The Quality Analysis of Cheese with Mould inside Dough

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Abstract

The aim of this work was quality analyse of cheese samples with mould *Penicilium requeforti* inside dough. The samples of cheese were evaluated in day of production and day of packaging after 22 days of maturation during 10 months. From the physico-chemical properties were monitored mainly changes of dry matter, fat content, active acidity, fat content in dry matter and content of NaCl. From microbiological properties were monitored especially coliform bacteria. Process of maturation influenced from the physico-chemical properties mainly fat content and dry matter of cheese, which increased to the desired value. The active acidity, fat in dry matter and content of NaCl were changed during maturation of at least. Presence of coliform bacteria as indicator of hygiene during production was not detected in any samples of evaluated cheese.

Keywords: blue cheese, mould inside dough, *Penicilium requeforti*, quality of cheese

1. Introduction

Milk and dairy products are recognized as an almost complete food product in the human diet because it provides all macronutrients (such as proteins, lipids and carbohydrates) and all micronutrients (elements, vitamins and enzymes) [1, 2]. The white mould, *Penicilium camemberti,* and the blue-green mould, *Penicilium roqueforti,* are the two main species of mould used as adjuncts. Moulds contribute directly to the appearance of the cheese surface or, in the case of blue-veined cheeses, to the appearance of the cheese body [3]. Blue cheese are characterised by the growth of the mould *Penicilium roqueforti*, giving them their typical appearance and flovour. Many countries have developed their own types of Blue cheese, each with different characteristics and involving different manufacturing methods [4]. The microenvironment in Blue cheese is, in general, heterogeneous with pronounced gradients of pH, salt, water activity (a_w), etc. The ripening temperature is typically 8-15°C depending on the variety. Furthermore, there are considerable structural differences within these cheeses, which influence the level and distribution of O_2 and CO_2. These parameters and their changes during the course of ripening have a great impact on the growth and biochemical activity of the various micro-organisms present in the cheese and thereby the quality of the final product. Therefore, knowledge of the levels encountered at different ripening times is important in order to construct realistic model systems [4].
The aim of this work was quality analyse of cheese samples with mould *Penicilium requeforti* inside dough. The samples of cheese were evaluated in day of production and day of packaging after 22 days of maturation during 10 moths.

2. Materials and methods

In samples of cheese with mould *Penicilium requeforti* inside dough was evaluated physico-

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chemical and microbiological properties after production and day of packaging after 22 days of maturation during 10 moths. Followed physico-chemical properties of these cheese samples: active acidity (pH) using pH-meter (Gryf 209 L, Czech Republic), content of sodium chloride (NaCl), fat content and dry matter content were analysed. The analyses were performed according to STN 57 0107 (2001). Content of sodium chloride was determined by direct argentometric titration from cheese filtrate. Fat content was determined by acidobutyrometric (operating) method. Dry matter determination was made by gravimetric method–drying of cheese sample at 102±1°C to constant weight. Folowed was calculated fat content in dry mater (%) and water content in the fat-free cheese (WFF) (%). From microbiological properties was analysed count of coliform bacteria (STN ISO 4832).

The results were statistically processed using program Statgraphics Plus version 5.1 (AV Trading, Umex, Dresden, Germany), where we have calculated the basic variation-statistical values and to determine the evidential differences between groups, we used analysis of variance by t-test.

3. Results and discussion

We analyzed the quality of the cheese after the date of production and day of packing. From the physico-chemical properties have been observed mainly changes of dry matter, fat content, active acidity, fat content in dry mater, water content in the fat-free cheese and NaCl and results are showed in Table 1. Effect of maturation on the physico-chemical properties worked mainly on the fat content and dry matter of cheese, which increased to the standard value. The dry matter content during the maturation period increased by approximately 5-10%, and day pack reached the required standard-at least 48 mass. %. The average dry matter content on the day of production was 45.05%, and day pack was 51.39%. Observed individual values ranged dry day in the production of individual samples from 44.22-47.66%. After maturation content of dry matter was 50.55-54.16%. The difference in dry matter content of cheese samples was highly statistically significant ($P \leq 0.001$). The minimum values of dry matter (at least 48% by weight). Similar results were found in the cheese Chetwynd (Ireland) 49.8-50.8% of dry matter and cheese Gorgonzola (Spain) 57.8-50.4% dry matter [5, 6].

Fat content also after maturation reached the required standards-at least 27.04 mass. %. The average fat content, which is provided in cheese production was the day 24.03% for cheese after ripening, this value was higher, i.e. 27.41%. Detected levels of fat in the day of production for individual samples ranged from 22.98 to 25.49%.

After aging, the fat content of the samples increased with the value of 27.12 to 29, 18%. The difference in the fat content of cheese samples in both cases was highly statistically significant ($P \leq 0.001$). Analyzed samples of cheese contains from 27.12 to 29.18% fat. For example cheese Stilton (UK) contains 32.0-35.2% of fat [7, 8] and cheese Gorgonzola (Spain) 29.6-31.0% of fat [9].

The average active acidity, expressed as pH in cheese after production was 4.94 and after maturation 4.90. Active acidity was set to 2 day production of a pH meter. In cheese production for the active acidity in the samples ranged from 4.87 to 5.00. After maturation, the values of the active acidity from 4.86 to 4.95 pH. Unlike active acidity in fresh cheese after manufacture and after maturation was not statistically significant. It is important to maintain active acidity of its set point from the actual production to the end of maturation. The minimum pH of Blue cheese ranges from approximately 4.6-4.7 in Danablu [10], Mycella [11] and Stilton [7] to 5.15-5.30 in Gorgonzola [12] (Gobbetti et al., 1997), Picon Bejes-Tresviso [13, 14] and Cabrales [15]. According to the Codex Alimentarius of the Slovak Republic [19], fat content in full fat cheese is 45-60%. Fat in dry matter for individual samples on the day of production ranged from 50.25 to 56.78%, the average was 53.36%. The average value of the samples after aging was 53.35%, fat in dry matter are varied from 52.34 to 53.87%. The difference in the content of fat in dry matter between fresh and mature cheese was not statistically significant.

Soft cheese by the Codex Alimentarius of the Slovak Republic [19] is to contain 62-68% WFF. The average of WFF in cheese after production was 72.32% and in cheese after maturation over 66.96%. WFF content varied with fresh cheese production by 69.09 to 74.87% at the end of maturation difference in content WFF fresh cheeses for cheese production and post-curing was

highly statistically significant (P≤0.001). Cheese fulfills the requirements the CA SR [19].

Table 1. Physico-chemical properties of cheese in day of production and after maturation

Indicator	Dry matter (%)	Fat (%)	Acidity (pH)	Water content in the fat-free cheese (%)	Fat in dry matter (%)	NaCl (%)
			Day of production			
average	45.05	24.03	4.94	73.32	53.36	3.44
s	1.52	0.85	0.05	1.73	1.78	0.31
s_x	0.48	0.27	0.18	0.54	0.56	0.10
v %	3.39	3.55	1.12	2.39	3.35	9.09
			After maturation			
average	51.9	7.1	4.90	66.96	53.35	3.61
s	1.16	0.63	0.03	1.09	0.47	0.32
s_x	0.37	0.20	0.01	0.34	0.15	0.10
v %	2.26	2.31	0.68	1.64	0.89	8.86
t-test	+++	+++	-	+++	-	-

P>0.05-no statistically significant difference; + P≤0.05-statistically significant difference; ++ P≤0.01-statistically significant difference; +++ P≤0.001-statistically significant difference

Average content of salt (NaCl) in the cheese before ripening (3.salting) was 3.44%. Values ranged from 3.10 to 3.87%. After maturation content of salt ranged from 3.14 to 3.92%, the average content was 3.61%. The difference in mean values was not statistically significant. The main reason for salting cheese is to slow or stop the growth of bacterial cultures, the process of converting lactose to lactic acid [16]. Salt has three main functions in the cheese: it acts as a preservative, directly contributes to the flavor and is a source of dietary sodium. Along with the desired pH, water activity and redox potential, salt helps in the preservation, minimizing spoilage and prevents the growth of pathogens [17].

From microbiological properties were investigated mainly the presence of coliform bacteria. Coliform bacteria except early bloating may also cause an unpleasant taste of cheese. They are destroyed by pasteurization temperature of 72 to 73°C for 15 to 20 seconds [18]. In our assays, we found little or no presence of coliform bacteria. This indicating an excellent level of hygiene of production and properly treated the raw materials, and the technological process followed.

4. Conclusions

Milk and milk products, thus surface mould-ripened cheeses and cheese with mould inside dough may contribute to a balanced nutrition of consumers. It is therefore important to monitor the technological and microbiological quality not only the day of production, but also during the maturation a day of packaging and expedition, that these products satisfied all legislative requirements.

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