Quality assessment of commercial Bulgarian brined cheese, purchased in the commercial network

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Other sources (Baltadzhieva and Slavchev, 2003) claim that the ripening process of cheese is extremely important for its final product characteristics (Balabanova and Stankov, 2021). It has been shown that more intensive physical and chemical processes occur during the ripening of white brined cheese from cow’s milk, compared to buffalo milk cheese (Ivanov et al., 2016). The rennet coagulant used in cheese production during ripening does not alter the proteolysis process in the samples (Balabanova et al., 2017).

Since cheese is a staple food product, its quality control is essential. Indicators determining its quality include dry matter, water content, fat content in the dry matter, titratable acidity, salt content, among others. Additionally, essential organoleptic parameters include consistency, smell, taste, cut surface, and appearance. The determination of most of these indicators is carried out according to precisely established (standardized) methods, however, the organoleptic ones are determined subjectively by experts in the field (Bosakova-Ardeniska et al., 2015).

The purpose of the present work is to investigate the physicochemical indicators and sensory characteristics of Bulgarian white cow brined cheese, purchased in the commercial network, and to compare them with those of cheese meeting the quality parameters according to the Bulgarian state standard.

Material and methods

Samples
A total of 8 types of Bulgarian white brined cheese made from cow’s milk, purchased from major commercial chains in Bulgaria, have been investigated. A detailed description of the studied samples, categorized by number, can be found in Table 1. Three samples of each type of commercially available white brined cheese have been purchased.

Table 1. Specification of Bulgarian cow’s white brined cheese

<table>
<thead>
<tr>
<th>№</th>
<th>Type</th>
<th>Production technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>vacuum cured cheese</td>
<td>BDS</td>
</tr>
<tr>
<td>2</td>
<td>vacuum cured cheese</td>
<td>BDS</td>
</tr>
<tr>
<td>3</td>
<td>vacuum cured cheese</td>
<td>BDS</td>
</tr>
<tr>
<td>4</td>
<td>vacuum cured cheese</td>
<td>TPI</td>
</tr>
<tr>
<td>5</td>
<td>vacuum cured cheese</td>
<td>TPI</td>
</tr>
<tr>
<td>6</td>
<td>bulk brine cheese</td>
<td>TPI</td>
</tr>
<tr>
<td>7</td>
<td>bulk brine cheese</td>
<td>TPI</td>
</tr>
<tr>
<td>8</td>
<td>bulk brine cheese</td>
<td>TPI</td>
</tr>
</tbody>
</table>

Methods
The research has been conducted using the following standards:

Sensory analysis
A quantitative descriptive sensory profiling test has been conducted to determine parameters such as appearance, taste, smell, consistency, and crumb of cow brined cheese. The analysis has been performed by twelve trained tasters, previously familiar with the terminology and rating scales. The coded cheese samples have been presented simultaneously and evaluated in random order by the sensory assessors. The obtained results have been processed with Microsoft Excel 2020. Packaging and labeling conformance has been assessed based on Regulation 1169 from 2011.

Statistical methods:
Each parameter has been investigated based on three parallel measurements, with the average value presented as the result.

The average value has been presented as the result. To assess the influence of the factor labeled as "cheese brand", we employed a one-way analysis of variance and Duncan's test. Differences have been evaluated at a statistical significance level of 0.05. IBM Statistics 19, USA software has been used.

Results and discussion
According to BDS 15:2010, the water content of white cow brined cheese should be in the range of 54-55%. Of samples 1, 2, and 3, which according to the labeling were prepared according to BDS, only sample 2 meets the requirements of the standard. In the other two, the water content is below the minimum required value. For products 4 through 8, which are prepared according to different TPIs, the water content varies widely from 49.9 to
Figure 1. Water content of Bulgarian cow brined cheese

According to BDS 15:2010, the dry matter for cow’s cheese must be no less than 46%. Therefore, samples 1 and 3 meet the standard (Figure 2). For sample 2, the values for dry matter have a minimal deviation of less than 1%. The result obtained for samples 7 and 8, which were not produced according to BDS, but meet the requirements of the dry matter standard, is interesting. The remaining samples 4, 5, and 6 show dry matter content between 6.5% and 10% lower than required by the specified standard.

It is known that dry matter depends on the level of minerals, fat and protein content. Therefore, the study continued with the determination of oil content in the dry matter for the samples produced by BDS and fatty acid composition for those produced by TPI, their results are presented in Table 2. According to BDS, the fat content in the dry matter should not be less than 44%. Sample 1 meets the requirements of BDS 15:2010, in terms of fat content in dry matter - 46.8%. Samples 2 and 3 have values lower than the reference, 40.4% and 32.0%, respectively.

The results given in Table 2 show that the short-chain butyric and caproic fatty acids are relatively low in content. The C\(^{12}\) fatty acid content in sample 5 should be noted of the medium-chain fatty acids. This high value may be due to: the composition of the raw materials used, the production technology, or the addition of fats. In three samples 4, 6, and 8 oleic acid was the main one, and in 5 and 7 it was palmitic acid. The main saturated fatty acid in all samples was palmitic, and of the unsaturated fatty acids, the content of oleic acid (C\(^{18}\)) was the highest. These acids are major ones in cow, goat, and buffalo milk, with palmitic exceeding oleic. Balabanova et al. (2014), Cismileanu et al. (2020), Dimitrova et al. (2021) have investigated and observed the change in the fatty acid composition of raw sheep’s milk from Karakachan sheep and the Tulum cheese obtained from it. Sheep’s milk has the highest content of oleic (C\(^{18}\)) - 32.76 g/100 g, palmitic (C\(^{16}\)) - 25.88 g/100 g, and lauric (C\(^{12}\)) - 10.7 g/100 g fatty acids, while in the mature Tulum cheese obtained from it, an increase in the content of palmitic (C\(^{16}\)) and lauric (C\(^{12}\)) fatty acids has been found to 33.87 and 14.56 g/100 g, respectively, and a decrease in the content of oleic (C\(^{18}\)) fatty acid to 21.04 g/100 g. Therefore, not only the composition of milk for cheese production but also the introduced bacteria according to technological production instructions of individual cheese makers (TPI), are able to influence the butyric acid composition of the final product.

According to BDS, the salt content should be 3.5 ± 0.5%. All samples produced according to BDS are within the limits of the requirements of the standard. Elevated salt content has been reported in TPI-produced samples (4, 5, and 6). And for 7 and 8, the values meet the requirements of the BDS (Figure 3).
In a number of articles, the existence of correlation dependences between the water content and the salt content of white brined cow cheese has been noted (Lu et al., 2015; Bae et al., 2017; Loudiyi and Aït-Kaddour, 2019). A similar dependence has been observed in this study, as well (Figure 4).

During the ripening of the cow’s cheese, a constant tendency to increase the titratable acidity has been observed, as it is closely related to the temperature regime of cheese ripening (Ivanov et al., 2015). According to BDS 15-2010, the titratable acidity of white brined cow’s cheese must be from 200˚T to 270˚T (Figure 5.). For sample 2, it is within the limits, with the measured value being 256˚T, while for sample 3, this indicator is slightly above the norm. The acidity in sample 1 is 1.71 times higher than the lower limit of the standard.

The best appearance sensory analysis (Figure 6) determined samples 1, 3, and 8, all others received lower results. Sample 3 (44.6 points) has the best specific, distinct taste and smell of mature brined cheese. The cut surface, determining the correct course of the technological process, has the highest value for samples 1, 5 and 8. In the first place with a moderately hard consistency is sample 3, with very close results sample 4 (19.3 points) and 8 (19 points) out of a maximum number of 20. Except for samples 6 and 7, all others received the maximum number of points for packaging and marking. This proves the good condition of the packaging, legible and clear marking, meeting the requirements of Regulation 1169/2011. Figure 7 presents the summary characteristics of the studied samples from the sensory analysis.
Except for samples 6 and 7, all other samples received the maximum number of points for packaging and labeling. Samples 3 and 8 received the highest total scores across all sensory analysis indicators, followed closely by samples 1 and 4, with values close to them.

Conclusion

In the analyzed samples of white brined cow's cheese labeled as produced according to the BDS standard, most results either aligned closely with or fully met the standard criteria. A significant deviation has been noted in the titratable acidity of one sample. For the other five cheese varieties, certain assessed indicators displayed a broad range. Despite this, the sensory evaluation of three of these samples — considering consumer preferences and perceptions — was comparable to the BDS samples. Thus, even though these samples were produced based on TPI guidelines, some demonstrated a quality level not inferior to cheeses produced under the BDS standard.

References


BDS 1109:1989. Methods for determining water content and dry matter (Bg).


