

STUDY ON THE THE AMOUNT STARTER CULTURE USED IN YOGURT MANUFACTURING

*Adriana DABIJA¹

Faculty of Food Engineering, Ștefan cel Mare University of Suceava, Romania

adriana.dabija@fia.usv.ro

*Corresponding author

Received 25 March 2012, accepted 11 May 2012

Abstract: *Among fresh dairy products, yogurt holds the largest share of value and is classified as a functional food with health benefits. Researches conducted worldwide have highlighted the beneficial effects of acid dairy product consumption on health, due to the viable microorganisms present in the finished product when sold to consumers. Yogurt is a fermented milk product with controlled technology benefiting from the activity of specific lactic bacteria, which have a well known taxonomy and morphology, making them easily detected and differentiated. The role of lactic bacteria in yogurt is that of milk acidification, the synthesis of flavor, texture and viscosity development. Interactions between lactic bacteria in yogurt are very complex and beneficial for stimulating the growth of biotechnological properties. The technology of yogurt manufacturing uses pure bacterial cultures selected in specialized laboratories, which are delivered to milk processing companies in either liquid or dry form. This paper proposes a study on the influence of the amount of added leaven towards the quality of the finished product. It was used as raw material cow's milk with 2.8% fat, which was then subjected to processing according to classical method, fermentation in packaging. . It was found that yogurt made with the smallest amount of leaven, only 1%, was appreciated by tasters and from a physico-chemical point of view it is a product within the normal parameters of quality*

Keywords: *functional food, viable microorganisms, lactic bacteria*

1. Introduction

Milk and dairy products are foods with exceptional nutritional value, but also a source of bioactive substances with multiple physiological activities beneficial to the human body.

Yogurt is a fermented dairy product obtained from milk by the action of some lactic bacteria; a product particularly appreciated by consumers. Worldwide various kinds of yogurt are produced, some locally using traditional methods, while others are produced by more elaborate industrial processes, with strict control for each manufacturing phase [1].

1.9 billion gallons of milk are consumed globally, the demand for milk having

increased in the last 7 years by 14%, higher, for example, than the increase in demand for oil, which is only 13% for the same period [2].

This trend stems from the fact that people became aware of the beneficial influence of milk and dairy products in general.

Yogurt quality depends on the characteristics of the milk - raw material, as well as numerous technological factors (technology adopted, equipment used, selected lactic bacteria starter cultures, etc.) [3, 4].

For milk fermentation and obtaining a product with specific biotechnological properties, the milk is seeded with a culture of lactic bacteria by "direct inoculation" with thermophilic lactic

bacteria: *Streptococcus thermophilus* and *Lactobacillus bulgaricus*. The role of lactic bacteria in yogurt manufacturing is that of milk acidification, the synthesis of flavor, development of texture and viscosity [5].

The technology of yogurt manufacturing uses pure bacterial cultures selected in specialized laboratories, which are delivered to milk processing firms in liquid or dry form.

This paper proposes a study on the influence of the amount of lactic bacteria starter culture on yogurt quality.

2. Experimental

To obtain the yogurt was used as raw material cow's milk with 2.8% fat, which was then subjected to processing according to classical method, fermentation in packaging.

After pasteurization and refrigeration, milk was distributed in plastic packaging of 250 mL and inoculated with a specific culture for yogurt in varying amounts (1 ÷ 3%), resulting in the final 5 samples of yogurt - finished product: sample 1 - yogurt with 1% leaven, sample 2 - yogurt with 1.5% leaven, sample 3 - yogurt with 2% leaven, sample 4 - yogurt with 2.5% leaven;

sample 5 - yogurt with 3% leaven. After seeding, samples were subjected to thermostatic incubation at 45°C / 3 hours, during which the milk clotting occurred. After the incubation, samples were cooled to 20°C, then stored in the refrigerator for 12 hours at 6°C and then were analyzed.

The yogurt samples studied were subjected to the following determinations:

- sensory analysis - method of rating scale;
- fat content - Gerber butirometric acid-method;
- protein substances content - Kjeldahl method;
- total solids content - the oven drying method;
- acidity - titrimetric method.

3. Results and Discussion

The five samples of yogurt were subjected to sensory analysis, followed by the physical and chemical analysis.

The basic principle of sensory analysis was to assess each organoleptic characteristic by comparison with the scale score of 0-5 points and obtain the average score given by the group of tasters (Table 1).

Table 1
Rating scale used in sensory analysis
(Costin, G.M., et al, 2005)

Number of points to be granted	Rating	Product features that constitute the basis for assessing the organoleptic characteristics
5	Very good	Specific product characteristics (texture, flavor, surface brightness, acidity), pregnant, very well defined, no defects
4	Good	Specific product features positive, fairly shaped, of very small defects
3	Satisfactory	Positive specific product characteristics, rather shaped and contoured, show small defects
2	Nonsatisfactory	Product characteristics has gaps or defects, which leads some users to repel
1	Inappropriate	The product has gaps or obvious defects different characteristics which leads consumers to reject it

Sensory analysis of the 5 types of yogurt in the study was conducted with the help of seven tasters. Each taster appreciated the

yoghurts' sensory qualities, for each product noting the compliance with the scoring scale.

The results obtained in sensory analysis, detailed for each taster in part and for each product and for each sensory property are presented in the tables below.

For sample 1, the sensory analysis results are presented in Table 2.

Table 2
Organoleptic analysis results – sample 1

No. taster	Degree of pleasure	Acidity	Consistency	Surface brightness	Smell	Total rating
1	3	2	5	4	3	17
2	3	2	3	4	3	15
3	5	3	4	4	4	20
4	4	3	4	3	4	18
5	4	2	3	2	3	14
6	2	3	4	4	2	15
7	4	3	4	4	3	18
TOTAL	25	18	27	25	22	117

The maximum score for this type of yogurt was 20 which was given by taster number 3. The best sensory quality of the product is its consistency, which received a score of 27 points, followed by the degree of pleasure and surface brightness - 25 points,

followed by smell with 22 points. Acidity received the lowest score - 18 points, this product seemed too sweet to tasters. Sensory analysis results for sample 2 are summarized in Table 3.

Table 3
Organoleptic analysis results – sample 2

No. taster	Degree of pleasure	Acidity	Consistency	Surface brightness	Smell	Total rating
1	5	3	4	3	3	18
2	2	3	2	2	3	12
3	4	3	4	3	3	17
4	2	1	2	2	3	10
5	4	1	2	4	3	14
6	4	2	2	3	4	15
7	3	2	2	4	4	15
TOTAL	24	15	18	21	23	101

The maximum score obtained for sample 2 is 18 points and was given by taster no. 1. As with sample 1, sample 2 was best appreciated in terms of degree of pleasure (acceptability), this characteristic totaling 24 points. The smell is ranked second

place with a score of 23 points, followed by surface brightness with 21 points and consistency with 18 points.

For sample 3 sensory analysis results are presented in Table 4.

Table 4
Organoleptic analysis results – sample 3

No. taster	Degree of pleasure	Acidity	Consistency	Surface brightness	Smell	Total rating
1	4	3	4	4	3	18
2	4	2	3	5	3	17
3	1	1	2	4	2	10
4	4	2	4	4	4	18
5	3	1	4	2	2	12
6	4	2	3	3	3	15
7	4	3	4	4	3	18
TOTAL	24	14	24	26	20	108

The panel awarded the maximum score of 18 points, given by three tasters, and obtained the minimum score of 10 points which was granted by taster no. 3. Surface brightness received the maximum score of 26 points, followed by consistency and

degree of pleasure by 24 points. The lowest score was received for acidity, only 14 of the maximum score of 35. Sensory analysis results for sample 4 are summarized in Table 5.

Table 5
Organoleptic analysis results – sample 4

No. taster	Degree of pleasure	Acidity	Consistency	Surface brightness	Smell	Total rating
1	2	3	2	3	2	12
2	2	3	2	2	5	14
3	4	3	3	4	3	17
4	3	3	2	4	3	15
5	3	3	4	4	3	17
6	3	3	1	2	3	12
7	2	4	1	5	3	15
TOTAL	19	22	15	24	22	102

Surface brightness obtained the highest score of 24 points, followed by acidity and smell both with 22 points. The degree of pleasure gained 19 points, followed by

consistency with the lowest score of 15 points. For the last sample, sample 5 sensory analysis results are presented in Table 6.

Table 6
Organoleptic analysis results – sample 5

No. taster	Degree of pleasure	Acidity	Consistency	Surface brightness	Smell	Total rating
1	4	3	3	3	4	17
2	2	3	2	2	4	13
3	2	3	3	4	4	16
4	4	1	2	2	2	11
5	2	3	3	2	4	14
6	5	3	3	3	3	17
7	5	2	4	4	4	19
TOTAL	24	18	20	20	25	107

Analyzing the data shows that the maximum score calculated for this test is 19 points and was awarded by taster no. 7, and the minimum score is 11 points and is given by taster no. 4. The most appreciated the quality of this product is the smell with 25 points, followed by the degree of pleasure with 24 points and tied, the surface brightness and consistency with 33 points each.

Figure 1 shows that the sample of yogurt that has obtained the highest score for the sensory characteristics is to use the smallest amount of starter culture, 1%.

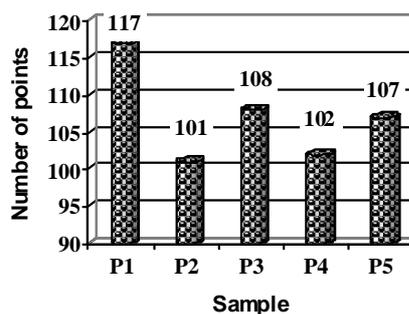


Figure 1. Summary of organoleptic evaluation of yogurt samples

Physico-chemical analysis results are summarized in Table 7.

Table 7
Physico-chemical characteristics of the studied yogurt samples

Physico-chemical characteristic	YOGURT SAMPLE				
	S1	S2	S3	S4	S5
Fat content, %	2,80	2,85	2,80	2,74	2,80
Protein, %	3,20	3,25	3,18	3,12	3,20
Solids, %	11,50	11,85	11,05	11,09	11,90
Acidity, °T	74,5	77	80,2	78	81

Examination of the data obtained the following:

- in terms of fat content of yogurt, only one sample - sample 4 does not fit the standardized fat content (2.74% instead of 2.8%);
- protein content and solid matter content that are close in value, registering small differences between samples. Samples 3 and 4 do not meet the conditions imposed by Romanian standards, namely min. 11.3% total solids for this type of yogurt, with 2.8% fat;
- acidity of the samples studied are within normal limits for such products. There is a correlation of this indicator with the amount of starter cultures used to obtain the yogurt (increasing the amount of starter culture led to higher acidification of yogurt samples analyzed).

4. Conclusion

Yogurt is the best known fermented dairy product that is produced in a wide range of varieties that differ by texture, taste and aroma.

One of the determinants of the quality of yogurt - finished product is the quality and quantity of lactic bacteria starter cultures specific in yogurt manufacturing, respectively a culture consisting *Streptococcus thermophilus* and *Lactobacillus bulgaricus*. Technology for obtaining the starter culture varies from manufacturer to manufacturer, but it is essential that both species are present.

This paper presented a study on the influence of the amount of leaven of lactic bacteria used in yogurt obtainment, a study performed by assessing organoleptic characteristics and determining the main

physico-chemical characteristics of yogurt samples obtained with varying amounts of leaven.

Analyzing the data obtained it was found that yogurt made with the smallest amount of leaven, only 1%, was appreciated by tasters and from a physico-chemical point of view it is a product within the normal parameters of quality, as with current standards. An increasing amount of leaven over this value led to a worsening quality of yogurt, and in technological practice this may negatively affect the production cost of the finished product.

Fermented dairy products are considered functional foods, especially due to the beneficial physiological effects on the human body, effects resulting also from the biochemical activity of starter cultures used to obtain them.

5. References

- [1]. BANU C., *et al.*, *The influence of technological processes on foodstuffs quality (Influența proceselor tehnologice asupra calității produselor alimentare)*, Editura Tehnică, București, (1974)
- [2]. Costin, G.M., *et al.*, *Fermented dairy product (Produse lactate fermentate)*, Editura Academica, Galați, (2005)
- [3]. BANU C., VIZIREANU, C., *Industrial processing of milk (Procesarea industrială a laptelui)*, Editura Tehnică, București, (1998)
- [4]. BANU C., *et al.*, *Selected cultures and preparation guide and microbiological examination in dairy (Îndrumător pentru prepararea culturilor selecționate și examenul microbiologic în industria laptelui)*, Editura Tehnică, București, (1986)
- [5]. COLLADO M.C., *et al.*, *Food Research International*, 39, p.530-535, (2006)