

HEALTH-PROMOTING PROPERTIES OF PROBIOTICS IN FERMENTED DRINKS

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Abstract

Consumers' interest in maintaining and improving health through food is increasing, which leads to the design of functional food that, in addition to basic nutrients, contains ingredients that are considered to promote health and reduce the risk of disease. Fermented foods and beverages play an important role in the human diet, and have a long history of safe use. The functional properties of fermented products are often attributed to the presence of probiotics, defined as "live microorganisms that when administered in adequate amounts confer a beneficial health effect on the host," including therapeutic effects, metabolic effects and immunomodulation. Probiotics restore the natural intestinal microflora and inhibit the development of pathogenic bacteria. Fermented foods are ideal for delivering probiotics to the gastrointestinal tract and providing an optimal environment for their growth. Consuming fermented foods that contain sustainable microorganisms is an important strategy for improving the overall health and well-being of the body. The paper provides an overview of the characteristics and health effects of probiotics present in different fermented foods.

Keywords: functional foods, probiotics, fermented foods, health benefits

1. Introduction

Probiotics are microorganisms that live in a colony of bacteria that live in our intestines and that tend to give benefits to the body when consumed through products that contain them or through supplements in a way that regulate metabolism and strengthen immunity. They are used in clinical settings to prevent and treat conditions such as diarrhea, colon cancer, hypertension, diabetes, acute pancreatitis, *Helicobacter pylori* infections, ventilator-associated pneumonia, migraine and autism (Tegegne & Kebede, 2022). In essence, functional probiotic foods are products that, with their biologically active ingredients and consumed in the current diet, contribute to optimal physical health and mental health in a person.

2. The health benefits of probiotics

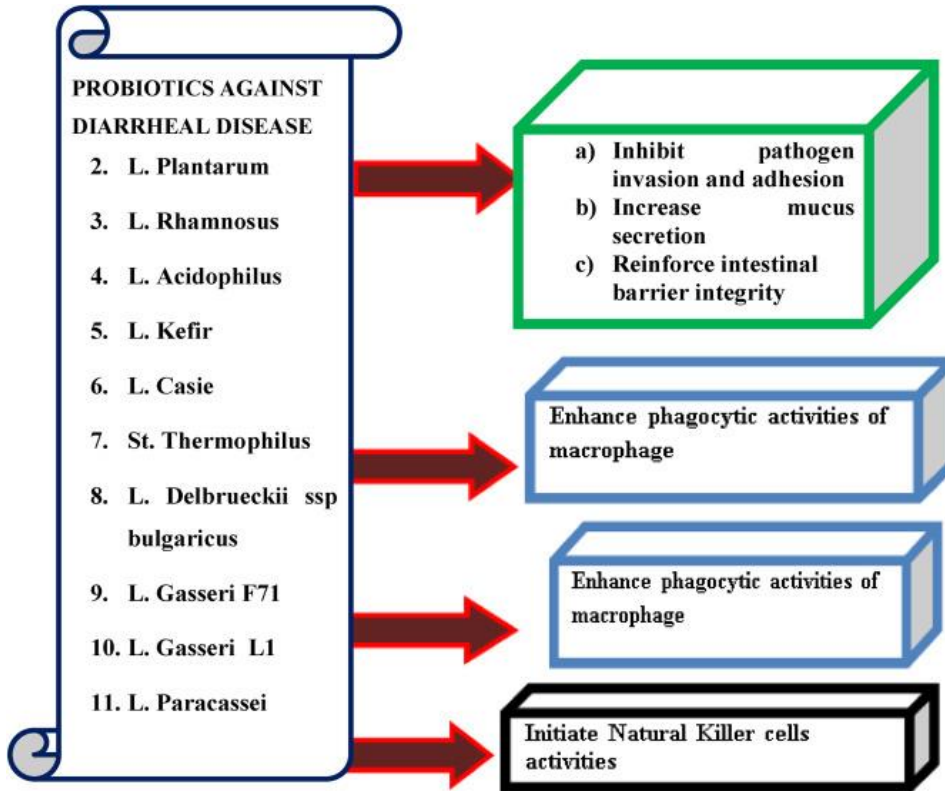
The necessity for alternative approaches to combat deadly bacteria and antagonistic microorganisms, such as probiotics, is evident in many foods and drinks, due to the fact that there is resistance to many drugs in different countries, the side effects are important. In addition, microorganism useful or antagonists are necessary to prevent and treat various diseases that are transmitted.

The results were analyzed based on evidence that human studies and animal models have shown the clinical potential of probiotics against many diseases (Yan & Polk, 2011). It has been reported that probiotics suppress diarrhea (Lye et al., 2009), alleviate lactose intolerance (Pelletie et al., 2001) and postoperative complications (Woodard GA et al., 2009), show antimicrobial activity (Karska-Wysocki, 2010) and colorectal cancer (Liong, 2008), reduce symptoms and bowel irritation (Rafter J., et al 2007) and prevent intestinal inflammation (Moayyedi et al., 2010). However, generalizations about the potential health benefits of probiotics should not be made, as the effects of probiotics are species-specific. Thus, a health benefit that is attributed to a specific species is not native and applicable to a specific species, even if it is a specific

species (Golowczyc et al., 2007).

In conclusion, probiotics represent one of the most promising biotherapies to address issues related to antibiotic resistance by enhancing specificity, regulating the release of antimicrobial agents, and reducing the likelihood of antibiotic resistance development.

Currently, consumers prioritize functional foods. Their perceptions of healthy food aligns with the concept of "functional food" (Brown, 2018).



3. The mechanism of probiotics

Figure 1 : Mechanism of action of probiotics against diarrhea (Tegegne & Kebede, 2022)

Probiotics protect epithelial membranes from harmful microorganisms by passing through the stomach and mucosa when consumed orally. Probiotic bacteria such as Bifidobacterium and Lactobacillus produce acids like lactic acid, propionic acid and acetic acid, which lower the pH and inhibit the growth of harmful bacteria.

The primary mechanisms of probiotic action include the improvement of the epithelial barrier, increased adhesion to the intestinal mucosa, simultaneous inhibition of pathogen adhesion, competitive exclusion of pathogenic microorganisms, production of antimicrobial substances and modification of the immune system. Given the anatomical structure and tissue composition of the intestine, the epithelial layer can be considered as a front line for external stimuli, while the Gut-Associated Lymphoid Tissue (GALT) mediates adaptive immune responses (Mörbe et al, 2021). Probiotics play a role in host innate and adaptive immune responses by modulating immune cells such as dendritic cells (DCs), macrophages, and B and T lymphocytes. Interactions between host intestinal cells and probiotics mainly occur at the surface of the intestinal barrier, including the intestinal epithelium and the underlying lamina propria (Mazziota et al, 2023). Given its cytological composition and its histological architecture, the intestine is considered the largest

immunological organ as it contains approximately 70–80% of all IgA-producing B cells (Reinholdt & Husby, 2013). IgAs are proteolytic-resistant antibodies locally synthesized in effector tissues which, in turn, are particularly important in the mucosal membrane immune function (Rotondo et al 2022, Nuguiera et al, 2021).

4. The most popular probiotic drinks

4.1. Kefir as a probiotic: Kefir is a fermented milk product derived from kefir grains that has been reported by many studies as a probiotic drink with great health-promoting potential. Kefir was originally prepared by mixing two types of milk, such as mare's, goat's and sheep's milk (Sokolińska et al., 2016), or by adding additives such as inulin, to improve its beneficial effect and final texture. (Glibowski. et al., 2012). Existing research data link regular kefir consumption to a wide range of health-promoting attributes, and more recent findings support the link between kefir strains and probiotics and its biofunctional metabolites in improving the immune system, providing significant antiviral effects (Ganatsios et al., 2021). Kefir grains are believed to have been traditionally passed down from generation to generation among Caucasian tribes and are considered a source of family wealth (Guzel-Seydim, et al., 2021).

Kefir grains belong to the category of SCOBY (symbiotic colony of bacteria and yeast). The most dominant bacterial species found in kefir grains are *Lactobacillus kefirifaciens*, *Lactocaseibacillus paracasei* (basic name *Lactobacillus paracasei*), *Lactiplantibacillus plantarum* (basic name *Lactobacillus plantarum*), *Lactobacillus acidophilus delabruae bulgaricus*. On the other hand, *Saccharomyces cerevisiae*, *S. unisporus*, *Candida kefir* and *Kluyveromyces marxianus ssp. marxianus* are the predominant yeast species present in kefir (Fiorda, et al., 2017). Several metabolic products are generated during kefir production and are responsible for its distinctive taste and aroma: lactic acid, ethanol, carbon dioxide and aromatic compounds such as ketones and acetaldehyde. This beverage consumption is associated with a wide array of nutraceutical benefits, including anti-inflammatory, anti-oxidative, anti-cancer, anti-microbial, anti-diabetic, anti-hypertensive, and anti-hypercholesterolemic effects (Azizi et al, 2021)

Kefir comes with a number of health benefits related to probiotics, kefir contains many more types of good bacteria than yogurt and colonizes the digestive tract more thoroughly and for longer.

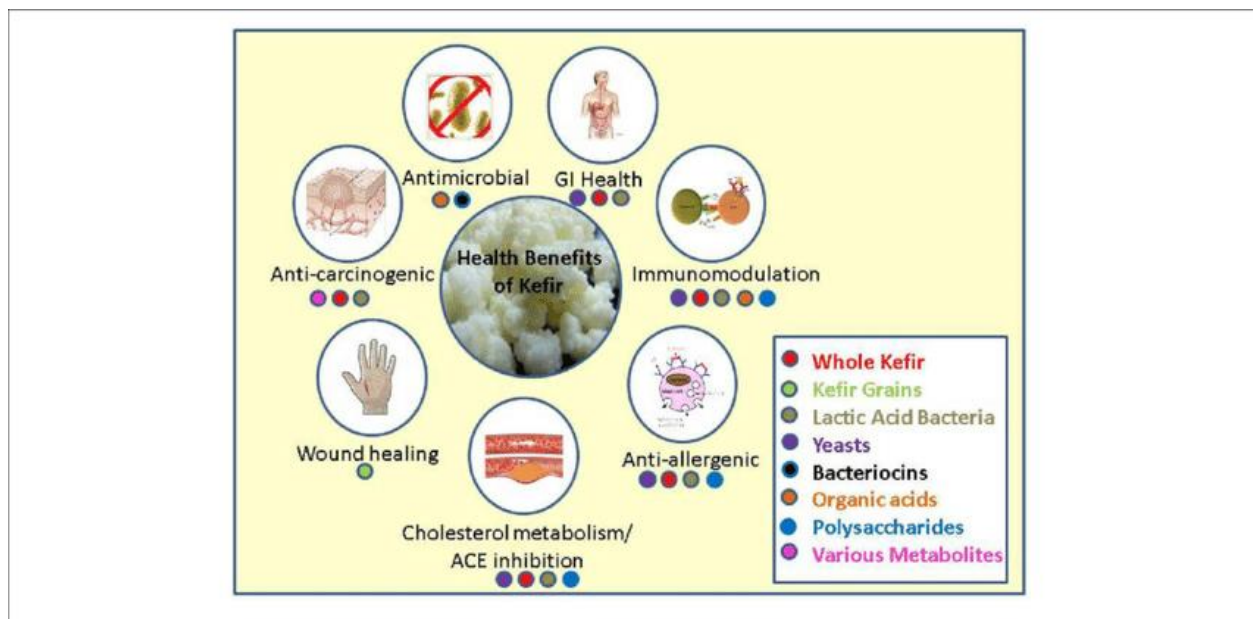


Figure 2. Health benefit of kefir (Bourrie et al, 2016)

Excessive accumulation of fat in the body can result in obesity, which is a serious health concern. Kefir as a probiotic has shown potential health benefits in the fight against obesity. Overall, kefir has the potential to prevent obesity (WHO, 2021). Historically, kefir was recommended to treat several diseases, including tuberculosis, cancer, and gastrointestinal disorders when modern medical treatments were not available (Rosa, 2017). In addition to improving the intestinal flora, other benefits of kefir are: reducing the effects of lactose intolerance, immunomodulation, protection against pathogenic microorganisms, cholesterol modulation, anticancer effect, reducing the risks of chronic diseases and prevention of metabolism and gastrointestinal diseases, ischemic heart diseases, allergies and hypertension (Diniz et al, 2003 & St-Onge et al, 2002). Kefir is a fermented product obtained mainly from milk through the action of kefir grains, which are symbiotic relationships between microorganisms, including: yeast, lactic acid and acetic bacteria coated with a polysaccharide known as kefiran, which surrounds and preserves the kefir microbiota immobilized in the grains and ensures its preservation. This fermented milk drink is rich in dioxide carbon, vitamin B12 and polysaccharides that give certain sensations. Lactic acid acts as a natural preservative, so kefir becomes a safe product for consumption (Maldonado et al, 2020&Souza et al., 1984).

Lactose from milk is broken down into acid during the fermentation process, which causes a decrease in pH and an increase in consistency. Approximately 30% of milk lactose is hydrolyzed by the enzyme β -galactosidase, converting lactose into glucose and galactose. Moreover, the bacteria present in kefir converts glucose into lactic acid (Ferreira, 2010) In this context, kefir is a good option for people who cannot tolerate lactose. The content of lipids (monoacylglycerols, diacylglycerols and TAG (triacylglycerol), NEFA (non-esterified fatty acids) and steroids in kefir can vary depending on the type of milk used in fermentation. Kefir contains a rich vitamin composition, when it is ready for consumption. The vitamin content depends on the quality of the milk used, the microorganisms present in the kefir grains and the preparation method. Kefir contains vitamins B1, B2, B5, C (Sarkar, 2008) A and K and carotene in its composition According to (Kevičius & Šarkinas, 2004), the concentration of pyridoxine, vitamin B12, folic acid, biotin, thiamin and riboflavin increases during the fermentation process. Kefir is a good source of Mg, Ca and P (Otle, & Cagindi, 2003) In addition, minerals such as Zn, Cu, Mn, Fe, Co and Mo are found in milk kefir. Lactic acid, CO₂ and ethanol are the main products originating from the lactic fermentation process. Kefir also contains formic acids, propionic and succinic, aldehydes, traces of acetone and isoamyl alcohol and various folates (Güven, 2003). The pH value of kefir varies between 4.2 and 4.6, ethanol content between 0.5 and 2.0 % (v/v), lactic acid between 0.8 and 1.0 % (w/v) and CO₂ between 0.08 and 0.2 % (v/v) (Coste, 1996)

4.2. Kombucha: Kombucha is a fermented drink that gives the feeling of a carbonated taste, it is produced by the fermentation of tea and sugar with a symbiotic culture of bacteria and yeasts, the so-called SCOBY. It is prepared from different types of teas: such as black, green, white, red and oolong tea, providing various health benefits and properties. Animal studies show that drinking kombucha can help prevent liver toxicity and damage caused by exposure to harmful chemicals (Wang et al, 2014, Dipti et al., 2003, Murugesan, et al., 2009). (Kaewkod, 2019,) in a research found that kombucha can help cause the death of cancer cells and block the spread of cancer cells. Some animal studies even found that kombucha helped lower blood sugar, triglycerides, and LDL cholesterol (Aloulou et al., 2012).

Several types of bacteria and yeasts are involved in the fermentation process, which generates many beneficial compounds, such as polyphenols, organic acids, amino acids, vitamins, minerals, organic nitrogens and hydrolytic enzymes, which have important health effects and therapeutic properties, such as p .sh. as antioxidant, anti-inflammatory, anticarcinogenic and antimicrobial properties (Kitwetcharoen et al, 2023).

Kombucha has many beneficial effects on human health, such as detoxifying the blood and reducing cholesterol levels, blood pressure, kidney calcification, inflammatory problems, arthritis, rheumatism, gout

symptoms, obesity, menstrual disorders, menopausal hot flashes, insomnia, stress, and nervous disturbances (Kitwetcharoen, 2023). Kombucha is also known to stimulate liver functions, glandular systems, the immune system, and interferon production; improve hair, skin, and nail health; improve eyesight; normalize intestinal activity and balance intestinal flora; and prevent the formation of bladder infections (Jayabalan, 2014 & Dufresne, 2000).

5. Conclusion and discussion

Modern times have brought with them great interest in functional foods and drinks such as probiotics, and all this interest is devoted to healthy eating. Functional foods and drinks act as a stimulus in our body to develop biological functions in the most correct form, eliminating and protecting against various pathogens that appear in different forms. They help to choose many health problems without having other indications and help us to prevent them. I also want to emphasize that eating healthy is not always expensive, it is enough to have a good will to change your lifestyle. Seeing all these positive properties, I recommend that kefir be used first among dairy products, especially in times of viruses, both adults and children need protection, stronger immunity and regular functioning of the organism. Starting from the fact that kefir is a super drink with functional values in the body, I also recommend that you pay attention to its combination with medicinal plants that will certainly increase the health functions even more by making both together as powerful components in the prevention and healing many diseases. On the one hand, the kefir functional drink will be strengthened, on the other hand, the utilization of medicinal plants will increase, so that the organism will be offered even more opportunities for improvement.

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