THE EVALUATION OF SENSORY PROPERTIES OF LATVIAN SEMI-HARD CHEESES

Alla Novikova, Envija Strautniece, Inga Ciproviča
Latvia University of Agriculture
E-mail: Inga.Ciprovica@llu.lv

Abstract

Annual judging of dairy products including sensory evaluation of local cheesemakers' cheeses proved that the quality of Latvian classical cheeses is various. In fact, in last three competitions three different manufacturers gained the first place in category of Krievijas and Holandes types' cheeses. It indicates instability of Latvian cheese quality. Two types of semi-hard cheeses (Krievijas and Holandes) were selected for testing the quality of Latvian semi-hard cheeses in the beginning of 2008. Krievijas type cheese was selected from three different manufacturers, but Holandes type cheese – from five different manufacturers. Sensory properties such as flavour, structure and colour were measured using line scale method. Statistical analysis of obtained data showed differences between such assessed properties as colour (yellowness), texture (firmness), holes, flavour (acidity and bitterness) in Krievijas type cheese, and colour (yellowness), texture (firmness), flavour (saltiness) in Holandes type cheese.

Key words: cheese, texture, flavour.

Introduction

The main sensory properties of cheese such as flavour and texture depend on the number of processes which occur in cheese during its ripening. Degradation of protein, fat and carbohydrate affect the sensory quality of cheese. Through many reactions different precursors of flavour compounds (such as short chain fatty acids, peptides, amino acids, diacetyl, etc.) and gases that satiate cheese flavour and are liable to cheese texture are rendered (Singh et al., 2003).

As emphasized before, the formation of sensory properties is a complex of complicated biochemical processes occurring during cheese maturation, where enzymes of starter and milk indigenous flora play significant role. Nowadays identification of new volatile compounds and studying sensory properties of cheeses is still central aim of many debates.

Transformation of initial constituents into final compounds depends mainly on cheese milk quality, sanitary and cheese milk treatment conditions (Buchin et al., 1998). Due to failure of noted factors, advanced flora may get into the milk after pasteurization or survive during it, which leads to out-of-balance of compounds derived from protein, fat and carbohydrate, and influence different defects of sensory properties especially off-flavour and texture defects (Fox and McSweeney, 2004; Wendorff and Smukowski, 2007). As it is mentioned before, also ripening conditions play a significant role in formation of cheese sensory properties and their no observance can cause different deviations in sensory assessment of cheese (Singh et al., 2003; Kujawski et al., 2003).

Annual judging of dairy products in Latvia, including sensory evaluation of local cheeses, has proved that the quality of Latvian classical cheeses is various. In fact, in last three competitions three different manufacturers have gained the first place in category of Krievijas and Holandes types' cheeses (Dieziņa, 2006; Tamane, 2004).

The objective of this paper is to estimate sensory properties of such popular semi-hard cheeses as Krievijas and Holandes produced in Latvia and to clear up possible distinctions between samples of one type cheese from different cheesemakers.

Materials and Methods

The sensory properties of two types of Latvian semi-hard cheeses (Krievijas and Holandes) were evaluated by scaling methods using line scale.

Before sensory evaluation, cheeses were stored at room temperature for one hour, then cut into 2 cm^3 pieces and put into plates randomly labeled

with three number codes. Krievijas type cheese from three di□erent manufacturers and Holandes type cheese from □ve di□erent manufacturers were selected for sensory assessment. Krievijas cheese was selected from following cheesemakers: JSC 'Smiltenes piens', JSC 'Trikātas piens' and JSC 'Rīgas piena kombināts'. Holandes cheese was selected from following cheesmakers: JSC 'Smiltenes piens', JSC 'Rīgas piena kombināts', JSC 'Trikātas piens', JSC 'Cesvaines piens', and LTD 'Mālpils piensaimnieks'. Cheese with di□erent fat content in a dry matter was tested. For evaluation were used Holandes cheese with 450 g kg^{-1} and 500 g kg^{-1} fat content in a dry matter, and Krievijas cheese – with 500 g kg^{-1} fat content in a dry matter.

Sensory evaluation was carried out in the Laboratory of Sensory Evaluation at the Department of Food Technology of the Latvia University of Agriculture in the beginning of 2008. All cheese samples were simultaneously evaluated by twenty seven panelists. During one session, panelists were o□ered to assess one type of cheese (e.g., Krievijas) from various manufacturers. The panelists were provided with water to rinse their mouth between samples.

In order to represent the perceived intensity of the properties, the panelists were asked to note intensity of such cheese properties as colour (yellowness, evenness), texture (□rmness, crumbliness, elasticity), holes, and □avour (acid, bitter, salty, sharp, rancid) on a line scale by placing a mark (Meilgaard et al., 2007; Strautniece, 2004).

The marks from line scale were measured with ruler and converted into numbers. Obtained data was averaged across panelists, then analysed using statistical analysis of variance (ANOVA), and di□erences among cheese samples were evaluated in the experiment. When signi□cant ($p<0.05$) di□erences were found among treatments, mean was compared using Tukey's test. The StatistiXL (Version 1.8) program was used.

Results and Discussion

The obtained data given in Table 1, showed highly signi□cant di□erence between holes and bitterness of Krievijas type cheese samples. Other distinctions were found between yellowness, □rmness and acidity of samples.

The sample from JSC 'Smiltenes piens' was noted as the best with less acidity and bitterness and good quality holes. The same opinion was declared by experts at annual judging of dairy products one and half year ago (Dieziņa, 2006; Tamane, 2004). That con□rms the invariable sensory quality of this cheesemaker's product. The sample from JSC 'Rīgas piena kombināts' was bitter with high acidity.

Table 1

Evaluation of sensory properties of Krievijas type cheese (mean±SD)

Properties		'Smiltenes piens' JSC	'Rīgas piena kombināts' JSC	'Trikātas siers' JSC	p value
Colour	Evenness	8.99±1.82	8.22±2.55	7.74±2.79	0.18
	Yellowness	7.49^{a}±1.87	7.06^{a}±2.42	5.13^{b}±2.37	0.001
Texture	Firmness	$5,04^{b}$±2.26	5.65^{b}±3.10	7.54^{a}±2.60	0.003
	Crumbliness	4.73±2.36	5.15±2.86	4.42±2.48	0.56
	Elasticity	2.96 ±2.43	4.69 ±2.98	4.21 ±2.81	0.07
Holes		8.67^{a}±2.35	6.27^{b}±2.42	3.20^{c}±2.42	$3.02*10^{-11}$
Flavour	Acid	4.95^{b}±2.31	7.33^{a}±1.85	5.57^{b}±2.36	0.001
	Bitter	2.78^{b}±2.07	5.46^{a}±2.18	5.02^{a}±3.09	$4.13*10^{-4}$
	Salty	5.45±2.24	6.37±2.44	5.67±2.40	0.33
	Sharp	3.27±2.46	4.12±2.43	3.76±2.80	0.49
	Rancid	2.71±2.31	3.67±2.22	4.02±2.58	0.13

*^{a,b,c} – samples within property with a similar letter superscripts do not differ significantly (P>0.05). Letters are subordinated from the highest value to the least.*As emphasized in some papers investigating origin

of cheese o□-□avours, the bitterness is nearly the one of the main problems in the manufacture of many cheese varieties, especially those made with mesophylic starter cultures (Singh et al., 2003). Bitter □avour explains as de□ciency, in the used strain, of proteolytic enzymes capable of hydrolyzing bitter primary breakdown products of the cheese protein (Lemieux and Simard, 1991; Mullan, 2002). In addition to noted, bitterness is caused not only by peptides but also a number of other compounds such as amino acids, amines, amides, long-chain ketones and some monoglycerides that can contribute to bitter o□-□avour (McSweeney et al., 2000).

Cheese manufacturing and ripening conditions are also two of the main factors contributing to bitterness formation and excess acidity of cheeses (Buchin et al., 1998; Hill, 1995b). Higher temperatures of ripening intensify the enzymatic processes, but allow growing of secondary □ora that is responsible for contribution to o□-□avours; whereas low temperatures of ripening are liable to absence or rare holes in cheeses (Hill, 1995a; Kujawski et al., 2003) and allow the formation of bitter □avour due to slow reactions of protein breakdown in cheese.

Signi□cant di□erences between yellowness, □rmness and saltiness were observed among the samples of Holandes type cheese. These results are indicated in Table 2. The vast majority of samples were evaluated similarly. JSC 'Trikātas siers' Holandes cheese was acknowledged as the best cheese with typical cheese taste and good appearance.

This evaluation di□ers from experts' conclusion for Holandes type cheese at annual judging of dairy products. In the period of last three competitions, JSC 'Trikātas siers' did not gain any awards in comparison with 'Mālpils piensaimnieks' LTD and JSC 'Smiltenes piens'. (Dieziņa, 2006; Tamane, 2004)

Cheese from JSC 'Cesvaines piens' was evaluated as hard and salt, but the saltiest was sample from JSC 'Rīgas piena kombināts'.

Both of these properties depend on cheese manufacturing process; □rmness also depends on composition of cheese milk. The role of fat in the development of sensory qualities of cheese appears to be decisive. Fat a□ects texture of cheese, too. Reduction of fat content leads to increase in the moisture and protein content of cheese.

Table 2

Evaluation of sensory properties of Holandes type cheese (mean±SD)

Properties		'Smiltenes piens' JSC	'Rīgas piena kombināts' JSC	'Trikātas siers' JSC	'Cesvaines piens' JSC	'Mālpils piensaimnieks' LTD	p value
Colour	Evenness	8.45±2.28	8.22±3.04	8.42±2.50	7.76±3.12	8.20±2.60	0.90
	Yellowness	7.01^{b}±2.25	4.30^{c}±2.21	7.55^{b}±2.23	9.79^{a}±2.41	4.29^{c}±2.01	$1.23*10^{-17}$
Texture	Firmness	4.02^{b}±2.31	6.91^{a}±2.52	6.87^{a}±2.59	8.20^{a}±2.88	6.63^{a}±2.62	$1.03*10^{-6}$
	Crumbliness	2.81±2.14	2.72±1.91	3.74±2.83	4.16±3.20	4.13±2.46	0.14
	Elasticity	2.44±2.77	2.36±1.93	2.84±2.83	3.73±2.00	3.62±2.84	0.14
Holes		2.52±2.19	3.84±3.27	3.44±3.15	4.39±2.62	4.28±3.09	0.12
Flavour	Acid	5.03±2.34	6.22±2.71	4.97±2.30	5.38±2.67	5.78±2.34	0.30
	Bitter	4.90±2.47	4.62±2.06	3.72±1.93	4.13±2.24	4.16±2.05	0.30
	Salty	3.77^{b}±1.69	5.84^{a}±2.08	4.92^{a}±2.50	5.54^{a}±2.94	5.70^{a}±1.97	0.006
	Sharp	3.05±2.06	3.91±2.71	3.42±2.58	3.74±2.40	4.02±2.33	0.59
	Rancid	3.09±1.99	3.46±1.86	3.36±2.25	4.18±2.69	4.15±2.46	0.31

^{a,b,c} – samples within properties with a similar letter superscripts do not differ significantly (p>0.05). Letters are subordinated from the highest value to the least.

The in□uence of ripening conditions on product □rmness plays a signi□cant role. Cheese maturation at low temperatures leads to a chain of chemical reactions that contribute not only to holes and □avour quality, as mentioned before, but also to changes in cheese texture. Low ripening temperatures or de□cit of proteolytic enzymes contribute to signi□cant increase in primary proteolysis when changes in the α_{s}-, β- and γ-caseins occurs and peptides with high content of hydrophobic amino acids are derived. It

relates to □rmness of the texture of cheese (Early, 1998).

The results of sensory study show that the quality of Holandes and Krievijas cheeses is variable. The next stage is evaluated the protein, fat and carbohydrate degradation products and their concentration, the role of cheese micro□ora and enzymes that are responsible for biochemical processes during the maturation of cheese. Obtained results should allow promoting and developing of Holandes and Krievijas cheese quality in Latvia.

Conclusions

The results of this study indicate that Holandes cheese from di□erent manufacturers di□ers in yellowness, □rmness and saltiness.

The sensory properties of Krievijas cheese principally di□er between samples and mainly depend on quality, technology and producer.

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