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Medicinal plants collected by visitors in protected areas in Bulgaria

Asya Dragoeva¹, Ivayla Kuleva², Teodora Koynova¹, Nikolay Kolev¹, Zheni Dimitrova¹, Vanya Koleva¹

¹ Department of Biology, Faculty of natural sciences, Konstantin Preslavsky University of Shumen, 115
Universitetska Str., 9700 Shumen, Bulgaria

² Department of Biology, Faculty of Pharmacy, Professor Paraskev Stoyanov Medical University of Varna,
9002, 55 Marin Drinov Str., 9000, Bulgaria

Abstract: *This survey is a part of a broader ethnobotanical research conducted amongst visitors of protected areas in Bulgaria. The aim of the present study was to find out which herbs are collected by the visitors. Two types of interviews were conducted – among visitors of the Shumen Plateau Nature Park and among users of social network Facebook. Only small proportion from both groups collected medicinal plants from the visited areas. On the other hand, their answers revealed the knowledge about the most used medicinal plants in Bulgaria. Notably, most of them specify, that they comply with legal requirements and that the collected herbs are for personal use only. There are some differences between two groups – a smaller proportion of the online group collected medicinal plants from natural habitats, but demonstrated a greatest knowledge than the visitors of the Shumen Plateau Nature Park. Reported medicinal plants by the respondents are widely distributed in Bulgaria. Two endangered species have been mentioned: *Aesculus hippocastanum* L. and *Sideritis scardica* Griseb. Four medicinal plants were cited from both groups: – *Hypericum perforatum* L., *Thymus* sp. div., *Tilia tomentosa* Moench and *Rosa canina* L. Results revealed also the major disadvantages of the online surveys – skewed respondents, as only people interested in using herbs participate in the survey.*

Keywords: medicinal plants, Nature and National Parks, face to face and online surveys, questionnaire

Introduction

The use of medicinal plants, as an element of the healthy lifestyle, is very popular worldwide [1-3]. Herbs can be obtained from natural habitats, from pharmacies or markets. In the first case, the protected areas are attractive due to the presumption of their ecological purity [4]. On the other hand, there is legislation about

maintaining of natural habitats. So, the matter of interest is the statement of current Bulgarian society about the preferred medicinal plants and the way by which the herbs are procured.

Ethnobotanical studies were carried out usually through face-to-face interviews. Recently, the online surveys have become a leading method of collecting data. The advantages of the online surveys upon the face-to-face interviews are well known – they are faster, cheaper and representative [5, 6].

The aim of this study was to find out which herbs are collected by visitors of protected areas by face-to-face interviews and by online survey.

Material and Methods

Two types of interviews were conducted – among visitors of the Shumen Plateau Nature Park (NP group) and among users of social network Facebook (SN group). The questionnaires were advertised among 15 to 65+ aged members of the Bulgarian population. The demographic features of the people who accepted to participate in the interview were determined.

The interviews were conducted as a part of broader previous ethnobotanical studies [4, 7]. NP group and SN group were asked: Do you collect herbs from Nature and National Parks? If a positive answer was indicated, the respondents were asked to indicate the herbs they used. Data is presented as a percentage ($\% = \text{number of the respondents from the group reported the herb} / \text{number of all respondents from the same group} \times 100$).

Results and Discussion

The random sample in the present study were of 539 people: 136 visitors in Nature Park Shumen Plateau and 403 respondents from the social network.

Surveys generally contain two types of questions: topic-based and demographic. Well known is that the internet population is demographically skewed relative to the general population [8, 9]. This difference is closing as more people around the world have gained internet access. It should be noted that in our SN-survey the typical respondent is a working woman with a university degree. The number of the men was much lower than the women. This is in *accordance with the observation* of other study [10], that there are differences in the types of activities carried out on online by men and women, as the women show a preference for health and social issues.

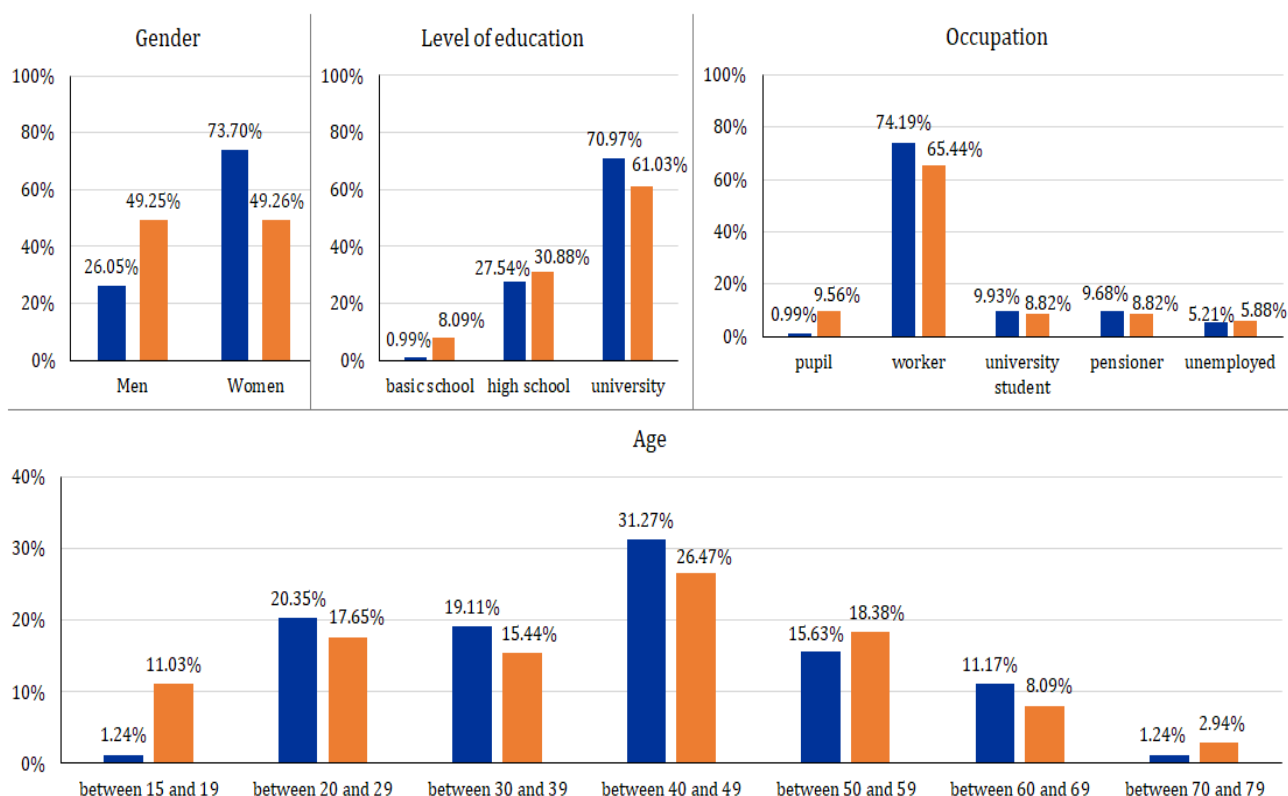


Figure 1. Demographic features of SN and NP groups. In blue – SN group, in orange – NP group.

Some of the participants did not indicate demographic characters [7]

Only 26.55% from SN group and 30.88% from NP group gave a positive answer to the question “Do you collect herbs from Nature and National Parks?” (Table 1). Table 2 summarized reported by both groups collected herbs. As mentioned above, medicinal plants growing in protected areas are presumed as “naturally pure” [4]. The collection of medicinal plants from natural habitats is under legislation [11].

Table 1. Do you collect herbs from Nature and National Parks?

	SN	NP
Answers	n (%)	n (%)
Yes	44 (10.92%)	21 (15.44%)
Sometimes	63 (15.63%)	21 (15.44%)
No	291 (72.21%)	94 (69.12%)

n – number of the respondents

Table 2. List of medicinal plants collected from the participants of NP (n=136) and SN (n=403) groups

Family	Species	SN group n (%)	NP group n (%)
Adoxaceae	<i>Sambucus ebulus</i> L.	2 (0.5%)	0 (0.00%)
	<i>Sambucus nigra</i> L.	2 (0.5%)	0 (0.00%)
	<i>Sambucus</i> sp.	2 (0.5%)	1 (0.74%)
Amaryllidaceae	<i>Allium ursinum</i> L.	2 (0.5%)	0 (0.00%)
Anacardiaceae	<i>Cotinus coggygria</i> Scop.	2 (0.5%)	5 (3.68%)
Asteraceae	<i>Achillea millefolium</i> L.	8(1.99%)	8 (5.88%)
	<i>Cichorium intybus</i> L.	1 (0.25%)	0 (0.00%)
	<i>Matricaria chamomilla</i> L.	12 (2.98%)	1 (0.74%)
	<i>Taraxacum officinale</i> F. H. Wigg.	1 (0.25%)	0 (0.00%)
Equisetaceae	<i>Equisetum arvense</i> L.	1 (0.25%)	0 (0.00%)
Fabaceae	<i>Trifolium pratense</i> L.	1 (0.25%)	0 (0.00%)
Hypericaceae	<i>Hypericum perforatum</i> L.	22 (5.46%)	7 (5.15%)
Lamiaceae	<i>Lavandula angustifolia</i> Mill.	1 (0.25%)	0 (0.00%)
	<i>Melissa officinalis</i> L.	7 (1.74%)	0 (0.00%)
	<i>Mentha</i> sp. div.	8 (1.99%)	2 (1.47%)
	<i>Origanum vulgare</i> L.	5 (1.24%)	5 (3.68%)
	<i>Sideritis scardica</i> Griseb.	1 (0.25%)	0 (0.00%)
	<i>Thymus</i> sp. div.	28 (6.95%)	12 (8.82%)
Malvaceae	<i>Malva sylvestris</i> L.	0 (0.00%)	1 (0.74%)
	<i>Tilia tomentosa</i> Moench	10 (2.48%)	4 (2.94%)
Pinaceae	<i>Pinus sylvestris</i> L.	1 (0.25%)	0 (0.00%)
Plantaginaceae	<i>Plantago major</i> L.	3 (0.74%)	0 (0.00%)
Primulaceae	<i>Primula veris</i> L.	1 (0.25%)	0 (0.00%)
Rosaceae	<i>Agrimonia eupatoria</i> L.	1 (0.25%)	0 (0.00%)
	<i>Crataegus monogyna</i> Jacq.	3 (0.74%)	6 (4.41%)
	<i>Prunus spinosa</i> L.	1 (0.25%)	1 (0.74%)
	<i>Rosa canina</i> L.	10 (2.48%)	9 (6.62%)

Sapindaceae	<i>Aesculus hippocastanum</i> L.	1 (0.25%)	0 (0.00%)
Urticaceae	<i>Urtica dioica</i> L.	4 (0.99%)	4 (2.94%)

n - number of the respondents

In present survey a small proportion of the respondents collect herbs themselves. On the other hand, their answers revealed the knowledge about the most used medicinal plants in Bulgaria. The presence of traditional knowledge in modern Bulgarian society is reported in other surveys [12-20].

There are some differences between two groups – a smaller proportion of SN group collected medicinal plants from natural habitats (Table 1), but listed much more herbs than NP group (Table 2). A possible explanation for this fact could be the demographic differences between two groups. Notably, most of them specify, that they comply with legal requirements and that the collected herbs are for a personal use only.

The respondents from SN group indicated 28 plant species belonging to 15 families. Most often gathered herbs reported by SN group (above 2.50%) were *Thymus* sp. div. (6.95%), *Hypericum perforatum* (5.46%), *Matricaria chamomilla* (2.98%), *Tilia tomentosa* (2.48%) and *Rosa canina* (2.48%). The respondents from NP group indicated 14 species from 8 families. The preferred herbs (above 2.50%) were *Thymus* sp. div. (8.82%), *Rosa canina* (6.62%), *Achillea millefolium* (5.88%), *Hypericum perforatum* (5.15%), *Crataegus monogyna* (4.41%), *Cotinus coggygria* (3.68%), *Origanum vulgare* (3.68%), *Tilia tomentosa* (2.94%) and *Urtica dioica* (2.94%). Reported medicinal plants by the respondents are widely distributed in Bulgaria. Two endangered species have been mentioned: *Aesculus hippocastanum* L. and *Sideritis scardica* Griseb.

Four medicinal plants were cited from both groups: *Hypericum perforatum* L., *Thymus* sp. diversa, *Tilia tomentosa* Moench and *Rosa canina* L. *Hypericum perforatum* has been widely used in traditional medicine as antidepressant, wound healing, and antibacterial. Scientific studies proved presence of valuable secondary metabolites, mainly hyperforin and hypericin [21]. *Thymus* sp. div. is used traditionally for treating disorders of the respiratory and gastrointestinal systems [22]. Frezza et al. [23] analysed inflorescences of *Tilia tomentosa* and established different chemical compounds, as flavonoids, followed by organic acids and pentacyclic triterpenes. All compounds showed a wide range of beneficial effects for human health including anti-inflammatory, antioxidant, antiallergic, antitumor, hepatoprotective, cardioprotective, antidiabetic, neuroprotective. *Rosa canina* L. is known to possess antioxidant, antimutagenic and anticarcinogenic properties [24].

In the most cases, demographic variables (as independent features of the participants) weakly contributed to the choice of the answers (Table 3 and Table 4).

Table 3. Relationship between demographic features of the respondents from SN group and their answers to the question “Do you collect herbs from Nature and National Parks?”

Demographic features	Answers				Correlation (r)
	Yes	Sometimes	No	No answer [#]	
Gender					0.20
Male	2.86%	15.24%	80.95%	0.95%	
Female	13.80%	15.82%	69.02%	1.35%	
No answer [#]	0.00%	0.00%	100.00%	0.00%	
Age					0.38*
15 - 19 years	0.00%	0.00%	100.00%	0.00%	
20 - 29 years	3.66%	8.54%	87.80%	0.00%	
30 - 39 years	6.49%	16.88%	76.62%	0.00%	
40 - 49 years	13.49%	20.63%	65.08%	0.79%	
50 - 59 years	12.70%	12.70%	73.02%	1.59%	
60 - 69 years	20.00%	20.00%	55.56%	4.44%	
70 - 79 years	40.00%	0.00%	40.00%	20.00%	
No answer [#]	0.00%	0.00%	100.00%	0.00%	
Level of Education					0.36
Basic school	25.00%	0.00%	75.00%	0.00%	
High school	13.51%	13.51%	72.07%	0.90%	
University	9.79%	16.78%	72.38%	1.05%	
No answer [#]	0.00%	0.00%	50.00%	50.00%	
Occupation					0.23
Pupil	0.00%	0.00%	100.00%	0.00%	
Worker	9.36%	17.39%	72.24%	1.00%	
University Student	10.00%	10.00%	80.00%	0.00%	
Pensioner	23.08%	12.82%	58.97%	5.13%	
Unemployed	14.29%	9.52%	76.19%	0.00%	

No Answer [#]	0.00%	0.00%	0.00%	0.00%
Total (for SN group)	10.92%	15.63%	72.21%	1.24%

* - $P \leq 0.05$; r – Pearson`s contingency coefficient:  $0 < r < 0.3$  weak correlation,  $0.3 < r < 0.5$  moderate correlation,  $0.5 < r < 0.7$  significant correlation,  $0.7 < r < 0.9$  strong correlation,  $0.9 < r < 1$  very strong correlation. <sup>#</sup> – some respondents didn`t point any answer

Table 4. Relationship between demographic features of the respondents from NP group and their answers to the question “Do you collect herbs from Nature and National Parks?”

Demographic features	Answers				Correlation (r)
	Yes	Sometimes	No	No answer [#]	
Gender					0.23
Male	10.45%	14.93%	74.63%	0.00%	
Female	20.90%	14.93%	64.18%	0.00%	
No answer [#]	0.00%	50.00%	50.00%	0.00%	
Age					0.56*
15 - 19 years	0.00%	6.67%	93.33%	0.00%	
20 - 29 years	8.33%	16.67%	75.00%	0.00%	
30 - 39 years	9.52%	9.52%	80.95%	0.00%	
40 - 49 years	19.44%	8.33%	72.22%	0.00%	
50 - 59 years	8.00%	28.00%	64.00%	0.00%	
60 - 69 years	45.45%	36.36%	18.18%	0.00%	
70 - 79 years	75.00%	0.00%	25.00%	0.00%	
No answer [#]	0.00%	0.00%	100.00%	0.00%	
Level of Education					0.22
Basic school	0.00%	9.09%	90.91%	0.00%	
High school	14.29%	11.90%	73.81%	0.00%	
University	18.07%	18.07%	63.86%	0.00%	
No answer [#]	0.00%	0.00%	50.00%	50.00%	
Occupation					0.50*
Pupil	0.00%	7.69%	92.31%	0.00%	
Worker	14.61%	15.73%	69.66%	0.00%	
University Student	0.00%	16.67%	83.33%	0.00%	
Pensioner	58.33%	25.00%	16.67%	0.00%	
Unemployed	12.50%	12.50%	75.00%	0.00%	
No answer [#]	0.00%	0.00%	0.00%	0.00%	
Total (for NP group)	15.44%	15.44%	69.12%	0.00%	

* - $P \leq 0.05$; r – Pearson's contingency coefficient: $0 < r < 0.3$ weak correlation, $0.3 < r < 0.5$ moderate correlation, $0.5 < r < 0.7$ significant correlation, $0.7 < r < 0.9$ strong correlation, $0.9 < r < 1$ very strong correlation. # – some respondents didn't point any answer

Two values from the Pearson's contingency coefficient indicated a significant correlation ($P \leq 0.05$) between the age and employment of NP group respondents and their answers to the question "Do you collect herbs from Nature and National Parks?". The percentage of people who collect medicinal plants increases with the age of the respondents. This observation is notable in NP group. Similarly, pensioners are predominant in both groups.

Conclusions

Nature and National Parks in Bulgaria present various ecosystem services to the visitors. Amongst them, the collection of naturally pure medicinal plants has become attractive recently. A matter of interest is the existence of traditional knowledge and utilization of herbs in modern society. In this study the *most popular medicinal plants collected by visitors of Nature and National Parks were determined*: – *Hypericum perforatum* L., *Thymus* sp. div., *Tilia tomentosa* Moench and *Rosa canina* L. Results from present survey revealed *the major* disadvantages of *online surveys* – skewed respondents, as only people interested in using medicinal plants participate in the survey.

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