

## Technological Mapping of Fermented Cocoa Honey Beverages Using Kefir Grains with Functional Effect

Isabela Lessa Sotero Gomes<sup>1\*</sup>, Carolina de Araújo Rolo<sup>1</sup>, Danielle Devequi Gomes Nunes<sup>1</sup>, Gabriele de Abreu Barreto<sup>1</sup>, Katharine Valéria Saraiva Hodel<sup>1</sup>, Leticia de Alencar Pereira Rodrigues<sup>1</sup>

<sup>1</sup>SENAI CIMATEC University; Salvador, Bahia, Brazil

**Cocoa honey is a mucilaginous and bittersweet byproduct of the chocolate industry. To increase its added value, producers and researchers have explored new applications such as fermented beverages. Water kefir grains, used in fermentation processes, exhibit functional potential due to the presence of probiotic microorganisms. This study mapped patents related to the production of functional beverages combining cocoa, honey, and kefir, using the Derwent Innovation Index (DII), accessed through Universidade SENAI CIMATEC in Salvador, Brazil. Results revealed a technological gap, with few patents combining these elements, indicating opportunities for research and development of new products. The proposal aligns with global trends in sustainable reuse of byproducts, offering a beverage with attractive organoleptic characteristics and health benefits.**

**Keywords:** Byproduct. Functional Beverage. Fermentation.

Cocoa honey is a mucilaginous, opaque yellow liquid with a bittersweet taste, extracted from the pulp surrounding cocoa beans by cold pressing before fermentation begins. Named for its viscous and sweet characteristics reminiscent of bee honey, cocoa honey is not derived from beekeeping [1]. Considered a byproduct of the chocolate industry, producers and researchers have been seeking alternatives to valorize cocoa honey due to its physicochemical properties that resemble the fruit's original pulp [2]. Typical uses include alcoholic beverages, syrups, jams, and liqueurs, with promising potential in the pharmaceutical and cosmetic industries [3].

Water kefir grains have historically been used as starter cultures in fermentation processes, adapting to various media [4]. These gelatinous, irregularly shaped grains contain lactic acid bacteria, yeasts, and acetic acid bacteria [5]. Fermented products made with kefir grains may exhibit functional effects due to the presence of probiotic microorganisms, which help balance

the gut microbiota and are associated with significant health improvements [6].

Given this context, the objective of this study was to map the patent landscape related to the production of functional fermented beverages using cocoa honey and kefir grains.

### Materials and Methods

The research used the Derwent Innovation Index (DII) patent database, accessed through a license granted to SENAI CIMATEC University in Salvador, Bahia, Brazil. The search employed the keywords "cocoa honey", "kefir grain", "fermentation", and "probiotic beverage", along with the boolean operators "AND" and "OR" to refine or broaden the search results. The search was conducted between February and March 2025 to identify technologies involving the production of fermented beverages from cocoa honey using kefir grains. Graphs for analysis were generated from DII data to identify countries of origin and publication dates of patents.

### Results and Discussion

Patent prospecting results (Table 1) show that although cocoa honey and kefir are individually used in beverage production, their specific combination remains underexplored. The search

Received on 18 March 2025; revised 31 May 2025.

Address for correspondence: Isabela Lessa Sotero Gomes. Universidade Federal do Recôncavo Baiano. Centenário, 697 - Sim. Zipcode: 44042-280. Feira de Santana, Bahia, Brazil. E-mail: isabela.l.gomes@ba.estudante.senai.br. Original extended abstract presented at SAPACT 2025.

using all terms ("Honey Cocoa AND Kefir grain AND Fermentation AND Probiotic beverage") yielded zero patent records, indicating an untapped niche with high innovation potential.

Other search strategies yielded varying levels of relevance. For instance, "Honey ADJ Cocoa AND probiotic OR beverage OR kefir" returned a significant number of entries (n=187,053), reflecting the broader use of individual or less-specific term combinations. However, more targeted searches, such as "Cocoa AND Kefir" (66 patents) and "Cocoa AND Kefir AND beverage" (22 patents), revealed a smaller number of patents, reinforcing that this specific application is still in its early stages globally. Therefore, the "Cocoa AND Kefir" strategy was selected for constructing analytical graphs to explore the technological landscape and trends.

Figure 1A shows that the United States (10 patents), China (9 patents), and the European Patent Office (6 patents) lead in patent filings, indicating a more established development environment for fermented functional beverages using cocoa honey. Brazil, with only one patent, is in an early stage of this field. Figure 1B reveals that the first patent in this domain was filed in 1973. However, interest in this technology has surged more recently, with publication peaks in 2016 (9 patents), 2021 (8 patents), and 2024 (7 patents). This trend reflects growing investment and interest in technologies for developing functional beverages using fermentable substrates, such as cocoa and honey.

## Conclusion

Patent analysis highlights the innovative potential of using water kefir grains to ferment cocoa honey in the development of functional beverages. The results demonstrate the technological and commercial feasibility of this approach, aligning with global trends in sustainability, the reuse of agro-industrial byproducts, and the demand for functional foods.

This strategy not only promotes more efficient use of natural resources but also adds value to regional ingredients, enabling the creation of products with unique sensory attributes and health benefits. The study highlights the significance of innovation in the food production chain, opening up new opportunities for developing sustainable, functional products in both national and international markets.

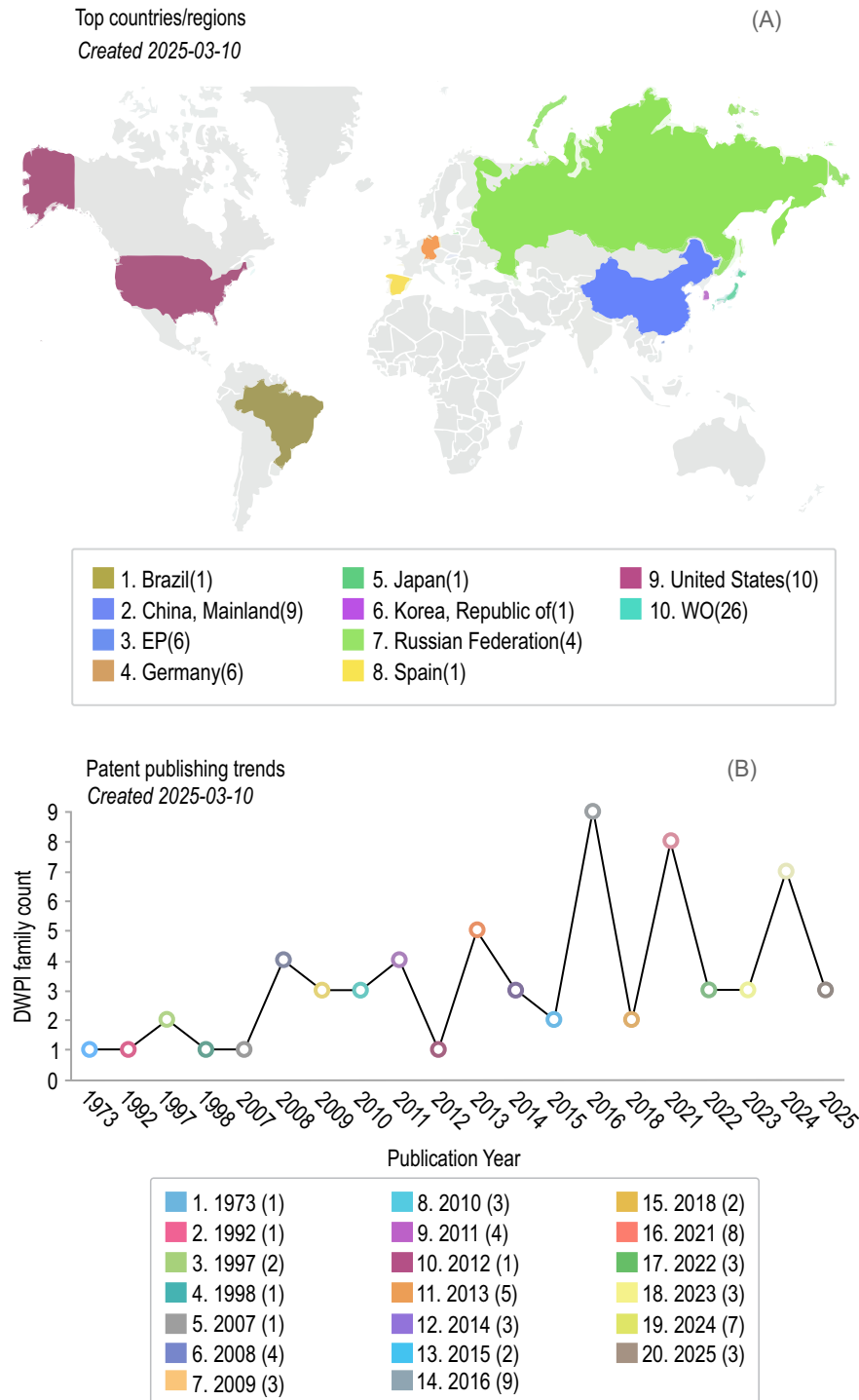
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**Table 1.** Patent search strategies and the number of records.

Search Strategy	Number of Patents
Honey Cocoa AND Kefir grain AND Fermentation AND Probiotic beverage	0
Honey ADJ Cocoa AND Beverage	4
Honey ADJ Cocoa AND Kefir	0
Honey ADJ Cocoa AND Probiotic OR Beverage OR Kefir	187,053
Honey ADJ Cocoa OR Probiotic AND Beverage	2,248
Cocoa AND Kefir	66
Cocoa AND Kefir AND Beverage	22

**Figure 1.** Countries and patent publishing dates.



Source: Derwent [x].

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