



## SEASONAL VARIATIONS' INFLUENCE ON CHEMICAL COMPOSITION OF COW MILK AND VIDRARU SEMI HARD CHEESE

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**Abstract:** Raw milk is a valuable food whose quality is important regarding both milk consumption and manufacturing of other dairy products. In this study, principles of traditional production and the characteristics of cow Vidraru hard cheese are presented. The aim of this study was to investigate the effect of different seasons on the variations of raw milk and Vidraru cheese composition. The technology process of hard cheese production was described in details. Different samples of raw milk and cheese were taken during spring, summer, autumn and winter and their physico-chemical properties were examined. The chemical composition of cow milk is influenced by seasonal feeding. Vidraru semi hard cheese is a traditional cheese characterized by ripening at ambient conditions and smoking.

**Keywords:** semi hard cheese, cow milk, chemical composition

### 1. Introduction

Milk is the ancient food known by humans and it represents a complex mixture of fats, proteins, carbohydrates, minerals, vitamins and other compounds dispersed in water [1].

There are various factors that influence milk chemical composition (fat, proteins, water and mineral substances) within the same species. Some of these factors relate to genetic, stage of lactation, feeding, age, animal health and season [2]. Production and the quality of milk products, like cheese, are influenced by these factors [3]. There is a negative correlation between the environment temperature and the quantity of proteins and fat in milk. When the temperature is high the fat content tends to decrease. The content of fat, proteins, and casein are influenced by the seasonal variations [4]. The content of fat and

protein is higher in the autumn and winter and smaller in spring and summer [5].

High environment temperature negative influence the fabrication yield and cheese properties by rising the clotting time and the rate of clot formation [5].

Semi hard cheese is one of the most popular cheeses with hard paste in many European countries. Semi hard cheese production is dating since eleventh century. Although the historical references suggest that this dairy product has an older tradition [6].

This type of cheese is different from others because milk utilization and the scalding of the obtained curd provide specific properties regarding its structure and flavor.

The aim of this study was the analysis of the chemical composition variation of milk, raw material at semi hard cheese fabrication and its influence on the final product.

## 2. Materials and methods

Milk samples were collected from the Dorna Lactate dairy products factory, working point TârguNeamț. This unity is supplied with raw material from the local farmers from Suceava, Neamț, Botoșani and Iași counties from the 126 centers of collection.

The research was conducted during an entire year, monthly being analyzed 30 milk and 10 hard cheese samples. Milk samples were collected direct from the cooling tanks in sterile recipients of 200 ml, stored at +8° C and immediately transported to the analysis laboratory.

## 3. Results and discussion

### *Cheesemaking process*

The production process of Vidraru semi hard cheese is subdivided into several steps as shown in a Table 1.

**Table 1.**  
**Production process of Vidraru semi hard cheese**

Step	Description
1	Raw cow's milk
2	Normalization (3,8-3,9 % fat)
3	Clotting (32-34° C, 40 minutes)
4	Coagulum machining
5	Way partial draining
6	Second heating (41-43° C, 14-20 minutes)
7	Curd verification
8	Progressive pressing of the curd (20-30 minutes)
9	Curd pieces formation
10	Curd ripening (26-28° C, 8-10 hours)
11	Cutting the curd in slices (0,3-0,4 cm thickness)
12	Curd scalding (74-75° C, 50-60 seconds)
13	Semi hard cheese formation
14	Semi hard cheese ripening (4-5 days, 14-18° C)
15	Smoking (2-4 hours)
16	Packing

Raw cow milk is first filtered, normalized to a fat percent of 3,8-3,9%, heated at 32-

Total fat was determined according to the Romanian standards using a milk analyzer (EkoMilk) and dry matter by gravimetry.

Titrate acidity and specific gravity of milk samples were determined as described by Kurt et al (2003) [7].

The chemical composition of hard cheese was determined according to reference standards: dry matter (SR EN ISO 5534:2004), salt (Mohr's method, Santa and Srbinovska, 2014), and fat (SR EN ISO 1735:2005) [8, 9, 10].

Milk and cheese samples were analyzed during the fourth seasons: spring, summer, autumn and winter.

34° C, renneted with rennet and left to coagulate within 40 minutes. Curd is stirred at the surface, cut, chopped and left standing for about 5 to 10 minutes. About 10% of the whey is drained. The next step is the second heating at 43-45° C for 15-20 minutes. After the heating the fresh curd is pressed for 20-30 minutes with a force of 15-25 kgf/kg. Afterwards the curd is cut into pieces of 4-6 kg.

The process of ripening starts and lasts for approximately 10 hours at 26-28° C. Then the curd is sliced into very thick pieces (0.3-0.4 cm) that are immersed in brine (10-12% NaCl, 74-75° C) for about 50-60 seconds. The sliced curd is gently stirred in order to achieve plastic and workable consistency.

The next step is semi hard cheese formation by casting the heated curd into round forms. The ripening of the semi hard cheese takes about 4 to 5 days at 14-18° C. The next step is semi hard cheese smoking with smoke from hard essence wood for 3-4 days at 20-25° C. After this the smoked semi hard cheese is ripened one more time at 16-18° C for 10-12 days. The Vidraru

semi hard cheese is usually packed in vacuum polymer foil.

*Physico-chemical parameters of cow milk used for the production of Vidraru semi hard cheese*

The physic-chemical parameters of raw cow milk used for Vidraru semi hard cheese production are presented in Table 2.

**Table 2**

**Physico-chemical parameters of cow milk used for the production of Vidraru semi hard cheese**

Parameter	Sample number	Season			
		Spring	Summer	Autumn	Winter
Fat (%)	30	3.59±0.02	3.45±0.08	3.64±0.04	3.78±0.03
Dry matter (%)	30	8.39±0.17	8.25±0.24	8.32±0.15	8.54±0.12
Acidity (° T)	30	15.7±0.36	17.0±0.27	17.2±0.48	16.8±0.36
Density (g/cm <sup>3</sup> )	30	1.0279±0.004	1.0282±0.005	1.0279±0.005	1.0276±0.004

The quality and quantity of milk products such as semi hard cheese is highly dependent on the quantity and quality of fat contained in the original milk.

The average fat content of cow milk was 3.59±0.02% for spring and 3.64±0.04% in the autumn. The total fat percent between winter and summer season has been shown differences. The mean fat content of milk was 3.45±0.08% during warm months and 3.78±0.03% in winter. Similar results were obtained by Sevi A. et al (2001).

The average content of dry matter in summer was 8.25±0.24%. The percentage of milk dry matter decreased from winter to summer gradually.

The titratable acidity (° T) had higher values in summer (17.0±0.27° T) and autumn (17.2±0.48° T) than winter (16.8±0.36° T) and spring (15.7±0.36° T).

The average density of cow milk was about 1.027 g/cm<sup>3</sup> in spring, autumn and winter and a bit higher in summer 1.0282 g/cm<sup>3</sup>.

Table 2 shows the chemical composition of cow's milk is affected by seasonal feeding in winter, spring, summer and autumn.

The changes in fat content of milk are explained by Colombari et al (1999) who correlated milk fat content to the rate of fiber digestion with consequent ruminal synthesis of fat precursors [11].

Hattem H. E. et al (2012) mentioned that the increased fat content in milk composition is due to the type of feeding and correlated the highest values for the pre-mentioned constituent with the starting of green feeding [12, 13].

*Physico-chemical parameters of Vidraru semi hard cheese*

Table 3 shows the chemical composition of Vidraru semi hard cheese as influenced by season. Moisture content was affected by the seasonal variations and the recorded values were higher in summer (44.026±0.31%) as compared to autumn and winter time (42.952±0.39%; 42.848±0.42%).

**Table 3**

**Physico-chemical parameters of Vidraru semi hard cheese**

Parameter	Sample number	Season			
		Spring	Summer	Autumn	Winter
Moisture (%)	30	43.076±0.24	44.026±0.31	42.952±0.39	42.848±0.42
Fat (%)	30	28.661±0.95	27.433±0.91	28.853±0.82	28.901±0.74
% Fat/dry matter	30	50.35±0.31	49.012±0.29	50.578±0.38	50.57±0.58
NaCl (%)	30	1.96±0.02	2.24±0.29	1.988±0.05	2.26±0.58

Concerning fat/dry matter content, the recorded average values ± standard

deviation of Vidraru semi hard cheese were the highest in the autumn and winter

season ( $50.78 \pm 0.38\%$ ;  $50.57 \pm 0.58\%$ ), thought to be due to the different feedings. The salt content was higher in summer period ( $2.24 \pm 0.29\%$ ) and winter ( $2.26 \pm 0.58\%$ ) as compared to spring ( $1.96 \pm 0.02\%$ ) and autumn ( $1.988 \pm 0.05\%$ ).

#### 4. Conclusion

Vidraru semi hard cheese is made from cow milk in a special way characterized by ripening at ambient conditions and smoking which results into a product of an exceptional taste.

The results of this study showed that the seasonal changes had an impact on milk

#### 5. Acknowledgments

#### 6. References

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Regarding the influence of milk quality on the cheese quality, based on the obtained data we can mention that the highest content of fat in milk determined in winter season was also found in the final product, Vidraru semi hard cheese respectively.

and cheese composition. As the season progressed, milk fat decreased from winter to summer. Fat recoveries in the cheese are not very different over the season.

Seasonal variations result in varied composition of milk predominantly due to animal feeding.

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