do not differ statistically at 5% probability of error by the Kruskal-Wallis test. ns = not significant.

CONCLUSIONS

With this study it was possible to conclude that the three materials evaluated, in relation to sensory analysis, showed good acceptance by the tasters.

This result is of great relevance, because it demonstrates the potential for promotion and use of the species in the list of fruit trees regularly consumed in the region of natural occurrence, in order to make compatible the promotion of its cultivation and conservation.

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