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# PRODUCTION TECHNOLOGY AND QUALITY ASSESSMENT OF FERMENTED DRINKS®

## Technologia produkcji i ocena jakości napojów fermentowanych®

*Fermented milk drinks MNF are becoming more and more popular among consumers. They owe their popularity to their health and dietary properties. They are known for their beneficial effects on our body. As the demand for fermented dairy products increases, so does the variety of these products on the market. Consumers more and more often know what to pay attention to in order to choose the most valuable for our body among so many products.*

*The article presents the production technology and characteristics of fermented milk beverages. Selected quality features of products available in the commercial circulation were examined (titratable acidity [° SH], dry matter content [%] and protein content [g]).*

**Key words**: fermented drinks, kefir, buttermilk, yogurt, ocean of quality.

*Mleczne napoje fermentowane MNF cieszą się coraz większym zainteresowaniem wśród konsumentów. Swoją popularność zawdzięczają posiadanym właściwościom zdrowotnym oraz dietetycznym. Znany jest ich dobroczynny wpływ na nasz organizm. Wraz ze wzrostem popytu na fermentowane artykuły mleczne zwiększa się różnorodność tych produktów dostępnych na rynku. Konsumenci coraz częściej wiedzą na co należy zwracać uwagę, aby wśród tak wielu produktów wybrać najbardziej wartościowe dla naszego organizmu.*

*W artykule przedstawiono technologię produkcji oraz charakterystykę mlecznych napojów fermentowanych. Zbadano wybrane cechy jakościowe produktów dostępnych w obiegu handlowym (kwasowość miareczkową [°SH], zawartość suchej masy [%] oraz zawartość białka [g]).*

**Słowa kluczowe:** napoje fermentowane, kefir, maślanka, jogurt, ocean jakości.

## INTRODUCTION

In Poland, dairy farming is the basic branch of agricultural production. Milk constitutes 15-17% of the commercial value of the production of the entire agricultural sector. Its production therefore not only affects the financial and development situation of the dairy sector, but also affects the entire agriculture.

Poland has been a member of the European Union since 2004, but restructuring and the adaptation of the dairy sector to its requirements has already started in 1998 [4]. In the modernization process, dairy plants carried out many investment activities to adapt to the requirements of the European Union, in particular in terms of sanitary and veterinary conditions and increasing technological standards. Activities such as modernization, adaptation and expansion of buildings, purchase of new machines, equipment and technological lines, improvement of water quality on farms or increasing the level of environmental protection in milk production and processing were undertaken.

Producers, adapting to the new regulations (and consumers' requirements), had to improve the quality of both the raw material - milk and its products. The quality of dairy products is significantly influenced by the quality of the milk used in the production process, therefore the quality of the dairy products increased along with the improvement of its quality. Of course, in addition to using milk with specific parameters, the producers also had to ensure appropriate production conditions.

The Polish dairy sector is among the largest in Europe both in terms of milk production as well as the production of dairy products. Moreover, the Polish dairy market is competitively priced compared to the market of other European countries. Poland is a significant exporter of dairy products, and foreign trade brings more and more profits.

The milk market, both in Poland and in other countries belonging to the European Community, is one of the most sensitive and is prone to large price fluctuations. Moreover, due to the level of farmers' income and consumer perception,

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the dairy sector is subject to many regulations by the EU. These regulations focus mainly on market support, limiting production volumes, compliance with sanitary and veterinary requirements (in the production, storage and marketing of dairy products) and compliance with sanitary and hygienic conditions in production (to ensure the best quality for consumers).

In recent years, the dairy processing sector has developed significantly in Poland. Among other things, the demand for dairy products. Among consumers, the interest in healthy food has increased, they are more likely to pay attention to what they eat and how it affects their body. The increase in interest can be easily seen by following production statistics. In the years 1990–1994 in Poland, a relatively small amount of processed milk products was produced in relation to the amount of milk produced. For example, the production of natural yoghurt was not involved at all (and the MNF itself produced 75 thousand tons per year), and already in 2012, its production was recorded at the level of 468 thousand. tonnes (MNF – 716 thousand tonnes) – importantly, with practically the same level of milk production.

On average, consumers spend about 15% of their expenses on food buying milk and milk products. The MNF market is currently the most profitable and dynamically developing segment of the dairy market in Poland. Consumers are interested in healthy eating and a proper diet. They pay attention to the nutritional value of products and their quality, and thus make more and more demands on producers. This is the driving force behind the development of the dairy processing sector. Currently used MNF production methods are modernized and modern, thanks to which products that are safe for health are created. They are free from microbiological, chemical and other contamination. Moreover, producers are obliged to carry out permanent internal control in dairy processing plants [5,7,8,10].

Milk and dairy products are of high nutritional value. They contain wholesome protein, vitamins and minerals [2]. Fermented milk drinks have a higher digestibility of proteins and fat than milk, but also a higher content of many vitamins. The bacteria present in them have a healing effect on the human body, including support the digestive and immune systems, inhibit the growth of pathogenic and putrefying bacteria, aid digestion, and reduce allergic reactions to milk (e.g. by partially breaking down lactose). Additionally, the peptides contained in them support the cardiovascular system. Fermented milk drinks also contribute to the degradation and decomposition of carcinogenic compounds [5].

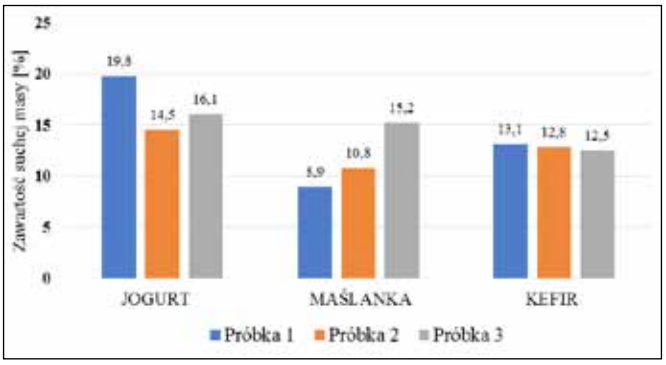
Fermented milk drinks are products obtained from milk (whole, partially or fully skimmed milk and from milk reconstituted from powder), which is fermented by microorganisms specific to the drink. In addition to the colonies specific to a given fermented beverage, other microorganisms may also be added. The microorganisms contained in these drinks must remain alive and active in an appropriate amount throughout the shelf life of the product. The exceptions are products that have undergone heat treatment after fermentation. In this case, the microflora is not required to remain alive [3].

**The aim of this article is to assess selected quality parameters of fermented beverages. The parameters of three types of fermented beverages (yogurt, kefir, buttermilk) available on the Polish market were compared. Selected quality parameters, such as acidity, protein content and dry weight – in selected purchased products were examined in the study**.

## RESEARCH METHODOLOGY

The research material consisted of three types of fermented milk beverages – natural yoghurt, buttermilk and kefir. To test the quality parameters of MNF, samples from generally available products in the commercial circulation were used – three for each type of MNF. Determination of the acidity of prepared MNF samples available in commercial circulation made according to Soxhelt-Henkel methods. There are different methods for determining the dry matter (and water) content of a food. The work uses the thermal drying method. It occurs when the water vapor pressure in the product is greater than the atmospheric pressure in the dryer. Increasing the differential pressure, incl. can be obtained by increasing the temperature of the dried substance, removing moisture from the air in the dryer, or by reducing the pressure inside the dryer. The protein content of the samples was determined by the formol method.

## ANALYSIS AND DISCUSSION OF THE RESULTS




**Pic. 1. Dry weight in test samples.**
**Rys.1. Sucha masa w badanych próbkach.**
**Source:** Own study
**Źródło:** Opracowanie własne

In the tested products, the dry matter content was normalized and ranged from 8.9% to 19.8%. The highest dry matter content in the tested products occurred in the case of natural yoghurts. The highest value is marked in sample no.1 – 19.8%, then there was sample no.3 – 16.1%, the lowest dry matter content in the case of natural yoghurts was determined in sample no.2 – 14.5%. In the case of buttermilk, there was quite a significant difference in the dry matter content – from 8.9% (sample 1) through 12.3% (sample 2) to 15.2% (sample 3). The dry weight of the kefir samples showed a very similar value from 12.5% (sample 3) through 12.8% (sample 2) to 13.1% (sample 1).

The obtained results of dry mass in the tested yoghurts are quite high and varied between products, but their level is acceptable and comparable to the results obtained in studies by other scientists (eg 14, 16% dry matter content in yoghurt [9]).

In the tested buttermilk, there was a significant difference in the dry matter content between individual samples. The water content in buttermilk is approx. 91%, therefore its dry mass should be approx. 9%. In the tested buttermilk, only sample 1 (8.9%) is close to the norm. The second sample (10.8%) is slightly higher, but still acceptable. The last result (15.2%) significantly differs from the adopted norm. This may be because this product is made with an increased dry matter content, but this information was not found on the product packaging.

Kefir with an increased dry matter content in a product is one that contains 14% of its composition [1]. Dry matter content test in kefir showed very similar results. All kefirs tested for this study showed a dry matter content below 14%, therefore it can be concluded that the tested products contain a dry matter content appropriate for them.

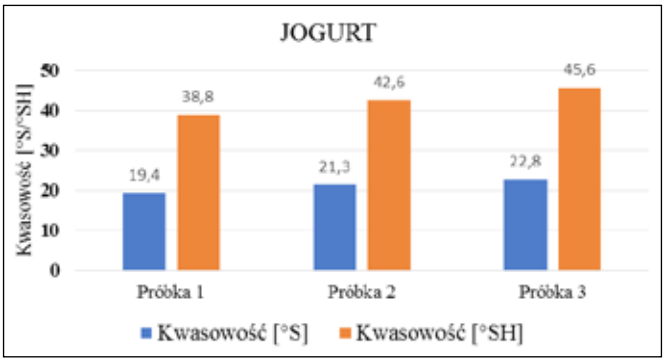



**Fig.2. The acidity of the yogurt.**
**Rys.2. Kwasowość jogurtu.**
**Source:** Own study.
**Źródło:** Opracowanie własne.

The study of the degree of acidity in individual analyzed yoghurts showed significant differences between the tested samples – from 38.8° SH through 42.6° SH to 45.6° SH. Observing the results of studies conducted by other scientists [9], who in their work checked the effect of storage time on the acidity of the product, it is possible to approximate the time that has elapsed since the production of the products tested for the purposes of the study. In their research, freshly produced products had an average acidity of 40.9° SH, after 7 days it was already 42.2° SH, and after 14 days – 44.1° SH. Comparing it to the results of own research, it was noticed that sample no. 1 has a low level of acidity (38.8° SH), which suggests a short time since its production and its freshness. Sample no. 2 and 3 already have a higher level of acidity, which may be caused by the passage of time (for sample no. 2, about a week, and for sample no. 3, even longer than two weeks) – from the date of production.

The level of acidity in all tested buttermilk is similar - from 36° SH to 40° SH. The obtained results were compared with the results obtained by a team of other scientists who investigated, inter alia, the level of titratable acidity in buttermilk available on the Polish market and the influence of the time on eggs [6]. The obtained results are within the limits set by the aforementioned scientists. As with yoghurts, the increase in acidity occurs as time passes from the moment the product is made. The data, however, are not as precise as in the previously described case, because the researchers did not use freshly manufactured products for their research, therefore it is impossible to determine how long the product was stored before the study. Taking into account the collected information and own observations, it can be concluded that sample no. 1 and 2 are fresher, and in the case of sample no. The storage time until testing was longer.

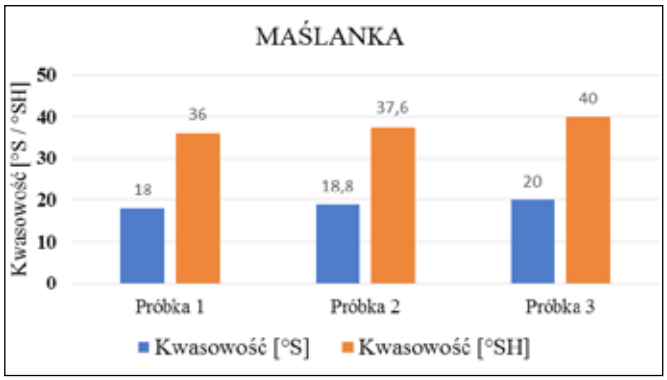



**Fig. 3. The acidity of buttermilk.**
**Rys.3. Kwasowość maślanka.**
**Source:** Own study
**Źródło:** Opracowanie własne

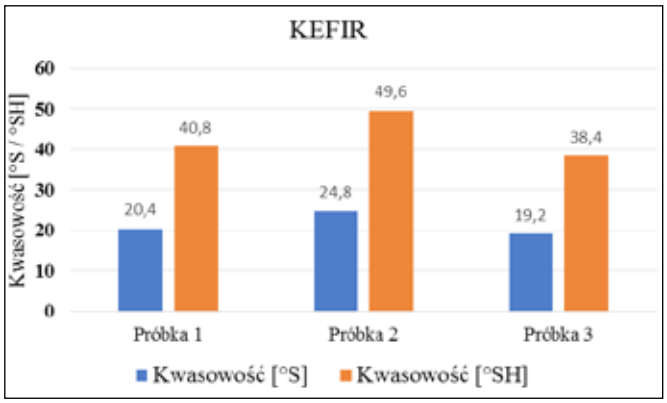



**Fig4. The acidity of kefir.**
**Rys.4. Kwasowość kefir.**
**Source:** Own study
**Źródło:** Opracowanie własne

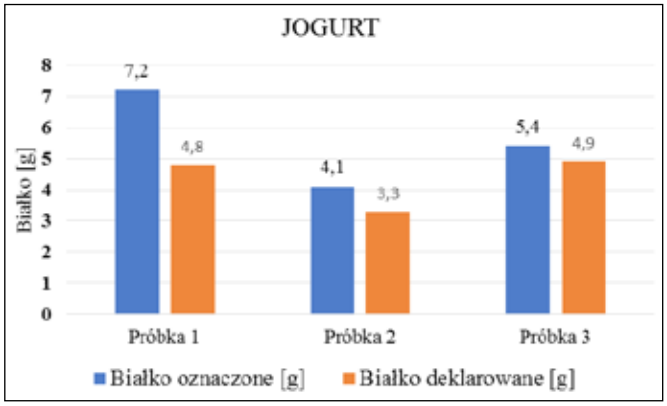



**Fig.5. Protein content as declared by the manufacturer - natural yoghurt.**
**Rys.5. Zawartość białka oznaczonego z deklarowanym przez producenta – jogurt naturalny.**
**Source:** Own study
**Źródło:** Opracowanie własne

The titratable acidity in the tested kefir samples is very diverse. Two of the tested samples showed the value of acidity at a similar level – 38.4° SH and 40.8° SH. In the third sample of kefir, a much higher level of acidity was found – 49.6° SH.

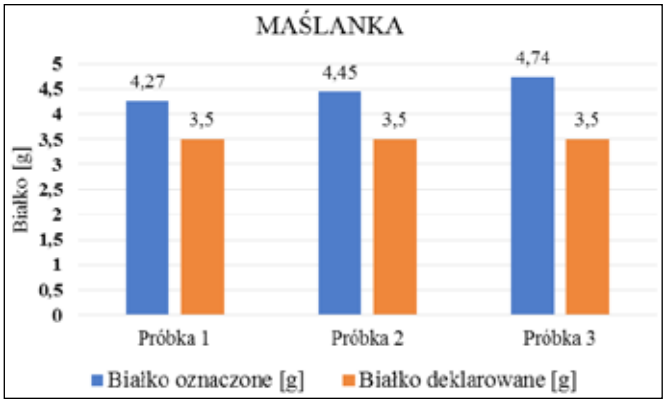



**Fig. 6. Protein content determined with the declared by the producer – buttermilk.**

**Rys. 6. Zawartość białka oznaczonego z deklarowanym przez producenta – maślanka.**

**Source:** Own study.

**Źródło:** opracowanie własne

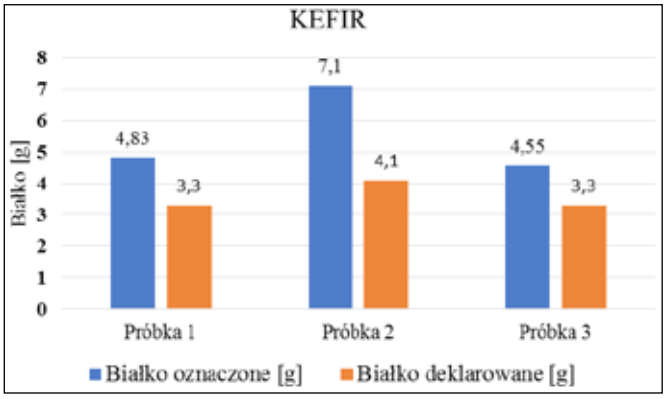



**Fig.7. Protein content marked with the declared by the manufacturer – kefir.**

**Rys.7. Zawartość białka oznaczonego z deklarowanym przez producenta – kefir.**

**Source:** Own study

**Źródło:** Opracowanie własne

All the tested samples of natural yoghurt showed a higher content of protein determined in the product than the content declared by the producer.

These differences ranged from 0.5 g (sample 3), through 0.8 g (sample 2) up to 2.4 g (sample 1) per 100 g of product. Producers declared different protein contents in their products.

The same can be observed in the measurement results – the obtained results are increased, but they increase proportionally to the declared values. The protein level declared by the producer is the minimum value that must be included in the product, therefore they all meet the quality requirements. Today, an increased amount of protein in dairy products is desired by many consumers.

As in the case of yoghurts, all tested buttermilk samples showed a higher content of protein in the product than declared by the manufacturer. The measurement of protein content in the samples was at a similar level – all producers declared the same protein content in their products.

The differences between the determined and the declaimed protein ranged from 0.77 g (sample 1), through 0.95 g (sample 2) to 1.27 g (sample 3) per 100 g of the product.

As in the above protein determinations, the same in the case of kefirs – the protein content in all samples is higher than the protein declared by the producer.

As in the case of natural yoghurts, also in kefirs, these differences are significant. They range from 1.25 g (sample 3), through 1.53 g (sample 1) up to 3.0 g (sample 2) per 100 g of product.

It can be seen that in the case of samples no. 1 and 3, the content of the declared protein is the same, and according to the results of the determinations, its value is increased by about 30% in both cases. The situation is different in the case of sample No. 2 where the marked value is almost twice as large as the declared value.

## SUMMARY

Consumers' awareness of the choice of fermented milk beverages of good quality and valuable to our body is growing. Consumers more and more often read the labels of products available on the market and know which ingredients are the most valuable for our body. As shown by the research, in the case of dry matter content, the lowest value was achieved in buttermilk, while the highest dry matter content was achieved in yoghurt. In the case of yoghurts and kefirs, the acidity varied, while in the case of buttermilk, the values were similar. All the tested samples showed a protein level higher than the level declared by the manufacturer. These values were very diverse - the lowest was found in natural yoghurt (10% more protein than declared by the manufacturer), the highest was found in kefir (as much as 73% more protein).

## PODSUMOWANIE

Świadomość konsumentów przy wyborze dobrych jakościowo i wartościowych dla naszego organizmu mlecznych napojów fermentowanych jest coraz większa. Konsumenci coraz częściej czytają etykiety dostępnych na rynku produktów i wiedzą które składniki są najbardziej wartościowe dla naszego organizmu. Jak pokazały przeprowadzone badania w przypadku zawartości suchej masy najniższą wartość osiągnięto w maślance, najwyższą zawartość suchej masy osiągnięto w jogurcie. W przypadku jogurtów i kefirów kwasowość była zróżnicowana, natomiast w przypadku maślanki wartości te były zbliżone do siebie. Wszystkie badane próbki wykazały poziom białka większy aniżeli poziom deklarowany przez producenta. Wartości te były bardzo zróżnicowane – najmniejszą wykazano w jogurcie naturalnym (10% więcej białka niż deklarował producent) najwyższą z kolei oznaczono w kefirze (aż 73% więcej białka).

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