Lactic acid bacteria as a source of functional ingredients

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Abstract

Lactic acid bacteria (LAB) are belong to Gram positive bacteria commonly found in the fermented food and gastrointestinal tract and commonly used in the food industry as a potential starter probiotics. Recently, the interest toward LAB is increased due to their wide application in food and medical field. Among the lactic acid bacteria, Lactobacillus species attracted many researchers because of its wide applications in the medical fields as anticancer, antiproliferative, antioxidant, anti-obesity anti-inflammatory, and anti-diabetics. This report shortlisted the importance of LAB for various application.

1. Introduction

Lactic acid bacteria (LAB) are rod shaped, Gram-positive, non-spore forming and catalase-negative bacteria (Amaretti et al., 2013). Lactobacillus produces circular, white and waxy colonies. They are obligate fermenters, fermenting glucose to lactic acid, ethanol and CO2, and can survive at a pH as low as 2.5. According to their morphology, LAB is divided into rods and cocci and according to the mode of glucose fermentation, homofermentative and heterofermentative (Arasu et al., 2013; Arasu et al., 2015). The homofermentative LAB convert carbohydrates to lactic acid as the only or major end-product, while the heterofermentative produce lactic acid and additional products such as ethanol, acetic acid and carbon dioxide. Thus, the main metabolism of LAB is the degradation of different carbohydrates and related compounds by producing primarily lactic acid and energy. Lactic acid bacteria include the following genera: Lactobacillus, Carnobacterium, Lactococcus, Streptococcus, Enterococcus, Vagococcus, Leuconostoc, Oenococcus, Pediococcus, Tetragonococcus, Aerococcus and Weissella (Rejiniemon et al., 2015).

Lactic acid bacteria (LAB) are industrially important microbes that are used the world over, in a large variety of industrial food and feed fermentations (Bermúdez-Humarán et al., 2013). Their contribution in these fermentation processes primarily consists of the formation of lactic acid from the available carbon source resulting in a rapid acidification of the food raw-material, which is a critical parameter in the preservation of these products (Drosinos et al., 2007; Garofalo et al., 2013). They exert a strong antagonistic activity against many microorganisms, including food spoilage organisms and pathogens. The other antimicrobial compounds produced by these bacteria include organic acids, hydrogen peroxide, diacetyl and bacteriocins which play an essential role in ensuring the safety and extending the shelf life of these products. However, besides their lactic acid forming capacity, LAB also have the ability to contribute to other product characteristics like flavour, texture and nutrition. Next to their most important application, which is undoubtedly in the dairy industry, LAB is also applied at an industrial scale in the fermentation of other food-raw materials like meat and vegetables.

In the human and animal bodies, LAB is a part of the normal microbiota or microflora (Kanmani et al., 2013). Besides fermented food products, LAB
has been isolated from diverse habitats such as rhizosphere soils, plant leaves, surfaces of fruits and vegetables, decaying plant or animal matter such as rotting vegetables, compost, etc.

LAB has a GRAS (generally regarded as safe) status and has been widely used as starters in the industrial production of a number of value added products such as cheese, yogurt, butter, sauerkraut and sausage etc (Sabir et al., 2013). They have several beneficial effects, such as antimicrobial activity, ability to modulate immune response and anti-tumorigenic activity. It has been shown that some lactobacilli possess antioxidant activity, and are able to decrease the risk of accumulation of ROS during ingestion of food. LAB also has been implicated in many agriculturally important traits such as IAA production, siderophore production and antagonistic activity against phytopathogens, ultimately leading to plant growth promotion. LAB find increasing acceptance as probiotics which aid in stimulating immune responses, preventing infection by enteropathogenic bacteria, and treating and preventing diarrhea. Nowadays, LAB plays an important role in the industry for the synthesis of chemicals, exopolysaccharides, vitamins, pharmaceuticals, low calorie sweeteners and other useful products. Also, the biotechnological production of lactic acid has recently been reported that offers a solution to the environmental pollution by the petrochemical industry. In non-food applications, lactic acid is the building block used in the chemical polymerization of poly (lactic acid) (PLA), a biodegradable and biocompatible material which is a good alternative to synthetic plastics. PLA find applications as surgical sutures, orthopaedic implants, in drug delivery systems and disposable consumer products.

2. Conclusion

Thus, lactic acid bacteria are very promising sources for novel products and applications, especially those that can satisfy the increasing consumer’s demands for natural products and functional foods (Vijayakumar et al., 2015). They can be used in the diet of humans and animals, with particular role in their health status. Despite recent advances, the study of LAB and their functional ingredients is still an emerging field of research that has yet to realize its full potential.

Conflict of interest statement

We declare that we have no conflict of interest.

Reference