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TECHNOLOGICAL POSSIBILITIES OF PRODUCTION OF SAMI-FAT TRAPPIST CHEESE[1]

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Content: In the Codex for individual cheese Saint-Paulin (Codex International Individual Standard for Saint-Paulin –C-13-1968) in which group Trappist cheese belongs, the possibility of production of fatty cheese (45 % of fat in dry matter) and semi fat cheese (40 % fat in dry matter) is predicted. In this paper is presented production of semi fat Trappist cheese from milk containing 2,5 % of butterfat .Technological process was carried out in Mlekoprodukt of Zrenjanin in the semi mechanized line for semi hard cheese. Curd milk is from the "Agro-Klek"farm from Zrenjanin, originating from Red Holstein cows, which with respect to hygienic and technological quality was suitable to EU norms. In the usual way milk was applied for production of Trappist, but the phase of processing the curd was on lower temperature, the grain was larger and wetter. The pre-pressing and pressing at certain pressure was carried out till the achievement of necessary ph value of cheese. After salting 48 h in the brine containing 20 % of salt, the cheese was on pre-ripening and then to ripening in a controlled conditions of wetness, temperature and air exchange. Ripening was in foil and with spreading. Trappist produced had characteristic sensory qualities with respect to flavour, smell plasticity and elasticity of cheese dough. Fat content (23,5-24 %) , protein (29,28 %), then dry matter (59,61 %) and water in the fat free dry matter (59,61 %) and water in the fat free dry matter (52,64) show that a semi fat cheese has been produced ,of characteristic sensory traits ,with smaller cholesterol (39,01 mg)/100g) and higher healthy value. Cheese was followed in the period of 6 months and with longer ripening period the quality of cheese was better.

Advantages of such production are in higher profitability (because of smaller butterfat) and better sale. The demands of consumers are increasing for milk and milk products with smaller fat because of higher health values of these products .With the microbiological respect cheese was correct and in accordance with Regulation (1993).By technological process, which considers adaptation of individual phases of process, which considers adaptation of individual phases of process to milk with smaller amount of fat, it is possible to produce cheese of highest quality and higher health quality. By introduction of semi fat Trappist into manufacturing, the production and utilization of the present lines would be increased , the assortment enlarged and the sale increased , which for cheese manufacturers must be interesting , because it would result to more profitable management of dairy .

Key words: semi fat Trappist, sensory characteristics, cholesterol, technological process

Introduction

Dairy industry is facing problems in regard to sale every year, so it must be in trend with its products for market and also must meet the demands of consumers. Nowadays the consumers want the food with lower fat content with benefit characteristics and without risks for some diseases.

Trappist is highly valued cheese wanted on world market. It has famous mild taste on milk and nuts, elasticity of pastry with minor number of holes with high nutritive value. Where ever it was made (France, Canada, German, Hungary, Croatia, Serbia, etc.) it is well known cheese and very favourable. For cheese production we used milk with 2,5% of milk fat and some phases of technological process were standardized. On declaration of Trappist cheese for market in a table for nutritive value we can find data about quantity of saturated fatty acids and cholesterol which are calculated on daily intake of 2000 calories (RDA). In this work we achieved cheese quality with characteristic sensor features and with lower content of fatty acids and decreased content of atherogenic compounds.

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1 Original scientific paper-Originalni naučni rad

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Material and methods

Milk used for production of semi-fat cheese originated from Red Holstein breed from farm „Agro – Klek“ near Zrenjanin.

The assay was done in dairy plant Mlekoprodukt from Zrenjanin. Trappist was made on controlled plant for semi-hard cheeses but some phases of process were modified because of lower content of milk fat. Standard analyses were done according to the methodology of *Carić et al., (2000*). Method of examination of fat content: JUS. E. K8. 038, gas chromathography. The cholesterol content was done according to the method of *Rudel et al., (1973*).

Results and discussion

Standardization of Trappist begins with standardization of milk for Trappist (*Popović et al., 2004*). Milk for semi- fat cheese Trappist was standardized on 2,5% of milk fat. Standardization of milk is important for production of Trappist according to standards and economical use of milk components. The hygienically regular milk which meets the standards of EU (92/46 EEC) was standardized while it was raw. It was necessary to keep the same high quality of milk so we used the HACCAP system from the beginning of the research (*Popović et al., 2001, 2002*). Table 1 shows technological process of production of Trappist cheese and it's phases.

Biological ripening of milk was done with DVC culture CHN 11(Cr. Hansen) until the determined acidity was reached. Biological ripening is important for culture activation and the increase of acidity, which is very important for milk coagulation, especially in second phase.

Rennet (calf himosin) was liquated in water and added in milk so the coagulation was finished after 30-40 minutes. Temperature must be controlled and equal in cheese vat because the activity of enzymes as well as aggregation of miceles are very sensitive on temperature changes (30-32° C). If the curd is breaking down when it is cut with knife, which is under the angle of 45° C, that means that curd is ready for cutting.

The size of curd grain is very important for holding of moisture in Trappist. There is connection between moisture of cheese and grain size of the curd. Trappist is semi-moisture cheese (cheese with scaled curd) and the content of moisture is very important, especially when the Trappist is made of milk with less milk fat. Cutting must be done in that way that the size of curd particle must not be bigger than the pea. Index of cutting quality can be controlled by measuring of content of fat in whey. For Trappist cheese it should be < 0,3 %.

The next phase is treatment with cheese curd. Combination of heating and the development of acidity (acidity decrease) cause the appearance of synersis which resulted in pasting of moisture, lactosis, acid, soluble minerals, salts and whey proteins. The treatment of cheese curd must not be fast because the moisture could be scaled. The whey should be drained when the pH is 6,38 (5,6° SH).

The content of lactose can be regulated with the drainage of water (synersis), by fermentation and attenuation with water. Temperature of water declared the moisture of the curd. For Trappist, temperature of water must be 60° C, so the temperature of the curd and whey must be between 36-38° C. Traditional washing means draining of 1/3 – 2/3 of whey and it's replacement with water and also the mixing for about 15 minutes. With this process the big content of whey will be attenuated and also recontrated or throw.

Trappist is than put under the prepress and press after those phases. Pressing helps creation of smooth texture and also keep from mechanical opening of cheese, which is related with air and whey nests. Pressing must be stepwise and must be fallowed with rotation of modles and the increase of pressure. Warmer curd needs less pressure.

Trappist shoud be salted in brine with pH 5,2 – 5,6, and the concentration of salt should be 20 – 25 %, for at least 48 hours. The brine must be mixed all the time.

The ripening of Trappist must be in controlled conditions (moisture, temperature, airing).

Table 1. Technological process of manufacturing of semi fat Trappist

Duration of operation	Phases of technological process	Parametar of process	Product	Adjusted (standardized)value
0 min		Added :$CaCl_2$ Mesophilic and aromatic culture	Milk for cheese 2,5 % butter fat 2,92 % proteins 4,58 lactose 7,84 % fat free DM	ºSH 6,6-6,8 0,20 g $CaCl_2$ 0,10 g / l ,CHN-11
30min	State of rest	Biological ripening	(milk+starter)	ºSH 7,4-7,6 pH 6,61-6,58
5 min	Mixing ,	Added : rennet	Milk curdled	30-32ºC 0,028 g/l himozin
30 min	State of rest	Rennet curdling	Tender curd	min Curdling 15 min Hardening 20-30min
10 min	Cutting of curd	First processing of curd	Curd–whey mixture	Mixing , speed : 4-5 r /min
10 min	Chopping up of curd and mixing	Forming of small grain	Whey–cheese grain	Mixing 8-10 r /min Cheese grain size Ø 6-8 mm,
5 min	Separation	Releasing of whey	Whey–cheese grain	Whey 30 % in relation to milk for cheese fat 0,3 % 5,6ºSH , pH 6,38
20 min	Mixing and heating	Added : Warm water	Curd –whey –water -mixture	Water (30-ºC) in relation to milk for cheese
50 min	Heating change Mixing	Second processing Rinsing and Drying of cheese grain	Curd (heated) Whey –water – mixture	Temperature 37-38ºC Whey : 4,8 ºSH , pH 6,34 ***Cheese grains*** Ø 5-3 mm Ph : 6,16 ; 38,0 ºSH SM : 48 %
30 min	Prepressing	Release of whey	Pre pressing 30 min	Pressure 2-3bars Cheese : pH 6,06 , ºSH 48,0
4-6 h	Pressing	Pressing of cheese in moulds	Pressing of cheese Dripping of whey	k Pressure 3 bar / 2 h (Phase I) 5 bar /2-4 h (Phase II)
48 h	Transport	Taking out from molds Sinking of cheese to brine	48 h Salting of cheese 48 h	Brine :20 % soli 10ºC , Ph 5,68 ,°SH 7,5
10-15 days 15-30 days	Preripening Ripening	Curing of cheese	85-90 % RM 14-16ºC 82-85 % RM 10-12ºC	Cheese pH5,42 lactose : 0,98% fat in DM 40 % Water in fat free DM 55 %

Technological process is done under the specific criteria for every phase of production. There are three factors important for Trappist production and the changes in texture during ripening: 1. pH of drained whey from the curd, wich declare the proportion of himosine and plasmine in cheese; 2. contol of relation of salt:moisture (S : M), together with contol of temperature during ripening, activity of residual rennet and plasmine in cheese; 3. pH of cheese after salting, factor which is the most important for texture (*Lawrance et al., 1987*).

For brined cheeses as well as for Trappist it is important to ripe from the inside to the outside of cheese. Cheeses which ripe on classical way (with cheese paring) get harder asperity during ripening because this cheese lose moisture throw the paring and the ratio of casein and moisture is higher.

Other factors also have influence on cheese and these are texture, moisture, salt, and content of calcium. Between pH 5,5 and 5,1 coloid phosphates and casein disolve from submicelles. This change in size

and characteristics of submicelles significantly increase their possibility for absorption of water. Presence of higher content of moisture on any pH level, gives softer texture of cheese. In this research we got the cheese with 55 % of moisture in non-fat matter which positively resulted on elasticity of cheese Trappist. Semifat cheese was made according to standards (Trappist is known because for it's unique characteristics) so it is important to advance it's nutritive value which is shown in table 2.

Table 2.Nutritive value of Trappist (100g)

Calories 365	**Calories from Fat 216**	
% Daitry Value *		
Total fat	24 g	37 %
Saturated Fat	14 g	70 %
Cholesterol	39 mg	17%
Sodium	350 mg	15%
Total carbohydrate	0,96 g	0,32%
Dietary fiber	0 g	0%
Sugar	0,96 g	0,32%
Protein	29 g	
* Daily intake estimated according to recommended Daily values on the basis of 2000 calories in diet (RDA)		

Fat is very important in cheese production especially for creation of taste and odour as well as softness and ability to melt (*Goff, 2000*). But there are evidence that high level of fats and saturated fats has influence on level of cholesterol, coronary diseases and obesity, *Lepšanović et al., (1995*). Sami-fat Trappts contain 15 % of fat versus fatty cheese. It also contain less cholesterol (39 mg), less saturated fatty acids (14g) and the energy value is lower (1250/365 kJ/kcal). Saturated fatty acid contains 8 % of stearic acid which is atherogenic (*Popović et al., 2005*.).

All these factors shows that semi-fat Trappist cheese content less atherogenic compounds so it has greater value for health. With quality raw milk and good technological process as well as with good conditions of ripening we can get cheese with sensore features characteristic for Trappist cheese (Standard for Saint – Poulin C- 13-1968). Semi fat Trappist has a light acid taste and odour on milk, cut is characteristic for that kind of cheese and the pastry was elastic.

Conclusion

According to our researches we can conclude:

1. With regular standardization of milk and with good technological process which is modulated for lower content of milk fat (2,5 %), we can produce semi-fat Trappist cheese with sensoric features characteristic for this type of cheese.
2. Trappist with lower fat content has a decreased level of cholesterol, it has less saturated fats, it also has lower energetic value which means that this kind of Trappist is better for human health than fat Trappist cheese.
3. Production of Trappist with lower fat content is very interesting for better range and the loan is higher because we spent less milk fat and the rest of the milk fat can be used for production of cream or some other product.

TEHNOLOŠKE MOGUĆNOSTI PROIZVODNJE POLUMASNOG TRAPIST SIRA

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R e z i m e

U Codexu za induvidualni sir Saint-Paulin(Codex International Induvidual Standard for Saint-Paulin –C-13-1968), u koju grupu pripada Trapist, je predviđena mogućnost proizvodnje masnog sira (45 % mastu u suvoj materiji) i polumasnog sira (40 % masti u suvoj materiji). U ovom radu je prikazana proizvodnja polumasnog Trapist sira od mleka sa 2,5 % mlečne masti .Tehnološki proces je izveden u Mlekoproduktu Zrenjanin na polumehanizovanoj liniji za polutvrdi sir. Sirovo mleko je sa farme "Agro-Klek " kod Zrenjanina, poreklom od krava rase crveni holštajn , koje je u pogledu higijenskog i tehnološkog kvaliteta odgovaralo normama EU. Mleko je na uobičajen način primenjeno za proizvodnju Trapista s tim što je faza obrade sirnog gruša bila na nižoj temperaturi ,zrno je bilo krupnije i vlažnije. Predpresovanje i presovanje pri određenom pritisku je vršeno do postizanja potrebne pH vrednosti sira. Nakon solenja 48 h u salamuru s 20 % sol, sir je bio na predzrenju a zatim zrenju u kontrolisanim uslovima vlage, temperature i izmene vazduha. Zrenje je bilo u foliji i sa premazom. Proizvedeni Trapist je imao karakteristične senzorne osobine u pogledu ukusa, mirisa, plastičnosti i elastičnosti sirnog testa. Sadržaj masti (23,5-24,0%), proteina (29,28%), zatim suve materije (59,61%) i vode u bezmesnoj suvoj materiji (52,64) , pokazuje da je proizveden polumasni sir, karakterističnih senzornih osobina, sa manje holesterola (39,01mg/100g) i veće zdravstvene vrednosti. Sir je praćen u periodu do 6 meseci i s dužim periodom zrenja, kvalitet sira je bio sve bolji.

Prednosti ove proizvodnje su u većoj profitabilnosti (zbog manje mlečne masti) i boljem plasmanu .Zahtevi potrošača rastu za mlekom i mlečni proizvodima sa manje masti zbog veće zdravstvene vrednosti ovih proizvoda .U mikrobiološkom pogledu sir je bio ispravan i u skladu sa Pravilnikom (1993). Tehnološkim procesom, koji podrazumeva prilagođavanje pojedinih faza procesa, mleku sa manje masti, moguće je proizvesti sir vrhunskog kvaliteta i veće zdravstvene vrednosti.Uvođenjem u proizvodnju polumasnog Trapista, povećala bi se proizvodnja i korištenje postojećih linija, proširio asortiman i povećao plasman, što za proizvođače sireva mora biti interesantno jer bi to rezultovalo profitabilnijem poslovanju mlekare.

Ključne reči: polumasni trapist, senzorne osobine, holesterol, tehnološki proces

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