EFFECT OF COCONUT WATER FERMENTED WITH *BIFIDOBACTERIUM BIFIDUM* ON THE COMPOSITION OF THE HUMAN FECAL MICROBIOTA

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ABSTRACT

Probiotics are live microorganisms that, when administered in adequate amounts, provide health benefits to the host. Plant-based products have been studied in recent years as vehicles for these microorganisms. Since they are rich in bioactive compounds, they have good acceptability by consumers and are options for people who cannot or do not want to consume dairy products. Thus, coconut water can be a vehicle alternative for the consumption of probiotic microorganisms. Thus, the objective of the present work was to develop a probiotic vegetable drink from the fermentation of coconut water by the Bifidobacterium bifidum B-41410 strain. Coconut water was fermented without added sugar for 24 h at 37 ºC. A simulated in vitro digestion was conducted using fecal inoculum from healthy adult donors who had not consumed antibiotics, probiotics or prebiotics in the 3 months prior to collection. Aliquots of the fermented beverage, digested and after colonic fermentation, were removed for DNA extraction. Genetic sequencing was performed in order to obtain an answer about the effect of consuming probiotic coconut water. The main families found in the analyses were Lachnospiraceae, Acidaminococcaceae, Leuconostocaceae, Eubacteriaceae, Ruminococcaceae and Streptococcaceae.

Keywords: Coconut water. Probiotic. Simulated in vitro digestion. Colonic Fermentation. Genetic Sequencing.

1 INTRODUCTION

Functional foods are products that promote consumer health benefits by providing micronutrients with antioxidant power or probiotics and prebiotics[1,2]. In addition to being seen as a source of basic nutrients, functional foods have come to be recognized for promoting physical and mental well-being, even contributing to reducing health-related problems[3].

In the area of functional foods, the gut microbiota has been highlighted due to the health benefits it promotes. Thus, it is important to stimulate the selective growth of probiotic bacteria, thus reducing the number of pathogenic bacteria[4,5]. Probiotics are "live microorganisms, which, when administered in adequate doses, confer a health benefit to the consumer" [6,7]. However, for the probiotic to reach the intestine, the cells have to resist adverse conditions during the digestion process, such as pH and osmotic pressure[8,9].

Fruit juices, teas, vegetable drinks, coconut water and other beverages are refreshing and aromatic with high nutritional value and are generally well accepted by people of all ages. These beverages are rich in bioactive compounds, nutrients, vitamins, and sugars, which corroborates their viability as vehicles for probiotics. The absence of food allergens, as occurs in milk, makes plant-based beverages a viable alternative for people with intolerances to milk components, such as lactose intolerance[10].

Coconut water can be a food matrix alternative that meets the needs of the market, as it is a product well accepted by the population, abundant and easily accessible.

2 MATERIAL & METHODS

The coconut water was obtained in local stores, sanitized and extracted on the day of fermentation. Its pH was adjusted to 6.7, and the microorganism was inoculated at 10% v/v in coconut water. Coconut water was fermented without agitation for 24 hours at 37ºC by Bifidobacterium bifidum (14 log CFU/mL). After fermentation, the beverage was stored under refrigeration at 4ºC for 42 days and was submitted to simulated in vitro digestion immediately after fermentation and after 42 days of storage, and a colonic fermentation was conducted after each digestion. This study was approved by the Human Research Ethics Committee of the Health Sciences Center of the Federal University of Ceará (CEP No. 107969/2021).

3 RESULTS & DISCUSSION

The phyla that colonize the human GIT and represent the largest percentage of the gut microbiota are: Firmicutes, Bacteroidetes, Proteobacteria, Actinobacteria, Fusobacteria, and Verrucomicrobia[11]. The phyla Bacteroidetes and Firmicutes are the most abundant, encompass the largest number of groups of intestinal bacteria and are present in almost all portions of the GIT, including the feces, while the others are found in smaller proportions[12].

The main families present in the analyzed samples were Lachnospiraceae, Acidaminococcaceae, Leuconostocaceae, Eubacteriaceae, Ruminococcaceae and Streptococcaceae, belonging to the phylum Firmicutes, Bacteroidaceae and Prevotellaceae, belonging to the phylum Bacteroidetes. Among the ten most abundant families, they also presented Enterobacteriaceae, belonging to the phylum Proteobacteria, and Fusobacteriaceae, belonging to the phylum Fusobacteria. Two families that were present in smaller quantities, but are important when it comes to probiotics, were Lactobacillaceae and Bifidobacteriaceae, belonging to the phyla Firmicutes and Actinobacteria, respectively.

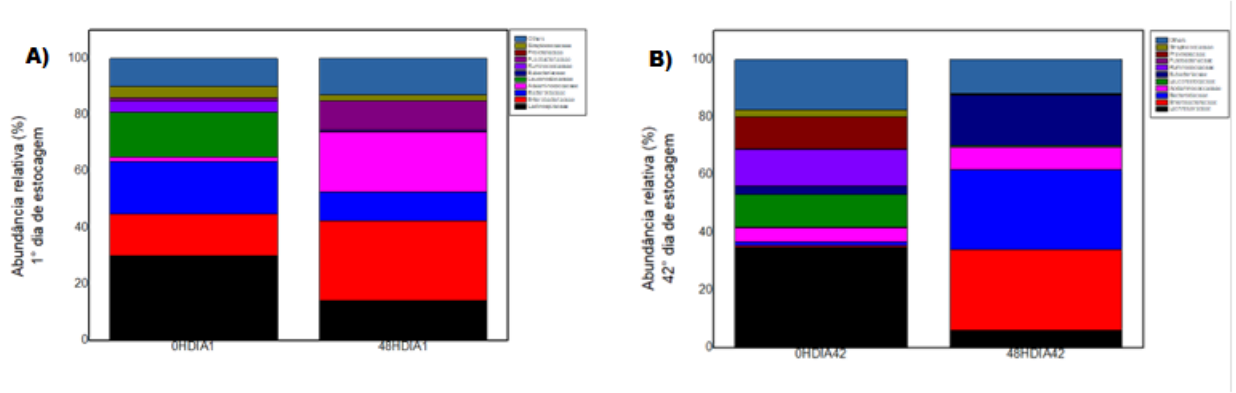

Figure 1 Relative abundance of the 10 most present families A) on the 1st day of storage and B) on the 42nd day of storage.

4 CONCLUSION

The coconut water fermented by B. bifidum went on to simulated in vitro digestion, obtaining satisfactory results, with the survival of the probiotic when crossing the gastrointestinal tract, suggesting that the beverage can be considered a potential probiotic, but for this more analysis and studies are needed.

The results of the genetic sequencing suggest that the fermentation of coconut water by B. bifidum favored the development of beneficial microorganisms, while pathogenic microorganisms decreased its relative abundance in the 48 h of colonic fermentation, corroborating the potential probiotic effect of the beverage.

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