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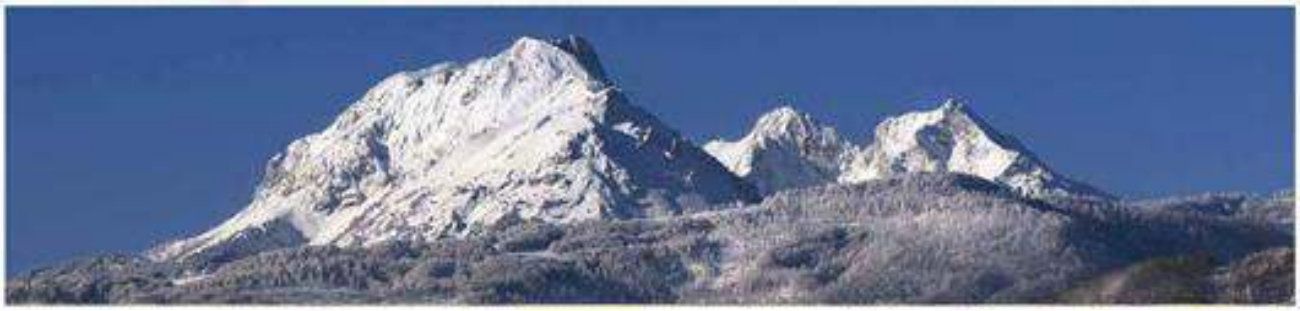

# GEA (Geo Eco-Eco Agro) International Conference

# Book of Proceedings I

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*Article*

# Monitoring the quality of yogurt during storage

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**Abstract:** Yogurt as a fermented dairy product is one of the most used in the daily diet due to the large number of positive effects on human health (improve digestion, rich amount of calcium and protein, increased immunity, improved bioavailability of other substances, etc.). According to this, the study was carried out to determine the effect of storage time of yogurt after opening (the first and fifth day), in the refrigerator, on titration acidity, viscosity and water holding capacity (WHC). The results of the research have shown that storage time has an impact on them. The changes that occur are more pronounced in the samples of yogurt analyzed after one month of refrigeration i.e. the quality of the yogurt is correlated with the expiry date.

**Keywords:** yogurt, quality, water holding capacity (WHC), titration acidity, viscosity

## 1. Introduction

Yogurt is a fermented dairy product produced by fermentation of lactic acid through the action of *Streptococcuss salvarius subsp. thermophilus, Lactobacillus delbrueckii subsp. bulgaricus* (Younus *et al*. 2002). The quality and composition of the applied bacterial cultures affect the quality of the yogurt obtained as a result of the fermentation processes of the milk. There is a symbiotic relationship between the two species of bacteria *Lactobacillus bulgaricus and Streptococcus thermophilus* (Tamime and Robinson 2000). Different combinations of starter cultures are selected during yogurt production to achieve the desired product characteristics. Depending on its activity, the manufacturer usually adds 2-4% starter culture (Deasi *et al*. 1994).

Yogurt is the most commonly used dairy product in the diet due to its favorable Ca/Na ratio and it belongs to the group of functional food that fulfils the nutritional and immune needs of the human body (Mckinley, 2005). Proteins in yogurt are with excellent biological quality, as in milk, because the nutritional value of milk proteins are well preserved during the fermentation process (Vucic, 2014). It is claimed that yogurt proteins are easier to digest than milk proteins, because it may occur bacterial overdose of milk proteins in yogurt (Adam, 2008).

In the group of the most commonly used parameters for analyzing the quality of yogurt are included: titration acidity, viscosity, and water holding capacity (WHC). The titration acidity of yogurt is a result of the lactic fermentation of lactose into lactic acid as a result of the action of starter cultures in yogurt, which mainly takes place during the incubation period (Adam, 2008). Viscosity is a characteristic property of yogurt that depends on the composition of the milk, standardization, heat treatment, added starter cultures and time, temperature and pH value during fermentation (Zamberlin *et al*. 2007). WHC is the amount of water that proteins can absorb (Vucic, 2014).

## 2. Materials and Methods

The aim of the study was to investigate the quality of yoghurt during cold storage, for that purpose ten samples of yogurt packed in a 1 liter tetrapack were taken. Five of the examined samples were taken on the day of filling, while the remaining five were stored in a refrigerator at a temperature of 4-6 °C and were analyzed one month after the day of filling. Samples for analysis were opened on the day of analysis (1st day) and stored at a temperature of 4-6 °C until the fifth day (5th day) when the second analysis was made.

The titration acidity of the yogurt was examined by the Soxhlet Henkel method (20g yogurt, 20 ml water and 2 ml 2% phenolphthalein (indicator) were titrated with 0.1 M NaOH until the appearance of a pale pink color). The viscosity of the yogurt was measured using a viscometer ThermoScientific HAAKE Viscotesters at a temperature of 20 °C with a constant spindle speed of 50 rpm. Meanwhile, the examination of the water holding capacity (WHC) was performed according to the Parnell-Clunies method with the help of centrifugation, after which the mass of the separated whey was measured. The results are expressed as a mass of separate whey per 100 g of yogurt (Andreas Hettich GmbH & Co. KGUNIVERSAL 320 R.

## 3. Results and Discussion

The obtained results (Table 1) indicate that during the storage of yogurt there is an increase in titration acidity ($p<0.05$). This increase is more pronounced in samples stored one month in the refrigerator before analysis, where during the analysis period the titration acidity of 42.44 $^0$SH increases to 46.62 $^0$SH ($p<0.05$), while in the samples analyzed on the day of filling the increase in titration acidity is insignificant (from 39.02 $^0$SH to 40.50 $^0$SH) ($p>0.05$). The results of our analysis correlate with the studies of Adam, (2008) and Ezeonu *et al*. (2016).

In addition, according to research by Alkali *et al*. (2007), during the storage period, an increase in titration acidity is followed by decreased activity due to improper storage conditions and possible microbiological contamination.

**Table 1** - Table of values obtained from the analysis of yogurt samples (N = 10)

| **Sampling time for analysis** | **On the day of filling** | **After 1 month** |
|---|---|---|
| **Titration acidity ($^0$SH)** | | |
| 1st day | 39.02$^a$ | 42.44$^b$ |
| 5th day | 40.50$^a$ | 46.62$^c$ |
| **Viscosity (mPas)** | | |
| 1st day | 693.50$^a$ | 1197.53$^b$ |
| 5th day | 701.90$^a$ | 1253.35$^b$ |
| **WHC (%)** | | |
| 1st day | 11.83$^a$ | 10.71$^b$ |
| 5th day | 11.10$^a$ | 9.90$^a$ |

* Differences in values with different superscripts in the same group are statistically significant at the level: a: b, a: c, b: c $p<0.05$*

According to the obtained results (Table 1) we can notice that on the first day of the analysis the samples stored for one month in the refrigerator have higher viscosity (1197.53 mPas), compared to those samples that are analyzed on the day of filling (693.50 mPas), i.e. there is a significant difference between the obtained results ($p<0.05$). However, in both types of yogurt, the storage period of the open sample does not lead to a significant increase in viscosity, i.e. on the fifth day we have insignificant increase in viscosity from 1197.53 mPas to 1253.35 mPas ($p>0.05$). The same tendency is observed in yogurt samples analyzed on the day of filling where the increase in viscosity is not significant ($p>0.05$), i.e. the same is increased from 693.50 mPas to 701.90 mPas during the fifth day of storage of samples in the refrigerator. Similar results were noticed by Vucic, (2014). In general, continuous viscosity or its minimal increase during the storage period of open yogurt is the result of the addition of a stabilizer in its production (Younus *et al*. 2002). According to research by **(**Zamberlin *et al*. 2007) significant changes would be observed on the 14 day of the opening and the same would result with changes in texture (Isteten and Karagul 2006).

On the first day of the analysis we can notice that the samples analyzed on the day of filling have a higher WHC (11.83%), compared to the samples stored for one month in the refrigerator (10.71%), which indicates the fact that the storage period leads to a decrease in WHC ($p<0.05$**)** (Table 1). In addition, as a result of low storage temperatures, a decrease in WHC was observed on the fifth day of analysis, 11.10% in the samples examined on the day of filling, compared to the samples examined after one month of filling and it was 9.90% ($p>0.05$). These results are confirmed by the results obtained by Bievzunska *et al*. (2019). According to Vucic, (2014), yogurt with a higher percentage of protein would have higher WHC as a result of the interaction of casein and whey protein and the newly formed porous gel who can absorb more amount of water (Sodini *et al*. 2004).

In the retail network, the quality of yogurt as a final product varies from manufacturer to manufacturer (Ezeonu *et al*. 2016) and when stored it is inevitable to preserve its physico-chemical characteristic and sensory properties (Younus *et al*. 2002). It is well known that during storage there is an increase in the acidity of yogurt (Sun *et al*. 2018), and thus a change in the original properties of yogurt - taste and texture (Al-Kadamany *et al*. 2002).

## 4. Conclusions

Monitoring the quality of yogurt is an inevitable segment if we want it to retain its characteristic properties. Depending on the remaining term, storage period and conditions as the most viable parameters in yogurt are: titration acidity, viscosity and water holding capacity. As a result of the storage period, the samples analyzed on the day of filling had lower titration acidity, compared with those stored in the refrigerator for one month. After the opening of the yogurt, the increase in titration acidity was significant in the samples that were stored in the refrigerator for one month. The increase in viscosity was observed on the first day of analysis in samples that were stored in the refrigerator for one month, and no significant differences were recorded during the analysis. The decrease in WHC as a result of the storage period was observed in the samples that were stored in the refrigerator for one month and the same was followed in both types of yogurt during the analysis.

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