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Fortified yoghurt: A new and effective method to utilize probiotics benefits

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Abstract

Yogurt is a milk product that confer health benefits to the consumers. It contain tremendous probiotic which have large impact on our gastrointestinal tract. However, not all yogurts are probiotic, neither are they all functional products. There is increasing demand for health-promoting beverages, which is prompting the dairy industry to develop functional probiotic yogurts to meet the demand. Yoghurt alone is not sufficient to provide all the health benefits of its probiotic since the microflora in it, have to travel long to reach the gastrointestinal tract where it can release its nutritional juice. It need to be incorporated with some prebiotic which may provide a layer of protection over the existing microflora to survive the acidic as well alkaline condition of ours digestive system. Also it may provide a base or Stabilizer so that the microflora can multiply in a desired number to meet the demand of probiotic number. This present review relates some of the product that have been tried by different scientist with its beneficial aspects and also open up the opportunities of many produce that have still unutilized till date. Probiotic yoghurt with these agricultural produce can open up a new source of employment by deploying additional produce and also guarantee to control over malnutrition in the poor people.

Keywords: Probiotic, prebiotic, yoghurt, gastrointestinal tract, lactose intolerance, probiotic viability

Introduction

The term Probiotics signifies live microorganisms, which when administered in adequate amounts confer health benefits to the host, such as maintaining a healthy gut which have robust microorganism that are capable of competing with pathogenic microorganisms (Khaneghah, *et al.*,) [8]. Although Various group of bacteria have been used as probiotics but species of *Lactobacillus* and *Bifidobacterium* have been widely used and are considered safe and effective to use (Ranadheera, *et al.*, 2017) [14]. Yogurts are considered to be a fermented dairy product which is the main vehicle for delivering beneficial probiotic bacteria to human's guts. This product is formed through the coagulation of milk protein by lactic acid, which is secreted by lactic acid bacteria in the starter culture (Amund, 2016) [1]. Yogurt is not only highly recommended for those suffering from gastro-intestinal disorders and lactose intolerance, but is beneficial to boost the immune system (Madora, *et al.*, 2016) [11] Moreover, yogurts are also used as a vehicle for the delivery of several key nutrients such as protein, minerals and various micronutrients (Ghadge, *et al.*, 2008) [6]. Therefore, these products are becoming increasingly popular among health-conscious consumers. Any of the Fruit juices, legumes, cereals and dry fruits are increasingly used to fortify yogurt (Ryan, *et al.*, 2020) [16]. It is difficult to produce yogurt with a good consistency using only probiotic cultures, without starter cultures such as *Lactobacillus delbrueckii* subsp. *bulgaricus* and *Streptococcus thermophilus*. (Kumari, *et al.*, 2015) [9]. generally, in yogurt production, fermentation needs to be carried out with these lactic acid producing microorganisms. The slow growth of probiotics may also permit the growth of undesirable organisms. Starter cultures can help to maintain the viability of probiotics by providing favourable metabolic substances for certain probiotics such as *Bifidobacterium*. Therefore, in probiotic yogurt manufacture, both probiotics and starter cultures are used together as adjunct cultures. Starter culture bacteria are also known to provide benefits and enhance consumers' immune system. However, their gastrointestinal survival is poor and hence use of the term probiotics to describe starter cultures is controversial (Senok, *et al.*, 2005) [18]. Probiotics need to survive both in the food matrix during storage and through gastrointestinal transit after consumption.

They must have to compete for the harsh environment of Small intestine so that they can reach up to large intestine hence, probiotics should maintain a minimum viability level of 10^6 – 10^7 CFU/mL per g of carrier food Product, at the time of consumption. This concentration is known as the minimum therapeutic level (Ranadheera, *et al.*, 2019) [15]. The viability of probiotics in yogurt is affected by many factors such as the oxygen content of the product and oxygen permeation through packaging materials (shah *et al.*, 1997) [19]. The concentration of lactic acid, hydrogen peroxide and bacteriocins which are mainly produced by the starter cultures (Mortazavian, *et al.*, 2011) [12] Therefore maintaining the minimum therapeutic level of probiotics in gut is nectary to have its maximum benefits.

Maintenance of probiotic in yogurt during storage is a challenge. Therefore Incorporation of prebiotics such as fruits like mango, Guava Litchi and any other products such as Water chestnut, Sweet potato etc are some of the major strategies employed by many scientist to enhance probiotic viability. The term Prebiotics defines the some non-digestible food ingredients that promote the growth and activity of beneficial microorganisms. The main purpose of this review to study various prebiotics that can be added to the yoghurt and how they would benefits the gastrointestinal tract of human being. Yoghurt are considered to be the most suitable probiotic carrier and when mixed with fruit it becomes more bioactive that may have ability to survive its probiotic in an effective way (Meenakshi *et al.*, 2018) [22]. Fruits like Litchi and sweet potato are rich in sugar, starch, protein, important fatty acid, vitamins and minerals that act like prebiotic and enhance the probiotic properties of the Yoghurt in a synergistic way (Ahmed *et al.*, 2015) [2]. Studies have shown that mixing milk and various prebiotic agents resulted in the formulation of the functional food that have nutritional as well as physiological attributes (Denis and Hutkins 2018) [4]. The nutritional effect is supplying of sufficient milk protein to the carrier probiotic with the protective layer of milk fat as well as phenolic components of added prebiotic agents that ultimately have prophylactic and therapeutic benefits on human health (Wang *et al.*, 2018) [7]. Evidences indicate that addition of prebiotic agents also has positive effect on probiotic viability during production and storage condition. The dairy and prebiotic mixture has been reported to improve probiotic tolerance during digestion as compared to non-dairy products (Sarkar. S., 2009) [17].

In the present investigation, we are studying the combination of yoghurt with different agricultural produce like litchi, Sweet Potato, Water chestnut, and Flax seed which is abundantly available in Bihar and rich in various vitamins, dietary fibre, potassium, phenolic compounds. And medicinal components. Also every year these produce are thrown way as waste. So combining all these can open a new opportunity to utilize various produce in an effective way. Yoghurt can also

be combine better with Flax seed. This miracle seed is also abundantly available in Bihar and is consumed in various forms in rural areas due to its advantages like presence of Omega-3 fatty acid, soluble fibres etc, which are considered to be associated with blood lipid improvement, reduce the risk of cardio vascular diseases, osteoporosis, diabetes. Etc.

Water chestnut and Sweet Potato has been identified for its stabilizing effects as reported in various studies (Afiati *et al.*, 2018, Kunal *et al.*, 2016) [5, 10]. These products are also locally available and popular among the people and provides nutritional and other benefits, apart from stabilizing effect. Litchi is also taken as a natural sweeteners and report indicated that litchi provide natural sweetening effect to yoghurt and sugar may act as a natural preservative for the yoghurt too. Addition of sweet potato or water chestnut have neutralizing effects on acidity developed by litchi juice (Zekai and Kucukoner, 2003) [23]. In addition to sugar litchi have another nutritional advantage that will go to the probiotic yoghurt and will promote growth of probiotic in the yoghurt. The Probiotic yoghurt fortified with all these nutritious agricultural produce have nutritional and therapeutic benefits of on human health.

Nutritional Benefits of Yoghurt in combination with Fruits

Slavin L 2016 reported that Fruits are an excellent source of dietary fiber, potassium, antioxidants, phenolic compounds, and carotenoids (β -carotene, lycopene, lutein, and zeaxanthin) (Figure 1), and are very low in energy density and high in water content. Most of the fruits have very less amounts of fat and protein, but have a relatively high percentage of simple sugars such as fructose and sucrose (Terry 2011)) [21] and have little starch except for bananas that have high sugar and fat content. Fruits are also high in insoluble fibres which ultimately helps in bowl movement through the intestine and thereby make our digestive system happy. The fruits fibres are also reduces the cardiovascular disease (CVD), and certain cancers as reported by Padayachee, 2018. The probiotic properties of fruit are thought to contribute to its health-promoting potential. Fruits, vegetables, and grains are good sources of oligosaccharides, a dietary prebiotic fiber that promotes the colonization of lactobacilli and Bifidobacteria in the colon. According to Delzenne, 2003 [3] high consumption of fruits and vegetables can contribute ≤ 11.3 g fructo-oligosaccharides in the human diet. Scientist also reported that specific prebiotic fibers have very interesting health benefits and can be isolated to be used as functional additives in processed foods, it is the fiber in the original food matrix that may be responsible for conferring health benefits (Slavin, 2013) Increasing fruit consumption would help populations with deficiencies meet recommendations for dietary fiber intake.

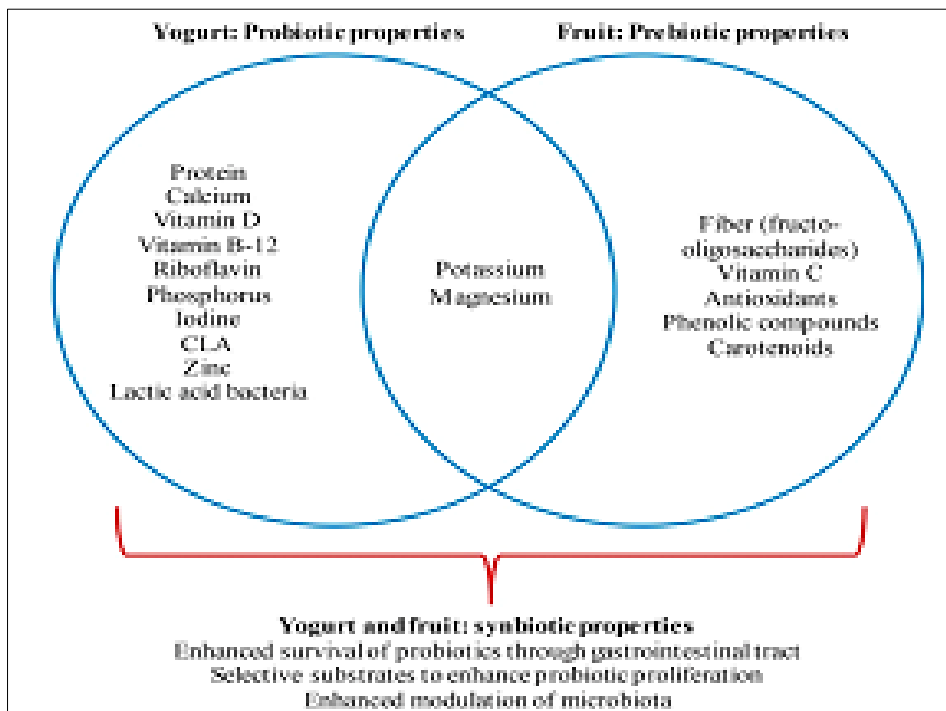


Fig 1: (Source: Melissa and Martte Adv Nutr 2017)

Nutritional Benefits of Yoghurt in combination tuber fruits:

Sweet potato is a native tuber fruit of Bihar which are consumed by a large number of population. In India, it is cultivated in almost all the states but major contribution comes from four states namely Odisha, Kerala, West Bengal and Uttar Pradesh. Odisha is the largest producer of sweet potato in India. China is the world's biggest producer and consumer of sweet potato, where it is used for food, animal feed, and processing (as food, starch, and other products). The importance of sweet potato as a food crop is growing rapidly in some parts of the world. Sweet Potato has been identified for its stabilizing effects as reported in various studies (Afiati

et al., 2018, Kunal et al., 2016)^[5, 10]. The tuber crop are rich in complex carbohydrates which have many antioxidant effects. Also these produces are locally available and popular among the people and provides nutritional and other benefits, apart from stabilizing effect. Amund 2016^[1] reported that yogurt with purple sweet potato extract supplementation using commercial culture and indigenous probiotics, namely *Streptococcus thermophilus* FNCC 0040, *Lactobacillus bulgaricus* FNCC0041 and *Lactobacillus plantarum* give excellent taste and therapeutic value. With ae excellent stabilizing effects

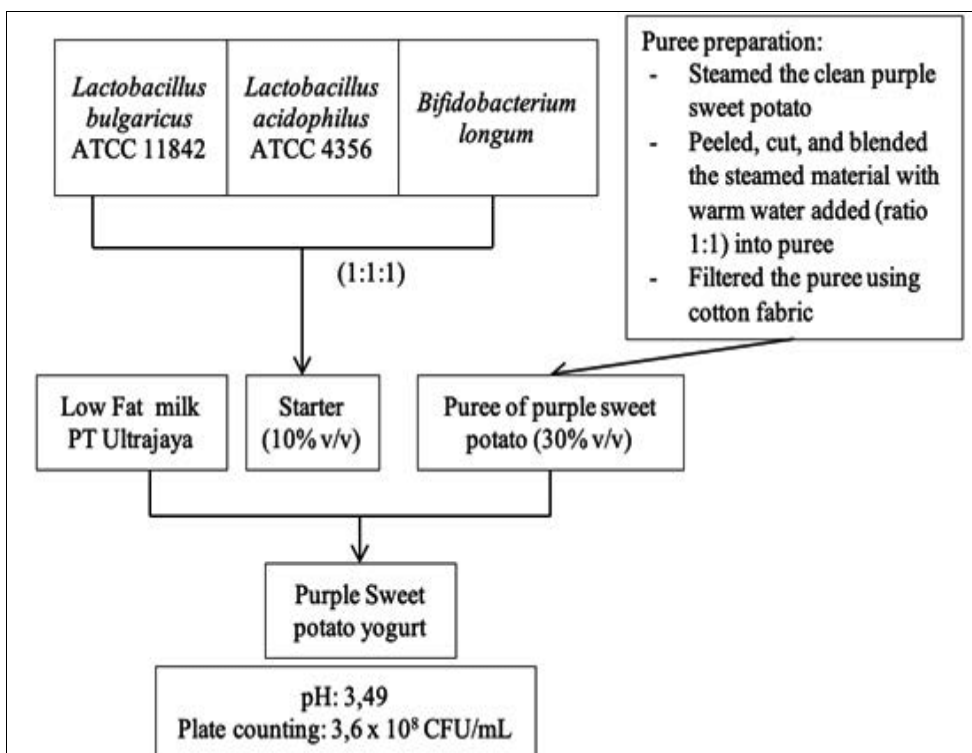


Fig 2: Preparation of Sweet Potato Yoghurt (Source: Researchgate.net Astrid et al., 2020)

Conclusion

Combining yoghurt with many agricultural products is a new and demanding technology to combat many of the disease associated with gastrointestinal tracts. Different scientist reported combination of yoghurt with different products and noted positive effects. An unutilized produce may be combined with yoghurt to make it more healthier and stabilized.

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