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SENSORY PROFILING AND RHEOLOGICAL PROPERTIES OF WHITE BRINED CHEESE PRODUCED BY DIFFERENT STARTER CULTURES

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Abstract

White brined cheese is a white cheese of high quality, manufactured from cow's milk according to a specific technology, which is matured and stored in brine. It has a salty, slightly acid taste, and pleasant sensory properties that nowadays have a worldwide acceptance.

It had been made three variants of white brined cheese: (K) variant in which was applied current technological process and was used yogurt as starter – culture gained along processing of previous day. At (B1) and (B2) variants it was used freeze dried culture of *Lactobacillus delbrueckii subsp. bulgaricus* and *Streptococcus thermophilus* 3:1; F-DVS YF-3331 Yo-Flex version: 2 PI-EU-EN and processing of curd was applied 5 minute earlier from current and the temperature of curdling at (B1) variant was 37^{0}C while at (B2) variant was 39^{0}C.

A study showed that the sensory characteristics of white brined cheese change dramatically with maturation, and it becomes hard in texture, and salty and acidic in taste. The major differences between variants of cheeses observed with maturation were shown between (B2) variant and others, were the same variant earned considerable number of points.

***Key words**: Cow milk, brined cheese, starter – culture.*

1. Introduction

The flavour of cheese is a critical quality attribute and sensory analysis is the best method for its determination. A number of sensory evaluation tools are available. These include grading, sensory discrimination methods, descriptive profiling and consumer acceptance tests. Cheese grading is a tool for quality control; it is a robust procedure for identifying and defining sensory defects in cheese. However, grading is not suitable for use in research and development or for assessing consumer acceptance. Tools such as sensory discrimination methods, descriptive profiling and consumer acceptance tests are required to characterize and assess the potential of product innovations.

The ripening cheeses do not have typical sensory properties immediately after hooping and salting. These are developed only during the cheese ripening. One of the most important biochemical processes determining the taste and texture of a cheese is proteolysis, which includes microbiological, enzymatic and physic-chemical processes (Fox and Law [2]). At the industrial level, the ripening period is 20 to 60.

2. Materials and Methods

Research which is the subject of this project was made in the "Mlekara Tetovo" DOO Tetovo. As raw for producing white cheese is used collective cow milk from the terrain of the whole Tetovo region in Macedonia.

White- brined cheese was made in triplicate. In each trial, pasteurized (75 ^{0}C for 15 second using a plate pasteurizer) milk was cooled at 5 ^{0}C. Then milk was transported carefully to a cheese vat with the temperature of 37 ^{0}C. Three treatments of cheese were made as follows: At (B1) and (B2) variants it was used freeze dried culture of *Lactobacillus delbrueckii* subsp. *bulgaricus* and *Streptococcus thermophilus* 3:1; F-DVS YF-3331 Yo-Flex version: 2 PI-EU-EN and processing of curd was applied 5 minute earlier from current and the temperature of curdling at (B1) variant was 37 ^{0}C while at (B2) variant was 39 ^{0}C.

- **(K) Control variant:** cheese with traditional starter – culture yogurt produced from past day, coagulation at 37 ^{0}C and classical treatment of cheese curd.

- **(B1) treatment** cheese freeze dried culture F-DVS YF-3331 *(Lactobacillus delbrueckii* subsp. *bulgaricus Str. thermophilus*), coagulation at 37 ^{0}C. One and half or 75 units of freeze lyophilized direct-to-vat containing *Lactobacillus delbrueckii* subsp. *bulgaricus and Streptococcus thermophilus* 3:1; F-DVS YF-3331 Yo-Flex: 2 PI-EU-EN was used as a starter
- **(B2) variants** cheese freeze dried culture F-DVS YF-3331 (*Lactobacillus delbrueckii subsp. bulgaricus Str. thermophilus*), coagulation at 39 ^{0}C. One and half or 75 units of freeze lyophilized direct-to-vat containing *Lactobacillus delbrueckii* subsp. *bulgaricus* and *Streptococcus thermophilus* 3:1; F-DVS YF-3331 Yo-Flex: 2 PI-EU-EN was used as a starter.

The milk was supplemented with 500 mL of (40%) $CaCl_2$/1000 L of milk. As coagulant, chymosin Chy Max™ Liquid Plus derived by fermentation of *Aspergillus niger* var. *awamori* [standard rennet, Chy-Max, Chr. Hansen Inc Danish.; 200 International Milk Clotting Units (IMCU)/mL was used at a amount of 200mL on 1000 L milk measured according to ISO 11815/IDF 157. Rennet was diluted with cold water then added to each 1000 kg batch of milk. After the approximately 30 min, the curd was cut crossways into cubes of 1 $cm^{3 \text{ and}}$ left for 5 min. After being cut, the curd was allowed to settle for 3-5 min and then gently agitated at gradually increasing rate for 20 min to avoid fusion of freshly cut curd cubes. The curd was carefully disposed under initial pressure of 0.8 kg/kg curd for 20 minutes, and after than was gradually increased up to approximately to 2 kg/curd for 2.5 hour when pH of cheese was dropped under 5.1. After complete draining and when pH was 5.1 cheese was molded with cutting to 12 cm (length) x 10 cm (width) x 10 cm (height), and was stored at 15 ^{0}C and covered with 20 % (w/v) brine for 18 hour. After this stage, the blocks were placed in airtight still containers covered with 10 % brine and stored at 17 ^{0}C for 20 days.

Sensory evaluation of all three variant was applied in day 60-th of ripening with usage of correction point system and ranging method (Sulejmani [5]).

3. Results and Discussion

7 panelists, with age range between 23 and 50 evaluated the sensory quality of the cheese. Before the evaluation, they were briefed on the use of the sensory evaluation techniques. The room temperature was approximately 22 °C, the relative humidity was between 70 and 80 %, and the lighting of the room was the same throughout the experiment. The panelists were given representative cheese samples of about 15 g placed on a disposable white plastic plate (Figure 1). To neutralize the taste, they used glass of water.

Figure 1. Sensory evaluation of white cheeses

Sensory attributes were scored on a scale from 1 to 10 points, where higher score meant more expressed attribute. All tests were made under identical conditions. Final grades from evaluation are represented in Table 1 and cheese sensory attributes are shown in Figure 2.

Table 1. Sensory evaluation of cheese treatment – scores

Evaluators	Treatment (K)	Treatment (B1)	Treatment (B2)
1	6.05	5.65	7.15
2	6.45	7.15	8.4
3	8.3	8.1	5.2
4	7.15	8.1	8.05
5	6.3	6.05	5.35
6	3.6	3.2	4.15
7	6.5	6.3	7.7
Sum of ranks	**44.35**	**44.55**	**46**

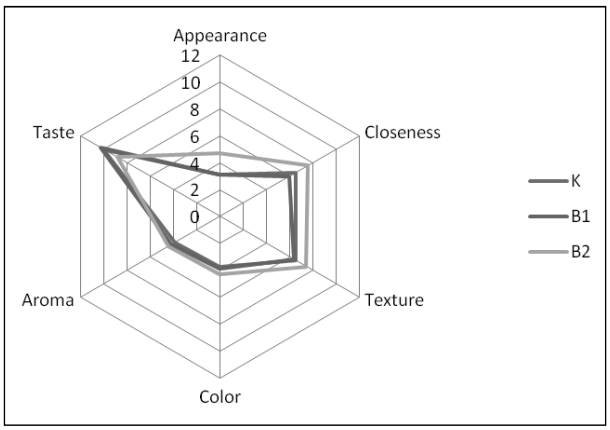

Figure 2. A spider web of the cheese sensory attributes

At all tins from analized cheeses the brine was clear and without rupiness with tipical acid and salty taste with exceptance in (K) variant.

Form all possible points, majority of them (46) has earned the cheeses from (B2) variant. Second ranged with 44.55 was the cheese from (B1) variant wich was with acceptable taste, and tipical aroma for this kind of cheeses but however it was with dark discoloration and it was with a few small holes.

Cheese from (K) variant was ranged in third place and low graded with 44, 35 points along with poorly expressed flavor and taste and with weakly surface.

Large numbers of gas holes or other openings were present in the cheese mass and it looks like cheese with poor or with insufficient acidity. The flavor was untypical for this kind of cheese respectively the cheese was with off-flavors including ester-like odors, 'plastic' or 'kerosene' odors.

This defect is more likely due to yogurt product used as starter-culture. The presence of slime (i.e. ropiness of the brine) in the brine of white-brined cheeses is a common defect (Abd El-Salam and Alichanidis [1]). This defect is usually not associated with any undesirable organoleptic characteristics in the cheese, but it affects the appearance of the brine at the retail point, and thus the reaction of the consumer. Slime formation can be caused by strains of *Lactobacillus plantarum* and/or *Lb. casei* subsp. *casei* (Yankov and Denkov [6]), *Lactobacillus plantarum* var. *viscosum* and *Lactobacillus pseudoplantarum* and *Alcaligenes* spp. (Samaras *et al*. [4]). The defect can be prevented by ensuring that the pH of the brine is <4.5, and the salt content higher than 8 g 100 g^{-1}. Yoghurt cultures containing strains capable of producing exopolysaccharides may be responsible for ropiness as well, thus the selection of the proper starter culture is an absolute must. Brines with less than 12 g NaCl 100 g^{-1} at a pH of 4.5 and above allowed the formation of slime on the cheese or the cheese became very soft (Luck and Jager [3]) as like as our case at (B1) variant.

4. Conclusions

On a basis of the studies performed and the results obtained we can draw the following conclusions:

- Consumer acceptance tests are important tools in product development. Producing a cheese with the desired sensory attributes for a target consumer is the first step towards launch of an effective product in the market.
- Prevention of the mentioned defects at (K) variant was achieved with avoided post-pasteurization contamination by improving plant sanitation. Walls, floors and ceilings were cleaned and the equipment sterilized. The key to avoid acid production at the appropriate rate and time, in order to suppress the growth of defect-causing microorganisms.
- A good practice is to pasteurize the salting-brine from time to time. If the cheese pieces are intended to be individually packed in plastic bags, packaging should be applied after the cheese is fully ripe and as much air as possible should be removed during vacuum sealing.
- Starter cultures should be active and free from bacteriophage and unwanted microorganisms and cheese and milk should be free from antibiotics

5. References

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