

# Research Progress of Lactic Acid Bacteria in Fermented Beverage

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## Abstract:

With the improvement of modern people's living standards and the improvement of beverage production technology, lactic acid bacteria fermented drinks are popular among consumers with their special and functional properties. In this paper, we will clarify the fermentation function of lactic acid bacteria in the process of beverage processing and production, and understand its effect on improving the flavor and quality of beverage, as well as its nutritional and health value. It also pays attention to the precautions and possible hazards, and elaborates the significance and prospects in the development of contemporary beverages.

**Key words:** Lactic acid bacteria; Fermented drinks; Food industry

## 1. Introduction

With the improvement of the quality of life, people put higher requirements for fermented drinks. Because of this, people are looking for better ways to improve drinks. Lactic acid bacteria belong to Bifidobacterium, Enterococcus, Lactobacillus, etc., and are widely distributed [1]. Lactic acid bacteria are Gram-negative bacteria having many probiotic functions and they can improve the quality of drinks. With the continuous in-depth study of lactic acid bacteria, it has been confirmed that using lactic acid bacteria in the food industry is generally safe, and their metabolites have been approved as recognized safe food products [2]. With the deepening of research on lactic acid bacteria, lactic acid bacteria fermented drinks have gradually become a hot trend in beverage processing and production industry, and have a good market prospect. Lactic acid bacteria fermentation can convert sugars, fats and proteins in food fermentation raw materials into a state that is easily absorbed by the human body. At the same time, they can also effectively improve the contents of phosphorus, iron, calcium and vitamin B, thereby improving the digestibility and nutritional value of food [3]. And they can better meet the demands of consumers for safety, health, nutrition and delicious food, with broad development prospects.

## 2. Type of lactic acid bacteria fermentation

Lactic acid bacteria (LAB) fermented drinks can be divided into non-viable type drinks and viable type drinks. At present, lactic acid bacteria fermented beverages are mainly viable bacteria type beverages with short shelf life [2]. Lactic acid bacteria fermentation is divided into homo-lactic acid fermentation and hetero-lactic acid

fermentation. Homo-lactic fermentation is the formation of pyruvate from glucose as the starting substrate, and then the reduction of pyruvate to lactic acid. Hetero-lactic acid fermentation produces lactic acid through pentose phosphate ketolysis pathway, in addition to CO<sub>2</sub>, ethanol or acetic acid and other substances [4]. In addition, LAB fermented beverage has a wide range and diverse types. For example, Lactic acid bacteria can be fermented vegetable protein drinks, fermented dairy drinks, fermented fruit and vegetable juice drinks, fermented grain drinks, fermented tea drinks, fermented Chinese herbal drinks and so on. And they have a variety of functions and values.

## 3. The value and function of lactic acid bacteria fermented drinks:

Lactic acid bacteria fermented drinks have many positive effects. Lactobacillus casei fermented yogurt can improve the rheology, texture and cold storage stability of yogurt [5] and the volatile metabolites produced by fermentation can form the unique flavor of yogurt [6], which can bring consumers a better experience. Lactic acid bacteria fermentation of seabuckthorn juice can not only reduce its acidity, improve the sour taste of sea buckthorn juice, but also improve its oxidation resistance. The contents of flavonoids and polyphenols in sea buckthorn juice increased, and the content of organic acids in sea buckthorn juice was changed by lactic acid bacteria [7]. Lactic acid bacteria fermented fruit and vegetable drinks can convert sugars in fruits and vegetables into lactic acid, such as apple lactic acid bacteria fermented beverage, cucumber lactic acid bacteria fermented beverage, tomato lactic acid bacteria fermented beverage, etc. With rich vitamins and minerals, they are

easy to digest and absorb, and they have unique flavor to make them more attractive[8]. In addition, lactic acid bacteria fermented juice can meet the needs of patients with lactose intolerance-related diseases and vegetarians. Previous studies have shown that lactic acid bacteria can use sugar as carbon source to produce various metabolites such as blood pressure lowering peptide, lactic acid, and external polypolysaccharide, and can convert polyphenols into lower molecular weight phenolic acids, making them have stronger biological activity and ultimately beneficial to human health [9]. Lactic acid bacteria can not only reduce the pH value of intestine and play an antibacterial role [2], but also have an inhibitory effect on *Helicobacter pylori*, *Salmonella enterica* and enterohaemorrhagic *Escherichia coli*[10]. The fermentation can also degrade anti-nutrient compounds, synthesize bioactive molecules, and improve the bioavailability of nutrients [11]. In addition, its metabolites can make the body produce immunoglobulin antibody, improve the body's immunity [2], which is conducive to enhancing physical fitness and has health significance. After lactic acid bacteria fermented blueberry juice, the antioxidant activity of blueberry juice was significantly enhanced, and the clearance rate of 2, 2-biphenyl-1-picrylhydrazyl reached 99.40%[12] and this can help slow aging and reduce the risk of disease. In addition, the acids and bacteriocins produced by lactic acid bacteria are considered as safe natural preservatives and exert an essential influence on the preservation of drinks [7].

#### **4. Precautions for lactic acid bacteria fermented drinks:**

In the process of fermentation, it is necessary to get command of the growth of microorganisms and take certain measures to ensure the quality of fermentation [13]. In addition, the presence of hemolytic, mucolytic activity and virulence genes of acidophilic microorganisms should not be ignored. And it is nonnegligible to investigate the safety and health functions of acidophilus bacteria and their released compounds prior to use in the food industry [14]. With the improvement of the quality requirements of fermented beverages, various raw materials are usually added to improve the fermentation process and enrich the taste. For example, adding chia seed extract to yogurt can promote the growth of lactic acid bacteria, which can not only shorten the fermentation time but also improve the quality of yogurt [15], which is a positive aspect. Improper addition of ginger juice in yogurt will adversely affect the viscosity and flavor of yogurt [16], so accurate experiments and risk assessment should be carried out when raw materials are added. The storage of fermented

beverages is also crucial, as improper storage will affect the quality of beverages and human health, for example, potential risks can be reduced through low temperature storage [17].

#### **5. Potential and prospect of lactic acid bacteria fermented drinks:**

With the increasing demand of special consumer groups for gluten-free and lactose-free products, tapioca, corn, potato and other things fermented by lactic acid bacteria to product beverages has great potential for development [18]. At the same time, carrot juice and beet juice fermented by lactic acid bacteria can adapt to the needs of people with lactose allergy or intolerance while maintaining their original sensory properties [19]. GABA beverage developed with brown rice and lactic acid bacteria has a good control effect on chronic diseases such as diabetes and obesity, has good antioxidant properties and rich taste, and can be refrigerated for 30 days, which provides reference value for the research and development of functional drinks [20]. Adding lactic acid bacteria strains to fermentation can improve the antioxidant and hypoglycemic functions of sheep yogurt in vitro, providing new ideas for the development of new functional sheep yogurt [21]. The good antioxidant properties of lactic acid bacteria fermented beverage also have a large space for development in beauty and health. Lactic acid bacteria fermentation can also improve the utilization rate of industrial by-products, protect the environment and achieve sustainable development, extend the industrial chain and increase the added value of products. For example, the beverage made of pomegranate peel extract fermented by lactic acid bacteria not only has good health care effect, but also realizes the utilization of industrial by-products[22]. In addition, lactic acid bacteria release acid and bacteriocins can inhibit the proliferation of spoilage microorganisms, so the developed fermented beverage has great potential in anti-corrosion and storage resistance.

#### **6. Conclusion**

Lactic acid bacteria fermented drink has important significance and value. It can improve the flavor, texture and nutritional value of drinks, which is beneficial to human health and has therapeutic effect. It can also meet the requirements of special consumers for lactose-free and fat-reducing drinks, and has good antioxidant and biological activity. Lactic acid bacteria fermentation also plays a positive role in the preservation and quality of drinks and it has broad prospects for development. In addition, lactic acid bacteria fermented drinks are widely

used in food industry, which can realize the utilization of industrial byproducts, help to protect the environment and extend the industrial chain. At the same time, attention should be paid to control, so as not to produce adverse effects on the quality of fermented drinks and human health.

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