

THE SPECIFIC CHARACTERISTICS OF PIROT KACHKAVAL¹

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Abstract: Recently, the special attention is focused on historical and social importance of traditional cheese making. Some of the unique cheese varieties are on the edge of distinction which comprises the loose of cultural identity of region. Revitalizing the traditional cheese making also means the preservation of cultural identity of the region. Regulative EU (EEC) No. 2081/92 defines the concept of *Protected Designation of Origins* and *Protected Geographical Indication*. A **PDO (Protected Designation of Origin)** covers the term used to describe foodstuffs which are produced, processed and prepared in a given geographical area using recognised know-how, and the quality and characteristics of which are essentially or exclusively due to a particular geographical environment with its inherent natural and human factors. In the case of the **PGI (Protected Geographical Indication)** the geographical link must occur in at least one of the stages of production, processing or preparation. The main important factors which are considered in procedure for getting PDO labeling include: contribution of natural pasture, specific characteristics of rennet used in manufacture process, natural microflora as starter cultures, traditional cheese making process, unique environment of ripening, as well as specificity of ingredients.

Pirotski kachkaval fulfill the requirements establish in procedure for PDO labeling as natural pasture of region contributes in animal feeding, the cheese making process comprises the traditional technology with specific treatment of raw milk and autochthonous micro flora of lactic acid bacteria as natural starters.

Key words: Pirotski kachkaval, traditional cheese making

Introduction

Stara planina is consisted of west parts of Balkan Mountain system, which situated from the Black Sea to Vrska Cuka, in total length of 530 km. Stara Planina lies between Zajecar and Dimitrovgrad, and occupied the east part of Serbia. Stara Planina is very rich in water sources, and river of Dojkinci represents the largest river. The climate picture of Stara planina is very complex and diverse, depending on height above sea level and in that sense represents the transition between middle continental and mountain climate. The coldest month is January while July represents the warmest month. An average temperature in January never drops below 2°C and is around 18°C in July. The diversity of geographic and ecological factors of Stara planina caused the biodiversity of their flora and fauna. It pointed out the complex historical development of flora and fauna and the process of adaptation of species, of which are most of autochthonous origin (Petrović, 1997). The vegetation of Stara planina is characterized by diversity of forest, bush and meadow populations (Milošević, 1996). Until now, it was described 52 types of herbs populations of which 24 forest and bush communities and 28 herbaceous populations (Mišić, 1978). For inhabitants of Stara planina the sheep represent the source of food, cloths and money, in other words the post of existence. The sheep breeding of Stara planina had always represented the significant factor in milk, meat and wool processing. The historical data showed that in 1903. year 160 waggons of kachaval was exported in Vienna and Budapest. In the region of Stara planina it was raised the autochthonous population of sheep, Pirot pramenka breed. This genotype is adapted on conditions of Stara planina so the sheep is movable, resistant and easy to breed. Although the sheep breeding had a comparative advantage because of natural ecological factors, until the 7th decade of XX century the autochthonous cattle in type of »busa« was raised. After that time it was starting the melioration of »busa« with domestic skewbald cattle. The half-breed are some larger but because of inadequate nutrition the milk yield in the period of lactation amount 6-10 kg per day (Petrović, 1997).

According to the historical material (Pejić, 1956), it can be most certainly presumed that the manufacturing of cheese kachkaval was brought to the Balkan Peninsula by nomadic tribes from the East. The ancient technology of cheese making is mostly spread on the Balkan Peninsula and in Italy, as well as in the

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southern regions of Russia (the Crimea, Be Arabia, South Ukraine), in Turkey, Algeria, Tunisia, Egypt and Morocco, that is in the regions with warm and dry climate, hilly relief and developed sheep breeding (Pejić, 1956).

In each of these countries with developed manufacturing of hard cheese during the time some varieties or types of hard cheese developed distinguishing themselves according to the properties and quality, such as hard cheese from Sarplanina Mountain, Pirot hard cheese in Serbia, Pirdop cheese from Bulgaria, Penlu from Romania and Tesalia and Epiria cheese from Greece.

The story about kachkaval production on Stara Planina Mountain necessarily includes the nomadic sheep breeders, who are known as "Crnovunci" (Black wool people). They were named after the black colour of the wool of their sheep. In the period from the end of the 19th century up to the third decade of the 20th century "Crnovunci" populated the pastures of Stara Planina Mountain with their flocks of 500-1000 sheep. Large quantities of sheep milk, which gave their flocks, "Crnovunci" processed into white cheese and kept in bellows. In order to prolong the shelf life of this cheese, it was soaked into hot water, mixed and salted, that is, in other words, the processing of milk into hard cheese-kachkaval had started. The skill of making kachkaval "Crnovunci" passed on the people inhabitants of Stara Planina, who improved it to the perfection and kept until today (Petrović, 1997).

Production of kachkaval on Stara Planina Mountain is connected with small dairies called "bacija". "Bacija" dairy represents cooperative organization for joint sheep keeping, pasture, production and processing of all products - wool, meat and milk. Peasants realized that small number of sheep is of no use, therefore they associated in all activities relating to sheep breeding and production at daires - "bacije" (Stojanović and Katić, 2003). The organized manufacturing of Pirotski kachkaval had been known for almost hundred years, and in the past time the important quantities of kachkaval were imported in Wiena and Budapest. Kachkaval which had been already known as "Staroplaninski", "Senokoski", "Dojkinacki", today we recognized as Pirotski kachkaval with general acception and well-documented fact because Pirot represented the administrative and cultural center of that region.

Material and methods

The material of investigation consisted of 15 samples of mixed milk (combined sheep's and cow's milk) from vats before starting cheese manufacturing and 15 samples of cheese at 60 days of ripening. At the end of ripening period, the number of lactic acid bacteria was also determined. The chemical composition of milk and cheese samples was performed according to standards methods (Official Methods of Analysis, AOAC, 1990).

The enumeration of *Lactococcus spp.* was carried out on M17 agar after incubation at 30°C for 24 hours. For the enumeration of lactobacilli the MRS agar was used after incubation in anaerobic conditions at 30°C for 24 hours. The isolation and enumeration of enterococci was carried out on kanamycin-aesculin-azide agar at 37°C after incubation period of 24 hours. Statistical analysis was performed with Microsoft Excel. The basic statistical parameters (mean, standard deviation, coefficient of variation, maximum and minimum values) were calculated.

Results and discussion

The quality and hygienic status of raw milk are of the most importance in getting the end product with consistent quality and good microbiological picture (Mijačević and Bulajić, 2002; Mijačević et al., 2003a). The raw milk which represents the starting material in manufacturing of kachkaval must have at minimum 4% milk fat and 3,2% proteins, to achieve the declared characteristics of end product (semi-hard, fat cheese). The standardization of chemical composition of milk is obtained (achieved) by mixing the sheep's and cow's milk. The chemical composition of mixed (combined) sheep's and cow's milk used in manufacturing of Pirotski kachkaval is presented in table 1.

Table 1. The chemical composition of mixed sheep's and cow's milk used in manufacturing of Pirotski kachkaval

| statistical parameters | Chemical composition | | |
|------------------------|----------------------|------------|------------|
| | dry matter | fat | proteins |
| n | 15 | 15 | 15 |
| X±s | 12,99±0,828 | 4,38±0,523 | 3,30±0,140 |

The ripened milk with acidity 8-8,2 °SH is used in manufacturing process of Pirotski kachkaval. By mixing the cold evening milk with warm morning milk it was achieved the temperature of mixed milk of 15-20°C. This temperature selected the growth of indigenous microbial population of lactic acid bacteria, mainly belonged to the genus *Lactococcus*, *Lactobacillus* and *Enterococcus*. These bacteria had been adapted through the time on substrate (raw milk) and unique microclimate and based on their metabolic activity had the great impact on production, ripening process and typical features of Pirotski kachkaval.

The duration of the phase of ripening the curd is 19-20 hours in microclimate environmental conditions at temperature of 19-21°C and relative humidity of 80-85%. The ripening of curd is entirely based on metabolic activity of autochthonous lactic acid bacteria, naturally present in raw milk. The acceptability of "baskija", ripened curd for steaming phase has been inspected by spreading and evaluate on empirical way. After the acidity has been inspected by spreading, baskija is being chooped on the cutter and vapoured in the water whose temperature is 75°C. Fuming is performed in weaved baskets, devaporated and put onto the cheese making table, on which it is being spread and salted, formed into the ball and put into casts. The manual processing of steamed dough is characteristic for cheese making, given the structure characteristic for "pasta fillata" cheese (flakiness observed on the cross-section). After drying of 1-2 days, the cheese is being transferred into the room for cheese ripening. The temperature in the room for ripening ranged between 15-18°C with relative humidity of 80-85%. The cakes of cheese are put one onto the other and salted with dry salt. Typical gold yellow colour of crust is obtained by wiping the edge of cheese which is in contact with air.. The cheese is ripened during period of 8 weeks. The chemical composition of Pirotski kachkaval at the end of ripening period is shown in table 2.

Table 2. The chemical composition of Pirotski kachkaval at the end of ripening period

| Parameters | Dry matter | Fat | Fat in dry matter | Proteins | pH value |
|-------------------|------------|-----------|-------------------|-----------|-----------|
| Number of samples | 15 | 15 | 15 | 15 | 15 |
| Mean | 64,08 | 30,30 | 47,32 | 20,09 | 5,44 |
| SD | 2,80 | 1,92 | 1,35 | 0,99 | 0,03 |
| Min-Max | 63,0-65,2 | 28,8-32,1 | 46,0-48,5 | 19,4-21,0 | 5,40-5,47 |
| Cv % | 4,3 | 6,3 | 2,8 | 4,9 | 0,5 |

According to the obtained results, Pirotski kachkaval fulfill the standard requirements (JUS E.C2.010), in spite of small variation in examined parameters. By sensory evaluation it was determined a spicy and salty taste, as the typical features of end product.

In order to study the natural bacterial population present in the production of Pirotski kachkaval, it was determined the number of autochthonous lactic acid bacteria. These microorganisms act as natural starters, and mainly belong to *Lactococcus* spp., *Lactobacillus* spp. and *Enterococcus* spp. The numbers of main groups of lactic acid bacteria determined in ripened Pirotski kachkaval is presented in table 3.

Table 3. The numbers (expressed as $\log_{10}cfu/g$) of main groups of lactic acid bacteria determined in ripened Pirotski kachkaval

| Microorganisms | <i>Lactococcus</i> spp. | <i>Lactobacillus</i> spp. | <i>Enterococcus</i> spp. |
|-------------------|-------------------------|---------------------------|--------------------------|
| Number of samples | 10 | 10 | 10 |
| Mean | 6,06 | 7,34 | 5,97 |
| SD | 0,30 | 1,21 | 0,48 |
| Min-Max | 5,34-6,62 | 5,70-8,35 | 5,13-6,65 |
| Cv % | 5 | 16,48 | 8 |

The number of lactic acid bacteria increased during the whole cheese-processing. *Mijačević et al* (2003b) studied the quality of kachkaval originated from Stara planina where the number of lactic acid bacteria during the ripening period ranged from 7.1-7.3 log₁₀ cfu/g. Specificity of microclimate, characteristics of substrate and no lethal stresses introduced through the manufacturing process selectively favored the growth of distinct microbial population of lactic acid bacteria with unique phenotypic characteristics. Their metabolic activity resulted in end product with specific sensory attributes, and according to that this kind of product might be considered as unique ecological entity (*Licitra, 1997*). The isolated strains of *Lactococcus spp.* showed the specific characteristic being able to grow at temperature of 45°C, which is not considered as their inherent attribute because of their general mesophilic character (*Mijačević et al., 2003b*). The strains of *Lactococcus spp.*, *Lactobacillus spp.* and *Enterococcus spp.* isolated in the same study were resistant to extreme environmental conditions (high and low temperatures, pH and increased quantity of salt), as the result of their long-term adaptation on technological conditions of processing. Based on their significant proteolytic activity, the isolated lactic acid bacteria contribute in proteolysis during the cheese ripening and positively affect the development of specific taste and flavour of Pirotski kachkaval.

Conclusion

The quality of Pirotski kachkaval is exclusively based on specificity of geographic area of origin, including human and natural factors. The traditional cheese making of kachkaval comprises the exclusive use of raw milk, ripening process in ambient conditions, hand made process of “pasta fillata” and for the end product a spicy and salty taste are typical. The primary treatment of milk allowed the multiplying of natural microflora of lactic acid bacteria, including species of genus *Lactobacillus*, *Lactococcus* and *Enterococcus*. Pirotski kachkaval has a nice structure with preserved layers as the result of steaming and hand processing of ‘pasta fillata’.

SPECIFIČNA OBELEŽJA PIROTSKOG KAČKAVALJA

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Rezime

U poslednje vreme pridaje se posebna pažnja istorijskom i socijalnom značaju proizvodnje tradicionalnih sireva. Pojedini jedinstveni varijeteti sireva su na granici izumiranja, što se može sagledavati sa aspekta gubitka kulturološkog identiteta regije.

Evropska zajednica je, u Regulativi (EEC) br. 2081/92, definisala koncept “Protected Denomination of Origins” (PDOs) -oznaka porekla i « Protected Geographical Indications» (PGIs) – geografska oznaka, koji upućuje na proizvode čiji kvalitet proizlazi isključivo usled jedinstvenosti geografskog područja sa kojeg potiču, uključujući ljudske i prirodne faktore, i čija se proizvodnja i prerada odvija u definisanim, jedinstvenim geografskim područjima.

Faktori koji se u toku procedure razmatraju podrazumevaju: učešće prirodne paše regije, rasa muznih životinja, upotreba sirovog mleka, jedinstvene karakteristike sirila koje se koristi u procesu, prirodna mikroflora kao starter kultura, jedinstvena ili pak tradicionalna tehnologija proizvodnje sira, jedinstvena prirodna sredina zrenja, jedinstveni oblik, kao i posebnost ingredijenata.

Pirotski kačkavalj ispunjava uslove jer prirodna paša regiona učestvuje u ishrani muzne stoke, za proizvodnju se koristi sirovo mleko, na karakteristike sira utiče prirodna mikroflora mleka koja je ovde starter kultura i sir se prouitvodi po tradicionalnoj tehnologiji.

References

1. LICITRA, G. (1997): Traditional European Cheeses Varieties: Will they survive? Marschal Italian-Specialty Cheese Seminars
2. MIJAČEVIĆ, Z., BULAJIĆ, S. (2002): Proizvodnja sira sa geografskim obeležjima u zanatskim mlekarama. Savremena poljoprivreda, 51 (3-4), 379-384
3. MIJAČEVIĆ, Z., BULAJIĆ, S. AND NEDIĆ, D. (2003a): Sir sa oznakom geografskog porekla -trend, marketinški izazov ili neminovnost. Veterinarski žurnal Republike Srpske, 3 (1-2), 58-61
4. MIJAČEVIĆ, Z., BULAJIĆ, S. AND BOŽIĆ, T. (2003b): Tehnološke karakteristike bakterija mlečne kiseline i enterokoka izolovanih iz kačkavalja poreklom sa Stare Planine. Biotechnology in Animal Husbandry, 19 (5-6), 159-165
5. MILOŠEVIĆ, S. (1996): Dinamika organske produkcije i kvaliteta biomase travnih zajednica različitih visinskih pojaseva Stare planine. Doktorska disertacija, Univerzitet u Beogradu
6. MIŠIĆ, V., DUNJIĆ, R.J., POPOVIĆ, M., BORISAVLJEVIĆ, L.J., ANTIĆ, M., DINIĆ, A., DANON, J., BLAŽENČIĆ, Ž. (1978): Biljne zajednice i staništa Stare planine. SANU, Beograd
7. PEJIĆ, O. (1956): Mlekarstvo, B Specijalni deo-sirevi. Naučna knjiga, Beograd
8. PETROVIĆ, M. (1997): Dojkinci. Biblioteka «Hronika sela», Beograd
9. STOJANOVIĆ, L., KATIĆ, V. (2003): Istorijski značaj i proizvodnja Pirotskog kačkavalja. Mlekarstvo, No.13, 390-394