



Study of Probiotic Fruit Juice Production

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ABSTRACT

Nowadays, nutritional improvement of the food product is the most challenging approach of research concern of the food industry. Considering this challenge, the utilization of food enriched with active friendly bacteria like lactic acid bacteria promotes the additional positive nutritional properties of food products and maintains the equilibrium of gut flora. The present investigation shows the incorporation of Probiotic microorganisms (Lactobacilli, Bifidobacterium, Yeast) into various types of fruit juices. Probiotic microorganism helps to fermentation of these fruit juice. Fermentation by the addition of LAB improves the task profile, aroma, and shelf-life period of the product. As Probiotic microbes are capable of breakdown sugar to release lactic acid which shows antimicrobial properties. The sample should incubate at 37° to 38° C for 24 hrs. and be refrigerated at different temperatures. After each 48 hrs. the pH, titrable acidity, stability at different temperatures, and shelf-life period should be checked. Due to the synthesis of lactic acid, the culture can survive a long period in a fermented juice sample with low pH and high acidity. The alter final product has a sour and tangy taste [1]. This review highlights valuable key factors as the milk-based product associated with cholesterol risks and some people are allergic to milk products considering this issue Probioticated drinks serve as an alternative source of the dairy product.

Keywords: Probiotics, fruit juice, Probiotic microorganism, microbial viability

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INTRODUCTION

In the market, there is more availability of milk-based probiotic products but in the current period, there has been significant importance for non-milk based "probiotic functional food and beverage". The fruit juices are suitable carrier matrices for "active friendly bacteria" like probiotic bacterial strains. Consumption of non-dairy food products and beverages supplies more nutritional factors met through Probioticated fruit juices.[2]. Moreover, consumers' consciousness regarding the connecting link between healthy diet and natural food has flare-up attentiveness to "healthy food products" in over last few years. The application of conventional nutritional effect in "functional food" exerts favorable health effect on the human body [3]. Naturally, "functional food" for example, "fruit juice" contains potential "bioactive compounds" such as dietary fibers, vitamins, minerals, and antioxidants. Considering this importance, the incorporation of live microbes such as probiotics (*Lactobacillus*, *Bifidobacterium*, Yeast) in juices to improve the quality of fruit juice and making this product more essential for a nourishing food with multiple beneficial effects is one of the key techniques for food industry [4].

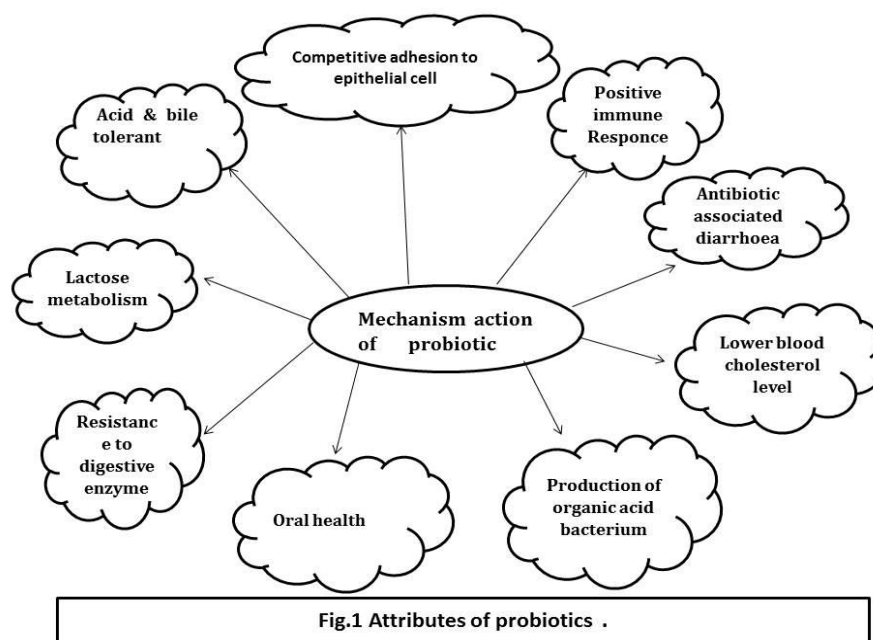
The live microbes from the genus of bacteria *Lactobacillus*, *Bifidobacterium*, and some strain of Yeast (*saccharomyces boulardii*) these species are applicable as probiotics. These microbes are part of gut flora and can generate antimicrobial activity against harmful microbes [5]. These probiotic microorganisms are widely used in the production of milk-based fermented products. Probiotics are capable to utilize sucrose, maltose, galactose, and glucose. Practically, it is possible to make Probioticated fruit juice using a selective strain of microorganisms [6]. Currently, the food industrial demand to build non-dairy food products by incorporating probiotics in "functional food" provides a promising approach to upgrade culture performance, resulting in symbiotic association (probiotic + fruit juice). Consequently, public demand for improved food products accommodates such "active friendly bacteria" (*Lactobacillus*, *Bifidobacterium*, Yeast) [4]. Fruit juices perfect suitable for non-milk beverages as they are a magnificent carrier matrix for the favorable confinement of beneficial bacteria [7]. Some species of probiotic microbes are responsible

to provide multiple positive health benefits during survival in the intestine including antimicrobial activity, antitumor effect, Anti-diabetic, cholesterol-free, immunomodulation, gastric discomfort, etc. [8]. Some researchers reported that the probiotic-supplemented food product should contain a minimum concentration of viable cell count is generally, 10^6 or 10^7 - 10^8 CFU/ml (cfu/g) has been considered as a satisfactory level [9].

Attributes of probiotics

The word 'probiotic' coined by Gibson and Robertfroid in 1995 relates to bacterial food supplements. Probiotics are the "active friendly bacteria" which is found in dairy-based food products and other foods stuff which is helpful for the gut. Prominently, it helps to improve the digestive system and helps to fight against many harmful microorganisms.

According to FAO (food and agricultural organization) and WHO (World health organization), the genera of *Lactobacillus* and *Bifidobacterium* both probiotics are both beneficial constituent parts of human intestinal microbiota. Exactly after the birth of a newborn baby, maternal gut microflora such as *lactobacillus* and *enterococci* start forming colonies on the gastrointestinal tract. Other probiotic strains like *clostridium* and *Bifidobacterium*, *Bacteroides* will populate the gastrointestinal system; with growing age, these microbes help to set a favorable intestinal environment to favor healthy digestion.[10]. Nearly 400 probiotic strains can be present in the mature human gastrointestinal tract. Human feces contain 50% weight of bacterial biomass.[11]. Probiotic gut microflora maintains their colonization by preventing an opportunistic population of harmful microbes. This mechanism is considered a barrier effect. Hence, probiotics are referred to as essential microbial supplements in a form of live culture when intake as a "functional food" and also can act as a preventative agent of the host's gut microflora as opposed to pathogenic bacteria strain [11,12].



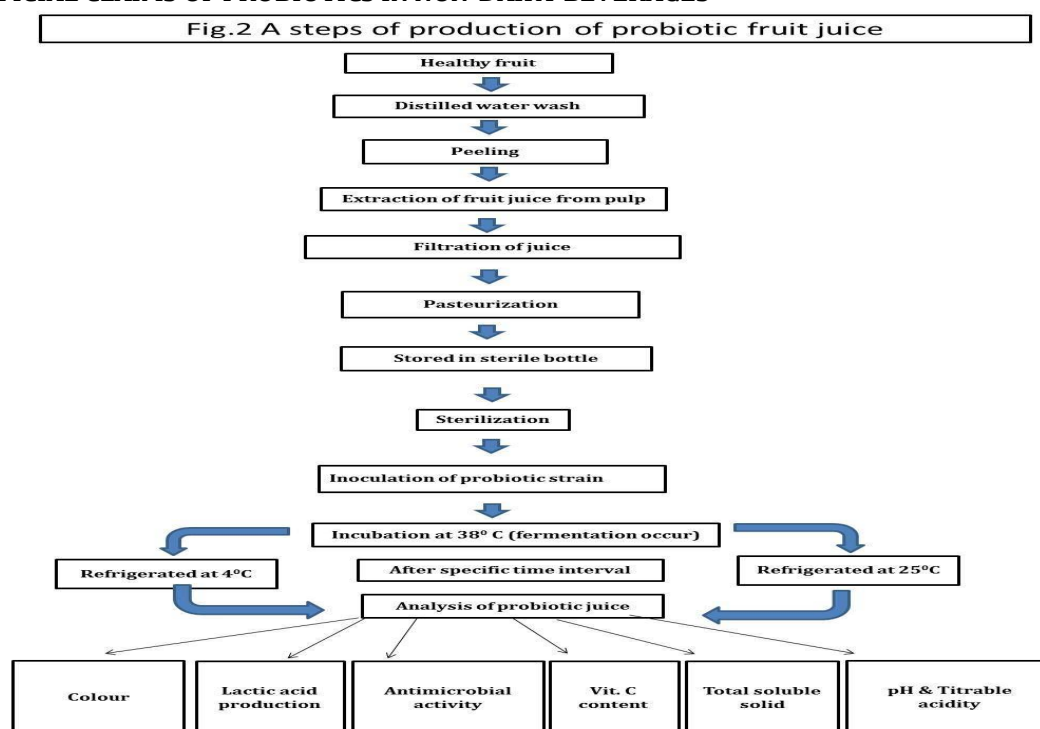
Many other bacteria could be classified under probiotics but two types of bacteria are commonly available i.e., *Lactobacillus* and *Bifidobacterium* and *saccharomyces boulardii* is the most common form of yeast found in probiotics. These microorganisms are useful in the technique of modification of "functional food". The genera of *Lactobacilli* and *Bifidobacterium* help for a breakdown of sugar to release lactic acid which shows antagonistic properties and the modified final product has a tangy-fresh taste with good texture. [1]. The beneficial effective manner of the mechanism of the action exerted by probiotics is still not completely elucidated. Their mechanism of action ranges from the producing level of short-chain fatty acid, bacteriocin helps to lower intestines pH and takes part in the nutrient competition for the stimulation of mucosal barrier function.[12]. There is some considerable evidence available subjected to probiotics' positive influence on some aspects of acquired and innate immunity, this is the response of IgA secretion and phagocytosis. Probiotics also act as a communicative link between the gut and the brain. Thus, dietary treatment with probiotic *Bifidobacterium*. Supplemented food is essential for people with mental health disorders like depression and anxiety.[13].

NUTRITIVE VALUE OF FRUIT JUICES

Fruit juices accommodated 83.20% to 89.30% moisture. Fruit juices are slightly acidic with pH 3.6 to 4.1 and the total soluble solid content of fruit juice is 10.5 to 15.47%, 20 mg to 60 mg vitamin c, and 0.92 mg

to 1.14 mg protein present in 100 gm sample. The nutritive value of juices varies with the types of fruit [14]. Considering the above-mentioned importance, the fruit juice is inoculated with probiotics resulting in the occurrence of fermentation of fruit juice. There are three ways available to achieve the probiotic action of fruit juice. spontaneous probiotic action through natural microflora, use of starter culture for probiotic action, and probiotic action by heat-treated material using starter culture [15]. During the preparation of probiotic fruit juice, the fresh juice can be pasteurized first through low heating, and add the probiotic strain in pasteurized fruit juice. concentration should be varying from 2×10^5 or 5×10^6 CFU/ml. [15]. The probiotics belong to the genera *lactobacilli* strain viz. *lactobacilli Brevis*, *lactobacilli xyloscus*, *lactobacilli avaricious*, and *lactobacilli Plantarum* are used for the fermentation of fruit juice. The following criteria were used to confirm which strain is suitable for probiotic action the ability of fruit juice acquires selective strain, the rate of lactic acid production by strain, the difference in pH and misplacement nutritive factors, reduction in NO₃- concentration and production of biogenic NH₂, metabolism type and ability of the bacterial strain to produce desirable essential properties after fermentation of fruit juice [16].

BENEFICIAL CLAIMS OF PROBIOTICS IN NON-DAIRY BEVERAGES



Probiotication of fruit juice is an advanced method of inoculating selective essential microorganisms into a liquid substrate to manufacture healthy beverages. After fermentation potential probiotics strains exert the beneficial effect determined by the *In vitro* test that acid and bile tolerance which is essential for oral medication administration and attachment to the mucosal and epithelial surface, this is a valuable property for successful prevention of pathogen adhesion & colonization.

Storage under refrigeration:

Many authors reported that probioticated microorganisms are highly sensitive to temperature, and the viable cell count in fruit juice is affected by variations in storage temperature [18].according to Sohail *et.al.*, the fermented orange juice inoculated with probiotic microbes like *L.acidophilus* and *L.rhamnosus* at 25°C for 9 to 10 days resulted in a reduction in acidification and an increase in viable cell account. according to lee sun Chua, the addition of probiotic strains of *L.plantarum* and *L.delbrueckii* in pomegranate juice resulted from $4 \times 74 \times 10^6$ CFU/ml viable cells and 4.00×10^6 CFU/ml viable cell after two weeks with a decrease in pH and sugar level while the increased acidity and when the sample which was stored at 4°C, the reduction of 3log CFU microbial cell count of *L.plantarum* seen after 14 days. The study by Yuliana *et.al.*show that the inoculation of probiotic strain *L.acidophilus* in coconut milk revealed that after 28 hrs the visible plate count of *L.acidophilus* found to be 10^9 CFU/ml and the test sample which refrigerated at 5°C retained a viable cell count nearly 10log CFU/ml on sixteenth day with decrease in sugar content & pH and increase in titrable acidity. While, Bukola Christianach et al reported that when

mango juice was successfully probioticated with i.e. two strains of lactic acid bacteria i.e. *pediococcus pentosaceus* and *pediococcus acid lactic*, resulted in significant improvement in microbial viable cell count at 4°C than stored at 25°C.

Substrate (fruit juice)	Probiotic strain	viability & storage period	Manufactured by	References
Mango juice	<i>L.rhamnosus</i>	4 weeks. 10 ⁷ cfu/ml.	TINEBA,Norway	[18]
Orange Juice	<i>L.plantarum</i> HEALg <i>L.paracasci</i> 8700	12 weeks. 10 ⁸ cfu/ml.	Golden circle Australia	[19]
Amala juice	<i>L.paracaseill</i> 1101	4 weeks 10 ⁶ cfu/ml.	Malee enterprise company Ltd.Thailand.	[20]
Peach juice	<i>L.casci</i> <i>L.delbrueckii</i>	4 weeks 1.72 X 10 ⁷ cfu/ml.	Bio-Live/microbz Ltd.UK	[21]
Tomato juice	<i>L.sanfranciscensis</i>	4 weeks 10 ⁶ -10 ⁷ cfu/ml.		[8]
Grapes juice	<i>L.paracesci</i>	72 hrs. 3.2-6.5 loge cfu/ml.	Malee enterprise company Ltd.Thailand.	[22]
Mixture of strawberry and banana	<i>B.lactis</i>	12 weeks. 10 ⁸ cfu/ml.	Tropicana,USA	[19]
Mixture of strawberry and coconut	<i>Bacillus</i> <i>Coagulance</i> GBI- 306086	12 weeks 10 ⁷ – 10 ⁸ cfu/ml.	KEVITA,USA	[19]
Pomegranate juice	<i>L.plantarum</i> <i>L.paracasci</i> <i>L.delbrueckii</i>	2 weeks 10 ⁶ cfu/ml.	Bio-Live/microbz Ltd.UK	[23]
Coconut milk and Grapes extract	<i>B.bifidium</i> <i>B.coagulance</i> <i>L.plantarum</i>	2 weeks (coconut) 10 ⁶ cfu/ml. 72h (grapes) 3.2-6.5 log cfu/ml	Biome1,UK.	[6]
Pineapple juice	<i>L.casci</i>	42 days 10 ⁶ cfu/ml.	Tropicana,USA	[24].

Table:1- List of different Probiotic juice manufactures

CONCLUSION

This review shows that in the market there is more availability of dairy-based probiotic beverage, but looking towards the public demand for a fruitarian diet, non-allergic and cholesterol free probiotic has led researchers to find out something new ideal substrate which has positive health effect and act as a good vehicle for the persistence of probiotic microbes. Fruit juices are associated with essential nutrients thus, inoculation of probiotics in fruit juices has become an advanced technique for the food industry. After Fermentation, the symbiotic association of culture and juices exert a newer altered product which has more probiotic microbial viability with low pH and increased acidity as compared to non-Probioticated juices. The commercialization of non-dairy probiotic beverages is dependent upon the task profile of the culture, aroma, good texture, and fresh taste of the product.

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