THE QUALITY EVALUATION OF SOME FORTIFIED YOGURT VARIETIES OBTAINED FROM THE MILK MICRO-PRODUCTION WORKSHOP AT IULS IAȘI

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Abstract

Yogurt is an acidified dairy product, similar to cream, obtained by fermenting pasteurized milk and inoculating it with a production STARTER culture composed of lactic acid bacteria. Yogurt is easily digestible due to its lower lactose content compared to pasteurized milk. Additionally, yogurt is considered the healthiest dairy product due to its high content of polyunsaturated fatty acids, proteins, calcium, and phosphorus.

In this paper, we aim to analyze the quality parameters of several types of yogurt produced in the milk processing workshop at IULS Iași, yogurt which we enriched with rose syrup, dehydrated bananas, aronia powder, aronia jam, and natural beetroot colorant. The newly obtained varieties were compared with two types of plain yogurt (a full-fat yogurt with a 3.8% fat content and a normalized yogurt with a 2.6% fat content). According to FAO and WHO, to obtain a value-added yogurt, it is recommended that the added ingredients should constitute between 5% and 15% of the final product.

To establish the quality parameters, sensory and physico-chemical analyses were performed, aiming to determine the water content (%), dry matter content (%), fat content (%), protein level (%), and mineral content (%). Fruit yogurt is not a new concept; however, the one processed by us contains no sugar or other sweeteners. Through the additives we used, we were able to enhance both the sensory characteristics and the nutritional values. Additionally, a lower syneresis was observed in the yogurt with additives compared to the plain varieties or those with only colorant added. From a sensory perspective, the scores were higher, especially for the yogurt with rose syrup.

Key words: *yogurt, dairy product, milk, digestible, protein*

INTRODUCTION

Yogurt is an acidic dairy product obtained from thermally treated milk, to which a production STARTER culture is added after the treatment process is completed, thus initiating the lactic fermentation necessary for the formation of the coagulum in the final product.

Milk is considered a basic food in human nutrition due to its high nutritional and biological value, and it is also the primary raw material used in the food industry to produce a diverse range of dairy products [9].

Numerous studies focused on the development of functional yogurts have demonstrated that the development of new technologies and recipes for dairy products provides benefits both for the dairy processing industry (as certain ingredients can extend the shelf life of products) and for the final consumer (as it offers the population access to a range of products with higher energy value and superior

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sensory qualities, compared to the same yogurt varieties without additives).

Studies conducted in the area of improving yogurt made from whole milk have shown that the addition of strawberries, combined with chia seeds, improved the organoleptic quality of the final product due to the strawberries, and increased the protein level and lipid content due to the addition of chia seeds [4].

Another practical approach describes how, by using a powder made from the peels of various fruits, acid dairy products can be produced with superior organoleptic properties and increased nutritional value, while also allowing for the valorization of plant by-products resulting from the processing of fruits and vegetables [10].

Various studies have demonstrated that by using powder obtained from bananas and mangoes in the preparation of fermented dairy products, both the antioxidant characteristics and the prebiotic properties of the final dairy products can be improved [2, 5].

Rhododendron flower powder, used as a natural ingredient in the production of a functional yogurt variety, has proven to be a valuable addition in the development of fortified dairy products, due to its rich content of bioactive components with antioxidant properties from rhododendron [7].

Another study demonstrated the benefits of using papaya pulp as an additive in the production of yogurt varieties with improved sensory properties, compared to some plain dairy products [1].

The color of fruit yogurts is an important aspect to consider when producing dairy products with superior sensory qualities. Studies have shown that during storage, the color of fruit yogurts undergoes changes and degradation [8].

The use of fruit additives in the production of enhanced dairy products is a process that must be carried out in a controlled manner, as the type of ingredients used (derived from different fruits) and the concentration of the added fruit in milk or yogurt influence both the technological parameters of the milk's pasteurization stage and the number of microorganisms in the product, as well as its titratable acidity, pH, and the structure of the dairy product [3, 6].

MATERIAL AND METHOD

The raw, whole milk was delivered to us from the teaching farm of the Faculty of Food and Animal Sciences, located in the village of Rediu, Iași County. The milk was processed in the milk micro-production workshop at IULS Iași, and the additives used were exclusively purchased from commercial sources. Laboratory analyses to determine the quality parameters, both for the raw milk and for the acid dairy products, were carried out in the specialized laboratories at IULS Iași.

In this study, to determine the physicochemical quality parameters of the raw milk, we used a portable EKOMILK M-type ultrasonic milk analyzer and a pH meter. For the laboratory analyses of the 8 yogurt varieties obtained, we used a series of laboratory methods to determine the water content (%), total solids (%), fat content (%), protein content (%), mineral content (%), and titratable acidity (°T).

The determination of water content and total solids was performed by the **oven-drying method**, the fat content was determined by the **Soxhlet extraction method**, protein content was determined by the **Kjeldahl method**, ash content was determined by **calcining the residue obtained through evaporation in a water bath**, and titratable acidity was determined by the **titrimetric method**, also known as the **Thörner method**.

The milk processing process, aimed at obtaining the 8 yogurt varieties, was carried out by following the technological stages of reception, filtration, normalization, pasteurization, inoculation, additive dosing, milk packaging, milk thermization, and storage of the finished products.

The milk reception - raw material was carried out qualitatively using the portable EKOMILK M-type ultrasonic milk analyzer and a pH meter (to determine the quality parameters of the milk), and quantitatively by applying the gravimetric method (to determine the total quantity of milk received). According to the laboratory analysis results performed on the raw material and presented in Table 1, the received milk met the quality standard required by national legislation (SR 2418, 2008).

Table 1. Chemical composition of milk raw - material used for the production of the 8 types of yogurt

Specification	N	$\bar{X} \pm s_X$	V%	Minimum	Maximum
pH	5	6.52±0.001	0.14	6.51	6.53
Moisture (%)		87.08±0.05	0.86	86.90	87.20
T.S.S. (%)		12.92±0.05	0.86	12.80	13.10
B.S.M. (%)		9.02±0.04	0.97	8.90	9.11
Fat (%)		3.90±0.03	1.81	3.80	4.00
Protein (%)		3.34±0.02	1.02	3.30	3.39
Mineral (%)		0.65±0.001	1.28	0.64	0.66
Density (g/cm^3)		1.0289±0.04	0.68	1.0288	1.0291

The milk filtration stage was carried out manually by passing the milk through a food-grade cheesecloth placed above the pasteurization vat. After filtration, we separated the milk into two different batches, and one of the batches was subjected to the normalization process until a fat content of approximately 2.6% was achieved. The normalization process was carried out by heating the milk to a temperature of approximately +35°C and applying a centrifugal force of about 800-1.000 revolutions per minute. After normalization, the milk was pasteurized in the vat at a temperature of approximately +75°C for 30 minutes, followed by rapid cooling to a temperature of around +43°C. After cooling the milk, the inoculation stage was carried out using a starter culture consisting of bacteria from the genera *Streptococcus salivarius subsp. Thermophilus* and *Lactobacillus delbrueckii subsp. Bulgaricus*.

The dosing of the milk and additives was carried out in plastic containers with a volume of 150 ml. To complete the packaging process, the containers were heat-sealed to ensure the airtight closure of the packages. The additives were dosed manually, and in different amounts depending on the type of ingredient used. **The powdered additives** (aronia powder and natural beetroot colorant) were directly incorporated into the pasteurized and inoculated milk, and the mixture was thoroughly homogenized to ensure the even distribution of the additive throughout the entire volume of milk, after which it was dosed into containers (Figure 1). **The solid additives** (dried bananas and aronia jam) **and the liquid additive** (rose syrup) were added separately into the containers, after which the pasteurized and inoculated milk was dosed in (Figure 2). The packaging of the pasteurized and inoculated milk was carried out using a semi-automatic dosing and heat-sealing machine for the containers.

Figure 1 Pasteurized milk enriched with aronia powder

Figure 2 Dosage of dried banana addition

After packaging, the products were subjected to the thermostating stage using a thermostat, where the containers were maintained under optimal temperature and humidity conditions to complete **the coagulation process** (maintaining a temperature of about +44°C for 180 minutes), **pre-cooling** (bringing the yogurt, after coagulation, to a temperature of about +18 ÷ +19°C), and **cooling** (bringing the yogurt to the storage temperature). The yogurt storage stage involved keeping the finished products for a period of 25 days for the plain yogurt varieties and 22 days for the fortified yogurts, in a room with a temperature ranging from +3 to +4°C (on day 22 for the fortified yogurts and on day 25 for the plain yogurts, the first signs of mold appeared on the upper surface of the coagulated products).

RESULTS AND DISCUSSIONS

For the 8 yogurt varieties, I conducted two sets of analyses: one set of sensory analyses and one set of physico-chemical analyses, to determine, by comparison with the plain yogurt varieties, what changes the new ingredients brought to the finished dairy products and how well these additives improved the new yogurt varieties.

From a sensory perspective, I analyzed and compared quality parameters for color, consistency, smell, and taste, and the results of the sensory analyses are presented in Table 2.

Table 2 Sensory properties of the 8 types of yogurts studied

Product name	General appearance		Smells	Taste
	Color	Consistency		
Fat yogurt 3.8% / **Normalized yogurt 2.6%**	White with a slight yellowish tint	Firm with a porcelain-like appearance and no air bubbles	Pleasant, slightly tangy	Pleasant, characteristic of yogurt
Fat yogurt with added dehydrated bananas (10% added content)	White with a yellowish tint	Firm with a porcelain-like appearance, containing dehydrated banana fragments, and without air bubbles	Pleasant, slightly tangy (without the scent of bananas)	Characteristic of yogurt with dehydrated bananas
Fat yogurt with added rose syrup and natural red beetroot colorant	Light pink, slightly toward yellow	Firm with a porcelain-like appearance and no air bubbles	Pleasant, mildly sweet	Mildly sweet
Fat yogurt with added aronia powder	Light purple	Firm with a porcelain-like appearance and no air bubbles	Pleasant, slightly tangy	Characteristic yogurt taste
Normalize yogurt with added aronia jam	White with a slight purple tint (purple color becomes more noticeable after the content is mixed)	Firm with a porcelain-like appearance, containing aronia fruit fragments, and without air bubbles	Pleasant, slightly tangy, with a faint aroma of aronia	Pronounced taste of aronia jam
Normalized yogurt with added rose syrup	Yellow with a slight whitish tint	Firm with a porcelain-like appearance and no air bubbles	Pleasant, slightly tangy	Mildly sweet
Normalized yogurt with natural red beetroot colorant	Light pink with a slight reddish tint	Firm with a porcelain-like appearance and no air bubbles	Pleasant, slightly tangy	Characteristic yogurt taste

For the 8 yogurt varieties, I conducted a series of tastings with 30 dairy product consumers to obtain feedback regarding the preferences of the population for the fortified dairy products. The average scores of the results obtained from the tasting sessions are presented in Figure 3.

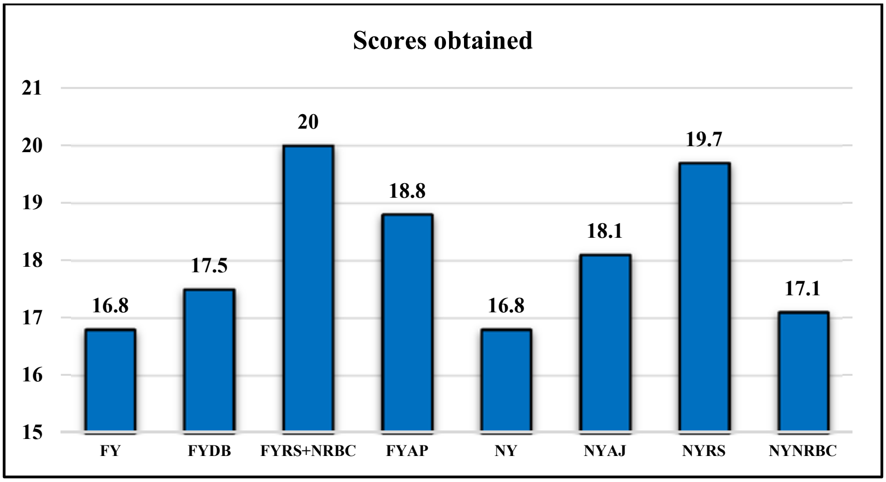

Figure 3 Average scores obtained from the sensory evaluation of the 8 types of yogurts studoed

Abbreviations of yogurt varieties: FY - Fat yogurt with 3.8% fat; **FYDB** - Fat yogurt with added dehydrated bananas; **FYRS+NRBC** - Fat yogurt with added rose syrup and natural red beetroot colorant; **FYAP** - Fat yogurt with added aronia powder; **NY** - Normalized yogurt with 2.6% fat; **NYAJ** - Normalized yogurt with added aronia jam;
NYRS - Normalized yogurt with added rose syrup; **NYNRBC** - Normalized yogurt with natural red beetroot colorant.

The types of plain yogurt (full-fat yogurt 3.8% and normalized yogurt 2.6%) exhibited organoleptic properties characteristic of yogurt made from cow's milk.

By producing the plain yogurt varieties, in which no additives were incorporated and which differed only by their fat dry matter content in the chemical composition of the finished products, we aimed to demonstrate that even in a microproduction system, with a simpler technological flow and semi-automatic processing, it is possible to obtain high-quality dairy food products.

The ingredients added to the new yogurt varieties were introduced in different quantities, depending on the flavoring strength of the addition, the coloring power of the powder, and the potential effects the addition could have on the shelf life of the finished products.

In the case of the yogurt variety standardized with the addition of natural beetroot dye, an average score of 17.1 points was obtained as a result of the pleasant color that the addition gave to the final product; however, in terms of taste, no changes were noted compared to the yogurt variety standardized with a fat content of 2.6%. For the yogurt variety with the addition of dehydrated bananas, an average score of 17.5 points was obtained, with the appearance and consistency being appreciated, but the taste and smell of bananas were absent in the finished product.

In the case of the yogurt varieties with added aronia in the form of powder and jam, higher scores were obtained compared to the plain yogurt varieties, due to the high novelty factor of the new sour dairy product varieties. The difference between the full-fat yogurt with added aronia powder (which achieved an average score of 18.8 points) and the normalized yogurt with added aronia jam (which achieved an average score of 18.1 points) was given by taste, as the aronia jam imparted a more sour flavor to the finished product compared to the yogurt with added aronia powder.

According to the average scores obtained from the tasting of the eight yogurt varieties studied, a preference for sweeter products was observed, as evidenced by the maximum score of 20 points achieved by the full-fat yogurt with added rose syrup and natural beetroot dye, and a score of 19.7 points for the normalized yogurt with added rose syrup (the 0.3-point difference between the two yogurt varieties was due to the more appealing color of the yogurt in which the dye was added).

The smell was influenced by all the additives used, with a distinct aroma being noticeable for each additive employed in the fortified yogurt varieties. Powdered additives (such as aronia powder and natural beetroot dye) did not have a significant impact on the taste or smell of the finished products in which they were incorporated.

Color was most influenced by the beetroot powder and aronia powder, with the finished product containing aronia powder exhibiting a lighter color shade compared to the pasteurized and inoculated milk in which the additive was inserted and homogenized. Aronia jam influenced the color of the finished product only after the subsequent homogenization of the contents in the containers, due to the fact that the additive was initially located at the bottom of the glass. After the milk was poured over the aronia jam, the contents of the glass were not homogenized, and as a result, the lack of homogenization prevented the additive from being properly incorporated into the milk.

The consistency was most influenced by the addition of dehydrated bananas (Figure 4) and the addition of aronia jam (Figure 5).

The taste was most influenced by the aronia jam and rose syrup (Figure 6), with the syrup, combined with the natural beetroot dye powder, forming the most appreciated yogurt variety from the consumers' perspective (Figure 7).

Figure 4 Yogurt with added dehydrated bananas

Figure 5 Yogurt with added aronia jam

Figure 6 Yogurt with added rose syrup

Figure 7 Yogurt with added rose syrup and natural red beetroot colorant

From a physicochemical perspective, according to the results presented in Table 3 and Table 4, more pronounced changes were recorded in the fortified yogurt varieties compared to the two plain yogurt varieties studied (full-fat yogurt with 3.8% fat and normalized yogurt with 2.6% fat). In the case of yogurt varieties enriched with different types of additives, more pronounced changes were recorded in the chemical composition of the finished dairy products for the full-fat yogurt with added dehydrated bananas and the normalized yogurt with added aronia jam.

From a physicochemical perspective, the additives used had an impact on all the fortified yogurt varieties; however, depending on the type and nature of the additive, each ingredient altered certain quality parameters of the finished dairy products to different extents.

Table 3. Chemical compozition of full-fat yogurt and the 3 types of fortified yogurts

Specification	Moisture (%)	T.S. (%)	Fat (%)	Protein (%)	mineral (%)	Acidity (˚T)
Fat yogurt with 3.8% fat						
$\bar{X} \pm s_X$	85.59±0.24	14.41±0.24	3.84±0.03	2.80±0.04	0.71±0.01	121
V%	0.65	3.90	1.67	2.66	4.96	
Minimum	84.91	13.98	3.75	2.73	0.66	
Maximum	86.02	15.09	3.91	2.91	0.75	
Fat yogurt with added dehydrated bananas (10% added content)						
$\bar{X} \pm s_X$	82.45±0.10	17.55±0.10	3.93±0.02	2.93±0.04	0.85±0.01	118
V%	0.27	1.27	1.19	2.76	2.44	
Minimum	82.10	17.30	3.89	2.80	0.82	
Maximum	82.70	17.90	4.00	3.01	0.87	
Fat yogurt with added rose syrup and natural red beetroot colorant (10% syrup + 10% colorant)						
$\bar{X} \pm s_X$	80.90±0.41	19.10±0.41	3.84±0.02	2.88±0,01	0.74±0.01	108
V%	1.13	4.81	1.34	1.36	3.44	
Minimum	80.10	18.02	3.84	2.82	0.71	
Maximum	81.98	19.90	3.95	2.92	0.77	
Fat yogurt with added aronia powder (15% added content)						
$\bar{X} \pm s_X$	82.97±0.03	17.03±0.03	3.84±0.02	2.90±0.03	0.73±0.01	114
V%	0.07	0.35	1.10	2.44	2.46	
Minimum	82.91	16.95	3.80	2.80	0.71	
Maximum	83.05	17.09	3.90	3.00	0.75	

Table 4. Chemical composition of normalized yogurt and the 3 types of fortified yogurts

Specification	Moisture (%)	T.S. (%)	Fat (%)	Protein (%)	Mineral (%)	Acidity (˚T)
Normalized yogurt with 2.6% fat						
$\bar{X} \pm s_X$	86.75±0.05	13.25±0.05	2.61±0.04	2.51±0.03	0.68±0.01	112
V%	0.14	0.96	4.14	2.99	3.28	
Minimum	86.61	13.04	2.45	2.40	0.65	
Maximum	86.96	13.39	2.75	2.59	0.71	
Normalized yogurt with added aronia jam (15% added content)						
$\bar{X} \pm s_X$	82.55±0.10	17.45±0,10	2.69±0.02	2.76±0.04	0.71±0.01	116
V%	0.28	1.31	1.56	2.98	2.23	
Minimum	82.20	17.20	2.65	2.65	0.69	
Maximum	82.80	17.80	2.75	2.85	0.73	
Normalized yogurt with added rose syrup (10% added content)						
$\bar{X} \pm s_X$	84.01±0.04	15.99±0.04	2.64±0.05	2.54±0.05	0.69±0.01	103
V%	0.10	0.52	4.32	4.49	2.39	
Minima	83.91	15.89	2.50	2.40	0.66	
Maximum	84.11	16.09	2.80	2.70	0.70	
Normalized yogurt with natural red beetroot colorant (10% added content)						
$\bar{X} \pm s_X$	83.52±0.19	16.47±0.19	2.61±0.04	2.58±0.01	0.72±0.01	116
V%	0.51	2.79	3.43	1.19	3.84	
Minimum	83.16	15.80	2.48	2.54	0.68	
Maximum	84.20	16.84	2.73	2.61	0.75	

Note: N = 5 (Five samples were prepared for each type of dairy product individually)

From a physico-chemical standpoint, the types of plain yogurt produced in this study fall within the quality standard recommended by FAO and WHO (CODEX STAN 243-2003).

The application of a gentle temperature during the milk thermal treatment stage, for a longer period of time, allowed for the production of high-quality pasteurized milk, effectively destroying pathogenic microbial flora and reducing the risk of over-pasteurization of the finished product.

The incorporation of additives for five of the fortified yogurt varieties was carried out in accordance with the specifications set by FAO and WHO, which recommended the use of an additive percentage ranging between 5-15% of auxiliary ingredients added to the finished product.

The additive used for the fortified yogurt variety, which was enhanced with rose syrup and natural beetroot coloring, was 20% by weight (10% syrup and 10% coloring). I used a 20% additive proportion for this yogurt variety to determine how much the sensory characteristics and physicochemical properties of the finished dairy products can be altered when a larger amount of additive is introduced into the milk, compared to the recommendations made in the quality standards.

The percentage of ingredients added to the milk was determined based on the potential influence of the additive on the sensory properties of the finished products. Thus, a concentration of 10% additive incorporated into the milk was used for dehydrated bananas, natural beetroot dye, and rose syrup, while a concentration of 15% additive incorporated into the milk was used for aronia powder and aronia jam.

In the case of the full-fat yogurt variety in which rose syrup was added in combination with natural beetroot dye powder, the proportions of ingredients incorporated into the milk were 10% rose syrup and 10% natural beetroot dye powder. We used equal concentrations of both types of additives because we wanted to achieve a balance in the sensory and physicochemical changes brought about by the ingredients used to obtain the improved product.

From a physicochemical perspective, in the case of the full-fat yogurt enriched with rose syrup and natural beetroot dye powder, a lower water content and a higher total dry matter content were recorded, as a result of using a larger amount of additive compared to the other fortified fermented dairy product varieties.

Changes in water content and total dry matter content were recorded both for the normalized yogurt with 2.6% fat and for all the fortified yogurt varieties. These changes in the ratio between the water content and the dry matter content were due to the removal of approximately 1.3% fat from the whole milk (in the case of the normalized yogurt) and as a result of the addition of ingredients that contributed extra water and dry matter to the finished products (in the case of the fortified yogurts).

The fat content was positively influenced by the addition of dehydrated bananas, due to the oils incorporated in the banana fragments, which were used for preserving the dehydrated fruit. The additions of aronia powder and natural beetroot dye did not affect the fat content in the finished products. Aronia jam and rose syrup had a smaller impact on the fat dry matter content determined in the yogurt varieties studied (the fat content in the finished dairy products increased by less than 0.10%).

The incorporation of dried fruits into pasteurized milk influenced the increase in protein content in the finished product, from a protein content of 2.80% in the whole milk yogurt to a protein content of 2.93% in the yogurt with added dried bananas. Another ingredient that contributed to the increase in protein content was aronia jam, resulting in a protein content of 2.76% in the finished product, compared to the 2.51% protein content recorded in the normalized yogurt variety. Aronia powder increased the protein level by 0.10%, natural beetroot dye by 0.07%, rose syrup by 0.03%, and the addition of rose syrup combined with natural beetroot dye powder increased the protein level by 0.08% in the finished product.

The mineral content in the fortified dairy products underwent quantitative changes, with an increase in ash content recorded in almost all the fortified yogurt varieties, except for the yogurt in which aronia powder was added. The highest increase in mineral content was recorded in the whole milk yogurt variety in which dried bananas were added. Compared to plain full-fat yogurt, which had an ash content of 0.71%, the full-fat yogurt with added dehydrated bananas showed an increase in mineral content, reaching an average value of 0.85%.

The titratable acidity underwent changes in all the types of acid dairy products studied in this work. Compared to the full-fat yogurt made from whole milk (which had a titratable acidity of 121°T), the yogurt made from normalized milk showed changes in titratable acidity, with the normalized yogurt with 2.6% fat having a titratable acidity value of 112°T, due to the separation of a portion of the fat from the milk. The greatest change in titratable acidity was recorded in the yogurt variety to which rose syrup was added (the titratable acidity of this yogurt variety was 103°T).

The use of different types of additives helped us observe to what extent the finished product is influenced by ingredients used in different forms but of the same nature (aronia in the form of powder and in the form of jam).

Aronia powder and jam influenced the sensory attributes and physicochemical properties of the two yogurt varieties obtained by incorporating these ingredients into the milk in different ways. Thus, we observed that aronia jam is a stronger additive, influencing to a greater extent the sensory attributes and physicochemical properties of the final product, compared to aronia powder.

CONCLUSIONS

The consumption of dairy products brings multiple benefits to the human body, providing an increased intake of essential nutrients such as calcium, proteins, phosphorus, vitamins, and others. However, due to more intense technological processes, such as the thermal treatment of milk at very high temperatures (from +85 to +145°C), there is a risk of degrading the quality of the processed milk, and for these reasons, all technological processes must be kept under strict control.

The use of gentler thermal treatments and equipment that allows processing smaller quantities of milk can represent a useful solution for factories with low production capacity, as it would result in lower electricity costs and a reduced risk of the phenomenon of over-pasteurization.

The use of natural ingredients to create new types of yogurt is a beneficial method for the food industry, as it leads to the diversification of the range of products marketed. At the same time, the use of various plant-based additives to enrich the chemical composition of milk results in the production of dairy products with superior sensory characteristics and physicochemical properties compared to the same types of dairy products that do not contain additional auxiliary ingredients.

The introduction of dried fruits, natural beetroot dye, additives obtained from aronia (in the form of powder and jam), and rose syrup allows for the production of dairy products with pleasant sensory attributes and improved physicochemical properties.

Fortifying milk with the addition of a mixture of rose syrup and natural beetroot colorant, in a proportion of 20%, improved the quality of the resulting dairy product, as each ingredient notably altered only certain organoleptic characteristics of the final product. However, in order to obtain high-quality dairy products using various plant-based additives, it is essential to maintain a balance between the percentage of milk and the percentage of additive used, so that the natural properties characteristic of the product are not compromised.

We recommend the consumption of simple and fortified dairy products due to the multiple benefits they bring to the human body and because of their superior sensory attributes, physicochemical properties, and nutritional qualities compared to pasteurized milk. At the same time, we recommend diversifying the range of functional dairy products, as incorporating additional ingredients into milk or finished dairy products allows for the use of certain by-products from other industries, thus reducing pollution from materials that, if not reused in the food sector or in other production and processing sectors, would otherwise end up in waste disposal.

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