Sensorial characteristics of yogurt obtained with YF-L811 culture

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Abstract
Exopolysaccharides produced by *Streptococcus thermophilus* and *Lactobacillus delbrueckii* ssp. *bulgaricus* lower syneresis, improve structure and viscosity of the product and are substituents for commercial stabilizers of yogurt. Exopolysaccharides are considered to be food bio-additives because have physiological health effects. In this work it was studied sensorial characteristics of some yogurts fermented with EPS-producing strains at various temperature conditions and with various supplements in culture medium.

Key words: yogurt, exopolysaccharides, sensorial characteristics.

1. Introduction

Exopolysaccharides (EPS) synthetised by lactic acid bacteria represent a class of polymers with potential as food additive and functional ingredient and can have beneficial health effects (Welman et al., 2006). Exopolysaccharides are important in producing fermented dairy products for improving viscosity, synaeresis prevention, improving gel consistency and minimizing negative effects caused by pumping and mixing in machines during dosage and packing (De Vuyst and Degeest, 1999). Strains producing EPS can be useful in prevention of these defects (Broadbent et al., 2003). EPS produced by *Streptococcus thermophilus* and *Lactobacillus delbrueckii* ssp. *bulgaricus* lower synaeresis, improve structure and viscosity of the product and are substituents for commercial stabilizers of yogurt (Cerning 1995). EPS-producing bacteria are utilized on a large scale in France, Holland, Austria due to popularization of the natural products, prohibition of the stabilizers and thickening agents and their high costs.

Exopolysaccharides produced by lactic acid bacteria can be considered food bio-additives. Although have no own taste, EPS contribute to improve taste perception (Welman and Maddox, 2003).

Another important side of exopolysaccharides is their important health effects. EPS are known to be antitumoral, immunostimulator and hipocholesterolemiant (Welman and Maddox, 2003). It was suggested that EPS are prebiotics (Gibson and Robertfroid, 1995), because remain a long period in gastro-intestinal tract improving their colonization with probiotic bacteria (Kleerebezem et al., 1999).

Starter culture EPS can be utilized to produce yogurt drink as well as yogurt with low content dry substance, low fat or even to produce skimmed yogurt. This kind of culture forms a characteristic structure and prevents gel breakage and whey dissociation (Florea and Costin, 2005).

Consequently, the use of EPZ-producing starter culture ensures a stable structure to fermented dairy products.

The purpose of this work is to study sensorial characteristics of fermented yogurt with thermophilic culture YF-L811, at various temperature conditions and with various supplements in culture medium, with a view to stimulate exopolysaccharides biosynthesis. Assessment was made with points rating method.

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2. Materials and methods

At the experimental procedure it was used yogurt thermophilic culture YF-L811, which is a characteristic mixture of *Streptococcus thermophilus* and *Lactobacillus delbrueckii* ssp. *bulgaricus* in freeze-dried form. YF-L811 is known to produce a full-bodied yogurt, moderate flavor and very low postacidification. The freeze-dried culture was stored at -18 ^{o}C (Chr. Hansen, Product information brochure, 2003).

In order to obtain yogurt, it was used reconstituted milk with 12.5% dry substance, prepared with full cream milk powder instant (Darling-full cream milk powder 26% fat, produced and packed by SC EURO FOOD PROD SRL). Milk was pasteurized (85^{o}C, 30 min.), cooled to suitable temperature for insemination (30 and 43°C) and used for two series of experiments. In one experiment, the culture medium was supplemented with lactose (2% and 6%) and in another with whey powder (2% and 6%) (ESPRION 300 – whey powder with 30% proteins, produced by KUK Romania). Samples prepared like this were inseminated with starter strain YF-L811 according to directions (50 U to 250 l of milk) and thermostated at 30^{O}C and 43°C. The fermentation was interrupted when sample pH reaches optimal value (4.65 – 4.7). After thermostate, samples were cooled to 4°C (Chr. Hansen, Technical Brochure, 2006).

The physico-chemical properties of the samples undergo sensorial assessment are shown in table 1.
Acidity (in Thörner degrees) was measured by titrimetric method.

pH measurement was accomplished with Checker – HANNA Instruments pH-meter, electrode type HI 1270, diameter 9 mm, pH-interval ranging from 0.00 to 14.00.

Synaeresis was assessed by whey quantity, spontaneously dissociated, in terms of ml%, by direct measurement of whey dissociated against yogurt quantity in the glass.

Ropiness was assessed with points from 0 to 5. After measurement of the whey dissociated, samples were homogenized to assess the ropiness of the product by flow test (adapted by Raus-Mediedo et al. 2002).

The following sensorial characteristics have been assessed: taste and odor, consistency, color and appearance.

Ropiness assessment degree	*Score*
Absent	0
Slight ropy	1
Light ropy	2
Ropy	3
Real ropy	4
Very strong ropy	5

Samples were degusted by 20 tasters.

Figure 1 shows incidence of consuming yogurt in percents, at questioned persons.

From a total number of tasters, 70% are eating yogurt every-day and frequent (at 2 or 3 days) and 30% rarely and sporadic (once a month).

The quality of the products was assessed by five points system. The five points system have 6 steps for every characteristic, therefore the product assessment is done differentially.

Table 1. Acidity and *p*H of the yogurt samples

		C	**1**	**2**	**3**	**4**
Fermentation at 30°C	Acidity, °T	98	101	94	114	135
	pH	4.70	4.71	4.77	4.85	5,03
Fermentation at 43°C	Acidity, °T	85	110	95	109	140
	pH	4.65	4.71	4.77	4.80	5.04

C-reconstituted milk powder 12.5% as control sample; 1-reconstituted milk 12.5% + 2% lactose; 2-reconstituted milk 12.5% + 6% lactose; 3-reconstituted milk 12.5% + 2% whey; 4-reconstituted milk 12.5% + 6% whey.

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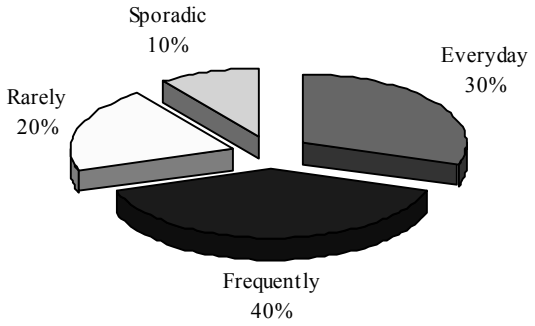

Figure 1. Incidence of consuming yogurt in percents, at questioned persons

The assessment steps of five points system were as follows:

Assessment step	*Score*	*General description of assessment step*
Very good	5	Exceptional qualities, ideally
Good	4	Qualities according to standard
Satisfactory	3	Small defects
Unsatisfactory	2	Obvious defects
Bad	1	Pronounced defects
Very bad	0	Adulterated, big changes of characteristics

According to importance of every characteristic, the following coefficients were used:

Characteristic	*Importance coefficient*
Taste and odor	0.4
Consistency	0.4
Color	0.1
Appearance	0.1

The score for every characteristic multiply with importance coefficient to result real score. Sum of real scores for every characteristic represent total score. The total score correspond to the respective interval.

Quality assessment was made using score variance intervals in order to correctly situate the product in certain quality class.

The assessment steps with score variance intervals are as follows:

Assessment step	*Score variance interval*
Very good	5 – 4,5
Good	4.5 – 3.5
Satisfactory	3.5 – 2.5
Unsatisfactory	2.5 – 1.5
Bad	1.5 – 0.5
Very bad	<0,5

3. Results and discussion

Figure 2 shows the degree of syneresis phenomenon in yogurt samples.

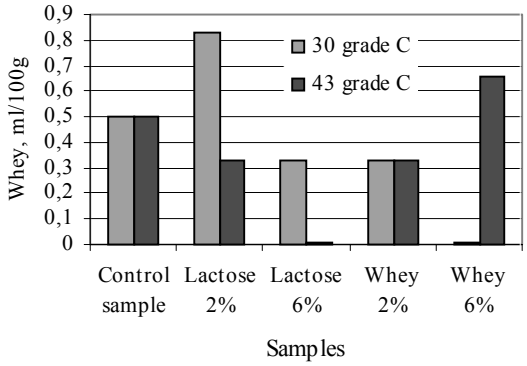

Figure 2. Quantity of whey (%) dissociated in yogurt samples

Whey dissociate in very small quantities, not more than 0.9%. Sample supplemented with 6% lactose supplement and thermostated at 43°C and sample supplemented with 6% whey powder supplement and thermostated at 30°C did not dissociate whey. Samples supplemented with 2% lactose supplement thermostated at 30°C and with 6% whey supplement thermostated at 43°C dissociate more whey than

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control samples. The rest of the samples had smaller values compare to control samples.

Whey was included into the product by mixing the samples and yogurt become creamy and smoothness. So, samples stored at 4°C did not dissociate whey anymore even after 72 hours of storage.

Figure 3 shows the assessment of yogurt ropiness.

It can be assessed that samples fermented at 30°C as much as those at 43°C, the ropiness increased in direct ratio to whey quantity added; whey addition increased the ropiness of yogurt samples more than lactose addition. The control sample and the sample with 2% lactose supplement fermented at 43°C had no ropiness, while the same samples fermented at 30°C had a light ropiness. Samples with whey addition were those with obvious ropiness, especially sample with 6% whey supplement.

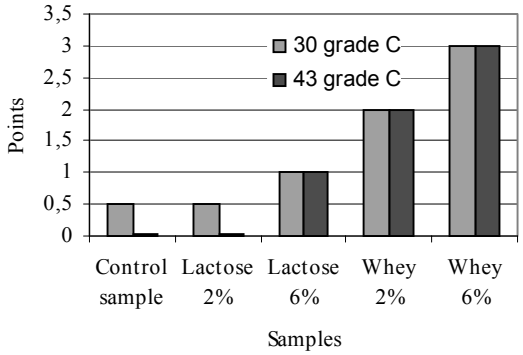

Figure 3. The assessment of yogurt ropiness by 5 points method

The results of the sensorial assessment of yogurt types subjected to analysis are shown in figure 4.

Pursuant to sensorial assessment by the tasters, sample with 6% lactose supplement was assessed to be very good by 55% of persons questioned. The sample with 2% lactose supplement was situated secondly with 50% percent. The control sample was assessed by 35% tasters as very good.

Samples with 2% and 6% whey supplement have been assessed as very good by a very small group of persons who prefer the taste sweet-caramel (because of whey powder addition) similar to cake cream. However, it was a small group of tasters who disagree samples with whey addition.

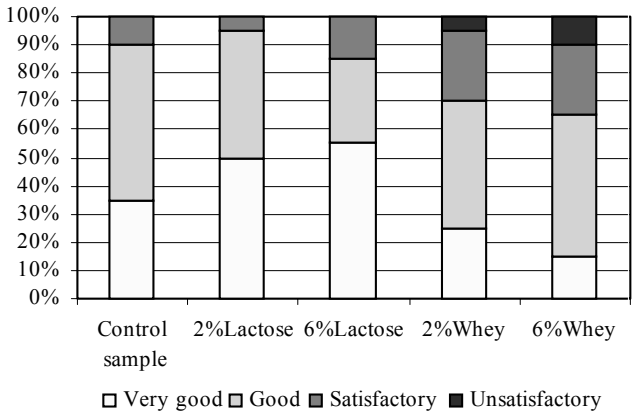

Figure 4. The results of the sensorial assessment of the yogurt tested

It can be considered that the results of taste assessment are eloquent because the majority of persons questioned is eating yogurt regularly.

Figure 5 shows the preference of questioned persons to eat regularly the yogurt samples degusted, in percents.

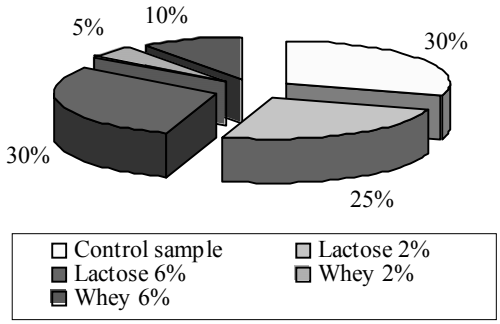

Figure 5. The preference of the questioned persons to eat regularly the yogurt samples

60% of questioned persons would prefer to regularly consume the sample with 6% lactose supplement as well as control sample. 25% of questioned persons would prefer to regularly consume the sample with 2% lactose supplement and just 15% of questioned persons would prefer the samples with 6% and 2% whey supplements.

4. Conclusions

- The yogurt samples examined dissociate small quantities of whey. The sample with 6% lactose

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supplement thermostated at 43°C and sample with 6% whey thermostated at 30°C did not dissociate whey. By mixing the samples, the whey was homogenized into the product and samples become very creamy and delicate. So, samples stored at 4°C did not dissociate whey even after 72 hours of storage.

- In both instances, the ropiness of the samples increased in direct ratio to supplement quantity added, and the whey supplement improve the ropiness of the yogurt samples more than lactose supplement.
- Pursuant to sensorial assessment of the tasters, the sample with 6% lactose supplement was assessed by most of the questioned as very good, followed by sample with 2% lactose supplement.
- The majority of questioned persons would prefer to consume yogurt with 2% and 6% lactose supplement and just 15% of questioned, the samples with whey supplement.

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