



WILD EDIBLE MUSHROOM USAGE BY THE URBAN AND RURAL POPULATION IN DIFFERENT REGIONS OF THE WORLD, COMPARED TO THE REGION OF VARNA-BULGARIA

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ABSTRACT

Purpose: Wild edible mushrooms are used worldwide and in Bulgaria as well. This inquiry investigation aimed at evaluating some mushroom usage practices by inhabitants in towns and villages in the Region of Varna, Bulgaria.

Material/Methods: We carried out a study of 200 adult individuals, 100 males and 100 females, on the territory of the Region of Varna using anonymous inquiry with a set of 12 concrete items about wild edible mushroom usage. Statistical data processing was performed using descriptive and correlation analysis.

Results: There was a domination of the negative attitude towards the wild edible mushrooms among the respondents from the towns, the villages and all the respondents as a whole on the territory of the Region of Varna. The inhabitants in the villages used more commonly cooking than those in the towns, and the inhabitants in the towns dried more seldom fresh mushrooms than those in the villages. Freezing was very rarely made use among all the respondents. There were statistically significant correlations between main town residence, on the one hand, and wild edible mushroom traditional usage, including cooking, drying, preservation and freezing, on the other hand.

Conclusion: This inquiry investigation revealed some peculiarities of the attitudes towards wild edible mushrooms among the urban and rural population in the Region of Varna and the extent of usage of common mushrooms in dependence on respondents' main residence.

Keywords: wild edible mushrooms, usage, inquiry, residence, Region of Varna-Bulgaria,

INTRODUCTION

Mushrooms' biological content exerts a positive effect on human welfare which is called the 'nongreen revolution' [1]. Its economic and social components provide long-term food nutrition, environmental conservation and regeneration of valuable resources. There is evidence that mushrooms can be a healthy food alternative to meat.

Using a newly-proposed classification system for categorizing mushroom species and assigning a final edibility status, 2786 mushroom species from 99 countries are reviewed after accessing 9783 case reports from over 1100 sources [2]. A total of 2189 edible mushroom species are identified, of which 2006 can be consumed safely while other 183 require some form of pretreatment before safe consumption or are associated with allergic reactions. There are 471 species of uncertain edibility because of missing or incomplete evidence of consumption as well as 76 unconfirmed species because of unresolved, differing opinions on their edibility and toxicity.

The bibliometric study of 200 European publications, primarily from Turkey, Poland, Spain, and the Czech Republic released between 2001 and 2016 about the contamination of mushrooms by selected elements includes 492 wild-growing and cultured mushroom species in 26 European countries and concentrations of 74 associated elements [3]. Many studies underline the need to assess the risk to human health arising from the consumption of contaminated mushrooms taken from various habitats.

In recent years, there have been scanty ethnobotanical investigations in Bulgaria [4]. The ethnobotanical study of the usage of medicinal plants by the local population in the Bulgarian North Black Sea coast area presents the impact of some demographic indicators such as place of residence, gender, age and education [5]. The local population of the North Black Sea coast area in Bulgaria demonstrates a steady positive attitude towards the use of medicinal plants and herbal remedy treatment [6] without outlining regional and local differences [7].

The purpose of our inquiry investigation was to evaluate some practices of usage of wild edible mushrooms by the urban and rural population in the territory of the Region of Varna, Bulgaria.

MATERIALS & METHODS

In 2020, we performed an inquiry investigation of 200 adult individuals, 100 males and 100 females, living in towns and villages in the Region of Varna con-

cerning their common practices of wild edible mushroom usage.

Respondents' distribution according to sex and main residence was demonstrated in Table 1.

Table 1. Respondents' distribution according to sex and main residence

Residence	males		females		total
	n	%	n	%	
town	60	60	52	52	100
village	40	40	48	48	100
total	100	100	100	100	200

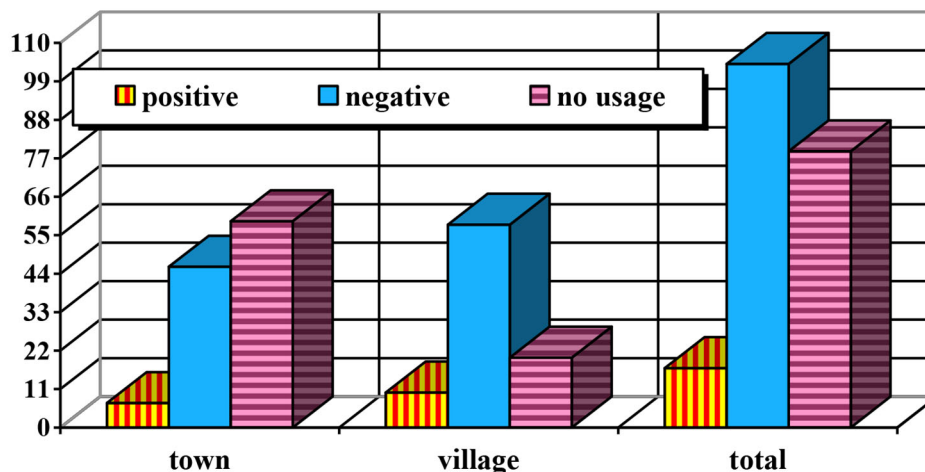
The respondents were anonymously asked to answer a set of 12 concrete items about methods of gathering, preparation and consumption of wild edible mushroom available in the territory of the Region of Varna. Statistical data processing was performed using descriptive and correlation analysis. Statistical significance was considered at the level of $p < 0.05$.

RESULTS

Some results of ours concerning the importance of residence for respondents' wild edible mushroom usage are presented in six figures.

The distribution of the respondents living in towns and villages according to their attitude towards these mushrooms is shown in fig. 1.

Fig. 1. Distribution of the respondents with different attitudes towards the mushrooms according to residence



The negative attitude towards wild edible mushrooms prevails considerably not only among the respondents from the towns (46% towards 7%) and from the villages (58% towards 10%) but also among all the respondents as a whole (52% towards 8.5% of the cases) on the territory of the Region of Varna.

A statistically significant correlation dependence between urban residence, on the one hand, and traditional usage of wild edible mushrooms, on the other hand (Pearson's coefficient $\chi^2 = 18.554$; $p < 0.0001$) is observed.

The distributions of the respondents with different residence in terms of the various manners of fresh wild edible mushroom preparation for food, such as cooking, drying, preservation and freezing, are illustrated in fig. 2 through fig. 5.

The distribution of the respondents from the towns and villages who cook the fresh mushrooms is shown in fig. 2.

The positive answers to this question prevail by 3.4 times towards the negative ones among the inhabitants in the villages (68 versus 20), while their number is a little bit smaller among the inhabitants in the towns (50 versus 62). The total relative share of the respondents' positive answers amounts to 59%.

The distribution of the respondents from the towns and villages that dry the fresh mushrooms is presented in fig. 3.

The number of urban respondents' negative answers to this question is 5.59 times greater than that of the positive ones, while that of rural respondents' negative answers is only 1.38 times greater than that of the positive ones. There is a small relative share of positive answers among all the respondents as a whole - of 27% only.

Fig. 4 displays the distribution of the respondents from the towns and villages that preserve fresh mushrooms.

Fig. 2. Distribution of the respondents who cook or do not cook the mushrooms according to residence

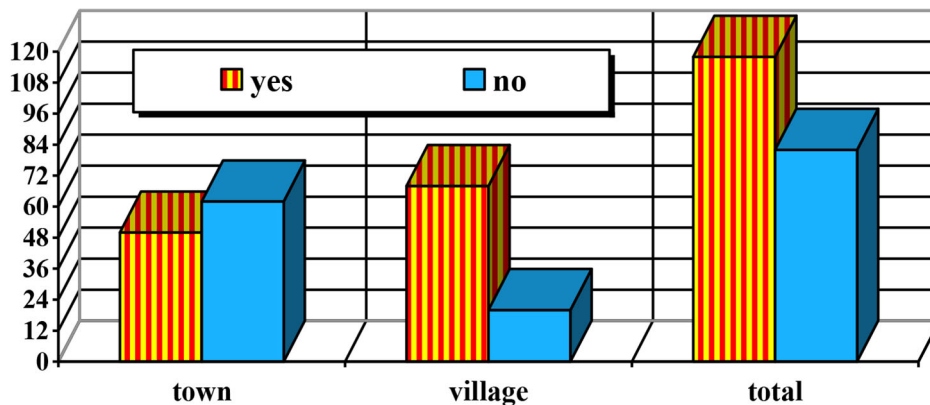


Fig. 3. Distribution of the respondents who dry or do not dry the mushrooms according to residence

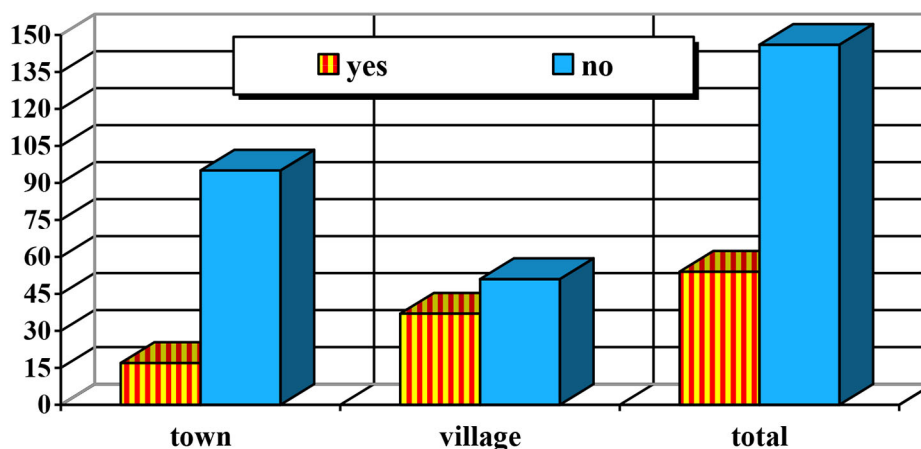
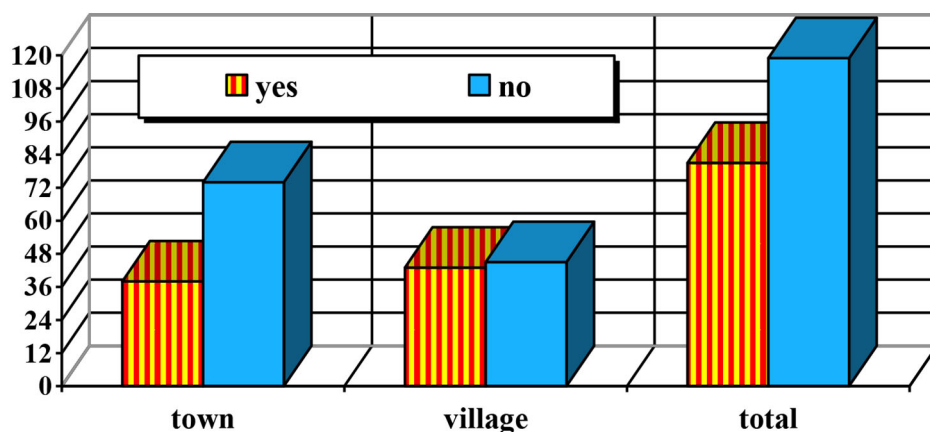


Fig. 4. Distribution of the respondents who preserve or do not preserve the mushrooms according to residence

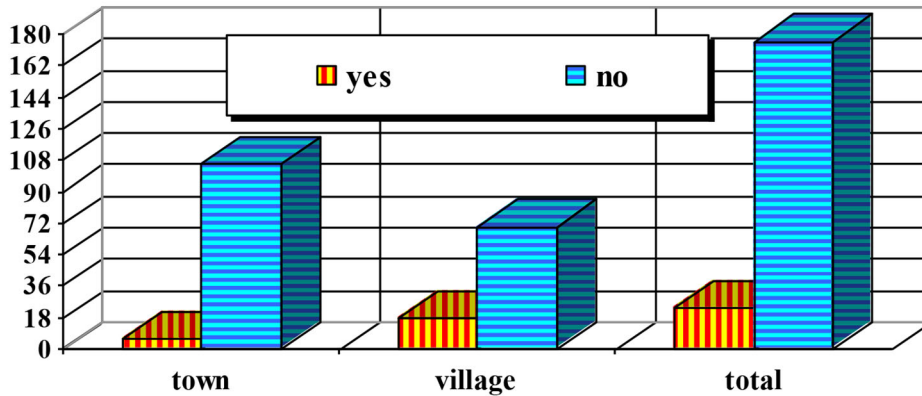


The number of negative answers to this question among the inhabitants in the towns is 1.95 times greater than that of the positive ones, and the total relative share of the negative answers among all the respondents as a

whole is 59.50%.

The distribution of the respondents from the towns and villages who freeze the fresh mushrooms is illustrated in fig. 5.

Fig. 5. Distribution of the respondents who freeze or do not freeze the mushrooms according to residence



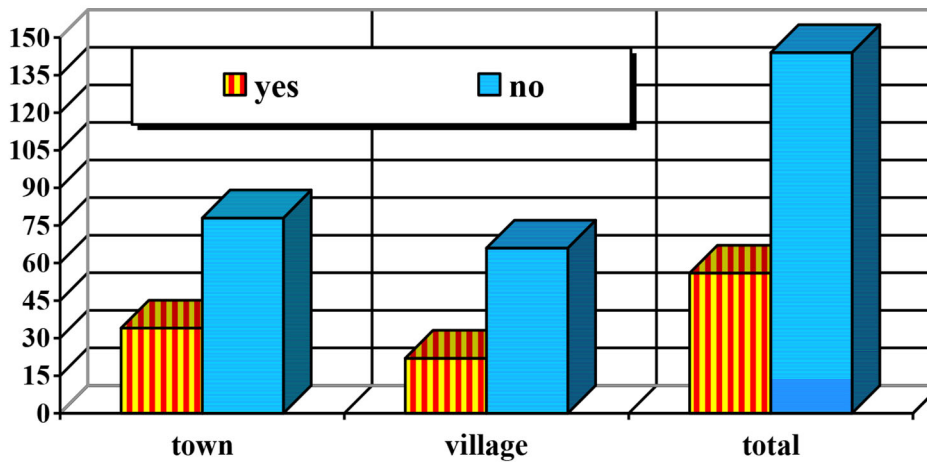
Obviously, there is considerable domination of the number of the negative over the positive answers to this question not only among the inhabitants from the towns (by 17.67 times) and from the villages (by 3.89 times) but also among all the inhabitants as a whole (by 7.33 times)

There are statistically significant correlation dependences between main town residence, on the one hand, and wild edible mushroom cooking (Pearson's coefficient $\chi^2=21.690$; $p<0.0001$; Fisher's exact test $p<0.0001$), dry-

ing (Pearson's coefficient $\chi^2=18.048$; $p<0.0001$; Fisher's exact test $p<0.0001$), preservation (Pearson's coefficient $\chi^2=4.562$; $p=0.033$; Fisher's exact test $p<0.023$) and freezing (Pearson's coefficient $\chi^2=10.637$; $p=0.001$; Fisher's exact test $p<0.001$) as well, on the other hand.

The distribution of the respondents with different main residence in terms of their attitude towards the practical application of mycotherapy is demonstrated in fig.6.

Fig. 6. Distribution of the respondents concerning the usage of mycotherapy according to residence



It is evident that it deals with a significant domination of the number of the negative over the positive answers to this question not only among the inhabitants from the villages (by three times) and from the towns (by 2.94 times) but also among all the inhabitants as a whole (by 2.57 times).

DISCUSSION

Our present results are similar to data from recent foreign publications available.

We establish moderate residence-related differences between male and female respondents in terms of their attitude towards and everyday usage of wild edible mushrooms.

The analysis of the recent literature available devoted to wild edible mushrooms convincingly proves the increasing importance of the different sociological methods which are applied alone or within purposeful ethnomycological or ethnobotanical investigations.

Among ten rural communities in the Kilum-Ijim mountain forest reserve, Northwest Region, Cameroon between 2014 and 2015, eight edible mushrooms species such as Polyporus tenuiculus, Termitomyces striatus, Termitomyces microcarpus Auricularia polytricha, Laetiporus sulphureus, Termitomyces sp.1, Termitomyces sp.2 and Polyporus dictyopus are used as food and medicine while other nine species such as Auricularia polytricha, Daldinia concentrica, Ganoderma applanatum, Lentinus

squarrosulus, Polyporus dictyopus, Termitomyces microcarpus, Trametes versicolor, Vascellum pretense and Xylaria sp. are used as medicine in traditional health care [8]. On the other hand, the non-edible species are considered food from Satan. Elderly men and women play an important role in primary health care services in these communities.

Four macrofungi species with ecological relationship to birch (*Betula* sp.) are collected near the town of Vimperk in the Bohemian Forest, the Czech Republic [9]. The lifestyle of two species such as *Leccinum scabrum* and *Leccinum versipelle* is mycorrhizal forming edible fruiting bodies, while the lifestyle of the other two ones, such as *Fomitopsis betulina* and *Inonotus obliquus* is parasitic and they are used in alternative medicine.

The study of the usage and consumption of mushrooms in three communities in Amealco de Bonfil, Querétaro, México, between August 2013 and November 2014 demonstrates 33 mushrooms species registered by 100 informants [10]. Most mushrooms are used for consumption by households, few are applied for commercial purposes, one species is medicinal, another has veterinary usage, and the last one is used as a toy. People harvest mushrooms in the forest, mainly during the rainy season. Both mushroom searching and collection strengthen family ties.

The results from a survey questionnaire among a total sample of 408 participants from the Marmara region in Turkey demonstrate that mushroom consumption accounts for 13,2% of meat consumption at the time of the mushroom collection period [1]. For every 1% increase in consumption of two mushroom species, *Lactarius semisanguifluus* and *Macrolepota procera* var., meat consumption decreases by 4,39% and 2,97%, respectively.

The analysis of the traditional consumption of edible wild or cultivated mushrooms by 45 adults from the indigenous peasant community of Benito Juárez, Oaxaca, Mexico, reveals a high frequency of mushroom consumption (>3 times per week) that significantly correlates to lower energy, lipids, saturated fatty acids and sodium intake, as well as to higher intake of cobalamin and zinc [11]. Triglycerides and total cholesterol levels, as well as diastolic blood pressure, are significantly lower in adults consuming edible mushrooms every day. These associations promote healthier diets in remote indigenous communities by keeping or increasing the consumption of edible mushrooms, either wild or cultivated. Edible mushrooms can play a more important role in community nutrition and health when considering their unique functional and medicinal properties.

The role of 19 wild edible mushrooms in meeting the food, nutrition and household income of indigenous communities under the biodiversity rich landscape of the Achanakmaar-Amarkantak Biosphere Reserve of Central India is examined [12]. There are remarkable differences among Baiga, Gond, Kol, and Oraon ethnic communities as well as between location (core, buffer and transition zone) effect on the utilization pattern of these mushrooms. They are collected, consumed, and the surplus is marketed

by the communities. On average, the number of wild mushrooms collected annually by households is 5-35 kg. Policy implications that ensure coherence and coordination of local indigenous communities for conservation and sustainable utilization of wild edible mushrooms in this area are discussed.

Morchella conica (*M. conica*) Pers. is one of six wild edible mushrooms that are widely used by Asian and European countries for their nutritional value [13]. *M. conica* is rich in bioactive compounds responsible for antidiabetic activity by targeting protein tyrosine phosphatase 1B, and thus it may be a potential source of the antidiabetic drug.

The evaluation of the nutritional value and biological properties of 24 samples of Chilean wild edible mushrooms reveals that the species *B. loyo*, *C. lebre* and *G. gargal* exhibit interesting nutritional value and biological properties as well as the potential to be used as a dietary nutritional supplement [14].

A total of 54 species of mushrooms sold in the open air markets of Luang Prabang, Laos PDR are recorded [15]. These markets are visited 38 times in four seasons: the dry season, early monsoon, mid-monsoon, and end-of-monsoon, at least 8 times per season. A large number of extremely rare *Russula*, with no reference sequences represented in databases or even species unknown to science, is present on sale in the markets. Luang Prabang markets are some of the richest in species of wild edible mushrooms in Asia and in the whole world. Measures should be taken to strike a balance between local foraging traditions and nature conservation priorities.

The concentrations of water-soluble polysaccharides in freeze-dried and hot-air-dried fruiting bodies of five wild-growing edible mushroom species such as *Armillaria mellea*, *Lactarius deliciosus*, *Leccinum aurantiacum*, *Suillus luteus*, and *Boletus badius* range from 36,3±0,7 mg/g dry weight to 105,9±3,9 mg/g dry weight [16]. The method of drying substantially affects the quantity of the water-soluble polysaccharides as in most cases, hot-air drying slightly increases their antioxidant potential.

Utilization of mushroom by 250 study participants, 200 females and 50 males, in six local government areas of Cross River State, Nigeria, is assessed by using a structured questionnaire [17]. Some 205 respondents (82% of the cases) utilize mushrooms as food supplement. Of them, 108 (43,20%) consume mushrooms always, while 142 (56,80% of the cases) do it sometimes during the year. The mushrooms constitute a part of the family menu in 234 users (93,60%), are used in place of meat by 197 subjects (78,80%) and as a remedy - by 208 respondents (83,20% of the cases). The mushrooms are the most cost-effective source of a healthier diet tackling food insecurity, diversification and malnutrition for the families in this region.

The results from the estimation of the element content of several wild edible and inedible mushroom species collected from the Belgrad Forests and the Ilgaz Mountain National Park in Turkey demonstrate that some of these species should be consumed in a controlled man-

ner as copper concentration of *Bovistella utrififormis* and cadmium levels of *B. utrififormis*, *Agaricus campestris*, *Armillaria ostoyae* and *Pleurotus ostreatus* exceed the legal limits determined by authorities [18].

The evaluation of three edible wild-growing mushroom species such as *Imlera badia*, *Boletus subtomentosus* and *Xerocomellus chrysenteron*, sampled in 60 different environmentally loaded localities in Slovakia in terms of the health risks associated with mercury content arising from their ingestion shows that this consumption represents a serious threat for adults and children [19].

The investigation of the chemical composition, bioactive compounds and antioxidant activity of two wild edible mushrooms such as the honey fungus (*Armillaria mellea*) and the parasol mushroom (*Macrolepiota procera*) collected from Northern Morocco and Portugal, indicates

that the geographic and climatic conditions of the collection site influence biomolecule compounds and antioxidant properties of these wild edible mushrooms [20]. Thus it contributes to the elaboration of nutritional, nutraceutical and pharmaceutical databases of the worldwide consumed mushrooms.

CONCLUSION

Our inquiry investigation reveals some interesting peculiarities of the usage of wild edible mushrooms among the urban and rural population in the region of Varna in dependence on respondents' main residence. Based on the statistically significant correlation dependences between the examined parameters, we could suggest the need for a wide ethnomycological study in Bulgaria on this topic.

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