Article

The Non-alcoholic fruit beverage Market through Patent Prospecting

Italo Emmanoel Mesquita Oliveira de Moura [1,4] *, Elaine Aparecida da Silva [2,4], José Machado Moita Neto [3,4]

[1] Production Engineering Department, Technology Center, Federal University of Piauí, Teresina - PI, 64049-550, Brazil
[2] Department of Water Resources, Geotechnics and Environmental Sanitation, Technology Center, Federal University of Piauí, Teresina - PI, 64049-550, Brazil; elaine@ufpi.edu.br (E.A.S)
[3] Federal University of the Parnaíba Delta, Parnaíba - PI, 64202-020, Brazil; jose.machado.moita.neto@gmail.com (J.M.M.N)
[4] PhD in Development and Environment (PRODEMA), Federal University of Piauí, Teresina - PI, 64049-550, Brazil
* Correspondence: italoo.mooura@gmail.com (I.E.M.O.M); Tel.: +558694941120

Abstract: Non-alcoholic fruit beverages hold significant importance in the fruit processing chain. This article aimed to conduct a technological prospective study, through patents, in this specific beverage area. Patents were searched in the online databases of INPI (Brazil) and EPO (Europe), using keywords, the internation classification number, and filing dates. A total of 80 patents were retrieved, excluding duplicates and out of scope ones. The year 2020 witnessed the highest number of filings, followed by a decrease in subsequent years. Japan held 46% of the patents considered in this study, while Brazil accounted for 26%. Overall, the primary filers are from the industry, while 48% of Brazilian patents had educational and research institutions as filers. Lemon, orange, and grapefruit were the most cited fruits in the analyzed documents, indicating a wide participation of tropical fruits in beverage production. Despite Brazil being one of the world's largest fruit producers, Japan leads in innovations related to fruit beverages. Brazil needs to improve its innovation ecosystem to encourage domestic companies, achieve greater competitiveness in international trade, and add higher value to its traded goods.

Keywords: agriculture; fruit processing; fruit growing; innovation; beverage market; intellectual property

Citation: Italo Emmanoel Mesquita Oliveira de Moura, Elaine Aparecida da Silva, José Machado Moita Neto. 2024. The Non-Alcoholic fruit beverage Market through Patent Prospecting. *Trends in Intellectual Property Research 2*,19-25.
https://doi.org/10.69971/tipr.1.2.2023.8

1. Introduction

The consumption of food and beverages outside home is a global trend driven by daily activities, often carried out away from the residence. According to research from the National Food Survey, between 2008-2009 and 2017-201 in Brazil, these meals saw a significant participation of ultra-processed foods, alongside a decline in soft drink consumption. Notably, 27.6% of the Brazilian food and beverage industry's sales in the domestic market cater to foodservice establishments or businesses (Brazilian Association of the Food Industry – ABIA 2024). This can favor strategies to promote healthier beverages, such as juices, and even the fruits that make up their composition (Domene 2021).

In this context, the diverse lifestyles of consumers and market niches pose challenges for the beverage industry, such as the pursuit of healthier products (with less sugar and additives), functional, practical (for a busy routine), and of higher quality. Furthermore, the use of packaging with reduced negative environmental impacts and the adoption of socio-environmentally sustainable production processes are aspects demanded of companies. These factors encourage industries to invest in the development and improvement of products, allowing them to maintain competitiveness, which can be monitored through patent registration.

All products involving public health risks, such as beverages, are regulated by the Ministry of Agriculture and Livestock (MAPA) and the National Health Surveillance Agency (ANVISA) in Brazilian territory, as established by Federal Law No. 6,360/1976 in Article 1st. More specifically, Federal Law No. 8,918/1994 defines (Article 2nd) MAPA's competence as the registration, standardization, classification, inspection, and oversight of the production and trade of raw agricultural products, products of animal origin, beverages, and vinegar. Beverages are defined in the national legislation as any product of plant origin, which is industrialized, intended for human consumption in a liquid state and does not have medicinal or therapeutic purposes. Also included in this definition are frozen fruit pulps, syrups, soda, beverage preparations, and alcoholic distillates of animal origin. These products are classified by type and subtype and can be non-alcoholic (with subtypes fermented and non-fermented)

and alcoholic (with subtypes fermented, distilled, rectified, and by mixture) (Brazil 2009). Non-alcoholic, non-fermented beverages derived from fruits, that are described in legislation, are presented in Table 1.

Table 1. Non-alcoholic beverages definition in the Brazilian legislation.

Beverage	Definition
Juice	Non-fermented, non-concentrated and undiluted beverage, intended for consumption, obtained from ripe and sound fruit, or part of the vegetable of origin.
Fruit Pulp	Non-fermented, non-concentrated product obtained from pulpy fruit, through an adequate technological process, meeting the minimum content of solids in suspension.
Coconut Water	Beverage obtained from the liquid portion of the coconut fruit (Cocus nucifera) not diluted and non-fermented, extracted and preserved by an adequate technological process.
Nectar	Non-fermented beverage obtained by diluting the edible portion of the vegetable or its extract in potable water, with the addition of sugars, intended for direct consumption.
Fruit or Vegetable Beverage or Refreshment (Refresco)	Non-fermented beverage obtained by diluting in potable water the juice of fruit, pulp, or vegetable extract of its origin, with or without the addition of sugars.
Soft Drink	Carbonated beverage obtained by dissolving in potable water juice or vegetable extract of its origin, with the addition of sugar.
Soda	Potable water carbonated with carbon dioxide, with a pressure exceeding two atmospheres at twenty degrees Celsius and may be added to mineral salts.
Quinine Tonic Water	The soft drink that contains, obligatorily, from three to seven milligrams of quinine or its salts, expressed in anhydrous quinine, per one hundred milliliters of beverage.
Syrup	Non-carbonated product obtained by dissolving in potable water fruit juice, pulp, or part of the vegetable and sugar, in a minimum concentration of fifty-two percent of sugars, by weight, at twenty degrees Celsius.
Liquid or Concentrated Liquid Preparation for Soft Drink	Product containing juice, pulp, or vegetable extract of its origin, added to potable water for consumption, with or without sugars.
Liquid or Concentrated Liquid Preparation for refreshment (Refresco)	Product containing juice or vegetable extract of its origin, added to potable water for consumption, with or without sugars.
Solid Preparation for Soft Drink	Product based on juice or vegetable extract of its origin and sugars, intended for the preparation of a beverage for consumption, after dilution in potable water, and may be added to a non-caloric or hypocaloric sweetener.
Ready-to-drink Tea	Beverage obtained by maceration, infusion, or percolation of leaves and buds of various species of tea of the genus Thea (Thea sinensis and others), of leaves, stems, petioles, and peduncles of yerba mate of the species llex paraguariensis or other vegetables and may be added to other substances of plant origin and sugars.
Beverage of Fruit, Pulp, or Vegetable Extract	Beverage obtained by mixing juices, pulps, or vegetable extracts, together or separately, with a product of animal origin, having a predominance in its composition of a product of plant origin, with or without the addition of sugars.
Guarana Extract	Product resulting from the extraction of the active principles of the guarana seed (genus Paullinia), with or without husk, observing the limits of its concentration.

Source: Brazil (2009).

The products listed in Table 1 must comply with all applicable regulations for this type of product, as well as health surveillance rules. However, other unregulated items participate in this market, such as Smoothies and Açai. According to data from the Brazilian Association of the Soft Drink and Non-Alcoholic Beverage Industries (ABIR 2022), the non-alcoholic beverage sector has grown in Brazil in recent years, both in per capita consumption and production volume. Considering the years of 2019, 2020, and 2021, for which data are available, per capita consumption of non-alcoholic beverage in liters/inhabitant/year was 152.8, 151.95, and 154.05, respectively, while national production volume was 32,112,711 thousand liters in 2019, 32,176,706 thousand liters in 2020, and 32,861,950 thousand liters in 2021 (ABIR 2022).

The Brazilian food and beverage market represents 10.8% of the Gross Domestic Product, dedicates 73% of its production to the domestic market, and processes 60.9% of what is cultivated by agribusiness. Regarding beverages, orange juice stands out, as

the country is the world's largest producer and exporter (ABIA 2024). This market is estimated to grow globally by 5.83% until 2030, with low participation of organic products (35%) and Asia as the world region with the largest increase in consumption (Exactitude Consultancy 2024).

This article addresses the market for non-alcoholic fruit beverages, of the non-fermented subtype, which encompasses a set of beverages that participate in the fruit processing stage and whose products compete with each other. The objective was to conduct a technological prospective study, at the national and international level, of the innovations registered in patents in the non-alcoholic fruit beverage sector.

2. Method

Initially, Brazilian beverage legislation (laws, decrees, and standards) was reviewed to understand what beverages are, their classification, the mandatory regulations for producers, and how they are inserted in the national market. Based on this, non-alcoholic beverages obtained from fruits were chosen as the subject of this study, due to their direct relation to the local context of the researchers and Brazil's prominence in fruit production.

Subsequently, a prospective study was conducted to understand the technological innovation landscape of the Brazilian non-alcoholic fruit beverage market. This stage was carried out through patent searches in the online databases of the National Institute of Industrial Property (INPI) and the European Patent Office (EPO) (Espacenet®). The choice of INPI's database was due to its status as the official institution responsible for the Brazilian system for granting and guaranteeing intellectual property rights. EPO's database was chosen for its comprehensiveness, containing information on patents from various countries, allowing access to a global collection.

Twelve searches were conducted in INPI's database, using the fields "keyword: title" or "keyword: abstract" with " International Patent Classification (IPC) Classification" (A23L*) and "filing date" (2020 to 2024). The keywords were selected based on the definition of non-alcoholic and non-fermented beverages from Federal Decree No. 6,871/2009, which regulated the Beverage Law (Federal Law No. 8,918/1994). For this study, the words fruit pulp, juice, nectar, refreshment (Refresco), solid preparation for soft drink, and soft drink were considered, as these are the beverages that make up the market of interest to the research. The results obtained from the recovery in the database are presented in Table 1. Fifty-three processes were identified, which after excluding duplicate patents and those outside the research scope, and 21 patents were considered in this study.

Table 2. Number of patents obtained from the INPI search.

Keyword	Search field		Results
	Title	Abstract	
“Polpa de fruta”	X		1
“Polpa de fruta”		X	4
Suco	X		10
Suco		X	29
Néctar	X		0
Néctar		X	0
Refresco	X		0
Refresco		X	0
Preparado sólido	X		1
Preparado sólido		X	0
Refrigerante	X		2
Refrigerante		X	3

Source: Adapted from INPI's database.

Four searches were conducted in EPO's database, using the fields "keyword(s) in title or abstract", "publication date" (2020 to 2024), and "International Patent Classification (IPC)" (A23L2/00 for non-alcoholic beverages, dry or concentrated compositions therefor and their preparation). Using the keyword "Fruit Pulp" and the other filters mentioned, the result obtained was 4 processes; for "Juice" it was 78 processes; for "Nectar" 0 processes; and for "Soft drink" or "Refreshment" 4 processes. Thus, the total was 85 patents, which after excluding duplicates and those outside the scope were considered 59 patents in this study.

From the retrieved patents (totaling 80), during the first half of July 2024, data related to filing year, country of origin, inventors, filers, and IPC code were extracted. Furthermore, the filers were classified by their sector of origin, namely industry, education and research, and independent inventor. The methodology of this work was based on the study by Santos et al. (2021), which conducted a technological prospecting of fruit beverages of the fermented and alcoholic type.

3. Results and Discussion

For the period considered in this study (2020 to 2024), the number of patents filed per year is presented in Figure 1. This information allows us to identify whether there was an evolution or retraction in patent filing in the sector under study.

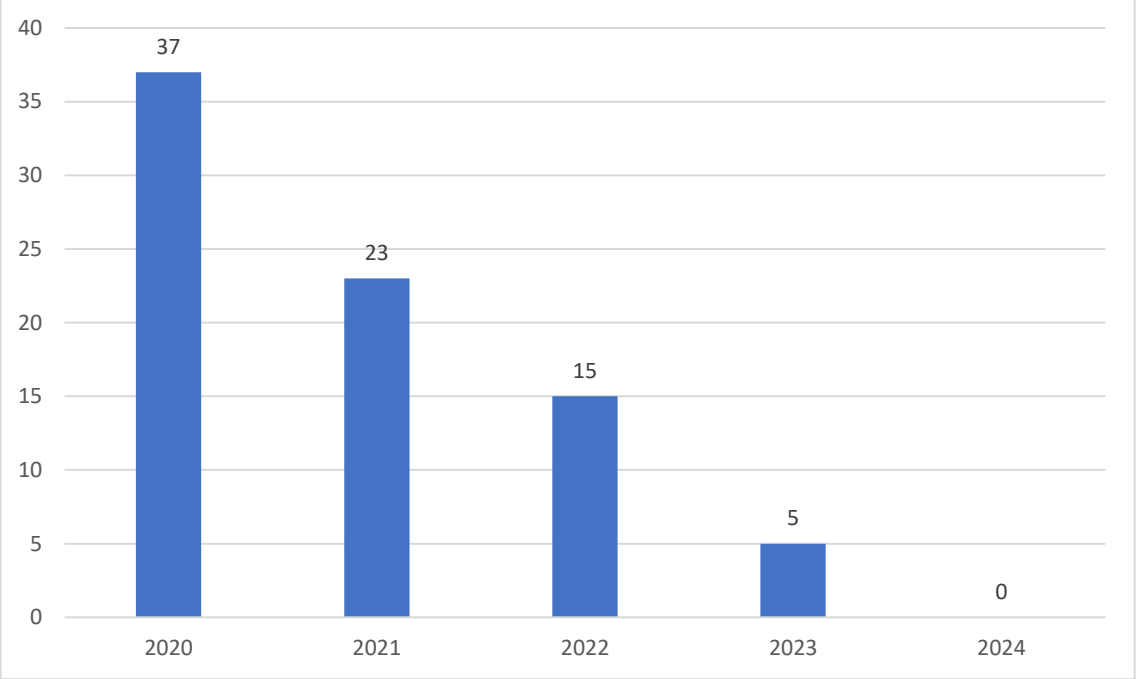

Figure 1. Number of patents filed per year **(**Adapted from INPI (2024) and EPO (2024).

Despite 2020 being marked by the Coronavirus Pandemic worldwide, this was the year with the highest number of patents filed in the area of non-alcoholic fruit beverages. It relates to the research period from to the patents filed in 2020 was developed in the period prior to the start of the pandemic. However, in the following years, there was a significant reduction, which may have been affected by the effects of the pandemic, such as the industry supply chains disruption and the research unfeasibility in companies, universities, and research institutes due to social isolation. In the entire studied period, 39% of the patents were filed only in 2020. Considering a general and global context, according to WIPO (2023), patent applications were affected by the COVID-19 Pandemic, leading to a reduction in patent applications in 2020, but rebounding in the following years.

Considering only Brazilian patents, the number filed in the years 2020, 2021, and 2022 remained with low variation, with 8, 6, and 7 patents respectively. Despite this, there was a sharp drop in 2023 to no patents. The most recent patent, registered in 2022, (BR 10 2022 017404 0 A2) addressed a Kombucha beverage with Bocaiuva flavor, where the inventors were Fabiane La Flor Ziegler Sanches and Mariana Falaschi, filed by the Federal University of Mato Grosso do Sul (Sanches Falaschi 2022). It is noteworthy that for the period under study, the data for 2024 has coverage from January to July, which may represent an apparent drop in patent registration.

The oldest patent in this study was registered in Japan (JP2021114920 (A)) on January 23rd, 2020, whose inventors were Shibata Yusuke and Nagayama Yui, filed by the company Asahi Soft Drinks Co Ltd. This patent describes a beverage based on soft fruit juice (1-80%) with the flavor enhancer Ethyl Hexanoate (0.0001-100 ppb.) (Yusuke and Yui 2020). In turn, the oldest patent in this study, under Brazilian ownership, was BR 20 2020 002434 0 U2, filed on February 5, 2020, whose independent inventor was Laís Aparecida Baldasso from São Paulo. The aforementioned patent described a ready-to-drink yacon potato juice flavored with fruit or spice flavors (Baldasso 2020).

It was possible to verify that the main countries holding patents for non-alcoholic fruit beverages are Japan, Brazil, China, and the Philippines, as shown in Figure 2. These three countries represent 89% of the total patent documents considered in this article. It is noteworthy that 37 patents are under Japanese ownership (46%), while only 21 patents are from Brazil and represent 26% of the total. In turn, the countries with the lowest patent ownership are Australia, the Republic of Moldova, Slovakia, Russia, EPO (Europe), and WIPO, whose representativeness was only 11%.

Globally, in 2022, the countries with the highest number of patents obtained were China (798,347 patents), the United States (323,410), Japan (201,420), the Republic of Korea (135,180), and EPO (81,086), which has not changed since 2020. However, offices in Brazil (-12.4%), Canada (-20.1%), and EPO (-25.5%) issued significantly fewer patents in 2022 than in 2021. As demonstrated in Figure 2, Asian countries are the ones with the most registered patents and this region was responsible for 67.9% of patent applications worldwide. In the context of this study, Brazil is present, occupying an important position in the registration of fruit beverage patents, related to its agriculture-oriented economy, in a scenario where only 1.6% of patent applications are from Latin America and the Caribbean (WIPO 2023).

The most innovative patent codes for the beverage sector are A23L27/00, A23F3/16, A23L2/60, and A23L2/54. For A23L27/00 and A23F3/16, fruit juice can be used as a flavoring agent for beverages, which the main composition is not the fruit itself. An example of this is iced tea and water, both flavored. For code A23L2/60, fruit juice can act as a natural sweetener, replacing synthetic sweeteners and ensuring the appeal of being a healthy beverage with no added sugar. For example, apple juice is widely used in the food industry for this purpose. Finally, code A23L2/54 encompasses products such as soft drinks and flavored carbonated water, which add gases to the beverage for a greater freshness sense for consumers.

Table 3. Description of the most repeated IPC Codes (Adapted from WIPO, INPI (2024).

IPC Code	Classification
A23L2/00	Non-alcoholic beverages, dry or concentrated compositions therefor and their preparation
A23L2/02	[...] Containing fruit or vegetable juices
A23L2/52	[...] Adding ingredients
A23L19/00	Products based on fruit or vegetables and their preparation or treatment
A23L27/00	Spices, flavoring or seasoning agents, artificial sweetening agents, table salts, dietary substitutes for salt, and their preparation or treatment
A23F3/16	Extraction of tea, tea extracts, treatment of tea extract, and preparation of instant tea
A23L2/04	Extraction of juices
A23L2/38	[...] Other non-alcoholic beverages
A23L2/60	Sweeteners
A23L2/54	[...] Mixing with gases

According to WIPO (2023), the areas with the most published patents were computer technology, electrical machines, measurement, medical technology, and digital communication, representing 33.4% of the global total. Among upper-middle-income countries, Brazil stands out in the area of special machines. It is possible to perceive that the food industry has little participation in patent registration in the general context, even when the consumer market demands more environmentally, economically, and socially sustainable products and processes. This should be present in the research and innovations of the sector in order to contribute, at least, to SDG 2 (zero hunger and sustainable agriculture), SDG 12 (responsible consumption and production), and SDG 15 (life on land).

The non-alcoholic fruit beverage industry faces challenges such as the use of natural resources and waste management in the fruit cultivation and beverage production stages, energy consumption in the distribution and use stages, and the improvement of its processes (Parajuli 2019). In addition, ensuring food quality and safety, meeting market niches (such as those with allergies to some ingredients in the composition), improving nutritional value, and reducing compounds that do not contribute to good health (such as sugar) are aspects that require a continuous improvement position in the management of companies in this sector.

Considering that the patents include fruits in their composition, Figure 7 shows the most cited fruits in the documents used in this research. It is noteworthy that the same document may consider various types of fruits, which might be appropriate invention.

Among the most cited fruits in the patents, it is possible to perceive a predominance of the tropical type, which are commonly found in Brazil. Of these, only Yuzu (citrus fruit similar to grapefruit) and Kabosu (citrus fruit similar to lemon) are from Asia, which contrasts with the fact that countries in this region are the largest holders of patents for fruit beverages.

China is the world's largest fruit producer, with production of 253.9 million tons in 2023, while Japan's productivity was only 3 million tons of fruit for the same period (FAO 2024). Both countries have industrialized economies, with China still having strong agricultural activity. Its imports and exports primarily involve fuels, machinery, and chemical products, with high added value, where agricultural products are part of China's exports (with a focus on rice) and Japan's imports. Operational aspects of the Japanese context, such as the low availability of arable land, make the fruits produced in the country high-value items in the domestic market (AICEP 2024a, 2024b).

In turn, Brazil is the third largest fruit producer in the world, with production of 39.8 million tons, and a primary exporting economy (FAO 2024). Although it has significant participation in foreign trade (with mango, melon, grapes, lemon, apple, watermelon, and papaya), Brazilian production is mainly intended for the domestic market (CNA 2024). On the other side, Philippines is the tenth largest producer worldwide, with 16.7 million tons (FAO, 2024), being a developing economy with low agricultural participation in GDP (AICEP 2024c).

In this scenario, it is possible to perceive that only Brazil has a predominantly primary economy comparing to the four countries with the highest number of patents in the studied area. Thus, the country trades commodities and fruits with low added value, resulting from its dependence on agriculture, whose focus is to serve the external consumer market. On the other hand, Asian countries (Japan, China, and the Philippines) cultivate/import the fruits used in beverage production, so as to market items with higher value, obtaining greater competitiveness in international trade. This justifies the fact that the fruits most cited in the patents are among those most exported by Brazil, but the country does not have patents registered by large national companies, such as Asahi and Ito from Japan.

In general, the patents covered juice preparations, flavored fruit beverages (different from a beverage directly from the fruit), and beverages with marketing appeals (healthier and more palatable). This demonstrates a shift in the positioning of companies to meet what is in high demand in the market, resulting from a time when there are greater dissemination of information and people have become more concerned about what they consume. It can be stated that the marketing around the main fruit beverages, such as pulps and juices, is mimicked by the market close to them (such as soft drinks, flavored beverages, and powdered preparations).

This action is part of nutritional marketing, which provides nutritional information about products to consumers to generate a connection between people and the brand (Silva 2014). Thus, companies present beverages, where fruits are present in a low percentage of the composition, with a strong appeal of practicality, functionality, and, mainly, health promotion, better flavor, quality of life, and natural composition. This represents the mimicry of the discourse that is socially in place around the consumption of

fruits and products derived from them. Aspects such as the lower addition of sugar and additives are also highlighted, although these are not already used in juices (100% fruit) and natural fruit pulps. This strategy can confuse the consumer, creating a false equivalence between products that are very different.

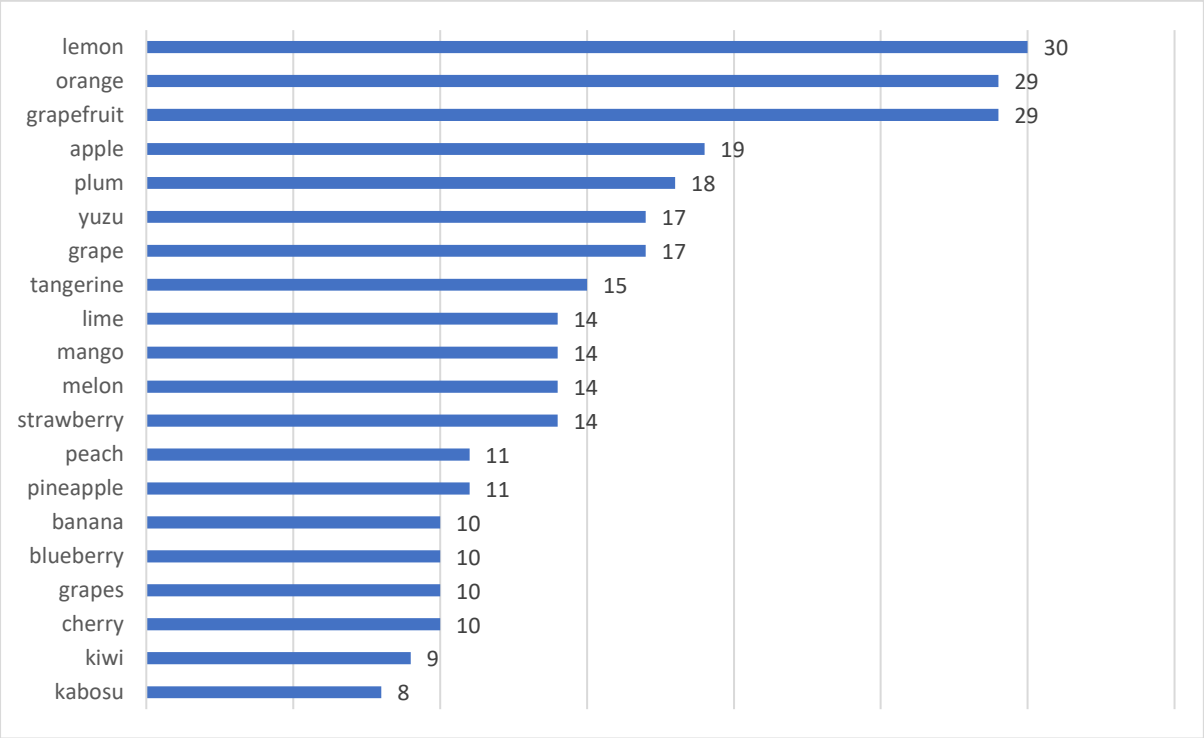

Figure 7. Ranking of the top twenty most used fruits in patents (Adapted from INPI (2024) and EPO (2024).

From the patents surveyed for this study, it is possible to perceive the sector interest in the functional food market, as it focused on the development of products with better nutritional properties. This demonstrates that the sector seeks to meet market trends through the development of food technologies, as well as acting in the marketing of its new products as a way to guarantee competitiveness and market share (Silva 2014).

4. Conclusions

From the data presented in this technological prospective study, it was possible to identify a reduction in the number of patents registered in the non-alcoholic fruit beverage sector after 2020, the year that marked the beginning of the coronavirus pandemic. In addition, it was identified that Asian countries lead the registration of patents in the area, while Brazil occupied second place in the ranking of the largest patent holders which is linked to its large fruit production. Inventors are dispersed, so that few of them have more than one patent in their name within the studied area. It was identified that even though Brazil is the third largest fruit producer and produces and exports a large part of the fruits cited in the patents, Japan was the country with the most innovations related to fruit beverages. In addition, it was noticed that patents from Japan are more linked to the industrial sector, while those from Brazil originate from research and teaching institutions. This demonstrates the need for the country to improve its innovation ecosystem and encourage R&D by national companies, as a way to achieve greater competitiveness in international trade. This has the potential to help overcome the primary exporting profile of the Brazilian economy, where adding value to traded items can increase the positive balance in negotiations. The non-alcoholic fruit beverage market is made up of several products, both regulated and unregulated, that compete with each other. Products that do not have fruits as their main item in the composition mimic the characteristics of those properly derived from fruits, seeking greater acceptance by consumers who seek healthier foods. This requires redoubled care from customers to ensure the purchase of truly healthy products with nutritional value within what they are seeking. For future research, it is recommended to include patents on regional beverages from the researchers' context, such as cajuína in Piauí, Guaraná Jesus in Maranhão, and Caju Soft Drink in Ceará. These beverages have participation in the market of their localities, making the companies responsible for them important local innovation players.

References

Agência para o Investimento e Comércio Externo de Portugal (AICEP). 2024a.Mercado: China. Available online:https://myaicep.portugalexporta.com/mercados-internacionais/cn/china?setorProduto=-1 (accessed on 31 July 2024).

Agência para o Investimento e Comércio Externo de Portugal (AICEP). 2024b. Mercado: Japão. Available online: https://myaicep.portugalexporta.com/mercados-internacionais/jp/japao?setorProduto=-1 (accessed on 31 July 2024).

Agência para o Investimento e Comércio Externo de Portugal (AICEP). 2024c. Mercado: Filipinas. Available online: https://myaicep.portugalexporta.com/mercados-internacionais/ph/filipinas?setorProduto=-1 (accessed on 31 July 2024).

Asahi Soft Drinks. 2024.Company. Available online: https://www.asahisoftdrinks.com/company/ (accessed on 31 July 2024).

Brazilian Association of the Food Industry (ABIA). 2024. Relatório anual 2024: Exercício 2023. Available online: https://www.abia.org.br/vsn/temp/RelatorioAnual2024_digital.pdf (accessed on 31 July 2024).
Brazilian Association of the Soft Drink and Non-Alcoholic Beverage Industries (ABIR). 2022. Dados: X – Todas as Bebidas Não Alcoólicas. Available online: https://abir.org.br/o-setor/dados/x-todas-as-bebidas-nao-alcoolicas (accessed on 31 July 2024).
Baldasso, Laís Aparecida. Suco de batata yacon saborizado. Depositor: Laís Aparecida Baldasso. BR 20 2020 002434 0 U2. Filling date February 5, 2020.
Brazil. 2009. Decreto nº 6.871, de 4 de junho de 2009. Diário Oficial da União, June 4, 2009. Available online: http://www.planalto.gov.br/ccivil_03/_Ato2007-2010/2009/Decreto/D6871.htm (accessed on 31 July 2024).
Brazil. 1976.Lei Federal nº 6.360 de 23 de setembro de 1976. Diário Oficial da União, September 24, 1976. Available online: http://www.planalto.gov.br/ccivil_03/leis/l6360.htm (accessed on 31 July 2024).
Brazil. 1994. Lei Federal nº 8.918 de 14 de julho de 1994. Diário Oficial da União, July 14, 1994. Available online: http://www.planalto.gov.br/ccivil_03/LEIS/L8918.htm (accessed on 31 July 2024).
Confederação da Agricultura e Pecuária do Brasil (CNA). 2024. Brazil is the world's third-largest fruit producer. Brazilian Farmers. Available online: https://brazilianfarmers.com/news/brazil-is-the-worlds-third-largest-fruit-producer/ (accessed on 31 July 2024).
Cruz, Brito. 2019. As 100 universidades brasileiras que mais publicam artigos científicos em revistas de circulação internacional: 2014-2018. Available online: https://ciencianarua.net/wp-content/uploads/2019/06/100-univ-inst-com-mais-artigos-2014-a-2018-BRASIL-corrigido-upe-20190614.pdf (accessed on 31 July 2024).
Silva, Erika Madeira Moreira. 2014. Estratégias e desafios para o desenvolvimento de novos produtos alimentícios. *Revista Brasileira de Pesquisa em Saúde* 16: 1-3. https://periodicos.ufes.br/rbps/article/view/12519.
Demir, Ezgi, Bican, Peter M. 2023.Patents and sustainable medical treatment in developing countries: lessons from COVID-19 vaccines. *Sustainability* 15: 3121. https://doi.org/10.3390/su15043121.
Domene, Semíramis Martins Álvares, Barata, Rita Barradas. 2021. National Food Surveys: diet and more. Revista de Saúde Pública, 55: 1s-2s. Available online: https://doi.org/10.11606/s15188787.2021055supl1ed (accessed on 31 July 2024).
European Patent Office (EPO). 2024. Spacenet: patent search. Available online: https://worldwide.espacenet.com/advancedSearch?locale=en_EP (accessed on 31 July 2024).
Exactitude Consultancy. 2024. Análise de mercado de alimentos e bebidas por natureza (orgânica, convencional), tipo (bebidas alcoólicas, bebidas não alcoólicas, produtos de grãos, laticínios, carnes, outros) e canal de distribuição (supermercados, hipermercados, comércio eletrônico, outros) e região, Tendências globais e previsões de 2024 a 2030. Available online: https://exactitudeconsultancy.com/pt/reports/35586/food-and-beverages-market/ (accessed on 31 July 2024).
Food and Agriculture Organization of the United Nations (FAO). 2024.Crops and livestock products: World fruit production (aggregated). Available online: https://www.fao.org/faostat/en/#data/QCL (accessed on 31 July 2024).
Brazilian Institute of Geography and Statistics (IBGE). 2024.Indicadores Brasileiros para os Objetivos de Desenvolvimento Sustentável. Available online: https://odsbrasil.gov.br/objetivo/objetivo?n=5 (accessed on 31 July 2024).
National Institute of Industrial Property (INPI). 2024. Consulta à Base de Dados do INPI: Base Patentes. Accessed June 20, 2024. Available online: https://busca.inpi.gov.br/pePI/jsp/patentes/PatenteSearchBasico.jsp (accessed on 31 July 2024).
Ito En. 2023.Corporate Profile. Available online: https://www.itoen-global.com/company/(accessed on 31 July 2024).
Mohamed, Maha Mohamed Alsebai, Liu Pingfeng, Nie Guihua. 2022. Causality between technological innovation and economic growth: Evidence from the economies of developing countries. *Sustainability* 14: 3586. https://doi.org/10.3390/su14063586.
Nguyen, Canh Phuc, Schinckus Christophe, Su Thanh Dinh. 2020. The drivers of economic complexity: International evidence from financial development and patents. *International Economics* 164: 140-150. https://doi.org/10.1016/j.inteco.2020.09.004 .
Pandey, Nimisha, Coninck, Heleen, Sagar Ambuj D. 2022. Beyond technology transfer: Innovation cooperation to advance sustainable development in developing countries. *WIREs Energy and Environment* 11: e422. https://doi.org/10.1002/wene.422.
Parajuli, Ranjan, Thoma Greg, Matlock Marty D. 2019. Environmental sustainability of fruit and vegetable production supply chains in the face of climate change: A review. *Science of the Total Environment* 650: 2863-2879. https://doi.org/10.1016/j.scitotenv.2018.10.019.
Sanches, Fabiane La Flor Ziegler; Falaschi, Mariana. Composição de kombucha sabor bocaiuva e seu método de desenvolvimento". Depositor: Universidade Federal do Mato Grosso do Sul. BR 10 2022 017404 0 A2. Filling date August 30, 2022.
Santos, Renata Torres dos Santos, Castro Clívia Danubia Pinho Costa, Rybka Ana Cecilia Poloni, Biasoto Aline Camarão Telles, Silva Flávio Luiz Honorato.2021. Estudo prospectivo de documentos de patentes relacionados à produção de bebidas alcoólicas fermentadas de frutas. *Cadernos de Prospecção* 14: 209-221. https://doi.org/10.9771/cp.v14i1.30515 .
World Intellectual Property Organization (WIPO), Instituto Nacional da Propriedade Industrial (INPI). 2024. Publicação IPC. Available online: http://ipc.inpi.gov.br/ (accessed on 31 July 2024).
World Intellectual Property Organization (WIPO). 2023.World Intellectual Property Indicators 2023. Geneva: WIPO. https://www.wipo.int/edocs/pubdocs/en/wipo-pub-941-2023-en-world-intellectual-property-indicators-2023.pdf (accessed on 31 July 2024).
Yusuke, Shibata, Yui Nagayama. 2020. Fruit juice-containing beverage. Depositor: Asahi Soft Drinks Co. Ltd. JP2021114920 (A). Filling date January 23, 2020.