

## *Desenvolvimento, qualidade e aceitação de licores finos de frutos da sociobiodiversidade*

A região amazônica é reconhecida pela rica biodiversidade, com destaque para a diversidade de frutas nativas com potencial agroindustrial. O objetivo desse artigo foi desenvolver licores finos de frutos da (uxi, umari e maracujá do mato) e avaliar sua qualidade e aceitação sensorial. Os licores foram desenvolvidos pelo método de infusão por 40 dias, seguido pela adição de xarope e envelhecimento por 30 dias., quando foram submetidos às análises físico-químicas (sólidos solúveis, acidez titulável, pH e açúcares totais) microbiológicas (E. coli a 45 °C) e teste sensorial de aceitação usando escala hedônica de nove pontos, seguida por intenção de compra com escala de cinco pontos. Os licores mostraram características físico-químicas dentro do esperado para o produto, com conteúdo de açúcar em conformidade com a legislação. A análise microbiológica mostrou baixos níveis de E. coli, demonstrando segurança sanitária do produto. A análise sensorial mostrou que os licores de maracujá do mato, umari e uxi tiveram grande aceitação entre os provadores, apresentando um índice de aceitação satisfatório para todos os atributos avaliados e intenção de compra, situando-se entre "Talvez comprasse" e "Certamente compraria", confirmando o potencial de inserção no mercado dos licores desenvolvidos.

**Palavras-chave:** Análise sensorial; Bebida alcoólica; Frutas nativas;

## *Development, quality, and acceptance of fine liqueurs from sociobiodiversity fruit*

The Amazon region is recognized for its rich biodiversity, with emphasis on the diversity of native fruits, which have agro-industrial technological potential. The objective of this paper was to develop fine liqueurs from fruits of sociobiodiversity (uxi, umari and wild passion fruit) and evaluate their quality and sensory acceptance. The liqueurs were developed by the infusion method for 40 days, followed by the addition of the syrup and rest for 30 days, when they were submitted to physicochemical tests (soluble solids, titratable acidity, pH, total sugars), microbiologicals (E. coli at 45 °C) and sensory acceptance test using a nine-point hedonic scale, followed by purchase intent using a five-point scale. The liqueurs showed physicochemical characteristics within the expected standards for the product, in compliance with the legislation regarding the sugar content. The microbiological analysis showed low levels of E. coli, demonstrating the sanitary safety of the product. The sensory analysis showed that wild passion fruit, umari and uxi liqueurs had a great repercussion among the tasters, presenting a satisfactory index of acceptability for all attributes and purchase intention, standing between "I maybe it would buy" and "I would definitely buy", confirming the potential for market insertion of developed liqueurs.


**Keywords:** Sensory evaluation; Alcoholic beverage; Native fruits.


Topic: **Tecnologia de Alimentos**


Received: **10/06/2023**


Approved: **20/08/2023**

Reviewed anonymously in the process of blind peer.

**Maria dos Anjos Corrêa Dias**   
Universidade Federal do Pará, Brasil  
<http://lattes.cnpq.br/6244421974890611>  
<https://orcid.org/0000-0002-6832-0129>  
[maria01cdias@gmail.com](mailto:maria01cdias@gmail.com)

**Odenira Corrêa Dias**   
Universidade Federal do Pará, Brasil  
<http://lattes.cnpq.br/3337186720478250>  
<https://orcid.org/0000-0002-2691-341X>  
[nira182017@gmail.com](mailto:nira182017@gmail.com)

**Simone Aparecida Almeida Araújo**   
Instituto Federal do Pará, Brasil  
<http://lattes.cnpq.br/4149030171846424>  
<https://orcid.org/0000-0001-5402-0080>  
[simone.araujo@ifpa.edu.br](mailto:simone.araujo@ifpa.edu.br)

**Fagner Freires de Sousa**   
Instituto Federal do Pará, Brasil  
<http://lattes.cnpq.br/4253326511902953>  
<https://orcid.org/0000-0001-7379-2078>  
[fagner.sousa@ifpa.edu.br](mailto:fagner.sousa@ifpa.edu.br)



DOI: 10.6008/CBPC2237-9290.2023.003.0002

### Referencing this:

DIAS, M. A. C.; DIAS, O. C.; ARAUJO, S. A. A.; SOUSA, F. F..  
Desenvolvimento, qualidade e aceitação de licores finos de frutos da sociobiodiversidade. **Natural Resources**, v.13, n.3, p.15-25, 2023. DOI: <http://doi.org/10.6008/CBPC2237-9290.2023.003.0002>

## INTRODUCTION

O In the floodplain and mainland regions of the Amazon on Pará the native fruits stand out as the main products of sociobiodiversity marketed by traditional populations, given the marked process of domestication and dissemination that these species have undergone over time, presenting themselves in abundance in large part of the region and because they are already rooted in the local food culture (CIALDELLA et al., 2014).

The comercialization of fruits, however, takes place mainly in natura, which, despite generating significant income for farmers, has limitations, mainly represented by the high perishability of the fruits, resulting in losses or sales at low prices (VUOLA, 2013). This problem, however, can be easily resolved with the use of technological processes of conservation and improvement, which also make it possible to add value to the product. The processing of these fruits for food production emerges, therefore, as an alternative capable to verticalize the production, through commercialization, innovating and generating income to the family production.

Among the various products of amazon sociobiodiversity, native fruit species stand out, such as uxi (*Endopleura uchi* (Huber) Cuatrecasas) and umari (*Poraqueiba sericea* tulasne), in addition to species of spontaneous occurrence, as wild passion fruit (*Passiflora cincinnata*), because they can reconcile social, environmental, and economic aspects.

The uxi can be found in all states of the Amazon Region, with a predominance in the States of Pará and Amazonas, with Pará being the center of origin of the species. The edible portion of the fruit is rich in dietary fiber and its lipid fraction has high levels of phytosterols and vitamin E (ALBUQUERQUE et al., 2014) (ALMEIDA et al., 2012). The 'mari' or 'umari' is a fruit tree native to the Amazon Region and can be found in regional fairs in Pará.

The umari tree is highly productive, generating extra income, mainly for family farmers. Rich in vitamin A and E, fiber, carbohydrates, oils, and proteins, the umari has a high nutritional value. These fruits are mainly consumed in natura form with an accentuated and striking flavor and aroma (INPA, 2015).

The wild passion fruit is one of those species whose occurrence is frequent and spontaneous in the Northeast Region of Pará, but it is still little commercialized, being limited, in most cases, to fresh sales in open markets in the municipalities of the State of Pará, with a basically extractive exploration. This fruit is rich in vitamin C, calcium, and phosphorus, in addition to having medicinal value. The pulp in general, is formed by black seeds, covered with a yellow and translucent substance, slightly acidic and with an accentuated aroma, being consumed in natural form or like juices. The seeds of the fruit are numerous, oval, and dark in color (AMORIM et al., 2013) (PITA, 2012) (SALVADOR, 2008).

In this context, although uxi, umari and wild passion fruit are traditionally consumed in natura, every form of value addition must be considered, as well as the dissemination of the potential of fruits that have not been explored so far, which justifies the application of technological processes to obtain derived products, including liquor.

According to Decree n. 6.871 of June 4, 2009 (BRASIL, 2009), the liqueur is a beverage with an alcoholic strength of 15 to 54%, by volume, at 20°C, with a percentage of sugar above 30 g/L. This can be made with potable ethyl alcohol or simple alcoholic distillate, both of agricultural origin, alcoholic beverage, added with extracts or substances of vegetable or animal origin, flavoring substances, colorings, and other additives allowed in a complementary administrative act. This classification is based on its sugar content, being considered dry, when it has 60 to 100g of sucrose/liter; fine or sweet, from 100 to 350g of sucrose/liter and creme, with more than 350g of sucrose/liter, sprinkled or crystallized (sugar in the saturation proportion).

The production of liqueurs represents a way to circumvent the problems related to the sale of perishable products and with visual aspects of smaller size and shape than required by the “table” market, but which is in good condition of conservation and with excellent sensory and nutritional value (TEIXEIRA et al., 2011). Furthermore, the manufacture of artisanal liquor constitutes a way of making use the raw material existing on the property and this processing requires simple technology, where the final product is sold at room temperature and has a long shelf life, configuring an alternative for adding value to family farming products (RODRIGUES, 2017).

The objective proposed in this study was to develop fine liquors from the amazon socio-biodiversity fruits (uxi, umari and wild passion fruit), characterizing them through physicochemical and microbiological analysis, and evaluating the acceptance of formulations by potential consumers.

## METHODOLOGY

The Physicochemical analysis was carried out at the Food Laboratorie of the State University of Pará and the Chemical Laboratorie from the Federal University of Pará, both located in Cametá, Pará, Brazil. The microbiological analysis was carried out in the Quality Control laboratory of the Amazon Bioactive Compounds Valorization Center, Belém/Pará.

The fruits were acquired in free market in the city of Cametá, Pará. All fruits was in full maturation stage and was originatung from native forest. After reception, the fruits were stored in a refrigerator (8 °C) until processing, which occurred less than 24 hours after acquisition.

### Biometric characterization of fruits and pulp yield

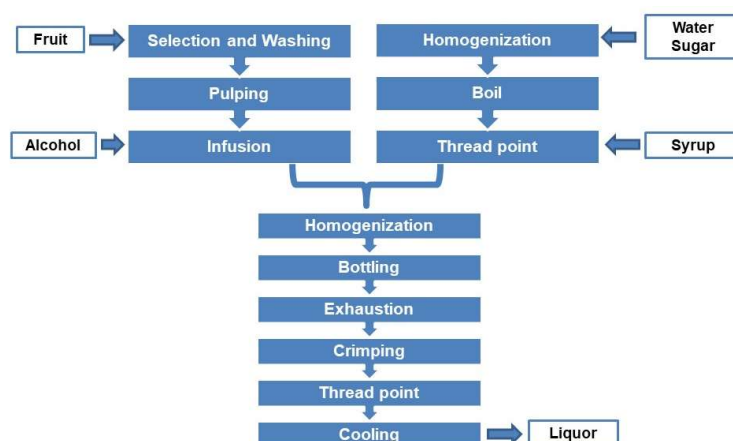
The biometric characterization of the fruits was carried out based on a sample of 60 umari fruit, 60 uxi fruit and 36 wild passion fruit. The fruits were analyzed individually, considering the following characteristics: total fruit weight (g), fruit length (cm) and fruit diameter (cm). To obtain the weight of the fruits, a precision analytical balance was used and to measure the length, a 0.05mm precision manual caliper was used. The biometric characteristics were presented as mean and standard deviation and yield were presented as percentage of pulp. In the case of umari and uxi, which have husks adhered to the pulp, this part of the fruit was considered as a component of the pulp. The total pulp yield was calculated in relation to the weight of the fruit, where according to the percentage yield of pulp, the fruit species were classified into

the following categories: very low (less than or equal to 20%); low (between 21% and 40%); medium (between 41% and 60%); high (between 61% and 80%) and; very high (greater than 81%) (CARVALHO et al., 2005).

### Liquor preparation

The preparation of the liquor was based on the methodology proposed by Pará (2004), according to the flowchart (Figures 1). The fruits were washed in running drinking water and then immersed for 15 minutes in a sodium hypochlorite solution at 100mg/L of active chlorine. Afterwards, they were rinsed under running water and manually peeled and pulped.

The pulps of the fruits were submitted to the infusion step, using sugar-cane liquor (*cachaça*) with 49 °GL, in the proportion of 2:1 for wild passion fruit (30 °Brix), 1.5:1 for umari (7.73 °Brix) and 1:1 for uxi (7.53 °Brix). The maceration was stored in glass containers with a hermetic lid and wrapped in aluminum foil to avoid exposure to the light, being infused by 30 days.



**Figure 1:** Liquor preparation flowchart.

After the infusion period, the liquor went through a filtration process to retain solid particles from the pulp of the macerated liquid and was later filtered on filter paper in order to obtain a clearer liquid. Then sucrose syrup was prepared, with commercial refined sugar and mineral water in the 1:2 (sugar: water) proportion. The sugar was dissolved in water heated to a temperature of approximately 60 °C and kept under stirring until it was completely dissolved, forming a viscous solution. Finally, the syrup was mixed with the macerated and filtered liquid at room temperature and then stored in amber glass bottles, where it was kept for 15 days for maturation.

The proportions of raw materials in the liqueur formulations based on passion fruit, umari and uxi are: 40 mL. 100 mL<sup>-1</sup> of alcoholic extract shown (proportion – 1 pulp: 1 alcohol (m/v)) e 60 mL. 100 mL<sup>-1</sup> of syrup (proportion – 1 sugar: 2 water (m/v)).

### Physicochemical characterization

The liquor samples were submitted to the following analyses: Total acidity content, being performed by titration with a 0.01 mol/L sodium hydroxide solution (NaOH), using phenolphthalein as an

indicator; determination of soluble solids (pulp and liquor), being performed by direct reading in a refractometer and the results expressed in Brix°; determination of pH by direct reading in a digital pH meter; total sugars by the Lane-Eynon method. The physicochemical analyzes were performed according to the methodology described by Zenebon et al. (2008), in triplicate, and the results expressed as the mean value  $\pm$  standard deviation.

### Microbiological analysis

The samples of passion fruit liqueurs from the wild, umari and uxi were submitted to microbiological analysis to determine the presence of *E. coli* at 45 °C, according to the guidelines contained in the American Public Health Association (APHA, 2001).

### Sensory analysis

The liqueurs formulations were submitted to sensory tests. These tests were carried out after approval by the Research Ethics Committee involving human beings, under the registration of the Certificate of Presentation for Ethical Appreciation (CAAE) 31793220.80000.0018, in order to enable tests with human tasters. The study received authorization from the tasters who participated in the sensory tests, upon signing the Term of Free and Informed Commitment-TCLE.

The sensorial analysis was carried out through the affective acceptance test, being applied through the Domestic Use Test, that is, in the taster's house, under the conditions of use. A nine-point hedonic scale was used, ranging from (1) "I very much disliked" to (9) "I extremely liked", to determine sensory acceptance, followed by purchase intention, with a five-point scale, with extremes (1) "I definitely would not buy" and (5) "I definitely would buy" Palermo (2015). In the sensory evaluation form, questions were also presented regarding the frequency in which the tasters would consume the product and a space for comments.

Forty untrained female and male tasters participated in the research. The formulations were served in 25mL disposable cups, coded with a random three-digit number, in an approximate amount of 10mL, accompanied by mineral water at room temperature to clean the palate. The attributes evaluated by the assessor group were appearance, aroma, flavor, texture (consistency), and alcoholic contents. No exclusion criteria considered - If under 18 years old, restriction on consumption of sugar (diabetes), not be consumer potential of product, smokers, and people with historic of diseases that interfere with sensory analysis or alcohol consumption.

To calculate the acceptance index, the same results obtained in the acceptance test were used. The test determined the percentage of frequency of responses of the values to calculate the Acceptability Index (AI) of the product, where the expression Equation 1 was adopted, adapted by Gularte (2009) in which it determines that the AI with good repercussion is considered  $> 70\%$ . Acceptability Index (%):  $AI = \frac{M}{N} * 100$   
Being: M: mean of the obtained values; N: number of points on the scale used.

## Statistical analysis

The results of the sensory analysis were submitted to analysis of variance (ANOVA) to compare the magnitude of variations between the formulations of the analyzed liqueurs, which was complemented with the Tukey test to verify the difference between the means of the attributes, at 0.05 of significance. For the set of analyses, the software Assistat 7.7 was used.

## DISCUSSION

### Biometric characterization and pulp yield

The results regarding the biometric characterization of the fruits are presented in Table 1.

**Table 1:** Biometric characteristics and pulp yield of wild passion fruit, umari and uxi.

Species	Fruit weight (g)	Length (cm)	Diameter (cm)	Pulp yield (%)
Wild passion fruit	56.11 ± 5.09	4.63 ± 0.17	5.48 ± 0.11	47.92±2.98
Umari	56.59 ± 6.52	6.11 ± 0.62	3.79 ± 0.42	28.32±4.09
Uxi	41.22 ± 2.00	4.92 ± 0.92	3.55 ± 0.26	46.00±2.93

Values referring to the mean ± standard deviation of 60 (each) fruits of uxi and umari, and 36 wild passion fruit.

The biometric results obtained are similar to those presented by Carvalho et al. (2005) for uxi and umari, although the results of this research have shown lower values in terms of average weight, length, and diameter. The uxi fruits, however, presented biometric parameters very similar to those observed in uxi fruits collected in Capitão Poço, Pará (ALBUQUERQUE et al., 2014). The results for passion fruit, in turn, are similar to those found by Oliveira (2009).

In the three species, variations in fruit weight, length and diameter were observed. Albuquerque et al. (2014), believe that these variations can be caused due to the genetic variability of the fruits and the environmental factors (biotic and abiotic) that affect the plant's development, influencing the biometrics, considering that the fruits selected for these analyzes present unknown collection points, which allows only assumptions about this measurement. It is possible to state that the length and diameter of the fruit of Uxi and Umari have an influence on the amount of pulp obtained, since larger fruits have a higher pulp weight than smaller ones.

Regarding the percentage yield, umari fell into the low yield group (21 to 40%), with 28.32% of pulp, while uxi and wild passion fruit presented a pulp yield of 46% and 47.92% respectively, falling into the group with average pulp yield (41% to 60%). Similar results were presented by Carvalho et al. (2005), who reported pulp/peel yield of 28.9 for umari and 47.9% for uxi; and by Oliveira (2009), with yields between 39.6% and 45.83% for wild passion fruit. The yield presented for the fruits of umari and uxi and wild passion fruit, although classified between low and medium, is close to those recorded for fruits with high commercial value, such as açaí and bacuri, for example, which allows us to state that yields low or medium do not make the use of the species unfeasible (CARVALHO et al., 2005).

## Physicochemical and microbiological characterization of liquors

The Table 2 presents the results of the physicochemical and microbiological characterization of the liqueurs from wild passion fruit, umari and uxi.

**Table 2:** Physical-chemical and microbiological characterization of wild passion fruit, umari and uxi liqueurs.

Analisis	Liquor		
	Wild passion fruit	Umari	Uxi
pH	3.76 ± 0,00	4.71 ± 0,00	4.47 ± 0,01
Titrateable acidity (g citric acid. 100mL <sup>-1</sup> )	3.23 ± 0,12	0.71 ± 0,11	0.84 ± 0,11
Soluble solids (°Brix)	24.83 ± 0,76	24.66 ± 0,57	23.66 ± 0,57
Total sugar (g. L <sup>-1</sup> )	130.57 ± 12,20	130.62 ± 7,18	125.84 ± 11,22
<i>E. coli</i> a 45 °C (NPM. mL <sup>-1</sup> )	< 3	< 3	< 3

Values referring to the mean standard deviation of the physicochemical analyzes of the fruit liqueurs.

As for pH, umari and uxi liqueurs had higher values than wild passion fruit, which is justified by the fact that these fruits have a less acidic and sweet taste, compared to wild passion fruit, which expressed lower values, having a higher hydrogenionic potential (pH). These values between 3.76 and 4.71 for the studied liquors were similar to those found by Vieira et al. (2010), which obtained a pH of 3,6 for camu-camu liqueur and by Penha et al. (2022), which obtained a pH of 3.6 for the acerola liqueur. A low pH allows the deceleration of microbial growth, providing greater product stability.

The passion fruit liqueur from the wild presented excellent values of SS (Soluble Solids) and AT (Titrateable Acidity), 24.83 and 3.23, respectively, giving it quality, from the agroindustry point of view. Umari and uxi liqueurs showed a result considered high for SS (24.66 and 23.66 Brix°, respectively), but the AT (0.71 and 0.84, respectively) had a low mean in this parameter. From an industrial point of view, a product with a high content of AT reduces the need for adding acidifiers and provides nutritional improvement, food safety and organoleptic quality (PITA, 2012).

Regarding total sugars, passion fruit liqueurs, umari and uxi meet current legal standard for fermented fruit liqueur drinks, with averages of 130.57g/L, 130.62g/L and 125.84g/L. According to legislation (BRASIL, 2009), the liqueur must have a minimum value of 30 g/L and are characterized as fine liqueurs, when total sugar content is between 100 and 350g of sucrose/liter.

The microbiological quality of foods can be established using, as a parameter, microorganisms that indicate fecal contamination, such as the Coliform group (SILVA et al., 2016). Regarding the analysis, there is no microbiological standard for alcoholic beverages. However, according to the results contained in Table 3, for the determination of *E. coli* at 45 °C, the liquor samples presented values < 3 NMP/mL (less than 3 Most Probable Number per milliliter), which indicates that the liqueurs do not present microbiological contaminants of the coliform group, being suitable for consumption (APHA, 2001).

## Sensory analysis

The group of tasters consisted of 60% female and 40% male, aged between 18 and 45 years, 60% of whom consumed liquor sporadically. The results of the acceptance test are shown in Table 3.

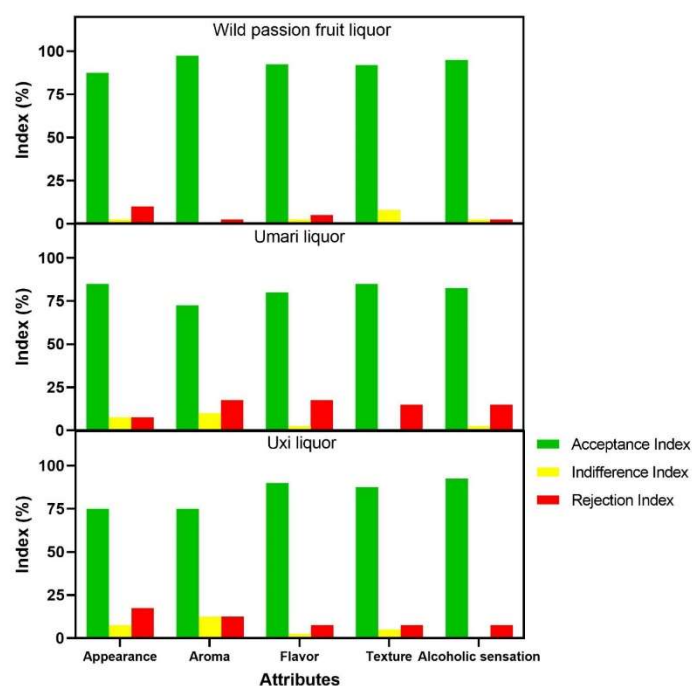
**Table 3:** Assessment of acceptability of attributes of wild passion fruit, umari and uxi liqueurs.

Liquor	Attributes				
	Appearance	Aroma	Flavor	Texture	Alcoholic sensation
Wild passion fruit	6.85a	7.40a	7.67a	7.47a	7.60a
Umari	7.07a	6.52a	6.82a	6.90a	6.97a
Uxi	6.40a	8.35a	6.80a	8.52a	7.30a

\* Means followed by the same letter, in the same column, do not differ statistically from each other. The Tukey test was applied with the 5% probability level.

The results obtained by the Tukey test at 5% probability, demonstrate that the passion fruit liqueurs, umari and uxi did not show significant differences in relation to the attributes analyzed and all showed means within the acceptance scale, ranging from "I liked moderately" and "I liked it a lot".

These results are reinforced by the liquor acceptance index (Figure 2). As can be seen, the passion fruit liqueur obtained, on average, 92.6% of acceptance, with an emphasis on aroma and alcoholic sensation. The umari liqueur obtained, on average, an acceptance rate of 81.2%, while the uxi liqueur, 83.8%. According to Palermo (2015), the sensory attributes of a food product can be considered accepted if they present an acceptability index higher than 70%. In this way, all formulations can be considered accepted, as they presented values above the recommended percentage.



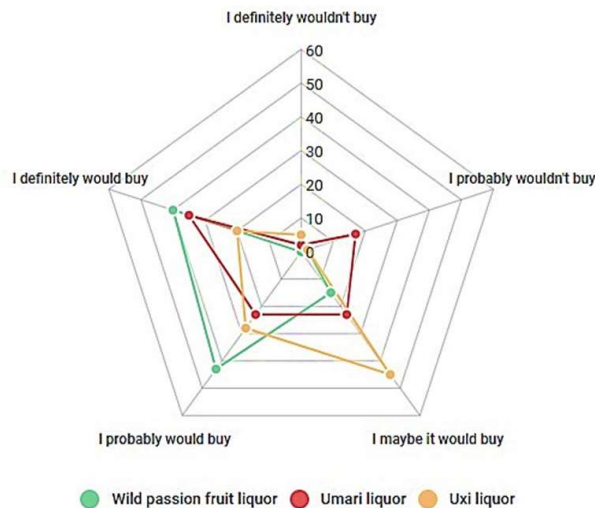
**Figure 2:** Index of acceptance, rejection and indifference for each attribute evaluated in the liqueurs of (A) wild passion fruit, (B) umari and (C) uxi.

Values close to those obtained in this study were demonstrated for tangerine peel liqueurs, which presented acceptance index between 71.13% and 75.42% (SILVA et al., 2017) and for passion fruit liqueur formulations with jambu flowers, with an acceptability index between 80 % and 90% (MARQUES et al., 2020). The results regarding the taster's intention to purchase liqueurs is expressed in Figure 3.

In the spider chart the intensity of the point increases from the center to the periphery and the values of each point in each sample are plotted on the corresponding axis. Thus, it is possible to observe that the wild passion fruit liqueur had a higher purchase intention by the tasters, with a percentage concentration of



43% for "I would probably buy" and 40% for "I would definitely buy". Similarly, the umari liqueur showed the highest concentration of attitude among the tasters, with 35% saying "I would definitely buy". As for the uxi liqueur, the attitude of the tasters was concentrated in 45% of "I maybe it would buy". It is important to destach that no formulation received the attitude "I definitely would not buy", confirming the potential for insertion in the market of developed liqueurs.



**Figure 3:** Purchase intention of passion fruit, umari and uxi liqueurs.

Amorim et al. (2013), working with the elaboration and sensory acceptance of wild passion fruit liqueur and Marques et al. (2020), with purchase intention test of passion fruit liqueurs with jambu flowers, obtained results similar to the ones presented for the wild passion fruit liqueur and umari, regarding the purchase intention, varying between "I would probably buy" and "I would definitely buy", if the tasters found the products available for sale.

Consumer purchase intention is influenced by sensory attributes of food appearance, taste, texture, and aroma, since sensory properties play an essential role in the purchase decision and acceptability of food products (VENTANAS et al., 2020). Thus, some comments left in the sensory analysis form by the tasters can help to explain the low purchase intention of the uxi liqueur, as can be seen below:

"The flavor of the uxi liqueur was more difficult to analyze. What I felt very clearly was the strong alcoholic smell, suppressing the aroma and flavor of the fruit" (Taster 9).

"In the uxi liquor, I didn't like the appearance very much, as it had some 'greasy bubbles'" (Taster 21).

## CONCLUSION

The physical-chemical characteristics of the liqueurs were within the expected parameters for the product, as well as the microbiological quality. The sensory analysis showed that the liqueurs of wild passion fruit, umari and uxi had a great repercussion among the tasters. The production of liqueurs is an alternative for the use of these fruits by farmers.

## REFERENCES

ALBUQUERQUE, E. M.; SILVA, M. K. F.; SILVA, A. C. M.;

OLORTEGUI, R. S.; SILVA, R. T. L.. Biometria de frutos de uxi,

em vegetação nativa de Capitão Poço (PA). **Enciclopédia Biosfera**, v.10, n.19, p.2787-2796, 2014. DOI: <https://doi.org/10.18378/rvads.v13i5.5750>

ALMEIDA, L. S.; GAMA, J. R. V.; OLIVEIRA, F. A.; CARVALHO, J. O. P.; GONÇALVES, D. C. M.; ARAÚJO G. C.. Fitossociologia e uso múltiplo de espécies arbóreas em floresta manejada, Comunidade Santo Antônio, município de Santarém, Estado do Pará. **Acta Amazônica**, v.42, n.2, p.185-194, 2012. DOI: <https://doi.org/10.1590/S0044-59672012000200002>

APHA. American public health association. **Committee on microbiological for foods**. 4 ed. Washington, 2001.

AMORIM, F. L.; SILVEIRA, P. T. S.; SILVA, G. V.; CAFIEIRO, C. S. P.. Elaboração e aceitação sensorial de licor maracujá-do-mato com diferentes tipos de calda. **Revista de Desenvolvimento e Inovação**, v.1, n.1, p.88-91, 2013.

BRASIL. **Lei no 8.918 de 14 de julho de 1994**. Dispõe sobre a padronização, a classificação, o registro, a inspeção, a produção e a fiscalização de bebidas. Brasília: DOU, 2009.

CARVALHO, J. E. U.; MÜLLER, C. H.. Biometria e Rendimento Percentual de Polpa de Frutas Nativas da Amazônia. **Comunicado Técnico**, v.139, p.1-3, 2005.

CIALDELLA, N.; NAVEGANTES, A. L.. La ruée vers l'«açaí» (Euterpe oleracea Mart.) : trajectoires d'un fruit emblématique d'Amazonie. **Revue Tiers Monde**, v.4, n.4, p.119, 2014.

GULARTE, M. A.. **Análise sensorial**. Pelotas: Universitária da Universidade Federal de Pelotas, 2009.

INPA. Instituto nacional de pesquisas da Amazônia. **Inpa explora o potencial do umas raizeiro em iguarias amazônicas**. Manaus: D24am, 2015.

MARQUES, L. R. L. H.; PEREIRA NETA, I. B.; AMORIM, I. S.; AMORIM, D. S.; CASTRO, V. C. G.; SILVA, B. A.. **Avaliação nutricional e sensorial de licor de maracujá (Passiflora edulis) com flores de jambu (Acmella oleracea)**. São Paulo: Científica Digital, 2020.

OLIVEIRA, E. S.. **Caracterização e rendimento das sementes e do albedo do maracujá para aproveitamento industrial e obtenção da farinha da casca e pectina**. Dissertação (Mestrado em Produção Vegetal) - Universidade Estadual do Norte Fluminense Darcy Ribeiro, 2009.

PALERMO, J. R.. **Análise sensorial: fundamentos e métodos**. Rio de Janeiro: Athneu, 2015.

PARÁ. **Processamento de Frutas**. Belém: Secretaria executiva de ciência, tecnologia e meio ambiente. Belém:

DOE, 2004.

PENHA, E. M.; MORETTI, R. H.; DELLA, M. R. C.. Processo para Fabricação de Licor de Acerola. **Comunicado Técnico**, v.48, p.1-2, 2022.

PITA, J. S. L.. **Caracterização físico-química e nutricional de polpa e farinha da casca de maracujazeiros do mato amarelo**. Dissertação (Mestrado em Ciências de Alimentos) - Universidade Estadual do Sudoeste da Bahia, Itapetinga, 2012.

RODRIGUES, V. N.. **Licor de guabiroba (Campomanesia xanthocarpa): análise mercadológica, desenvolvimento e caracterização físico-química e sensorial**. Monografia (Bacharel em Engenharia de Alimentos) - Universidade Federal da Fronteira Sul, Laranjeiras do Sul, 2017.

SALVADOR. Secretaria de Agricultura. **Cultura do maracujá**. Salvador: SEAGRI, 2008.

SILVA, Á. F. S.; LIMA, C. A.; QUEIROZ, J. J. F.; JÁCOME, P. R. L. A.; JÁCOME JÚNIOR, A. T.. Análise bacteriológica das águas de irrigação de horticulturas. **Revista Ambiente e Água**, v.1, n.2, p.428-438, 2016. DOI: <https://doi.org/10.4136/ambi-agua.1798>

SILVA, R. C.; AMORIM, A. B. F.; FEITOSA, R. M.; OLIVEIRA, E. N. A.; FEITOSA, B. F.; AMADEU, L. T. S.. Licor fino de casca de tangerina: processamento e caracterização. **Arquivos Brasileiros de Alimentação**, v.2, n.3, p.164-173, 2017. DOI: <https://doi.org/10.53928/aba.v2i3.1669>

TEIXEIRA, J. L. Q.; SIMÕES, L. S.; ROCHA, C. T.; SARAIVA, S. H.; JUNQUEIRA, M. S.. Tecnologia, composição e processamento de licores. **Enciclopédia Biosfera**, v.7, n.12, p.1-17, 2011.

VENTANAS, S.; GONZÁLEZ-MOHINO, A.; ESTÉVEZ, M.; CARVALHO, C.. Innovation in sensory assessment of meat and meat products. Em: BISWAS, A. K.; MANDAL, P. K.. **Meat quality analysis: advanced evaluation methods, techniques, and technologies**. Academic Press, 2020. p.393-418.

VIEIRA, V. B.; RODRIGUES, J. B.; BRASIL, C. C. B., ROSA, C. S.. Produção, caracterização e aceitabilidade de licor de camu-camu (Myrciaria dúbia (H.B.K.) MCVAUGH). **Alimentos & Nutrição**, v.21, n.4, p.519-522, 2010.

VUOLA, M.. **Regional Markets for Non-timber Forest Products in Eastern Brazilian Amazon**. Master's Thesis: Helsinki: University of Helsinki, 2013.

ZENEBO, O.; PASCUET, N. S.; TIGLEA, P.. **Métodos físico-químicos para análise de alimentos**. 4 ed. São Paulo: Instituto Adolfo Lutz, 2008.

Os autores detêm os direitos autorais de sua obra publicada. A CBPC – Companhia Brasileira de Produção Científica (CNPJ: 11.221.422/0001-03) detêm os direitos materiais dos trabalhos publicados (obras, artigos etc.). Os direitos referem-se à publicação do trabalho em qualquer parte do mundo, incluindo os direitos às renovações, expansões e disseminações da contribuição, bem como outros direitos subsidiários. Todos os trabalhos publicados eletronicamente poderão posteriormente ser publicados em coletâneas impressas ou digitais sob coordenação da Companhia Brasileira de Produção Científica e seus parceiros autorizados. Os (as) autores (as) preservam os direitos autorais, mas não têm permissão para a publicação da contribuição em outro meio, impresso ou digital, em português ou em tradução.