



Jelly-Like Algae and Fungi Used as Food in Bulgaria

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Abstract

The paper presents new data on the use of native and imported jelly-like algae (cyanoprokaryotes *Nostoc commune*, *N. verrucosum*) and fungi (basidiomycetes *Pseudohydnum gelatinosum*, *Auricularia auriculae-judae*, *A. nigricans*, *Tremella fuciformis*, *T. mesenterica*) as foodstuff in Bulgaria - Southeastern European country situated on the Balkan Peninsula. Despite the well-known strong conservatism of local people concerning the food habits, an enlargement of the spectrum of the algal and fungal species on the table of modern Bulgarians is proved and is related with increased urbanization combined with the effects of globalization.

Keywords: *Nostoc commune*; *Nostoc verrucosum*; *Pseudohydnum gelatinosum*; *Auricularia auriculae-judae*; *Auricularia nigricans*; *Tremella fuciformis*; *Tremella mesenterica*; globalization

Introduction

Jelly-like algae and fungi from the genera *Nostoc* Vaucher ex Bornet and Flahault, *Auricularia* Bull., *Pseudohydnum* P. Karst. and *Tremella* Pers. are widely spread in Bulgaria (Southeastern European country). They have been reported from 14 of all 16 floristic, namely in the following floristic and mycotic regions: Black Sea coast, Northeast Bulgaria, Forebalkan, Stara Planina Mts, Sofia, Znepole, Vitosha, Valley of River Struma, Pirin Mt, Rila Mt, Sredna Gora Mt, Rodopi Mts, and Thracian Lowland [1,2]. However, they are not subjects of traditional Bulgarian cuisine and some of them (*Auricularia*, *Tremella*) have been reported with relation to the new phase of mushroom consumption in Bulgaria [3]. According to the opinion of these authors due to globalization impact the jelly fungi like *Auricularia* started to be popular through the Chinese restaurants. During the last two years we continued our former ethnobotanical and ethnomycological inquiries (1986-2015, for methodological details see [3]) and we obtained new information on the uses of the jelly algae and fungi is presented in this paper.

Material and Methods

The study area covers the whole territory of Bulgaria (111 000 km² which is situated in the Eastern Balkan Peninsula and is

characterized by a temperate continental climate (op. cit.) 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% of the population [4]. Fungal names are given according to Index Fungorum [5] and algal names follow World Listing of Algae: Algaebase [6]. The present study is a continuation of the ethnobotanical and ethnomycological research conducted by us in the country in the years 1986 - 2015 [3,7].

Results

The cyanoprokaryotic algae of the genus *Nostoc* are widespread on soils, moist rocks or in freshwaters and could be briefly described as forming colonies of filaments embedded in a mucilage sheath. In dry conditions *Nostoc* colonies look like thin dark crusts and are ordinarily not seen, but after a rain, they swell up into conspicuous, jelly-like greenish masses. According to [8] they were once thought to have fallen from the sky and were coined the popular names, star jelly, troll's butter, witch's butter, and witch's jelly. Some species of the

genus are known as used as foodstuff, primarily in Asia but have never been even noticed in traditional Bulgarian cuisine [3]. Just recently, our colleague Assoc. prof. Dr. Stefan Draganov (a citizen of Sofia town, a member of the inquired people of age-group over 60) provided information on homemade jam from jelly algae of the genus *Nostoc*. In his opinion two broadly distributed and abundantly growing species of the genus, namely *N. commune* Vaucher ex Bornet and Flahault (Figure 1) and *N. verrucosum* Vaucher ex Bornet and Flahault (Figure 2) are the most suitable for jam production due to their high dimensions in comparison with other *Nostoc* species.



Figure 1: Jelly-like thallus of *Nostoc commune* collected from the northern Black Sea coastal region of Bulgaria (in the vicinity of Kavarna town).



Figure 2: Jelly-like thalli of *Nostoc verrucosum* in the rivulet Belevrenska reka (Southeastern Bulgaria).

The basidiomycete *Pseudohydnum gelatinosum* (Scop.) P. Karst (Figure 3) with common names toothed jelly fungus, false hedgehog mushroom, cat's tongue, and white jelly mushroom is a

widely distributed species, which often is pointed as an edible mushroom. However, during our previous studies [3,7], we did not find any documentation on its use as food in traditional or modern Bulgarian cuisine despite the fact that it is well-known in the country with its vernacular name *Pigs ears* (in Bulgarian – *Svinski ushi*). Just recently few young people (members of the age-group of 20 - 30 years) from the region of Blagoevgrad district (Southwestern Bulgaria) reported on the consumption of the fungus in home conditions. According to them it was used in fresh state (fresh basidiomata), cut in pieces as a supplement to green salads, mainly as starter.



Figure 3: Jelly-like basidiomata of *Pseudohydnum gelatinosum* collected from Rila Mt (Southwestern Bulgaria).

Most species of the jelly-like basidiomycete genus *Auricularia* are worldwide-known as edible and are grown commercially. The other worldwide spread basidial genus *Tremella* (the name of which in Latin means trembling) also contains species which are commercially cultivated (namely *Tremella fuciformis* Berk. and *T. aurantialba* Bandoni and M. Zang). The usage of these fungi in Bulgaria was described in our previous paper in relation to globalization impact on the food habits of the modern Bulgarians [3]. The recent information obtained from seven biggest towns in the country showed the increased consumption of native and exotic species of *Auricularia* and *Tremella* in modern Bulgarian cuisine, mainly amongst young people. Most of the consumption is still related with Chinese restaurants (as it was already pointed by [3]) but a trend for broader use of jelly-like fungi in Chinese meals (mostly salads and soups, and mainly in vegetarian dishes) in Bulgarian restaurants and also in home cooking has to be outlined. A second trend is the reported increase of interest and consumption of *Tremella mesenterica* Retz (Figure 4) as food in Bulgaria together with the native and imported *Auricularia auriculae-judae* (Bull.) Quél (Figure 5), imported *Auricularia nigricans* (Fr.) Birkebak, Looney and Sánchez-García, and the imported *Tremella fuciformis* Berk. The rising

popularity of *Tremella mesenterica* is supported by the fact that recently fungus got different vernacular names: *Golden jelly* (in Bulgarian - *Zlatno zhele*), *Yellow jelly fungus* (in Bulgarian - *Zhulta zhelirana guba*) or *Yellow gelatinized fungus* (in Bulgarian - *Zhulta zhelatinova guba*).



Figure 4: Jelly-like basidiomata of *Tremella mesenterica* collected from southern Black Sea coastal region of Bulgaria (in the vicinity of Primorsko town).



Figure 5: Jelly-like basidiomata of *Auricularia auriculae-judae* collected from Vitosha Mt (Western Bulgaria).

Discussion

The jelly-like algal and fungal vegetative bodies contain exopolysaccharides with different biological properties. The polysaccharide of *Nostoc commune* demonstrated antibacterial and antioxidant activities [9,10]. The extracellular polysaccharides of the yellow brain mushroom *Tremella mesenterica* possesses

a wide spectrum of medicinal properties, including immunostimulating, protecting against radiation, antidiabetic, anti-inflammatory, hypocholesterolemic, hepatoprotective, antioxidant and antiallergic effects [11,12]. The polysaccharides in the basidiomata of Jew's ear *Auricularia auricula-judae* have hypoglycemic and antitumor effects [13,14]. Despite their positive effect on human health, in Bulgaria the public awareness of jelly-like algae and fungi is far away from being sufficient. The recorded positive trends of increase of their use as foodstuff, in our opinion, is due more to their appearance on the Bulgarian market as exotic products than to the knowledge on their biologically active compounds.

Nevertheless, taking into account the strong conservatism of Bulgarian people especially in food habits in combination with the rich natural resources, which supply the great diversity of plants and animals used in the traditional Bulgarian cuisine, it is important to note the great step forward made recently in the food habits of modern Bulgarians. The additional information obtained from our inquiries carried-out during the last two years shows that yet most of the people more readily consume these organisms as ready-to-serve exotic food in restaurants, chopped in small pieces, without seeing in nature the strange, sometimes trembling gelatinous vegetative bodies. More positive reactions were shown by young women from big towns, who even declared readiness to try to prepare dishes with these peculiar organisms at home in case that relevant recipes are provided. Doubtless, the general rise of interest in use of more healthy food advertised in media and Internet in combination with increased import of exotic products on Bulgarian market in the frame of globalization effects and general urbanization of Bulgaria (for details see [3]) are among the main reasons for expanding the palette of species used as foodstuff in the country.

Conclusions

The conclusions from the facts briefly reported above, logically, are on conformity with those from our previous paper [3] and confirm the trend for enrichment of the food spectrum of modern Bulgarian people due to globalization effects with increased import of goods and raised influence of media and Internet sources.

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