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**ODESSA NATIONAL ACADEMY OF
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International Competition of
Student Scientific Works

BLACK SEA SCIENCE 2018 PROCEEDINGS



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Odessa National Academy of Food Technologies

International Competition of Student Scientific Works

BLACK SEA SCIENCE 2018

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ENRICHMENT OF GEORGIAN CHEESE WITH BIOLOGICALLY ACTIVE COMPONENTS OF SAPERAVI

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Food quality can be considered as one of the most important and essential issue in every epoch. Nutrient substances play a prominent role in supplying the human body/organism with special biologically active components. According to balanced feeding theory for normal functioning in the physiological framework of the human body, not only proteins, fats and carbohydrates are necessary, also there are other substances such as irreplaceable amino acids, vitamins, minerals and other biologically active natural substances.

Increasing food quality of product and food optimization natural and accessible way is depended on combination of animal and vegetable raw materials. It has been proved that with merge of animal and vegetable components we make enrichment of products with biologically active substances.

Dairy products are considered as one of the perspective raw materials for making multicomponent product that can include dietary, medicinal and prophylactic purposes.

The paper represents the discussion and results of the experiment about some phenols which are transferred into the cheese after aging in Saperavi wine and the cheese which prepared in Saperavi wine and then aging in the same wine. On the base of experiment the following results have been uncovered – the common phenols and anthocyanin's rate in the cheese aged in Saperavi wine and define the reliability of mentioned substances as biologically active, and a real source for the formation of medicinal and prophylactic value.

Introduction

“Cheese – this is a milk leap for immortality”

Clifton Fadiman

Many centuries ago, Socrates declared a genius phrase: ‘Health is not everything, but everything becomes nothing without health’. A lot of influential factors are considered to be the hinder for human health, such as modern life rhythm, undesirable ecological environment, improper meal, stress, deficiency of important substances for the human body, etc.

A lot of scientific researches and experiments prove that on the one hand traditional, high quality food, prepared with a variety of ingredients, still is not able to give human body full range of adequate quantity of biologically active and necessary substances, on the other hand useful nutrients has negatively impacted on human health for normal functioning of human body. Mainly, it is especially important that every cell to be fulfilled with diverse range of necessary substances.

Analytical review

Food quality can be considered as one of the most important and essential issue in every epoch. Nutrient substances play a prominent role in supplying the human body/organism with special biologically active components. According to balanced feeding theory for normal functioning in the physiological framework of the human body, not only proteins, fats and carbohydrates are necessary, also there are other substances such as irreplaceable amino acids, vitamins, minerals and other biologically active natural substances. Number of scholars held experiments and made their own views around the exact topics.

One of them is an academician Valentin Ivanovich Pokrovsky who was the founder of rational feeding claims that a special significance is regarded to irreplaceable nutrients, such as irreplaceable amino acids, balance of fatty acids, interaction between vitamins and minerals and connection with other food components.

World famous organizations Food and Agriculture Organization (FAO) and World Health Organization (WHO) experts reported scientific invoice that in the balanced ration from the total nutrition energy proteins represent/contains 10-15%, Fat – 15-30% and Carbohydrates – 55-75% [1].

It is known that daily human body needs 90 nutrition, it can't formed by themselves, they are receive the substances from food. 60 micro and

macro elements, 16 main vitamins, 12 exogenous amino acids and 3 basic fats are included in necessary food components.

Increasing food quality of product and food optimization natural and accessible way is depended on combination of animal and vegetable raw materials. It has been proved that with merge of animal and vegetable components we make enrichment of products with biologically active substances.

Dairy products are considered as one of the perspective raw materials for making multicomponent product that can include dietary, medicinal and prophylactic purposes.

It is necessary to identify that dairy products, especially cheese has one of the most outstanding places in the list of correct, balanced feeding product. History of cheese production is 4 000 years old all over the world. In Georgia there is saved cheese storage pottery – Kvevri (picture 1) – that is dated as 8000 years old. According the information Georgia can be named not only the home of wine, but the home of cheese [19].



Picture 1. Kvevri Picture 2. Variety of cheese

There are hundreds of species of cheese those are prepared with the help of various technologies. Officially 14 varieties of cheese are registered in Georgia: Dambalkhacho, Chogi, Tenili kveli, Kalti, Kobi, Acharuli Chechili, Meskhuri Chechili, Sulguni, Megruli sulguni, Svanuri sulguni, Gudis kveli, Tushuri Guda, Imeruli kveli and Kartuli kveli. A founder of “cheese house” – Ana Chikvaidze-Mikadze explained that Imeruli kveli and Sulguni have the most popularity in Georgia [15], (picture 2) [15].



Picture 3. Cheese aging in Saperavi wine (a) [20]; the cheese aged in Saperavi wine and (b) the cheese which prepared in Saperavi wine and then aging in the same wine [18]

Cheese is defined as the most valuable nutrient that contains number of substances, such as: milk protein, fat, irreplaceable amino acids, Calcium salt, phosphorus, etc. It is obvious that all above mentioned substances supply to make better function of a human body [2]. All of substances are prominent values for normal functioning and regeneration of body. For instance: Calcium makes strengthen of bones and teeth. Calcium which is in cheese has better features. Organism can absorption it easily.

The global issue about food quality has been raised to be solved by the world scientists and entrepreneurs. Products should satisfy human body with highly qualified and biologically safe ingredients. In current years, in the consumer market absolutely new product has been appeared – cheese aging in red wine of Saperavi (pickture 3a,b) [18,20].

On the base of our opinion, it is a great combination nutritional value of cheese that is raised in such a case. We claim that the rate of therapeutic and prophylactic enrich the cheese. Combination of dairy products and vegetable components include multifunctional purpose. We should mention that combination of dairy and vegetable proteins makes more complete amino acid composition than only dairy product proteins [3]. A lot of scientific researches prove the thesis that red wine contains phenols which have high biological activity [4].

Phenols become almost a century investigating issue for majority of researchers. There are many scientific works which study phenol structure, also the issues of development and improvement of their research methods. Antioxidant activity of phenols is the most important point of scientists. It promotes the benefits of wine and therapeutic preventive values.

Wine that is so interesting liquid contains substances that are important for the body and they are soluble in biologically structured water. Red wine (picture 4) [17] include more than 600 chemical substances. Among them is noteworthy the following substances: carbohydrates (Glucose, Fructose), vitamins, acids (wine, apple lemon, amber, milk), micro and macro elements (Calcium, Magnesium, Sodium, Phosphorus, Iron, Copper, Zinc, Manganese, Iodine, Fitter, Cobalt, Titanium). All amino acids necessary for life are discovered in red wine. In addition to the above listed substances, Biological point of view especially phenols are distinguished (flavonoids, phenolic acids, catechins, anthocyanins, stilbenes). They have strong antioxidant properties. To sum up the overview of the issues about it, we can say that they have unique feature of the binding of free radicals – cell damaging particles.

When we speak about health, wine and cheese it is impossible not to mention the product which is prepared by these two great products. And their combination makes synergism between the substances that they contain. There is a Georgian said: ‘cheese should exactly go step by step as a good housewife in the place where the wine steps’.

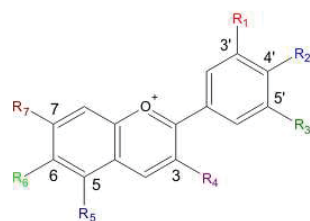
Centuries ago, in Georgia the cheese was saving in Clay potteries as well as wine. They were together for protecting human health during a long time. On the same base in 2010 a festival – “wedding” of cheese and wine Georgia was held in Anaklia. It was symbolic performance were cheese was a ‘bride’ and wine was a ‘son in Chokha’ to be presented their culinary pairing.

Phenols antioxidant activity is 20-50 times more rather than C and E vitamins. That's why polyphenols are considered as the most important and essential biologically active substances of decade, as some phenols increase life expectancy by 30-50% [5]. On the base of experiments, it is proved that the products that contain total number of polyphenols characterize synergism of antioxidant activity [6].

Anthocyanins are red pigments of grapes. Mostly they are in the form of anthocyanins monoglycosides. In composition of grapes and wine mostly are following monoglucosides: cyanidin, delphinidin, pelargonidin peonidin, malvidin, peonidin and petunidin [4] (picture 6) [16].

Some well-known researchers define that anthocyanins have antioxidant and P vitamin activity and they make chalet complexes with metals [7]. Anthocyanins protect tissues from superoxide oxidation [8]. Others prove that anthocyanidins can decrease the multiplication of malignant cells by increasing the number of oncogenic signals. Anthocyanins extract

is effective for increasing capillary conductivity. Also the substance has an impact on cancer cells. It can braking growth and development the cells. And also it has anti-action against of edema and inflammatory. Some scholars prove that in condition of “in vitro” anthocyanin decrease cancerous cells in human body (9 -13).



Anthocyanidin	R1	R2	R3	R4	R5	R6	R7
Cyanidin	OH	OH	H	OH	OH	H	OH
Delphinidin	OH	OH	OH	OH	OH	H	OH
Pelargonidin	H	OH	H	OH	OH	H	OH
Malvidin	OCH3	OH	OCH3	OH	OH	H	OH
Peonidin	OCH3	OH	H	OH	OH	H	OH
Petunidin	OH	OH	OCH3	OH	OH	H	OH

Picture 6. Basic Structure of Anthocyanidins [16]

Depending on the above mentioned, gives the opportunity to assume that in the preparation process of cheese it is active and too important to ageing it in the wine made from Saperavi grapes. On the base of it, the purpose of the research was to examine some of the phenolic substances that were transferred to Saperavi wine.

Object, subject and methods of research

As an object of an experiment was used:

- a cheese crust ageing in Saperavi wine;
- kneaded cheese crust in Sapersvi and aged it in the same wine;
- a cheese heart ageing in Saperavi wine;
- kneaded cheese heart in Sapersvi and aged it in the same wine;
- Saperavi wine before using for cheese ageing;
- Saperavi wine after using for cheese ageing;

There is a huge tandem between the cheese kneaded in Saperavi wine which has a sharply expressed aroma of the wine and a human health and his long living life. Also for the cheese wine makes natural vacuum and protects it from spoilage. Some technologies of the cheese which is kneaded in Saperavi are following: already prepared cheese that weighs about 200-300 gram is put on the wooden shelves for drying for 2 or 3 days. Then the dry cheese is placed in the clay pottery – Kvevri where the Saperavi wine is added and the aging process begins, that is lasted about 2-3 weeks. After this period it is taken again and put it for 2-3 days to dry it again. After drying we repeat the mention process once more and finally it dries again and after a month the cheese is ready for realization.

The objects for the research were taken from: Food & Beverage Company in village kurdgelauri (Telavi municipality). Telavi, Kakheti, Georgia „Tsvivi Kveli” , Individual entrepreneur Gocha Ghaghashvili (picture 5) [21].



Picture 4. Red wine [17] Picture 5. Cheese aging in Saperavi wine; cheese knead and aging in the same wine

We have identified some common phenols and anthocyanins by using spectrophotometric method [14]. Namely, for the research we used the method of Glories. Anthocyanins and general phenols were extracted from the cheese crust and heart were expelled the ingredients in a water-alcoholic resin, during 4 hours the solution was centrifuged at room temperature. On the filtered searching pattern was added buffer solution pH-3.2. Generally, in this type of buffer solution the maximum amount of antioxidants is transmitted from the experimental sample to the buffer solution. In our case to define anthocyanins and common phenols we used spectrophotometric apparatus. For determining the measurement of common phenols 280 nm wavelength ray was used, and for anthocyanins 520nm wavelength ray was used, 1 cm thick quartz and the data obtained in the formula.

Results of work

On the base of Experiment we can identify the results. It has shown that in the cheese there are phenols, including anthocyanins and common phenol content (tab. 1, 2). As it is known they are characterized by biological activity in different directions, therefore they have preventive and medicinal-prophylactic properties against the diseases such as tumor, cardiovascular pathologies, allergic and so on. Phenols, those are transferred in the cheese from Saperavi wine, with its own biologically active components promote high biological activity of the final product.

Table 1 – Cheese which is aging in Saperavi wine (Mg/L)

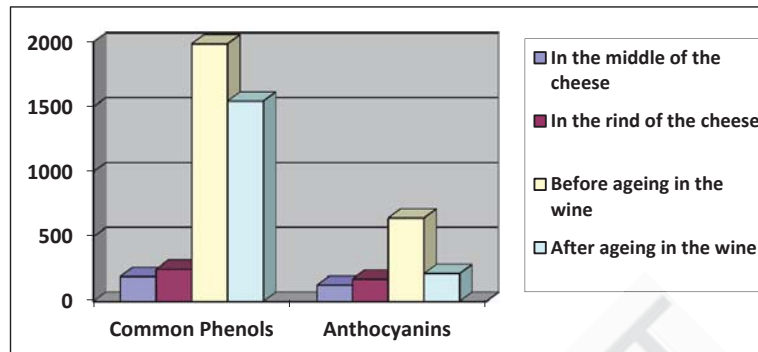
Names of Components	In the middle of the cheese	In the rind of the cheese	Before ageing in the wine	After ageing in the wine
Common Phenols	192	248	1985	1544
Anthocyanins	124	173	643	215

Table 2 – The cheese which prepared in Saperavi wine and then aging in the same wine (Mg/L)

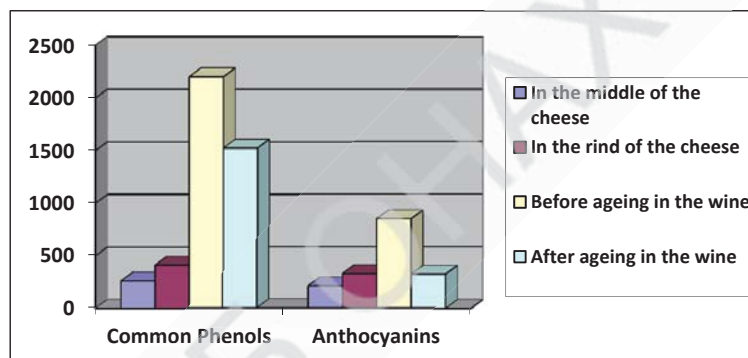
Names of Components	In the middle of the cheese	In the rind of the cheese	Before ageing in the wine	After ageing in the wine
Common Phenols	261	412	2202	1525
Anthocyanins	210	327	849	321

After comparing the results it's obvious that the experimental rind of the cheese is more enriched with common phenols and anthocyanins rather than middle space of the cheese that is caused with the direct contact to the rind of the cheese and Saperavi wine. Otherwise kneaded cheese in Saperavi and aged in Saperavi wine again contains more common phenols and anthocyanins rather than cheese which is only ageing in Saperavi wine (graph. 1,2).

We can prove that substances common phenols and anthocyanins can be used to enrich the cheese and produce specially functioned cheese in future.



Graph 1. Cheese which is ageing in Saperavi wine



Graph 2. The cheese which prepared in Saperavi wine and then ageing in the same wine

Conclusion

To sum up, on the base of experiment and overview (analysis) of some papers connected to the topic, proves that phenols which are transferred in the both kinds of cheese (the cheese which is ageing in Saperavi wine and the cheese which prepared in Saperavi wine and then ageing in the same wine) are reliable and represent a real source for the formation of medicinal and prophylactic value. It gives a scientific basis for its functional-purpose use.

At last, the above mentioned/given results are the basis for continuing scientific research to study the total impact of a wide range of phenolic compounds those are transmitted through the use of useful substances.

References

1. Diet, nutrition and the prevention of chronic diseases. Report of a Joint WHO/FAO Expert Consultation. WHO Technical Report. Geneva. – 2003. Series 916. – P. 56.
2. Еремина О.Ю.; Ветрова О.Н. Разработка комбинированного мягкого кисломолочного сыра повышенной пищевой ценности. Приоритеты и научное обеспечение реализации государственной политики здорового питания в России: [Электронный ресурс]. – Материалы О.Ю IV международной научно-практической интернет-конференции 15 ноября – 15 декабря 2015 г. (ФГБОУ ВО «ПГУ»), г. Орел, Россия) – 2015. – Ст. 196.
3. Е.П. Лосева, М.П. Щетинин, З.Р. Ходырева. Актуальность производства многокомпонентных продуктов питания фгбоу впо «Алтайский государственный технический университет им. И.И. Ползунова» Современные проблемы здорового питания. Инновации и традиции. Международная научно-практическая конференция (11-12 ноября 2014 года) Сборник статей и докладов г. Барнаул, РОССИЯ – 2014. – Ст. 69.
4. Эланидзе Л. (2013): Технология биологически активной добавки виноградного происхождения «Georgian Vitae rimas XXI». Диссертация на соиск. уч. степ. докт. пищевых технологий. Телавский Государственный университет им. Як. Гогешавили, Грузия, г. Телави – 2013. – Ст. 7-8; 14-15.
5. Эланидзе Л.Д., Бежуашвили М. Г., Окруашвили Д. Ш. Фенольные источники биологически активного пищевого добавка “GEORGIAN VITAE RIMAS XXI”. «Пищевая наука и технология» – 2013.- № 2(23). – Ст. 46-48.
6. Joseph Kanner, Edwin Frankel, Rina Granit, Bruce German, John E. Kinsella. Natural antioxidants in grapes and wines// *J. Agric. Food Chem* – 1994. – №42 (1). – Pp 64–69.
7. Lapidot T., Harel S., Akiri B., GrantR., Kanner J., Agric J. pH-Dependet Forms of Red Wine Antocyains as Antioxidants // „Food chem.“ – 1999 – №47. – Pp. 67-70.
8. Harborne, J.B.; Williams, C.A. Anthocyanins and other flavonoids. *Nat. Prod. Rept* – 2001. – №18. – P.310-333.
9. Middleton, E.; Kandaswami, C. Effects of flavonoids on immune and inflammatory cell functions. *Biochem. Pharmacol* – 1992. – № 43. – P. 1167-1179.

10. Zhao M.; Yang B.; Wang J.; Liu Y.; Yu L.; Jiang Y.M. Immunomodulatory and anticancer activities of flavonoids extracted from litchi (*Litchi chinensis* Sonn.) pericarp. *Int. Immunopharmacol* – 2007. № 7. – P. 162-166.

11. Wang X.; Yuan S.; Wang J.; Lin P.; Liu G.; Lu Y.; Zhang J.; Wang W.; Wei Y. Anticancer activity of litchi fruit pericarp extract against human breast cancer in vitro and in vivo. *Toxicol. Appl. Pharm.* – 2006. – № 215. – P. 168-178.

12. Mukherjee A.K.; Basu S.; Sarkar N.; Ghosh A.C. Advances in cancer therapy with plant based natural products. *Curr. Med. Chem.* – 2001. № 8. – P. 1467-1486.

13. Cooke, D.; Steward, W.P.; Gescher, A.J.; Marczylo, T. Anthocyanins from fruits and vegetables – Does bright colour signal cancer chemopreventive activity? *Eur. J. Cancer*- 2005. – №41. – P. 1931-1940.

14. Maturation phenolique: Définition et contrôle. – 1998. GAILLAC (Tarn) – 8 JUILLET. – P. 3 -11.

Internet Resource:

15. <https://sputnik-georgia.com/reviews/20160519/231737498.html>

16. <http://www.dongmyung.co.kr/htm/pdf/AnthocyaninsBrochure.pdf>
 “Anthocyanins and Anthocyanidins” (2009) ChromaDex, Inc.

Internet Resource of Photos:

17. <http://vinoge.com/enologia/wiTeli-Rvinis-dayeneba>

18. <https://www.facebook.com/tsiviskveli/photos/a.1380597798645339.1073741841.474956305876164/1380683745303411/?type=3&theater>

19. <http://bulvar.ge/?type=pages&cat=9&id=4795>

20. <https://www.facebook.com/cheesehouse/photos/a.311017769054524.1073741831.300285746794393/351023695053931/?type=3&theater>

21. Personal photo collection

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