



## CARFT BEER WITH NATIVE FRUITS: A MULTIFACETED ANALYSIS

*FRUTAS NATIVAS EM CERVEJAS ARTESANAIS: UMA ANÁLISE MULTIFACETADA*

*FRUTAS NATIVAS EN CERVEZAS ARTESANALES: UN ANÁLISIS MULTIFACÉTICO*



Bruna GEWEHR<sup>1</sup>

e-mail: brunagew@gmail.com



Mirian Ribeiro Galvão MACHADO<sup>2</sup>

e-mail: miriangalvao@gmail.com



Tainá Bacellar ZANETI<sup>3</sup>

e-mail: tainazaneti@gmail.com

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<sup>1</sup> Federal University of Rio Grande do Sul (UFRGS), Porto Alegre – RS – Brazil. PhD student in the Postgraduate Program in Rural Development (PGDR). Teacher.

<sup>2</sup> Federal University of Pelotas (UFPel), Pelotas – RS – Brazil. Associate Professor at the Center for Chemical, Pharmaceutical, and Food Sciences. Doctor.

<sup>3</sup> University of Brasília (UnB), Brasília – DF – Brazil. Adjunct Professor at the Center for Excellence in Tourism UnB (CET). Doctor.

**ABSTRACT:** The use of native fruits in craft beer formulations in Brazil presents, on the one hand, the opportunity to develop a market for these species, which can significantly contribute to the country's Food and Nutritional Security. On the other hand, it is important to consider that this practice can consolidate an elite niche for these products. In this context, this article aims to discuss the use of native fruits in craft beers in Brazil, analyzing the challenges and opportunities in the process. To this end, a documentary survey of beers with native Brazilian fruits was carried out in a specialized online catalog. From the data, the challenges and opportunities of including these fruits were analyzed. The research revealed a significant number of craft beers, totaling 231 (n=100%), characterized by a diversity of native fruits incorporated, covering 34 different Brazilian species. The most commonly found fruits were guava (*Psidium guajava*) (17.3%), passion fruit (*Passiflora alata*; *P. cincinnata*; *P. edulis*; *P. setacea*) (10.8%), blackberry (*Rubus brasiliensis*) (8.7%), hog plum (*Spondias monbim*) (7.6%), cashew (*Anacardium occidentale*) (6.9%), jaboticaba (*Plinia cauliflora*) (6.5%) and Surinam cherry (*Eugenia uniflora*) (5.8%). It is considered that the incorporation of these fruits in craft breweries stimulates their production and commercialization. Craft beers are part of local markets where collaboration with farmers is fundamental. It is understood that craft breweries have the potential to contribute to the strengthening and appreciation of native fruits in Brazil, especially through the promotion of these species.

**KEYWORDS:** Gastronomy. Food Security. Biodiversity.

**RESUMO:** A utilização de frutas nativas em formulações de cervejas artesanais no Brasil apresenta, por um lado, a oportunidade de desenvolver um mercado para essas espécies, o que pode contribuir significativamente para a Segurança Alimentar e Nutricional do país. Por outro lado, é importante considerar que essa prática pode consolidar um nicho elitizado para esses produtos. Nesse contexto, o presente artigo visa discutir o uso de frutas nativas em cervejas artesanais no Brasil, analisando os desafios e oportunidades no processo. Para isso, realizou-se uma pesquisa documental de cervejas com frutas nativas brasileiras em catálogo on-line especializado. A partir dos dados, analisaram-se os desafios e oportunidades da inserção dessas frutas. A pesquisa revelou um número expressivo de cervejas artesanais, totalizando 231 (n=100%), caracterizadas por uma diversidade de frutas nativas incorporadas, abrangendo 34 espécies brasileiras distintas. As frutas mais encontradas foram a goiaba (*Psidium guajava*) (17,3%), maracujá (*Passiflora alata*; *P. cincinnata*; *P. edulis*; *P. setacea*) (10,8%), amora (*Rubus brasiliensis*) (8,7%), cajá (*Spondias monbim*) (7,6%), caju (*Anacardium occidentale*) (6,9%), jaboticaba (*Plinia cauliflora*) (6,5%) e pitanga (*Eugenia uniflora*) (5,8%). Considera-se que a incorporação dessas frutas em cervejarias artesanais estimula sua produção e comercialização. As cervejas artesanais fazem parte de mercados locais nos quais a colaboração com os agricultores desempenha um papel fundamental. Compreende-se que as cervejarias artesanais têm o potencial de contribuir para o fortalecimento e a valorização das frutas nativas no Brasil, especialmente por meio da promoção dessas espécies.

**PALAVRAS-CHAVE:** Gastronomia. Segurança Alimentar. Biodiversidade.

**RESUMEN:** La utilización de frutas nativas en formulaciones de cervezas artesanales en Brasil, por un lado, crea un mercado para estas especies, pudiendo representar contribuciones importantes para la Seguridad Alimentaria y Nutricional del país. Por otro lado, puede respaldar un nicho de elite para estos productos. En este contexto, el presente artículo tiene como objetivo discutir el uso de frutas nativas en cervezas artesanales en Brasil, analizando los desafíos y oportunidades en el proceso. Para ello, se llevó a cabo una investigación documental de cervezas con frutas nativas brasileñas en un catálogo en línea especializado. A partir de los datos, se analizaron los desafíos y oportunidades de la inserción de estas frutas. La investigación reveló un número significativo de cervezas artesanales 231 (n=100%) con diversidad de frutas nativas insertadas, incluyendo 34 especies brasileñas. Las frutas más encontradas fueron la goiaba (*Psidium guajava*) (17,3%), maracuyá (*Passiflora alata*; *P. cincinnata*; *P. edulis*; *P. setácea*) (10,8%), amora (*Rubus brasiliensis*) (8,7%), cajá (*Spondias monbim*) (7,6%), caju (*Anacardium occidentale*) (6,9%), jabuticaba (*Plinia cauliflora*) (6,5%) y pitanga (*Eugenia uniflora*) (5,8%). Se considera que la utilización de estas frutas en cervecerías artesanales incentiva su producción y comercialización. Las cervezas artesanales forman parte de mercados de proximidad en los cuales la colaboración con los agricultores es fundamental. Se entiende que las cervecerías artesanales pueden colaborar para el fortalecimiento y la valorización de las frutas nativas en Brasil, principalmente mediante la promoción de las especies.

**PALABRAS CLAVE:** Gastronomía. Seguridad Alimentaria. Biodiversidad.

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## Introduction

In the last ten years, there has been significant growth in the beer industry in Brazil, resulting in the creation of microbreweries (GIORGI, 2015) and the introduction of a new product on the national market: “craft” beers (GEWEHR, 2019). Although not legally defined in the country, craft breweries are characterized by business models that are distinct from large industries due to production volume, manufacturing method, actors involved, and marketing model (GEWEHR, 2019; OLIVER, 2013; DALMORO; FEL, 2020). They are guided by the motto “drink better, drink less” (MARCUSO, 2015) and seek differentiation in products through sensorial innovation (GIORGI; CONCEIÇÃO JUNIOR, 2016; GEWEHR, 2018). In fact, they present greater intensity of color, aroma, and flavor when compared to mass beers (ARAÚJO; SILVA; MINIM; 2003), becoming a product distinct from the drink “beer,” approaching the concept of artisanal food.

Although Brazilian legislation recommends the use of inputs that are not native to the country in formulations, such as hops (BRASIL, 2019), national production of these mandatory inputs is small, despite progress due to demand from craft breweries (KROHN; 2018;

MARCUSSO; MULLER, 2019). As a result, sensory innovation in craft beer formulations sometimes ends up being guided by the inclusion of native ingredients (GEWEHR, 2019). Among other inputs, fruits, spices, and flowers have been used in formulations (GEWEHR, 2019; DIAS, 2015; HOP CAPITAL BEER, 2019).

According to studies by Venturini (2005) and Morado (2009), beer can be considered a source of nutrients and soluble fibers with essential B vitamins, polyphenols, phosphates, organic acids, and nucleic acids. Based on this, the inclusion of fruits in the formulation can add antioxidants or other benefits, including bioactive potential (HOLLAS; GEREMIAS, 2020). Native fruits have high nutritional value, often higher than conventional fruits, presenting good indicators, especially vitamins A and C (CORADIN; CAMILLO, 2018), therefore being an interesting addition to the formulation.

The consumption of native fruits is a strategy for Food and Nutritional Security in the country as it strengthens and values sustainable chains of local products (FAO, 2019) and encourages the preservation and diversification of food (CORADIN; CAMILLO, 2018). Although these species have been facing neglect from producers and consumers, the inclusion of these fruits in craft beers can contribute to the promotion and structuring of their production chains, as it creates a market for them.

On the other hand, the added value that native fruits bring to beers can endorse a specific niche. It is worth noting that this type of product has a high price and that, in many cases, it contributes to the formation of an elite market (FRANKENTHAL, 2018; VALADARES *et al.*; 2017), which creates barriers to promotion and access to products. From this context, the article aims to discuss the use of native fruits in craft beers in Brazil, analyzing the challenges and opportunities of using these species in formulations.

## **Materials and methods**

The first step was to carry out documentary research in an online beer catalog<sup>4</sup>. The platform maintains a catalog with information such as style, photos of labels, a list of ingredients, and manufacturer information. Inclusion in the catalog is open, however, the information entered follows a list of pre-defined classifications. The research used beers listed on the platform as a database from 2007 to March 2021.

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<sup>4</sup> Available at: <https://www.brejas.com.br>.

To collect data, the platform's advanced search tool was used, searching for the names of fruits (popular and scientific) with the descriptors "beer" and "Brazil". From the identified universe, each product was analyzed individually, considering only those manufactured in the country that included native Brazilian fruits in their composition. The rest were excluded. Data were collected about the brewery, name of the products, style, and label information.

The universe of native fruits was delimited according to the list in Interministerial Ordinance No. 284 of May 30, 2018 (BRASIL, 2018). Data from the ordinance were also used to categorize the region of occurrence of native fruits. The choice is justified because the ordinance is the most current legal framework on the subject and an essential instrument for strengthening and valuing these products.

Data analysis was carried out in tables, and the data was organized by frequency. The beers were categorized by region, and native fruit was included in the formulation. The number of fruits inserted, the proportion of insertion of each fruit in the universe of beers with native fruits in the formulation, and insertion count by region of the brewery were carried out. Furthermore, the variable "region of beer production" was crossed with the variable "region of fruit occurrence".

The second stage took place with the discussion of challenges and opportunities based on a literature review. For this analysis, we sought to understand which species are used and which factors influence this insertion. Furthermore, we sought to discuss whether these products are part of local markets, relating the region of occurrence of the fruit and the region of insertion.

## **Results**

In the research, 231 (n=100%) craft beers with native fruit were selected, of which 34 Brazilian species were found. Of the total found, 16% had more than one native fruit in their formulation. Combinations of two, three, four, and six different native fruits were found in the formulations. The identified native fruits are presented in Table 1, below:

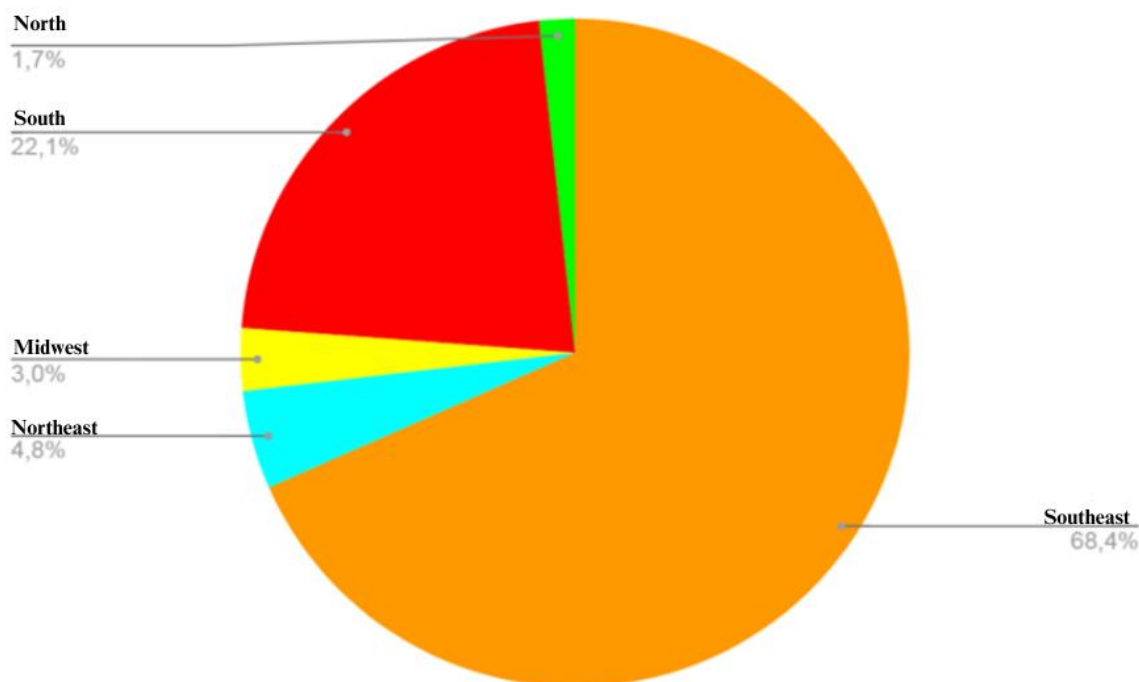
**Table 1** – Native fruits used in craft beers and their region of occurrence in Brazil

Native Fruit (Scientific name)	Region of occurrence of Native Fruit
Pineapple ( <i>Ananas comosus</i> )	Northeast.
Açaí berry ( <i>Euterpe oleracea</i> )	North, Northeast, Midwest.
Açaí-juçara ( <i>Euterpe edulis</i> )	Northeast, Midwest, Southeast.
Blackberry ( <i>Rubus brasiliensis</i> )	Northeast, Midwest, Southeast, South.
Araçá ( <i>Psidium cattleianum</i> )	North, Northeast, Midwest, Southeast, South.
Araticum ( <i>Annona crassiflora</i> )	North, Northeast, Midwest, Southeast, South.
Bacuri ( <i>Platonia insignis</i> )	North, Northeast.
Butiá ( <i>Butia catarinenses</i> )	South.
Cocoa ( <i>Theobroma cacao</i> )	North, Northeast.
Cagaita ( <i>Eugenia dysenterica</i> )	North, Northeast, Midwest, Southeast.
Hog plum ( <i>Spondias monbim</i> )	North, Northeast, Midwest, Southeast.
Cashew ( <i>Anacardium occidentale</i> )	North, Northeast, Midwest, Southeast.
Cambuci ( <i>Campomanesia phaea</i> )	Southeast.
Camu-Camu ( <i>Myrciaria dúbia</i> )	North, Midwest.
Camuru ( <i>Campomanesia phaea</i> )	Southeast.
Rio Grande cherry ( <i>Eugenia involucrata</i> )	Southeast, South.
Coquinho-Azedo ( <i>Butia capitata</i> )	Northeast, Midwest, Southeast.
Cupuaçu ( <i>Theobroma grandiflorum</i> )	North.
Gabiroba ( <i>Campomanesia adamantium</i> )	Midwest, Southeast, South.
Guava ( <i>Psidium guajava</i> )	North, Northeast, Midwest, Southeast, South.
Goiaba-serrana ( <i>Acca sellowiana</i> )	Southeast, South.
Soursop ( <i>Annona mucosa</i> )	North, Midwest, Northeast, Southeast, South.
Grumixama ( <i>Eugenia brasiliensis</i> )	Northeast, Southeast, South.
White guabirola ( <i>Campomanesia xanthocarpa</i> )	Northeast, Midwest, Southeast, South.
Guarana ( <i>Paullinia cupana</i> )	North.
Jaboticaba ( <i>Plinia cauliflora</i> )	Northeast, Midwest, Southeast, South.
Licuri ( <i>Syagrus coronata</i> )	Northeast, Southeast.
Mangaba ( <i>Hancornia speciosa</i> )	North, Northeast, Midwest, Southeast, South.
Passion fruit ( <i>Passiflora alata</i> ; <i>P. cincinnata</i> ; <i>P. edulis</i> ; <i>P. setacea</i> )	North, Northeast, Midwest, Southeast.
Murici ( <i>Byrsonima crassifolia</i> )	North, Northeast, Midwest, Southeast, South.
Pequi ( <i>Caryocar brasiliensis</i> ; <i>C. coryaceum</i> )	North, Northeast, Midwest, Southeast, South.
Surinam cherry ( <i>Eugenia uniflora</i> )	Northeast, Midwest, Southeast, South.
Umbu ( <i>Spondias tuberosa</i> )	Northeast, Southeast.
Uvaia ( <i>Eugenia pyriformis</i> )	Midwest, Southeast, South.

Source: Adapted from Brazil (2018)

Of the beers analyzed, 68.4% were produced in the Southeast region, while the South region contributed 22.1% of the total identified. Together, these two regions represent 90.5% of the cases investigated. Although they concentrate the largest number of registered breweries in the country (BRASIL, 2020), it is notable that these regions do not stand out for the use of native fruits compared to the North and Northeast regions of Brazil (CORADIN; CAMILLO, 2016; CORADIN; SIMINSKI; REIS, 2011). Therefore, it is essential to consider how craft beers can boost the dissemination of these fruits or deconstruct their associated stigmas, encouraging their consumption in regions where their use is less explored. Graph 1, below, shows this distribution.

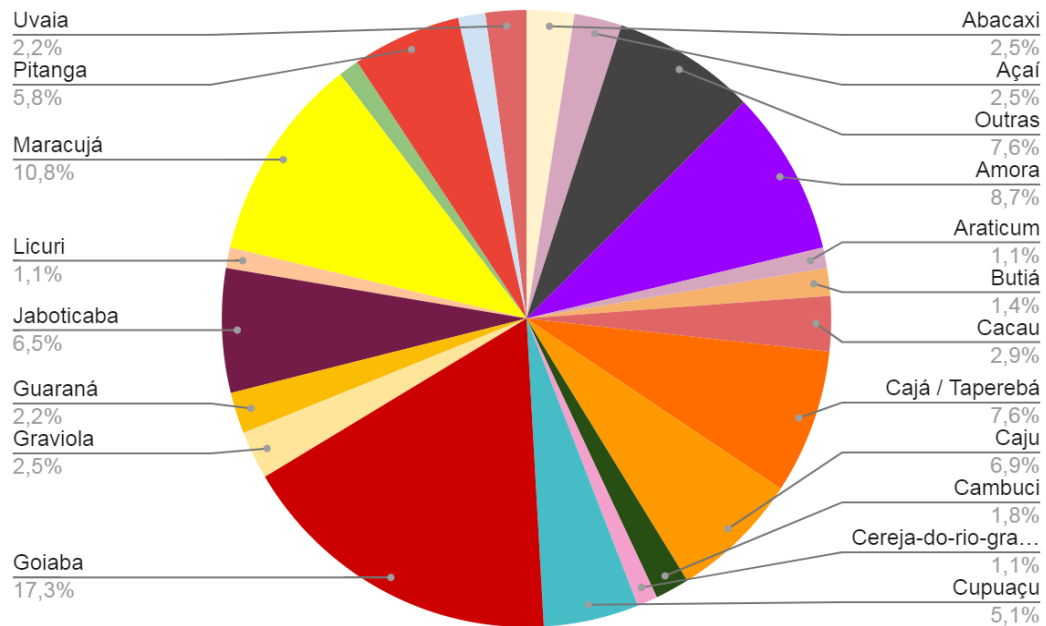
**Graph 1** – Distribution by region of Brazil of craft beers with native fruits



Source: Own preparation

The most common native fruits found were guava (*Psidium guajava*) (17,3 %) and passion fruit (*Passiflora alata*; *P. cincinnata*; *P. edulis*; *P. setacea*) (10,8 %). In addition to them, blackberry (*Rubus brasiliensis*) (8,7 %), cajá (*Spondias monbim*) (7,6 %), cashew (*Anacardium occidentale*) (6,9 %), jaboticaba (*Plinia cauliflora*) (6,5 %) and surinam cherry (*Eugenia uniflora*) (5,8 %) also stood out. It was observed that some fruits were identified in only one formulation, such as açai-juçara (*Euterpe edulis*), camu-camu (*Myrciaria dúbia*), camuru (*Campomanesia phaea*), goiaba-serrana (*Acca sellowiana*) and murici (*Byrsonima crassifolia*) while others appeared in just two formulations. The following are part of this group: araçá (*Psidium cattleianum*), bacuri (*Platonia insignis*), cagaita (*Eugenia dysenterica*), coquinho-azedo (*Butia capitata*), gabirola (*Campomanesia adamantium*), grumixama (*Eugenia brasiliensis*), guabirola (*Campomanesia xanthocarpa*) and mangaba (*Hancornia speciosa*). These two sets were grouped in the “Others” category in Chart 2 below, which shows the distribution of native fruits found in the formulations.

**Graph 2 – Native fruits in craft beer formulations in Brazil**



Source: Own preparation

The combination of guava (*Psidium guajava*) and passion fruit (*Passiflora alata*; *P. cincinnata*; *P. edulis*; *P. setacea*) was the most common in the formulations. It is often observed that these species have a better-structured production chain compared to less incorporated fruits, such as goiaba-serrana (*Acca sellowiana*) and camu-camu (*Myrciaria dúbia*), for example (CORADIN; CAMILLO, 2016; CORADIN; SIMINSKI; REIS, 2011). The structuring of the production chains of these native fruits, therefore, emerges as a significant element. Furthermore, both guava (*Psidium guajava*) and passion fruit (*Passiflora alata*; *P. cincinnata*; *P. edulis*; *P. setacea*) are fruits that occur in the five regions of Brazil (BRASIL, 2018).

The use of the other fruits most frequently found in the research – blackberry (*Rubus brasiliensis*), cajá (*Spondias monbim*), cashew (*Anacardium occidentale*), jaboticaba (*Plinia cauliflora*) and pitanga (*Eugenia uniflora*), also seems to be explained by the structuring of their production chains, as well as the extension of the region of its occurrence. For example, cashew (*Anacardium occidentale*) is cultivated on a large scale, with a good production structure, despite production being primarily located in the Brazilian Northeast (CORADIN; CAMILLO, 2016).

Jaboticaba (*Plinia cauliflora*) and blackberry (*Rubus brasiliensis*) are widely found throughout Brazilian regions (BRASIL, 2018). Still from this group, cajá (*Spondias monbim*) and pitanga (*Eugenia uniflora*) do not have large production scales, however, they are widely



found in the form of pulp in local markets, making their minimally processed forms easily accessible (CORADIN; SIMINSKI; REIS, 2011).

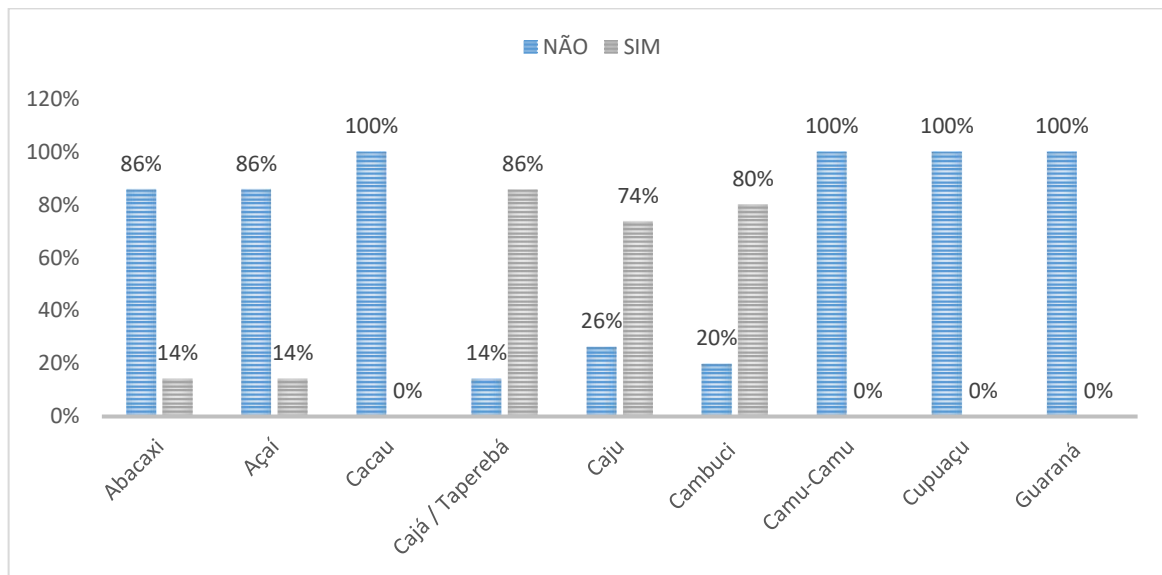
Another important element identified in the research was the constant partnership between farmers, generally through institutions, and breweries. The case of *Experimento Beer* illustrates the point well. The brewery partnered with the Family Agricultural Cooperative of Canudos, Uauá, and Curaçá (Coopercuc) and with the Production and Commercialization Cooperative of Agroextractivist Family Farmers and Artisanal Fishermen of the Municipality of Esperantina (Cooaf-Bico), to produce beers with umbu (*Spondias tuberosa*) and murici (*Byrsonima crassifolia*), respectively (DIAS, 2015). Another example is the Micro X brewery and the Auá Institute partnership that resulted in the development of the Tropicalista beer made with uvaia and grumixama (TERUYA, 2017). In these cases, the partnership is essential for access to fruit in sufficient quantity to manufacture the products.

If, on the one hand, the successful insertion of native fruits seems to be linked to the structuring of the production and commercialization chain, on the other hand, the lack of insertion of others seems to be related to the disruption. This is the case, for example, of the açai-juçara fruit (*Euterpe edulis*), found in only one formulation. Açai-juçara (*Euterpe edulis*) is the fruit of the juçara palm tree from which the heart of palm is commercially exploited, the extraction of which causes the plant to be cut down, which has been causing the risk of extinction of the species in Brazil (CORADIN; SIMINSKI; REIS, 2011; KÖHLER; BRACK, 2016). Added to the decline of the species and the commercial preference for palm hearts over fruits, the production of açai-juçara (*Euterpe edulis*) is small in the country. Only recently has there been mobilization in the fruit chain, mainly in pulp production, through the Juçara Network, which sees fruit management as a sustainable opportunity for commercializing the species (COSSIO, 2010; RAMOS; LONGHI; MARTINS, 2019). Therefore, access to fruit appears quite restricted, which seems to impact the low number of fruit insertions in craft beers.

Another relevant element in the analysis of native fruit consumption is the proximity relationship between production and consumption regions. When comparing the variables of the region where the native fruits used in the formulations occur and the region where the beer was produced, it is observed that 82% of the breweries used native fruits from their respective region, while only 18% did not. This data reinforces the idea that native fruits make up local marketing circles, indicating that craft breweries are part of local markets and can strengthen them, even if exceptions exist.

Among the 34 varieties of native fruits identified in the research, 9 of them (26.5%) were used in production outside their regions of occurrence. This scenario is illustrated in Graph 3, presenting the “Yes” column that represents the percentage of local insertions in beer formulations, while the “No” column indicates the opposite.

**Graph 3** – Native fruits not included locally in craft beers in Brazil<sup>5</sup>



Source: Own preparation

It is noteworthy in Graph 3 that cocoa (*Theobroma cacao*), cupuaçu (*Theobroma grandiflorum*), camu-camu (*Myrciaria dúbia*) and guarana (*Paullinia cupana*)<sup>5</sup> were not used locally in any of the formulations. Another curious fact is that açaí (*Euterpe oleracea*) and abacaxi (*Ananas comosus*) were used 86% of the time outside their regions of occurrence. This seems to be related to the fact that these fruits are among the eight domesticated native Brazilian species that have consolidated production chains in the country, differing from the general reality of native fruits (CORADIN; CAMILLO, 2018). Camu-camu (*Myrciaria dúbia*) appears to be an isolated case since the plant has not yet been domesticated in Brazil (CORADIN; CAMILLO, 2018), and no data was found on partnerships to access this fruit.

Although cashew (*Anacardium occidentale*) and cajá (*Spondias monbim*) appear in Graph 3, they present a reality opposite to the other fruits in this list, as, in the majority, 74% and 86% of cases, respectively, these fruits were used locally. The duo was also the second

<sup>5</sup> Color translation: Blue - No; Gray - Yes. The fruits below are presented in the table above with their scientific names.

most found combination in the formulations. The respective scales of production of these fruits in the Brazilian Northeast, and their importance in local cultural habits seem to explain the fact (CORADIN; CAMILLO, 2018).

In addition to native fruits, the inclusion of other products listed in the ordinance (BRASIL, 2018), was observed, such as: yerba mate (*Ilex paraguariensis*), aroeira-pimenteira/pimenta rosa (*Schinus terebinthifolius*), baru (*Dipteryx alata*), Brazil nut (*Bertholletia excelsa*), jambu (*Acmella oleracea*), mandioca (*Manihot esculenta*), ora-pro-nóbis (*Pereskia aculeata*) and urucum (*Bixa orellana*). Craft beers with spices and edible flowers were also found, as well as other ingredients native to unlisted Brazilian biomes, such as cumaru and cerrado vanilla.

These data inform the growing interest in Brazilian socio-biodiversity and the trend towards using local ingredients in the formulation of craft beers in the country (GEWEHR, 2019). From this relationship, the idea is reinforced that craft beers seek, through local ingredients, a relationship with the culture of the territories, thus becoming a possible market for native fruits.

## Discussion

Brazilian legislation defines beer as being obtained through the fermentation of malted barley wort or malt and hop extract (BRASIL, 2019). Beer is considered a source of nutrients and soluble fiber, as it contains important B vitamins, polyphenols, phosphates, organic acids, and nucleic acids (VENTURINI, 2005). Furthermore, it contains natural antioxidants from malt, hops, and folic acid. Studies indicate that, if ingested in moderation, it can help reduce Parkinson's disease, prevent cardiovascular diseases, and inhibit harmful bacteria and protozoa in the intestinal tract (MORADO, 2009).

The addition of fruits to the beer formulation can add bioactive potential to the product. An experiment with blueberry beer observed that the addition of the fruit in the form of an extract and nature increased the amount of polyphenols in the beer, a characteristic bioactive property of the fruit. Therefore, the study indicates that there is a nutritional increase. Although changes in sensory characteristics, such as color, flavor, and aroma, vary depending on the fruit, their addition is noticed by consumers in beers (HOLLAS; GEREMIAS, 2020) and is accepted in sensory analysis tests (ROSA *et al.*, 2017; SOARES *et al.*, 2019). Thus, the use of native fruits can represent sensory and nutritional gains without compromising the quality attributes of the beer (ROSA *et al.*, 2017; SOARES *et al.*, 2019).

Based on this, it is understood that the use of native fruits provides improvements in the quality of products, considering the nutritional potential of these species. Data from the BFN project confirmed that many native fruits have higher amounts of vitamins than conventional fruits. Buriti, for example, has almost twice as much vitamin A compared to carrots, with 1204 and 663 units of vitamin A per 100g of pulp, respectively (CORADIN; CAMILO, 2018).

Another example is related to the amount of vitamin C. Native fruits identified in the research, such as cagaita (*Eugenia dysenterica*) and gabirola (*Campomanesia adamantium*) have more than double the amount compared to oranges. Cagaita (*Eugenia dysenterica*) contains 288 units of vitamin C per 100g of pulp, gabirola (*Campomanesia adamantium*), has 420 units, and orange contains only 53 units. Camu-camu (*Myrciaria dúbia*), another species found in the research, also has significant amounts of vitamin C, reaching 6000 units in 100g of pulp (CORADIN; CAMILLO, 2018).

But, in addition to the nutritional increase, one of the central arguments of this article is that the use of these fruits in craft breweries encourages their production and commercialization. The use creates a market for these neglected species, which, in many cases, are immersed in close relationships. This local market encourages and better remunerates farmers and collaborates with the sustainable development of territories and logic of organic, extractive, and small-scale production (PREISS; SCHNEIDER, 2020).

Considering that native fruit production chains in Brazil are still under construction (COSSIO, 2010) and their main challenge is the distance between consumers and farmers (CETAP, 2015), access to differentiated markets seems fundamental to strengthening these products.

Furthermore, formulations with native fruits generate propaganda about the species. This is because contact with the fruits' name, shape, and taste can often be the gateway for consumers to these species. In this case, the consumption of a craft beer with a certain native fruit can encourage the interest and consumption of other local native fruits in their fresh forms. Therefore, another argument of this article is that craft beers can promote and value these species.

Encouraging the consumption of native fruits is extremely relevant when looking at the Brazilian situation of Food and Nutritional Insecurity (HOFFMANN, 2021). Although Brazil has around 20% of the world's biodiversity in the country, the economic and nutritional potential of these native species is neglected, resulting in a diet with low diversification in the

country (CORADIN; CAMILLO, 2018). At the same time, there is a high number of food and nutritional insecurity in the country (HOFFMANN, 2021).

The contemporary agri-food system has caused a significant environmental impact, overloading natural resources and contributing to the extinction of native species and the loss of traditional knowledge. At the same time, while malnutrition and global hunger are growing due to the lack of adequate access to food, there is also an excessive consumption of foods with low nutritional content (FAO, 2019; HLPE, 2020). This dynamic has been causing a global Syndemic of obesity, malnutrition, and climate change (SWINBURN *et al.*, 2019). From this perspective, in addition to individual assessment, the current food system produces an environment of Food and Nutritional Insecurity in the territories.

To reverse this situation, the publication of the High-Level Panel of Experts on Food Security And Nutrition (2020) indicates the diversification of food and appreciation of native species. A recent publication by the Food and Agriculture Organization of The United Nations (2019) corroborates this proposal and highlights these elements as fundamental to sustainable food systems, contributing to the Food and Nutritional Security of countries. Additionally, family farming and establishing local markets, which promote proximity between consumers and producers, are equally relevant factors in reversing the Global Syndemic (PREISS; SCHNEIDER, 2020; SWINBURN *et al.*, 2019).

Based on the above, it is understood that the collaborative role of craft beers in promoting species is aligned with the recommendations of publications from the Food and Agriculture Organization of The United Nations (2019) and the High-Level Panel of Experts on Food Security And Nutrition (2020). This is because native species of Brazilian biomes play a significant role at the local level in several regions, involving local production chains, family farmers, extractive practices, organic production, and sustainable models (KÖHLER; BRACK, 2016). Furthermore, using these products positively impacts the health of consumers and producers while stimulating the preservation of native biodiversity (CETAP, 2015).

Another relevant aspect is the observation that, in the production of craft beer in Brazil, the majority of inputs used are imported (GEWEHR, 2019). Malt production shows little diversification, being absorbed mainly by large companies (KROHN, 2018), and hop production is limited in the national context (MARCUSO; MULLER, 2019). From this perspective, native fruits present themselves as an alternative for craft beer producers to incorporate elements of Brazilian food culture into their drinks (GEWEHR, 2019). However, access to these species is a challenge. Despite the diversity of fruits identified in the research,

those most frequently used in formulations are those with more structured production chains, which does not reflect the reality of most of these species (CORADIN; CAMILLO, 2018).

Another challenge associated with the use of native fruits is the capital barriers that have been emerging around these products. The use of these species is becoming a trend in food. Gourmetization, which results in elite products, has highlighted native fruits, imposing high prices for these items (ZANETI, 2017). At the same time, craft beer is still considered an elite product (GIORGI, 2015; GEWEHR; ZANETI, 2019). The price of this type of beer is higher compared to mass beers, which are distinguished by more competitive prices in the Brazilian market (GEWEHR, 2019).

An extensive study of Brazilian consumers indicated that 35% of the population has never tried craft beer and that the majority are not frequent consumers of the drink (FRANKENTHAL, 2018). Other research indicates that consumption of the drink in the country is more frequent among social groups with greater purchasing power (VALADARES *et al.*, 2017). However, craft beers with native fruits can endorse a market niche in which the inclusion of native fruits is justified by adding value to products and not by valuing local products and producers.

However, in the same research, it was identified that the biggest motivation for consuming craft beers is the flavor. Furthermore, 77% of consumers believe that the difference in flavor between mass and craft beers is noticeable (FRANKENTHAL, 2018). These impressions were confirmed in a sensory analysis study, indicating that craft beers have a greater intensity of color, aroma, and flavor when compared to Brazilian mass beers. Furthermore, the differentiated manufacturing process of craft beers implies higher production costs, which may partly justify their high price and superior sensory result (GEWEHR, 2019).

This argument supports the idea that the craft beer sector is looking for sensory diversification to break away from food monotony. In this trajectory, native ingredients stand out not only for their added value driven by the gourmetization trend but also for their quality, the appreciation of farmers, and their contribution to sustainable development in the territories.

## **Final considerations**

The most frequently used native fruits are those that have a better-structured production chain and a wide occurrence in Brazilian regions. However, the supply and access of these native fruits represent challenges for their insertion. Partnerships between local producers and breweries were fundamental to insertion, promoting exchanges on the use of fruits and supplying sufficient quantities for production. The minimally processed form of these fruits is another alternative to the obstacle. However, it is worth highlighting that the leading role in managing and commercializing native fruits must remain linked to family farmers, with management that contributes to Sustainable Food Systems.

Native ingredients are highlighted in the craft beer sector not only because of the gourmet trend but also because of the quality of these ingredients and their contribution to local development. Furthermore, craft breweries are part of local markets since the insertion of native fruits occurred, for the most part, locally. Thus, the sector constitutes a market for native fruit farmers, encouraging their production and extraction and promoting the conservation of these species through their use. Therefore, even in the face of the existence of elite environments, whose presence can prevent craft beer from reaching a wider audience, there is evidence that craft beers can play a role in promoting sustainable development in territories.

It is argued that craft beers contribute to strategies for valuing and strengthening native fruits, encouraging their consumption, and playing an educational role in relation to them. Therefore, this insertion seems to be related to strategies for Food and Nutritional Security, contributing to the structuring of native fruit chains and their valuation among consumers.

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