

## SENSORIAL CHARACTERISTICS AND RHEOLOGICAL PROPERTIES OF PROBIOTIC PRODUCT "CĂTINOLACT"

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The probiotic product CĂTINOLACT was prepared from cow milk and medicinal plant extracts – sea-buckthorn and liquorice – using a mixed thermophilic culture of probiotic bacteria ABY 3 provided by the Chr. Hansen company, Copenhagen, Denmark. The probiotic dairy product CĂTINOLACT seeks to combine the favorable effects of probiotic bacteria and the therapeutic virtues of the medicinal plants. The aim of this study was to characterize the probiotic CĂTINOLACT product from a sensorial and rheological point of view. The new product thus obtained was evaluated by panelists (especially the taste, the appearance and the mouthfeel sensation) and the rheological measurements showed that the CĂTINOLACT product is a non-newtonian fluid with time-independent characteristics.

*Keywords:* new dairy product, sea-buckthorn extract, liquorice extract, flowing proprieties, sensorial attributes.

### 1. Introduction

The probiotic bacteria are defined as “living microorganisms which have benefits over the health of the host organism if they are prescribed at the proper moment” (FAO/WHO, 2002; Vasiljevic & Shah, 2008).

The probiotic dairy products are worldwide-known aliments due to the pleasant sensorial characteristics and also due to their capacities of maintaining and even improving the consumers’ health (Maragkoudakis *et al.*, 2006).

The general consumption of dairy products and, particularly, of probiotic dairy products reached a new dimension during the last years due to the favorable effects over the health attested by the records of nutritionists and doctors (Milanovic, 2006).

Food products which contain probiotics can be categorized as functional aliments and together with the prebiotics they represent the largest segment of the functional food market in Europe, Japan and Australia (Vasiljevic & Shan, 2008).

The lactic bacteria, mainly lactobacillus and bifidobacteria, are the primary agents of the probiotics in the functional food industry (Zacarchenco & Massaguer-Roig, 2006).

The medicinal plants are known to be the most important and a remedy at-hand that man ever had at his disposal. The plants with favorable effects on the human organism or with inhibiting properties over some pathogenic agents owe their therapeutic value to some specific substances. The Global Health Organization recently announced that 75 – 80% of the world’s population treats themselves using natural remedies.

## 2. Materials and Methods

### 2.1. Materials

➤ Cow milk was acquired from a collecting center in the County of Galati. By the help of a Milk Lab device, the following characteristics were determined: mineral substances – 0.72%, nonfat dry matter – 9.08%, lactose – 4.32%, proteins – 3.52%, fats – 1.5% and titratable acidity – 18 °T.

➤ The sea-buckthorn fruits and the liquorice powder were acquired from SC Hofigal Export Import SA, Bucharest. The sea-buckthorn and the liquorice extracts were obtained as follows: 100g vegetal material was subjected to the water extraction, at room temperature, for two hours. The aqueous extracts thus obtained were filtered using filter paper type of 3 m with a 65 g/m<sup>2</sup> retention capacity (provided by Sartorius Company, Romania); the filtration time was of 30 s. Afterwards, the extracts were concentrated in a rotary evaporator Rotavapor Buchi at 50 °C, 200 mbar pressure and stored at 4 °C until usage (Crăciunescu *et al.*, 2005);

➤ Lyophilized culture of lactic bacteria ABY 3 provided by the Chr. Hansen Company containing the following species: *Lactobacillus acidophilus*, *Lactobacillus delbrueckii* ssp. *bulgaricus*, *Streptococcus thermophilus* and *Bifidobacterium* ssp.

Three variants of the new CĂȚINOLACT product were fabricated and coded as follows:

A: milk + 5% inoculum;

B: milk + 5% inoculum + 6% sea-buckthorn extract;

C: milk + 5% inoculums + 6% sea-buckthorn extract + 6% liquorice extract.

### 2.2. The sensory evaluation

The sensory analysis implied an analytical hedonic test of directional differentiation through classification. This type of test is a subjective test. The hedonic scale measured the pleasure level of the product which varied from 5 (very pleasant) to 1 (unpleasant) because the evaluation was made by untrained panelists (Dello Staffolo *et al.*, 2004). The Romanian standard SR 6345/95 defines the directions and the steps to be followed in the sensory analysis of the milk and dairy products using the scoring scale.

### 2.3. Rheological measurements

The dynamic viscosity and the torque, of the probiotic dairy product with medicinal plants extracts, were measured at 9 °C using a rotary viscosimeter Brookfield DV – E, equipped with a LV 2 spindle (Kip *et al.*, 2006).

### 2.4. The data analysis

The bifactorial ANOVA method without replication was used in the processing of the statistical data. The method was applied in order to observe if there are any significant differences between the three obtained variants of the new CĂȚINOLACT product and between the sensorial attributes evaluated individually. The significant differences were determined for the P = 0.05 level of reliability (Ekinci & Gurel, 2008).

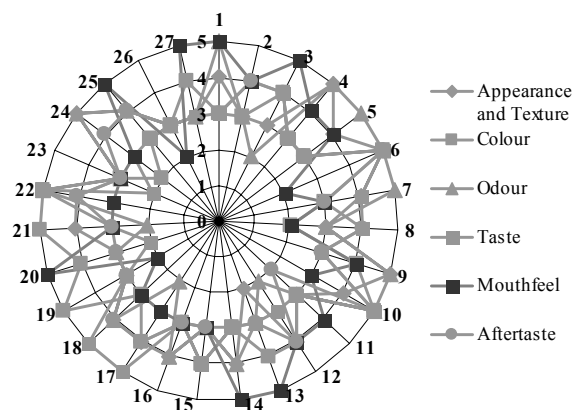
## 3. Results and Discussion

### 3.1. The sensory analysis

The sensory analysis of the three assortments of the new CĂȚINOLACT probiotic dairy product was made by the help of 27 untrained panelists. Each panelist evaluated the sensorial characteristics of the three new product assortments rating them according to the scoring scale on the sensory analysis sheet.

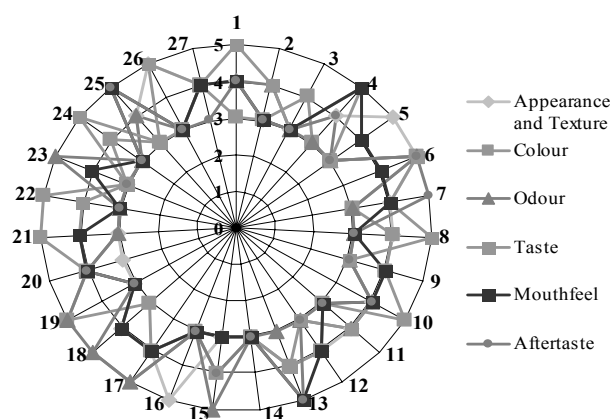
The panelists were dairy product consumers with a high interest "take-over" analysis and of ages between 20 and 25 years; they had a great focusing capacity, without being cold or tired and without being under any treatment which might affect the sensorial perception.

The sensory evaluation descriptors: appearance and texture, color, taste, odor, mouthfeel and aftertaste were gathered in the radar graph (figure 1) in accordance with the total scoring given by the panelists for each assortment of the new product.



**Figure 1.** The sensory evaluation of sample A.

The best appreciated sensory qualities of sample A were: appearance and texture, and odor, each being rated with a score overreaching 100 points. The color was evaluated with the lowest score (94 points) because the panelists considered that this attribute does not influence the acceptance of the product. The radar graph 2 was made for the sensory evaluation of the sample B descriptors: appearance and texture, color, odor, taste, mouthfeel and aftertaste. The most appreciated qualities for this sample were the appearance and texture (102 points), the taste (104 points) and the color (101 points).



**Figure 2.** The sensory evaluation of sample B

The figure 3 shows the radar graph of sample C (milk + 5% inoculums + 6% sea-buckthorn extract + 6% liquorice extract) where the most appreciated sensory characteristics were the appearance and texture, color and mouthfeel. The lowest score (99 points) was obtained by the aftertaste descriptor.

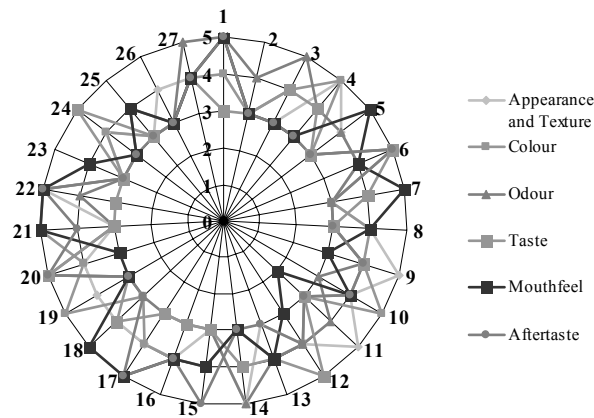


Figure 3. The sensory evaluation of sample C

Analyzing the radar graph in figure 4, it can be concluded that the most appreciated new product assortment is sample C (milk + 5% inoculums + 6% sea-buckthorn extract + 6% liquorice extract) being rated at the “good” appreciation level.

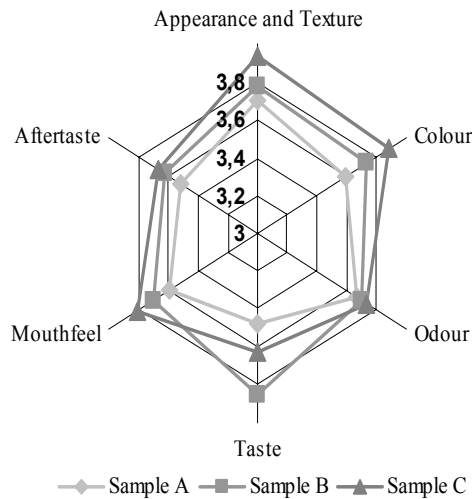


Figure 4. The sensory analysis diagram for samples A, B and C according to the appreciation levels

As a conclusion, we can note that all three types of fermented dairy products were appreciated by all the 27 tasters. The scorings were mostly tight. Although the tasters were untrained they expressed an objective opinion over the sensorial attributes of the three assortments of the new probiotic product. They have performed an analysis for the consumers aged between 20 to 25 years.

### 3.2. The rheological analysis

The rheological behavior of the probiotic dairy products added medicinal plants is presented in figure 5 (the dynamic viscosity variation according to the shearing stress) and figure 6 (the shearing stress variation according to the shearing rate).

It was determined that samples A, B and C have a rheological behavior similar to the one of the non-Newtonian fluids, time-independent, therefore, a pseudo-plastic behavior.

Specific for a fluid with this type of behavior is the flow resistance decrease as a result of the fluid shearing rate increase.

All analyzed samples have in common the fact that at low values of the shearing rate, the tangential shearing stress (depending on the sharing rate) is almost linear (the regression coefficient  $R^2$  varying between 0.957 and 0.9868).

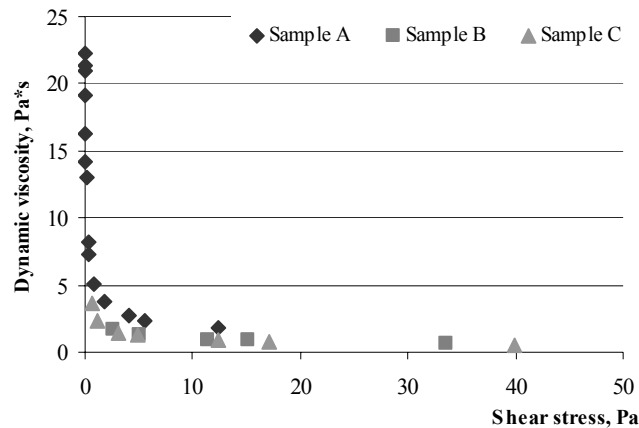


Figure 5. The dynamic viscosity variation according to the shearing stress

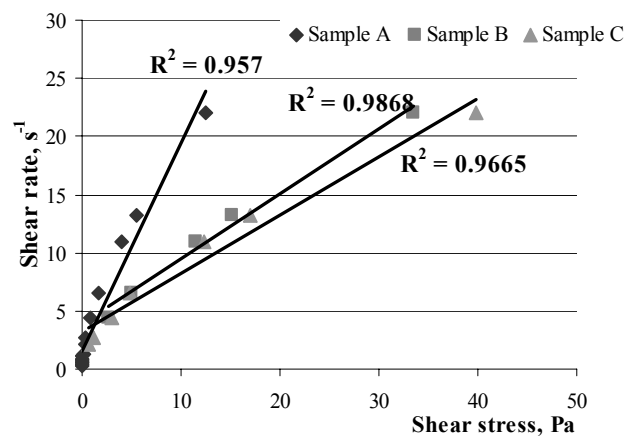


Figure 6. The shearing stress variation according to the shearing rate

### 3.3. The statistical analysis

The statistical data processing using the ANOVA method revealed that there are significant differences between the three variants of the new *CÁTINOLACT* product and especially between the sensorial attributes appearance and texture, taste, odor and color ( $P < 0.001$ ).

## 4. Conclusions

As regards the assortments of fermented dairy products (FDP), according to the analyzed sensorial characteristics, the following conclusions can be drawn:

- ✓ All FDP variants were sensorially evaluated by the tasters.
- ✓ The previous conclusion allows us to continue the research with a complete characterization of the probiotic dairy products with addition of medicinal plants extracts having the goal of diversifying the range of functional products.
- ✓ For the samples with sea-buckthorn and liquorice extract the most appreciated sensory characteristics were the appearance and texture, the color and the taste.

- ✓ The rheological analysis showed that the addition of medicinal plants does not modify significantly the flowing proprieties of the probiotic dairy products.
- ✓ According to the rheological criteria the products obtained during this study were categorized as non-Newtonian fluids, time independent and with a pseudo-plastic behavior.
- ✓ According to the statistical analysis results, there can be estimated by a 95% probability that there are significant differences between sample A and samples B and C, and also between the sensorial attributes analyzed individually.

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