

Micromycetes in Traditional and Modern Bulgarian Cuisine

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ABSTRACT

This paper provides information on the micromycetes used in foods and drinks in traditional and modern Bulgarian cuisine. It presents the results from an ethnomycological study which compiles and evaluates the ethnobiological data currently available in combination with field studies and inquiries conducted by the authors in the years 1986-2015. The results on 8 foods and drinks are organized according to the micromycetes used (yeasts and moulds) in order of appearance on Bulgarian table (traditional and modern). According to data obtained, it is possible to claim the use of micromycetes in both traditional and modern Bulgarian cuisine. The significant changes in the food habits of Bulgarian people with increased use of new *healthy exotic* products based on micromycetes practically follow the ongoing processes of globalization and urbanization with enormous role of social nets and media. Most of the changes concerned the younger population, the citizens of the capital and biggest towns and middle and higher class in the country. This conclusion is on conformity with our previous statements based on usage of algae and mushrooms on the role of globalization in changing the food habits of modern Bulgarians.

Keywords: Bulgarian green cheese, Blue cheese, Ethnomycology, Koji, Kombucha, Lukanka, Miso, Moulds, Nafpavok, Soya sauce, Sudjuk, Yeasts

INTRODUCTION

Modern ethnobotanical studies focused on European territories have been growing very quickly with attention turned to long neglected regions such as the Balkans [1]. This area is *extraordinary and unique* due to the incomparable biological and cultural complexity of this territory within the Old continent [2]. Bulgaria, which occupies a part of the south-eastern Balkan Peninsula, also achieved higher ethnobiological attention during the last 15 years with a start given by the medicinal plant inventory of the country [3]. Yet the higher plants and particularly edible and medicinal vascular plants have been more often in the focus of such studies [4,5] in comparison with algae and fungi [6,7]. The aim of this paper is to provide information on the micromycetes used in foods and drinks in traditional and modern Bulgarian cuisine.

Materials and Methods

This study compiles and evaluates the ethnomycological data currently available [8-18]. Fungal names are given according to Index Fungorum [19]. Inquiries were conducted by the authors in the years 1986-2015 during their scientific field trips and student summer practices in the country. Our students were also inquired and

were asked to mention all fungal species and products, which were used by them or their parents, friends and relatives. Ethical guidelines drafted by the International Society of Ethnobiology [20] and American Anthropological Association [21] were followed.

The study area covers practically the whole territory of Bulgaria – 111 000 km² (**Figure 1**). The highest point is the peak Musala, at 2,925 m and the lowest point is sea level. Bulgaria has a temperate continental climate. The temperature amplitudes vary significantly in different areas: from the lowest recorded –38.3°C to the highest of 45.2°C. Precipitation averages about 630 mm per year, and varies

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from 500 mm in plains to more than 2,500 mm in the mountains. Continental air masses bring significant amounts of snowfall during winter. Due to the interaction of climatic, hydrological, geological and topographical conditions, Bulgaria is one of the countries with highest biodiversity in Europe. The population of Bulgaria is 7 245 677 people according to the 2011 national census. The majority of the population, or 72.5%, reside in urban areas; approximately

one-third part of the total population is situated in the seven biggest towns (>100, 000 inhabitants – Sofia, Plovdiv, Varna, Burgas, Russe, Stara Zagora, Pleven) of the country and only in the capital Sofia is concentrated one-sixth of the total population. Bulgarians are the main ethnic group and comprise 84.8 per cent of the population [22].



Figure 1. Map of Bulgaria with general distribution of Bulgarian products which use micromycetes:

- - Green cheese producing region;
- △ - Main regions producing Lukanka and Sudjuk (Sudzhuk);
- - Nafpavok producing region.

Results and Discussion

During our inquire, mentioning of micromycetes in relation to food and drinks certainly provokes in Bulgarian people the association with traditional production of bread, wine and beer based on yeasts. The second association is made namely with the *blue cheese, Roquefort*, based on moulds and mainly imported in the country. During the last decades the awareness of the importance and high food quality of all types of blue cheese has been growing up and now it is really rare to get a negative reaction like “ooff, this stinking thing”. More, the usage of such cheese becomes more and more popular, at least in big Bulgarian towns and occupies an important place on the table of middle and higher classes. It has to be outlined, that in spite of the general increase of interest, in popular magazines and newspapers with recipes, mainly the common name “blue cheese” is noted, without indication of the type, trademark, country of origin, etc. Mentioning of all types of foreign cheese on modern

Bulgarian market is practically impossible, but it has to be noted that their consumption (incl. the yeasts and moulds on which they are based) notably and continuously increases, especially in the capital and in the big towns.

Due to the restricted volume of the paper, the use of micromycetes in production of bread and alcoholic drinks had to remain out of its scope and will be published elsewhere. However, we would like briefly to mention the recent rapid increase in consumption of different white beers, popular as *Zhiva bira* (which means a “living beer” in Bulgarian language).

During the last decades in Bulgaria obviously increased also the popularity and consumption of non-alcoholic *exotic* drinks prepared with the use of fungi in parallel with the increased interest in the application of fungi in other products of traditional and modern Bulgarian cuisine. Below they are described in more detail and are organized according to the micromycetes used (yeasts and moulds) and

in order of appearance on Bulgarian table (traditional and modern).

Tea fungus (Kombucha, Japanese fungus)

Tea fungus (Japanese fungus, kombucha) is the common name given to a symbiotic growth of acetic acid bacteria and osmophilic yeast species in a zoogloeal mat which are cultured in a sugared tea, and to the final liquid as well. The exact microbial composition of *kombucha* depends on the source of the inoculum for the tea fermentation and therefore varies in each liquor. A broad spectrum of yeasts has been reported including species of *Candida*, *Clavispora*, *Debariomyces*, *Dekkera*, *Issatchenkia*, *Hanseniaspora*, *Kluyveromyces*, *Meyerozyma*, *Mycoderma*, *Pichia*, *Saccharomyces*, *Saccharomycodes*, *Schizosaccharomyces*, *Torulosporea* and *Zygosaccharomyces* [23].

Kombucha drink is consumed worldwide as a homemade refreshing beverage and it is also commercially sold by some companies [23]. On the Balkans the *Tea fungus* (known also as *Chinese fungus*, *Hongo*, *Ma-Gu* or *Mo-Gu*, *The miracle fungus*, *The fungus of longevity*, *The fungus of mercy*) appeared in the middle of 20s of 20th century in the *second wave* of its invasion of Europe (Denmark, Germany, recent Czech Republic and Slovakia) after Baltic countries, Poland and Russia and was followed by appearance in Switzerland, France, Spain, Italy, etc. [15,16]. The broader spread in Bulgaria the fungus achieved in 60s of 20th century [16]. In the family of the second author of this paper it was imported from Moscow (Russia) for household needs in 1968. Then, like in other families and like it was described by Kraft [15,16], for years it was kept in home conditions in a glass jar (closed on the top by double-layered gauze with the original jar cover loosely laying over it), regularly “fed” by sweet black tea and “cleaned” by taking out of the oldest culture layers. Since the *exotic* fungus liquor provoked interest in relatives, family friends and many colleagues, it was spread among them through the fungus subcultures. The spread through friends and relatives, without payment, was one of the reasons the fungus to be known also as *The fungus of mercy* [15,16] in spite that this name was not popular at that time in Bulgaria. There the liquid affected by the fungus was used generally as mild vinegar spice for salads after ca. one week “ripening” and as a soft refreshing beverage in the first 2-3 days after “feeding” by fresh sugared black tea. Another popular way of use of the fungus tea liquor, according to the Russian experience, was its drinking for sobering down. In the end of 90s the *Tea fungus* was already quite well-known and used in households in Sofia (the capital of the country) and as we believe, the cultures used were based only on the black tea, as was the “original recipe” brought from Russia. In addition to its healthy properties, it became popular among ladies as a “luck bringing tea” in case the fungus produces new “babies” on its surface and could be further spread to other people. For sure, at that time the name *kombucha* was not

used and the liquor was known only as *Tea fungus*, or *Japanese fungus*. According to our knowledge, the name *kombucha* is used in the country no longer than 5-6 years. There is no certain information about the use of the *Tea fungus* in the other parts and towns of Bulgaria.

Since January 2013 in Bulgaria started certified production of *Kombucha tea* [8]. The certified companies marketed the *Tea fungus* in health food stores and drugstores, but now many restaurants, cafes, supermarkets and gyms also offer it as a bio drink. Recently many different trade products based on the *Tea fungus* exist on Bulgarian market. They are mainly naturally carbonated drinks from green tea in combination with different fruits (e.g. chokeberry, rosehip, papaya, pineapple and cherries), barks (cinnamon), roots (ginger) and flowers (elderberry), but there is also *kombucha* vinegar for salads, sauces, marinades and dressings. All of these trade products are designed to restore health, extend longevity and clarification of mind and get more and more public recognition.

Tibetan fungus (Milk fungus, kefir)

Kefir is fermented milk beverage with a uniform creamy consistency and a slightly sour taste. The milk fermentation is achieved by kefir grains which are composed of yeast and bacteria [24]. A broad spectrum of yeasts has been reported including species of *Candida*, *Cryptococcus*, *Debaryomyces*, *Dekkera*, *Dipodascus*, *Issatchenkia*, *Kazachstania*, *Kluyveromyces*, *Pichia*, *Saccharomyces*, *Schwanniomyces*, *Torulaspora*, *Yarrowia*, and *Zygosaccharomyces* [24]. Most probably *Milk fungus* has been imported in Bulgaria also from Russia (where it is quite popular), but this is still not proved. Actually the fungus became popular in Bulgaria in the end of 80s of the last century and again, according to our knowledge, the first spread was in the capital Sofia. Then, according to the memories of the second author of this paper, the liquid kefir milk culture, mainly known as an exotic Tibetan culture of a healthy milk and called simply *Tibetan fungus* or *Milk fungus* by Bulgarian people, passed from hand to hand through relatives, friends and colleagues and was kept in many households. However, in our opinion, the home kefir production did not become very popular in the country and there are few explanations for this. On first place, the necessity to provide regularly fresh quality milk to the fungus, made extremely difficult keeping the culture in home conditions during the strong economic (and food) crisis in the country in early 90s and many households (including this of the second author of this paper) left off its maintenance. On the other hand, taking in mind the peculiarity of Bulgarian characters with a strong traditionalism in food habits (for details see [7]), at that time kefir with its more peculiar taste could not compete with the widely used and beloved Bulgarian yogurt. Nowadays, with much more increased interest to exotic products due to the globalization and urbanization of the country with a strong Internet influence for its advertisement as a healthy drink, kefir is sold in the shops of the capital and other big

Bulgarian towns and there are different kefir trade products (even such without yeasts inside).

Green cheese or Bulgarian naturally cultivated *Penicillium*

Green cheese (Figure 2) is a modification of white sheep cheese, which can be eaten directly or can be spread, crumbled or melted into or over foods. Since many centuries in the summer sheep pens, located in the Stara Planina Mts

and particularly in the village Cherni Vit (Figure 1), people made cheese from sheep milk and stored it in wooden tubs. Gradually, the brine of the cheese is drained through the pores of the wood and the pieces remained dry. In the end of the summer shepherds transferred cheese at home and stored it in the basement at constant humidity and temperature of about 10-12°C. With the opening of tubs and contact with moist and cool air, the cheese becomes coated with blue-green mould from the genus *Penicillium*. The cheese has a strong, spicy flavor and slightly spicy aftertaste [8,9].

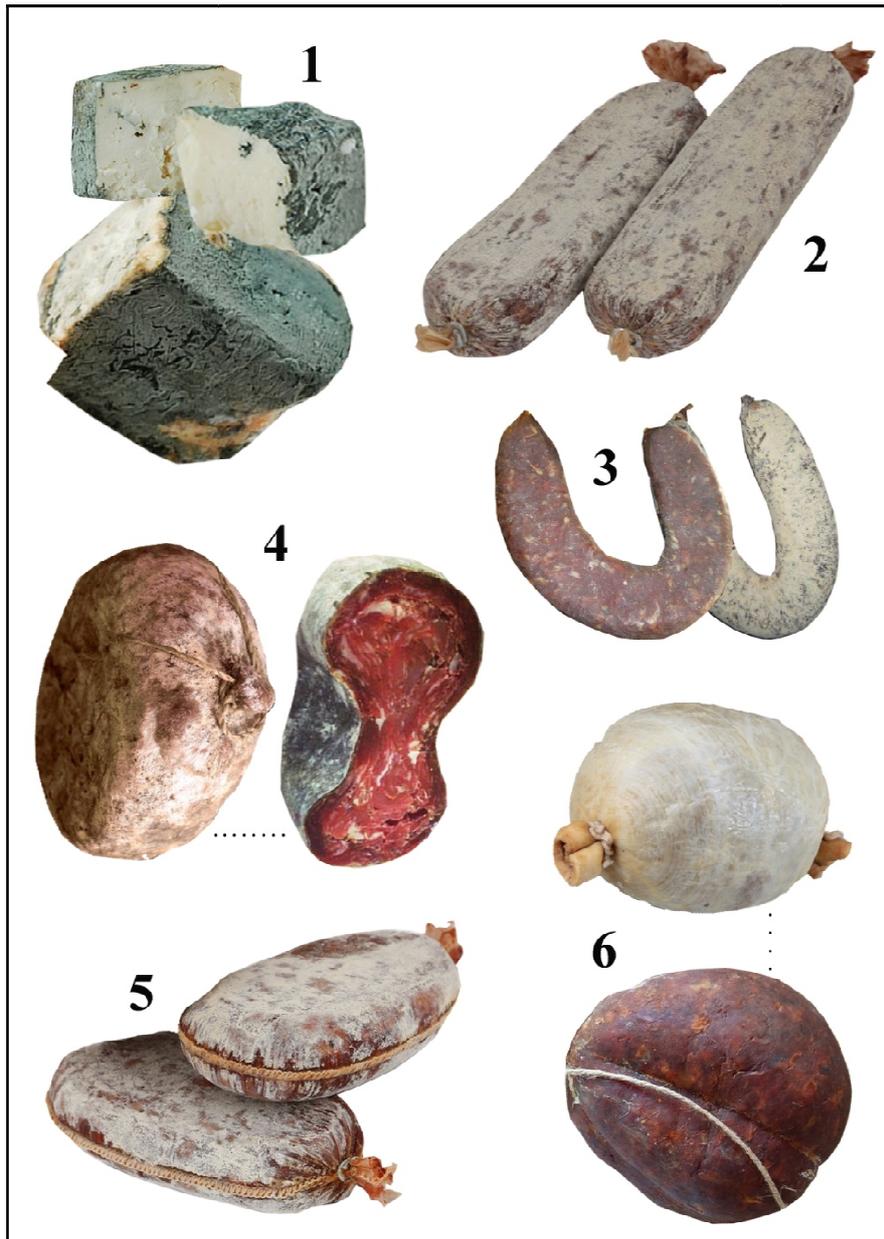


Figure 2. Traditional Bulgarian products which use micromycetes: 1 - *Green cheese*, 2 – *Lukanka*, 3 - *Sudjuk (Sudzhuik)*, 4 – *Meurche*, 5 - *Nafpavok: Dedets (Dyado)*, 6 - *Nafpavok: Babichka (Baba)*.

The people from Cherni Vit village long neglected this mouldy cheese for its *spoiled and poor quality*. It began to disappear in the 70s of the 20th century, when local producers replaced wooden tubs with plastic containers. However, this peculiar cheese was rediscovered in 2007 by Italian specialists from the international organization *Slow Food* and since then regularly was submitted to the World Exhibition of cheese in the town Bra, Italy. There the Bulgarian green cheese received high praise for its uniqueness and quality [10]. Curiously, the green cheese has never been offered on Bulgarian market. Nowadays just some people from Cherni Vit still produce it using sheep and goat milk.

Blue cheese and its moulds

Blue cheese is a general classification of cheeses that have had cultures of the mould *Penicillium* added so that the final product is spotted or veined throughout with blue, or blue-grey mould and carries a distinct smell, either from that or various specially cultivated bacteria [11]. Blue cheese can be eaten directly or can be spread, crumbled or melted into or over foods. Many blue cheeses carry a protected designation of origin, meaning they can bear the name only if they have been made in a particular region in a certain country.

There is almost no doubt that *blue cheese* was imported in Bulgaria in the last century. By years it gained better and better acceptance by local people and nowadays it is an integral part of modern Bulgarian table. Therefore the interest in its production increased and this could be traced back to a period of ca. 10-15 years. Recently not only some milk farms and specialized factories in the country produce blue cheese, but many people do this in their households using white cheese inoculated with mould from another blue cheese. Recipes for homemade blue cheese are widely spread in Internet.

Moulds in traditional Bulgarian dried sausages *Lukanka* and *Sudjuk* (*Sudzhuks*)

Lukanka (**Figure 2**) is an unique Bulgarian (sometimes spicy) salami, a special mix of small pieces of meat and fat. It is semi-dried, has a flattened cylindrical shape, and brownish-red interior in a skin that is normally covered with a *white noble mould* [12,13]. Traditionally, *lukanka* is made of pork, veal, and spices (black pepper, cumin, salt), minced together and stuffed into a length of dried cow intestine as casing [12,13].

Sudjuk (*Sudzhuks* – **Figure 2**) is a dry, spicy cured sausage made with a ground meats (mainly veal) and spices including cumin, sumac, garlic, salt, and red pepper, minced together and stuffed into a length of dried pork intestine as casing. Then traditionally it is bended to take on its peculiar horseshoe shape.

After stuffing, the salamis of both types are hung to dry for ca. 40 to 90 days in a well-ventilated place [13]. In the

process of drying, each salami is pressed to acquire its typical flat form and develop typical *white noble mould*.

The *white noble mould* is composed of bacteria, yeast (*Debaryomyces*) and moulds (*Penicillium*). The taste qualities of *lukanka* and *sudjuk* depend on natural characteristics of the region it is produced in, and are formed under the influence of the local microflora. There are several regions in Bulgaria well known for production of these traditional meat delicacies. Most of these are located at the foots of the Balkan mountain range, notably the Smyadovo, Panagyurishte, Karlovo, Gorna Oryahovitsa, and Chiprovtsi regions and at the foots of Pirin Mt – in the regions of Bansko and Razlog (**Figure 1**). "*Karlovaska lukanka*" is a name protected on a local level by the Patent office of the Republic of Bulgaria for *lukanka* from the Karlovo region. The "*Lukanka panagyurska*" of Panagyurishte and the "*Gornooryahovski sudjuk*" have obtained a EU-wide Traditional specialties guaranteed (TGI) denomination.

Many people in Bulgaria have homemade production of *sudjuk*. After eating of the salami, people collected the peeled parts of dry intestines which were naturally covered with *white noble mould* and stored them in a closeable jar in the fridge for the next *sudjuk* preparation. Before using, the collected moulded peels are put in the pot full with water for some hours. When the new *sudjucks* are prepared, they are poured over with the water full with spores of micromycetes causing *white noble mould*. The next time sausages have even more *white mould*, which is a premise for their good taste.

Moulds in the traditional *Nafpavok* (*Bulgarian prosciutto*): *Dedets*, *Babichka* and *Meurche*

Nafpavok (**Figure 1 and 2**) is an old (known for more than 100 years) traditional dried meat delicacy from the Razlog region of Bulgaria. Its flavour is unique; it is only made in the months of December and January using small cut pieces of fresh pork (loin, ham and shoulder), spices (caraway, fennel and coriander) and salt [14]. It is then stuffed into intestines and is left to dry on wooden grill in several stages over several months. Important condition for correct *nafpavok* preparation is the permanent ventilation of the attic, where it is exposed for drying. Every second day the product is turned round for an equal drying. After being dried, the spiced meat is pressed by a stone to take out the air, and then is kept underground in boxes full of wooden ash, where it can be stored up to 16 months. The strange name of this delicious product comes from the peculiar local pronunciation "nafpavam" of the verb "strain (exert)", which in high Bulgarian language sounds as "napuvam" and is related with the strong efforts to push the cut meat mixture with spices in the pork intestine [op.cit]. When the same meat is put in the pork stomach it is called *Dedets* due to the fact that stomach resembles the humped back of an old man – "Dyado" in Bulgarian language. In case that the meat is included in the duodenum, which is wrinkled like the face of

an old lady, it is named *Babichka* or *Baba*, which means “Old lady” in Bulgarian language [op.cit]. If the same meat is enclosed in a bladder, then it is named *Meurche* [op.cit] after the dialect version “Meur” of the Bulgarian word “Mehur” for the bladder. The surface of the meat is normally covered by *white noble mould*, as it is in the cases of *lukanka* and *sudjuk*. However, contrary to these last products, which are quite widespread in the country, recently, the tradition of *nafpavok* production is kept only in the village Gorno Draglishte and the product was rediscovered by the *Slow Food* organization [15]. Nowadays it received the greatest number of online votes in the competition launched by the Association for the Promotion of Arts and Crafts [16] and got the Bulgarian award of Keeper of the Traditions in Culinary line for 2013 [14].

Miso and Koji mould

Miso is a fermented soybean paste, one of the essential seasonings in Japanese cuisine. It is made from steamed soybeans mixed with salt and *koji*. The last is a mould-treated rice, barley, or soybean that acts as a fermentation starter [25].

The *koji mould* is *Aspergillus flavus* Link. In Bulgarian cuisine *miso* appeared only recently and is used as a spice, or as a part of the eponymous Japanese soup *miso*. *Miso* became popular mainly in the capital and in the biggest towns of the country with the opening of bio stores, large food shop chains and Japanese restaurants in Bulgaria in the last 10 years. In addition, the increased popularity of *miso* could be connected with the increased media and Internet advertisement of Japanese and other exotic cuisines by popular master chefs and related TV competitions. Doubtless, the increased public awareness of healthy, vegetarian and exotic food, played an important role for the appearance of such products on modern Bulgarian table. This concerns mainly younger people and people of middle and higher classes as well.

Soy sauce and Koji mould

Soy sauce is a dark brown liquid obtained from a fermented mixture of soybeans and wheat that has gained popularity worldwide. In general, there are two fermentation stages involved in the production of soy sauce. The first stage is an aerobic *koji* fermentation in which fungi (*Aspergillus flavus* or *Aspergillus sojae* Sakag. & K. Yamada ex Murak.) are involved to break down the polysaccharides into simple sugars. The second stage is an anaerobic salt mash, popular as *moromi* (in Japanese), where the mixture undergoes lactic acid bacteria and yeast (*Zygosaccharomyces rouxii* (Boutroux) Yarrow) fermentation [26]. In Bulgaria, the use of the soy sauce could be traced back to the middle of 90s of the last century, when first Chinese restaurants appeared in the country (for details see [7]). Its popularity gradually increased with the enlargement of the chains of Asian restaurants and big food chain shops in combination with

media and Internet influence. Again, as it was mentioned for the products enlisted above, the concentrated use is in the capital and big towns, and concerns mainly younger people and people of middle and higher classes.

Conclusion

According to data obtained in this ethnomycological study, it is possible to claim the use of micromycetes in both traditional and modern Bulgarian cuisine with significant changes in the food habits of Bulgarian people. On one hand, there is a line for keeping the traditional and unique recipes using yeasts and moulds in food production and it has to be boldly underlined that recently the interest in finding and keeping of such *endemic* recipes and products receives much more awareness. On the other hand, the ongoing processes of globalization and urbanization with enormous role of advertisements through social nets and media lead to changes in the food habits of modern Bulgarians and increased use of new *healthy exotic* products based on micromycetes. Most of the changes concerned the younger population, the citizens of the capital and biggest towns and middle and higher class in the country. This conclusion is on conformity with our previous statements based on usage of algae and mushrooms [7] on the role of globalization in changing the food habits and thus the mind (or *vice versa*) of modern Bulgarians.

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