STUDY OF THE EFFECT OF PROBIOTIC ORGANISMS (LACTOBACILLUS ACIDOPHILUS AND BIFIDOBACTERIUM BIFIDUM) ON ORGANOLEPTIC PROPERTIES OF SYMBIOTIC CONCENTRATED YOGURT

Maryam Tavakoli*, Narges Shahbazpour**, Mohammad Ali Shariati, Mitra Parsi***, Mehdi Kaviani*,*******
****Department of Food Science and Technology, Ferdowsi University of Mashhad. Mashhad, Iran.***
*****Food and Drug Deputy, Kermanshah University of Medical Sciences, Kermanshah, Iran.***
******Department of Food Science and Technology, Science and Research Branch, Islamic Azad University, Tehran, Iran.***
*******corresponding author email:kaviyani.mehdi@yahoo.com***

Abstract: *Having specific nutritional and technological characteristics, milk and its fermented products are highly regarded and investigated as carrying probiotic bacteria. Two factors are crucial to produce a suitable probiotic dairy product; survival of microorganisms during storage and sensory desirability of product from the customers' point of view. In this research prebiotic ingredients (inulin and oligofructose) were added in three levels (0%, 1.5%, and 3%) to the milk with other powder ingredients in order to produce symbiotic concentrated yogurt. Lactobacillus acidophilus (LA-5) and Bifidobacterium bifidum (Bb-12) were simultaneously inoculated with natural yogurt bacteria. 10 trained panelists were asked to study the organoleptic characteristics of samples. Panel test showed the samples inoculated with L. acidophilus got higher scores than those inoculated with Bb. Bifidum. The best sample was that containing 3% inulin, 1.5% oligofructose, and 1% inoculation level of L. acidophilus.*

Key words: *Bifidobacterium Bifidum, Concentrated Yogurt, Lactobacillus Acidophilus, Organoleptic Properties, Symbiotic.*

Introduction

Nowadays, producing safe and healthy food is so controversial and expressions like organic food, natural food and functional food are indicative of this trend. Probiotic products are considered as these kinds of food products. Probiotics are beneficial microorganisms which are able to grow in intestinal

condition (either humans or animals) and have advantageous effects on their host's health. Using these kinds of products positively influences different body systems such as digestion system, immune system, and so on. Number of these microorganisms have been recognized and introduced which are capable of being cultivated in dairy products like beverage milk, yogurt, ice-cream, and so on. High consumption demand for these products in developed countries is a significant motivation for dairy technology. Concentrated yogurt is one of dairy products which is more acceptable between customers due to having higher nutritional values, higher stability, and desirable texture and flavor.

One way to produce concentrated yogurt is using milk powder and additives. This action is known as Whey less system. reported that it is possible to produce concentrated yogurt by reconstructing of milk powder. The process is to reconstruct of milk powder in water and mix it with milk fat, stabilizer, and salt (if desired). Reconstructed milk enters the production cycle. Thereafter, it is under process according to yogurt production. After fermentation, the product is cooled to 20 °C then it is packed. Final cooling is done in a cold store. Using of buttermilk or whey protein concentrate has been successful in producing concentrated yogurt. Gelatin can be utilized as an additive to improve the yogurt consistency. Moreover, some additives such as Gelodans B235 or use of starters like *Leuconostoc* species, producing polysaccharide, have been favored.

Studying the organoleptic properties of concentrated yogurt revealed that the concentrated yogurt made of fresh milk got the highest organoleptic score compared with one obtained from reconstructed milk or buttermilk using nozzle separator. In addition, fortifying the set yogurt, researchers understood the role of whey powder and sodium caseinate on concentration of the yogurt. They also reported that it is possible to add 15% of whey protein concentrate (total Nitrogen basis) to ultra filtration retentate and produce concentrated yogurt with acceptable quality and ingredients. To produce a new dairy product with healthy characteristics, customers' sensory acceptance is so important in addition to survival of probiotic microorganisms and sustaining the proper rheological properties during storage. Organoleptic properties of concentrated symbiotic yogurt as a new product have been investigated in this paper.

Materials and methods

Materials

Ingredients were used in this study are as follows: pasteurized and homogenized milk was provided from Laban Dasht dairy products Co, Iran). Prebiotic materials, inulin and oligofructose (Orafti Co). Whey protein con-

centrates 80% (progel) and sodium caseinate (EM7) (from DMV Co).Non-fat milk powder without any antibiotics (from Neyshabour Paloud Parsian dairy products Co.Iran).

Microorganisms

Two commercial bacterial cultures were used containing yogurt culture (YC-380, freeze dried L. bulgaricus and S. thermophilus DVS) (Christian Hansen Co., Denmark). Freeze dried probiotic single strain cultures of *L. acidophilus* (LA5) and *Bb. Bifidum* (Bb12) kind of DVS were gained from Christian Hansen Co. (Denmark).

Methods

Starter culture: To prepare starter cultures to use in laboratory scale, according to company structure, package content was added to 1000 ml of milk and was mixed slowly so that granules were completely dissolved. Then 10 ml of the mixture per 1 L of milk added to prepared milk (2.5% of primary milk).

Probiotic cultures: To prepare probiotic cultures, according to company structure, package content was added to 500 ml of milk and was mixed to be completely dissolved. Then 0.4, 1.2, and 2 ml of probiotic culture per 1 L of milk added to prepared milk. The last amount is respectively 0.1%, 0.3%, and 0.5% of probiotic culture to primary milk.

Milk preparation: Primary quality (pH, acidity, microbial total count, amount of fat and protein, and absence of antibiotic test) were done on pasteurized milk (72 °C, 15 S). Powder ingredients like 80% whey protein, sodium caseinate, and powdered milk were added to the milk. Pribiotic ingredients such as inulin and oligofructose (specific ratios for each treatment) were added to the milk. Prepared milk was exposed to thermal treatment (80 °C, 5 min).at the end of the thermal process, bottles of milk were cooled immedeatly to less than 10 °C using cold bath. Then they were kept for a night in a refrigerator.

Concentrated yogurt: Prepared milk samples with different formula were heated to 37°C using water bath method. Moreover, they were inoculated with prepared starter cultures (2.5%) and prepared probiotic cultures (0.1%, 0.3%, and 0.5%). Completely mixed, each dish contents were divided into a 100-g dish and were moved to an incubator 37 °C. During incubation the temperature was regularly controlled. Samples with pH=4.7 were removed from incubator and moved to a refrigerator 4 °C.

Sensory assessment: organoleptic tests were done by 5 panelists. It is notable that they were trained using control samples before the main test. This followed some goals: to define tested characters, to find proper quantita-

tive sources, and to help understand the concept of the test; getting familiar of panelists with samples and methods.

Yogurt samples were coded and randomly tested. Samples were assessed in 12±2 °C. Black tea and water were drunk between testing each sample. In this case, taste, smell, and texture (consistency, viscosity, and creaminess) were regarded.

Table 1 - Standard sensory language and assessment methods to explain textural properties of yogurt

	Definition, Quantitative Resources, Method of Assesment	Intensity (five-score scale)
consis-tency	Deginition: force needed to take the product with a tea spoon Lowe consistency: --------- High consistency: fresh creamy cheese Assessment: insert the tea spoon into the yogurt, pick it up, regard the force needed to do this	Very good Very bad
Viscosity	Definition: resistance to flow Low viscosity: double cream 45% High viscosity: sour cream 18% Method: slowly tear the yogurt in a same direc-tion for 30 times with a tea spoon. Take a full spoon of yogurt. Let it flow drop by drop. Regard the flow rate.	Very good Very bad
Creami-ness	Definition: fat layer of a product when it is com-pressed between tongue and palate Low creaminess: non-stirred yogurt with 0.2% fat High creaminess: stirred yogurt with 10% fat Method: put a full spoon of yogurt in your mouth. Compress the product between your tongue and palate. Asses its creaminess	Very good Very bad

Being trained, the panelists did the organoleptic tests using specific forms. Table 2 shows a sample of used form.

Table 2 - Sample form of organoleptic properties

Sample No.	Tested property	Very good 5	Good 4	Average 3	Bad 2	Very bad 1
1	Taste					
	Texture					
	Mouth feeling					
	Overall acceptance					
2	Taste					
	Texture					
	Mouth feeling					
	Overall acceptance					
3	Taste					
	Texture					
	Mouth feeling					
	Overall acceptance					
4	Taste					
	Texture					
	Mouth feeling					
	Overall acceptance					
5	Taste					
	Texture					
	Mouth feeling					
	Overall acceptance					

Result and discussion

Effect of prebiotic ingredient and percentage inoculation of *L. acidophilus* on sensory properties of symbiotic concentrated yogurt

Table 3 shows the results of panel test related to yogurts containing *L. acidophilus*. According to these results, the sample containing 3% inulin, 1.5% oligofructose, 0.1% inoculation of probiotic bacteria got the highest score of taste, texture, and overall acceptance. However, the highest score of smell was related to the sample containing 3% inulin, 0% oligofructose, and 0.1% inoculation of probiotic bacteria. According to table 3, in samples containing *L. acidophilus*, the lowest taste score was related to sample No.

3 (1.5% inulin, 1.5% oligofructose, and 0.3% inoculation of probiotic bacteria). In addition, the lowest smell score was obtained by sample No. 11 (0% inulin, 0% oligofructose, and 0.5% inoculation of probiotic bacteria). The lowest texture score was observed in sample No. 6 (0% inulin, 0% oligofructose, and 0.3% inoculation of probiotic bacteria). Finally, sample No. 10 (3% inulin, 1.5% oligofructose, and 0.3% inoculation of probiotic bacteria) got the lowest overall acceptance score. Results indicate that percentage of inoculation of probiotic bacteria had a significant effect on organoleptic properties of concentrated yogurt, the more inoculation the less obtained score.

Table 3 -The affection of the type of Prebiotic compounds and Inoculation (%) of Probiotic Microorganism on Sensory Properties of Concentrated symbiotic Yogurt

	texture	smell	flavor	Inoculation (%)	Olygo fructose (%)	Inulin (%)	Overall acceptance
1	4.2±0.48	4.1±0.36	3.8±0.38	0.1	0	0	4.01±0.32
2	4.2±0.6	4.0±0.56	3.7±0.42	0.1	3	0	4.0±0.2
3	4.2±0.48	4.1±0.54	2.7±0.48	0.1	1.5	1.5	3.08±0.32
4	3.8±0.48	4.4±0.58	3.8±0.48	0.1	0	3	3.9±0.32
6	4.5±0.4	4.3±0.5	4.4±0.48	0.1	1.5	3	4.1±0.31
6	3.6±0.48	3.8±0.32	3.1±0.36	0.3	0	0	3.8±0.27
7	4.1±0.54	4.1±0.18	3.8±0.48	0.3	0	1.5	4.02±0.13
8	4.0±0.6	3.8±0.32	3.6±0.6	0.3	1.5	1.5	3.8±0.22
9	3.7±0.42	3.8±0.32	3.7±0.29	0.3	3	1.5	3.3±0.76
10	4.4±0.18	3.9±0.18	3.2±.54	0.3	1.5	3	3.1±0.54
11	3.7±0.56	3.7±0.32	3.5±0.9	0.5	0	0	3.7±0.42
12	3.8±0.64	3.9±0.36	3.2±0.48	0.5	3	0	3.5±0.9
13	4.2±0.32	3.8±0.48	3.7±0.32	0.5	.5	1.5	3.2±0.68
14	4.4±0.6	3.8±0.48	3.9±0.36	0.5	3	0	3.5±0.5
15	4.4±0.5	3.9±0.36	3.62±0.31	0.5	3	3	3.2±0.48

Effect of prebiotic ingredient and percentage inoculation of *Bb. bifidum* on sensory properties of symbiotic concentrated yogurt

Table 4 illustrates the results of panel test related to yogurts containing *Bb. Bifidum*. According to these results, the sample containing 3%

Table 4 - The affection of the type of Prebiotic compounds and Inoculation (%) of Bb. bifidum on Sensory Properties of Concentrated symbiotic Yogurt

	texture	smell	flavor	Inoculation (%)	Olygo fructose (%)	Inulin (%)	Overall acceptance
1	3.2±0.48	3.4±0.48	3.4±0.36	0.1	0	0	3.2±0.32
2	3.2±0.6	3.3±0.6	3.0±0.42	0.1	3	0	3.0±0.2
3	3.2±0.48	3.1±0.48	1.7±0.48	0.1	1.5	1.5	2.8±0.32
4	1.8±0.48	3.4±0.48	2.8±0.48	0.1	0	3	2.9±0.29
6	4.0±0.4	2.5±0.5	3.8±0.48	0.1	1.5	3	2.8±0.31
6	3.2±0.48	3.0±0.32	2.9±0.36	0.3	0	0	2.8±0.27
7	3.1±0.54	3.1±0.18	3.0±0.48	0.3	0	1.5	3.02±0.31
8	3.5±0.6	2.8±0.32	2.6±0.6	0.3	1.5	1.5	2.8±0.22
9	3.7±0.42	2.5±0.32	2.7±0.29	0.3	3	1.5	2.3±0.76
10	3.9±0.18	2.9±0.18	3.0±0.54	0.3	1.5	3	2.1±0.54
11	2.7±0.56	1.7±0.32	2.5±0.9	0.5	0	0	2.7±0.42
12	2.8±0.64	2.9±0.36	3.0±0.48	0.5	3	0	2.5±0.9
13	3.2±0.32	3.5±0.48	2.7±0.32	0.5	1.5	1.5	2.2±0.68
14	3.4±0.6	3.1±0.48	3.1±0.36	0.5	3	0	2.5±0.5
15	3.9±0.5	3.0±0.36	3.02±0.31	0.5	3	3	2.2±0.48

inulin, 1.5% oligofructose, 0.1% inoculation of probiotic bacteria and the sample containing 1.5% inulin, 1.5% oligofructose, 0.5% inoculation of probiotic bacteria got the highest score of taste and smell respectively. However, the highest score of texture and overall acceptance were respectively related to the sample containing 3% inulin, 1.5% oligofructose, 0.3% inoculation of probiotic bacteria and the sample containing 0% inulin, 0% oligofructose, 0.1% inoculation of probiotic bacteria. Moreover, in samples containing Bb. bifidum, the lowest taste and smell scores were respectively obtained from sample containing 1.5% inulin, 1.5% oligofructose, and 0.1% inoculation of probiotic bacteria and from sample containing 0% inulin, 0% oligofructose, and 0.5% inoculation of probiotic bacteria. Sample containing 3% inulin, 0% oligofructose, and 0.1% inoculation of probiotic bacteria and sample containing 3% inulin, 1.5% oligofructose, and 0.3% inoculation of probiotic bacteria respectively got the lowest score in texture and overall acceptance.

Conclusion

Samples containing *L. acidophilus* got higher scores in all organoleptic tests compared to samples with *Bb. bifidum*. Considering the higher total count (more *Bb. bacterium* survival), it seems that more growth of this microorganism has led to increase in lactic acid production. Therefore, increased acidity resulted in significant decrease in scores of taste, smell, and overall acceptance of samples containing *Bb. bifidum* compared with samples containing *L. acidophilus*. Combination of these two spices of bacteria can be regarded to modify the taste of the samples.

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