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Medicinal Plants used in Human Medicine in the Northern Black Sea Coast Region (Bulgaria).

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ABSTRACT

The purpose of this study is to investigate the demographic dependencies in the application of medicinal plants used in human medicine by the local population along the Northern Black Sea coast. The survey was conducted in the period from June 2014 to October 2017. Interviews with the local population were conducted using original questionnaires prepared upfront. 709 local residents from 32 communities were interviewed. The respondents were selected randomly. They belong to different age, gender, ethnicity, education and employment groups. As a result of the research, we found out that the residents of the studied area use a total of 204 species of medicinal plants from 162 genera from 71 families, for treatment and prophylaxis in human medicine. These include local region species as well as species from other parts of the country; there are also foreign species and a number of cultivated plants. Two new species, *Artemisia pedemontana* Balb. ex Loisel. and *Ornithogalum umbellatum* L., have been identified, for which no data on ethnobotanical research or research on Bulgarian medicinal plants have been published yet. All the established species of our research are listed in a special Appendix.
Keywords: ethnobotany, medicinal plants, Black Sea Coast

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INTRODUCTION

Worldwide, due to the globalization trend, traditional knowledge, including that regarding medicinal plants, vanishes and gets lost even more. The use of synthetic and artificial products is on the rise, and at the same time indigenous plant species are replaced with introduced ones which pushes out the plants used traditionally [1]. This determines the significance of ethnobotanical studies with the objective of exploring, preserving and updating this knowledge. Such studies in Bulgaria have been conducted since the end of the 19th century [2]. However, the data on the ethnobotanical application of medicinal plants in specific regions of the country are not very numerous. Such data can be found in some of the publications over the last two decades [2, 3, 4, 5, 6, 7, 8, 9, 10].

Bulgaria is rich in natural plant resources. According to the latest data, there are 4102 species of vascular plants in Bulgaria [11]. The total number of species of medicinal plants in Bulgaria is 844, belonging to 444 genera from 118 families. Of those, 730 genera of spontaneously widespread vascular plants are included in the Medicinal Plants Act of the Republic of Bulgaria [12]. The remaining 114 genera are spontaneously distributed and are described in the literature on medicinal plants in Bulgaria [13].

The richness of plant resources at regional level is also really impressive. For comparison only in the Northeastern Bulgaria floristic region, there are 600 species [14]. In the Northern Black Sea coast floristic region the number of medicinal plants is a total of 593. On the territory of the Frangensko plateau, part of which covers the investigated area, the number of medicinal plants is 362 species [15].

Despite the impressive wealth of medicinal plants, the Northern Black Sea coast region (Figure 1) has remained unstudied in terms of ethnobotany. The objective of this study is to investigate demographic dependencies of using and applying medicinal plants in human medicine, practiced by the local population in the area under investigation. The study is part of a broader ethnobotanical study of medicinal plants along the Northern Black Sea coast.
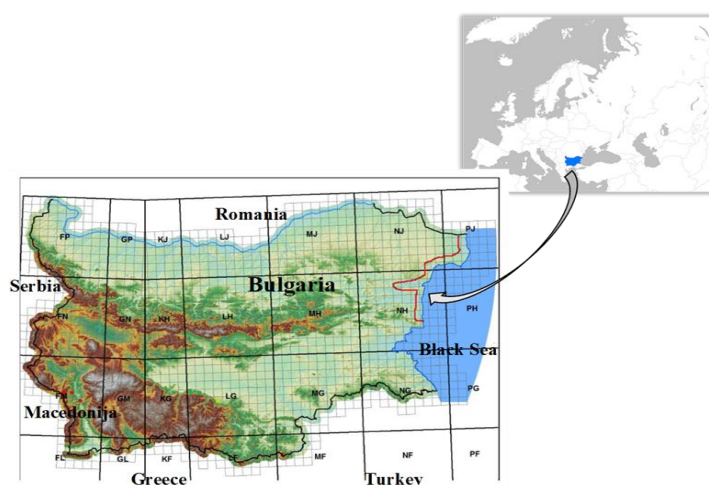

Figure 1: A map of the communities whose residents took part in the survey
(Borders are marked with a red contour)

MATERIALS AND METHODS

The Northern part of the Black Sea coast floristic region is selected for carrying out this study. The boundaries were determined using The Map of the Floristic Regions in Bulgaria [16]. The boundary between the northern and southern parts of the region is outlined by the Balkan Mountains. The survey was conducted in the period from June 2014 to October 2017. It was carried out in 32 communities, including 8 towns and 24 villages.

***Towns*:** Varna (43°12'N, 27°55'E), Beloslav (43°18'N, 27°70'E), Kavarna (43°43'N, 28°33'E), Shabla (43°15'N, 27°49'E), Byala (42°52'N, 27°53'E), Balchik (43°24'N, 28°90'E) and Obzor (42°49'N, 27°53'E).

***Villages*:** Bozhurets (43°42'N, 28°29'E), Bulgarevo (43°40'N, 28°41'E), Vaklino (43°64'N, 28°50'E), Gorun (43°59'N, 28°53'E), Ezeretz (43°59'N, 28°53'E), Kamen Bryag (43°45'N, 28°55'E), Kichevo (43°27'N, 27°96'E), Krapetz (43°62'N, 28°56'E), Kumanovo (43°27'N, 27°93'E), Poruchik Chunchevo (43°48'N, 28°46'E), Sveti Nikola (43°43'N, 28°49'E), Topola (43°41'N, 28°26'E) (43°47'N, 28°57'E), Hadzhi Dimitar (43°47'N, 28°44'E), Ezerovo (43°20'N, 27°76'E), Kazashko (43°20'N, 27°83'E), Osenovo (43°19'N, 28°10'E), Bliznatzi (43°40'N, 27°52'E), Kamenar (43°15'N, 27°55'E), Goritza (42°55'N, 27°51'E), Kranevo (43°20'N, 28°30'E), Shkorpilovtzi (42°58'N, 27°52'E), Topoli (43°13'N, 27°50'E) (Figure 1).

The study was carried out on the basis of questionnaire survey. Interviews with the local population were conducted using original questionnaires prepared upfront. The respondents belong to different age, ethnicity, gender, education and employment groups. Medicinal plants are defined according to the Medicinal Plants Act of the Republic of Bulgaria [12]. There are also a number of species that are not included in the Annex to the Medicinal Plants Act of the Republic of Bulgaria, but are used and established in the official and folk medicine [17, 18, 19, 20, 21, 22].

The taxonomical state and the denomination of the taxa have been interpreted according to the International Plant Names Index (IPNI) [23]. The family list is structured according to APG IV (Angiosperm Phylogeny Group) [24]. The Identification Guide to the Plants in Bulgaria [25] was used to identify the species and their origin. Poisonous plants list is defined by Bernhard-Smith [26], Hiller and Bickerich [27], Muenscher [28], Wagstaff [29]. Plants causing side effects in contact with them are listed according to Rycroft et al. [30] and Tampion [31].

The following statistical methods were used to process the obtained results:

- Correlation analysis to assess the correlation between the indicators tested (Pearson coefficient for quantitative indicators and Spearman coefficient for qualitative indicators);
- Student's t-curve in testing hypothesis for a statistically significant difference between two independent samples;
- Concentration coefficient (C) for nominal scales, Spearman coefficient (Sr) for ordinal scales, and Pearson coefficient (r) for interval scales were used to measure the strength of correlation.

For a null hypothesis significance level, $P < 0.05$ was accepted, with a confidence interval of 95%. The main measure of the dependency is the correlation coefficient r. Its value is interpreted by the Table 1 presented below.

Table 1: Correlation coefficient - value and interpretation

Correlation coefficient value	Correlation coefficient interpretation
0	No correlation
0-0,3	Weak correlation
0,3-0,5	Medium correlation
0,5-0,7	Moderate correlation
0,7-0,9	High correlation
0,9-1	Very high correlation
1	Perfect correlation

When the correlation coefficient is positive, the relationship between the units is positive correlation. In the case of a negative sign of the correlation coefficient, the dependence is negative correlation. The IBM SPSS Statistics for Windows, Version 19.0 and Microsoft Excel 2010 software were used for data processing.

RESULTS AND DISCUSSION

A total of 709 local residents from 8 towns and 24 villages located along the Northern Black Sea Coast participated in this study. Of these, 678 people (95.63%) have responded that they use medicinal plants in human medicine. The other 31 people (4.37%) do not use medicinal plants in human medicine. We found that residents from the surveyed area use a total of 204 species of medicinal plants for treatment and prophylaxis in human medicine. These 204 species of medicinal plants are from 162 genera from 70 families (Appendix). Of these, 92 species from 80 genera from 43 families are included in the Medicinal Plants Act of the Republic of Bulgaria. The remaining 112 species are referred to as medicinal plants in the specialized literature on medicinal plants published in Bulgaria.

According to their origin, approximately half of the medicinal plants used, 105 species (51.47%), are characteristic of the local floristic region. Almost 1/4 of the medicinal plants, 55 species (26.97%) are foreign to Bulgarian flora. Among the medicinal plants used, 33 species (16.18%) are grown as crop plants. The remaining 11 species (5.39%) are wild and are brought to that area from some other floristic regions of Bulgaria.

Of all the species mentioned by the respondents, 105 species from 88 genera from 47 families are characteristic of the area under investigation. According to Zahariev et al. [32] 593 species of wild medicinal plants from 357 genera from 96 families have been identified in this area. The results show that local people use 17.71% of the species of medicinal plants in the area they inhabit. This fact shows a low level of knowledge about the use of local medicinal plants in human medicine. As far as plant habitats are concerned, we have found almost complete lack of use of medicinal plants typical for the coastal sand areas. Only *Eryngium maritimum* L. and *Artemisia pedemontana* Balb. ex Loisel. are listed in this group of plants mentioned only by a few respondents. This also has the advantage of preserving these plant habitats that are of conservation importance and, additionally, are part of the European ecological network NATURA 2000.

The following plant families are represented among the most widely used medicinal plants: *Asteraceae* (20 genera), *Lamiaceae* (13 genera), *Rosaceae* (13 genera), *Apiaceae* (9 genera) and *Fabaceae* (7 genera). This list also includes the most commonly used medicinal plants in folk medicine by the local population [33], such as *Achillea millefolium* L., *Anethum graveolens* L., *Matricaria chamomilla* L., *Mentha sp. diversa, Origanum vulgare* L., *Thymus sp. diversa, Rosa canina* L., *Crataegus monogyna* Jacq., *Taraxacum officinale* F.H.Wigg. and others. The listed species of medicinal plants are also mentioned as the most commonly used in the country [1, 2, 4]. Some of these species: *Sambucus nigra* L., *Hypericum perforatum* L., *Tymus sp. diversa*, *Tilia tomentosa* Moench. and *Rosa canina* L., are also used by the local population along the Black Sea coast region of Turkey [34].

The species of medicinal plants used in the past and described in the Pharmacopeia from 1845 [5], are 69 species from 36 families. Of these, 45 species are also used by local residents of the Northern Black Sea coast region. This shows that there is stability in the information flow that has been transmitted and preserved over the years. It proves the fact that there is continuity in the folk knowledge and ethnobotanical application of the medicinal plants. The addition of 159 more species in this study outlines a trend of evolution and renewal of knowledge about medicinal plants. During the process of word-of-mouth communication, the content of knowledge changes and takes new interpretations, as noted by Koleva et al. [1].

When comparing the data of the ethnobotanical use of medicinal plants in different parts of the country we can observe the following: for the wetlands along the Northern Black Sea coast, which cover some of our research area, there are 103 species of medicinal plants [10]. The higher number of medicinal plants we have found can be explained by the larger area surveyed, with a larger number of communities - 12 more, and a larger number of respondents - 524 more people. In a survey of Kozuharova [2] for a number of settlements in the interior of the country, 183 interviews were made describing 77 species of medicinal plants, 60 of which are the same as those used in the Northern Black Sea coast region. The other 17 species were not mentioned by respondents in the present study. This is due to the fact that some of them are not spread in the Northern Black Sea coast floristic region. In an ethnobotanical study of medicinal plants in the region of Isperih [4], which is located in the Northeastern floristic region of Bulgaria and is close to our research area, 68 species of medicinal plants are described. 53 of these species are the same, and the other 15 species are not used by the local people in our research area. In researches made in different parts of the interior of Bulgaria [1], there are

62 species of medicinal plants listed, 14 of which are grown as crop plants. 57 species of them are listed in the present study and only 5 species are not used by the people in the Northern Black Sea coast floristic region.

When comparing the results of the present study with the data obtained from other researched regions of Bulgaria, it is noticeable that a significantly greater number of plants with application in human medicine have been found in the area we investigated. This is due to some regional differences in the knowledge about the use of medicinal plants. It should also be noted that this study first made such an extensive ethnobotanical research involving a large number of local residents.

In the present study, 97 species of medicinal plants are defined as used by the local population for treatment and prophylaxis but they are not mentioned by the researchers of the ethnobotanical studies listed here. A part of them (52 species) are characteristic of Bulgarian flora: *Achillea clypeolata* Sm., *Atropa belladonna* L., *Clinopodium vulgare* L., *Chelidonium majus* L., *Eryngium maritimum* L., *Fragaria vesca* L., *Paliurus spina-christi* Mill., *Malva sylvestris* L., *Mespilus germanica* L., *Tribulus terestris* L., *Viscum album* L., *Verbascum densiflorum* Bertol., and others. Another part of the medicinal plants used (45 species) are foreign to Bulgaria or they are cultivated as crop plants: *Coriandrum sativum* L., *Helianthus tuberosus* L., *Tagetes patula* L., *Pelargonium roseum* Willd., *Lavandula angustifilia* Mill., *Lycium barbarum* L., *Lycopersicon esculentum* Mill., *Rosmarinus officinalis* L., and others.

Two of the species of medicinal plants, mentioned by the respondents, that are part of the natural flora of Bulgaria, are not yet described in publications about the ethnobotanical studies in Bulgaria or in the literature on medicinal plants in Bulgaria. These are: *Artemisia pedemontana* Balb. ex Loisel. and *Ornithogalum umbellatum* L.

When we compare the degree of use of medicinal plants according to the **size of the community**, we find out that town residents use a larger number of medicinal plants (167 species) than villagers (125 species). The larger number of medicinal plants is due to both foreign and local species. For example, some foreign species are: *Panax quinquefolius* L., *Chenopodium quinoa* Willd., *Callisia fragrans* (Lindl.) Woodson, *Aspalathus linearis* (Burm.f.) R.Dahlgren. In many towns, such as Balchik, Kavarna and Aksakovo, local people grow in their yards other medicinal plants such as: *Diospyros kaki* L., *Salvia officinalis* L., *Cymbopogon sp. diversa*. Typical for the Northern Black Sea coast region medicinal plants, listed only by urban population, are *Foeniculum vulgare* Mill., *Eryngium campestre* L., *Ornithogalum umbellatum* L., *Berberis vulgaris* L., *Corylus avellana* L., *Capsella bursa-pastoris* (L.) Medik., and others. The main reason for this is that the majority of the surveyed respondents are urban residents - 538 people (75.88%), while the villagers are 171 (24.12%). Also, the urban population has better information provision and is more interested in alternative means of treatment.

The average number of medicinal plants used is 6.49 species per person. For towns, the use of 1 to 5 species of medicinal plants is the most common, followed by the use of 6 to 10 species. While with the villagers the percentage of people using from 1 to 5 medicinal plants is almost equal to that of people using from 6 to 10 medicinal plants (Figure 2).
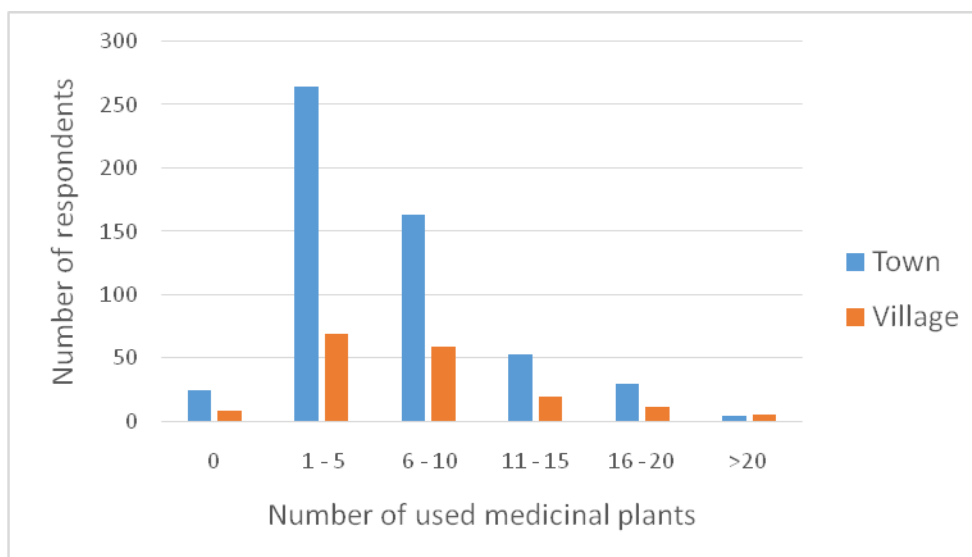
Figure 2: Number of medicinal plants used according to the size of community

The correlation coefficient (r=0.068) indicates the presence of a weak right link regarding the influence of the settlement (town or village) on the number of medicinal plants that the respondents use in human medicine. The results are statistically reliable as P=0.02. Similar results are reported by Cherneva [10] and Kozuharova [2].

The **ethnic composition** of the respondents in the Northern Black Sea coast region is rich and includes 6 ethnic groups. Of these, the largest group is the one of Bulgarians - 628 people (88.58%). The other two large groups are the Turkish group - 23 people (3.24%) and the Roma ethnic group - 37 people (5.22%) are the largest ones. With a smaller number of people represented are: Armenian group - 9 people (1.27%), Copans - 9 people (1.27%) and Tatars - 3 people (0.42%). The distribution of ethnic groups such as Bulgarian, Turkish and Roma is evenly represented in the communities throughout the region. The distribution of other ethnicities is concentrated in certain communities. All Armenians surveyed are residents of Varna. The Copans are residents of the town of Aksakovo. As for the Tatars - two people are residents of Topola village and one of Kranevo village. The most common pattern in the use of medicinal plants is that of 1 to 5 species, regardless of the ethnicity of respondents (Figure 3).

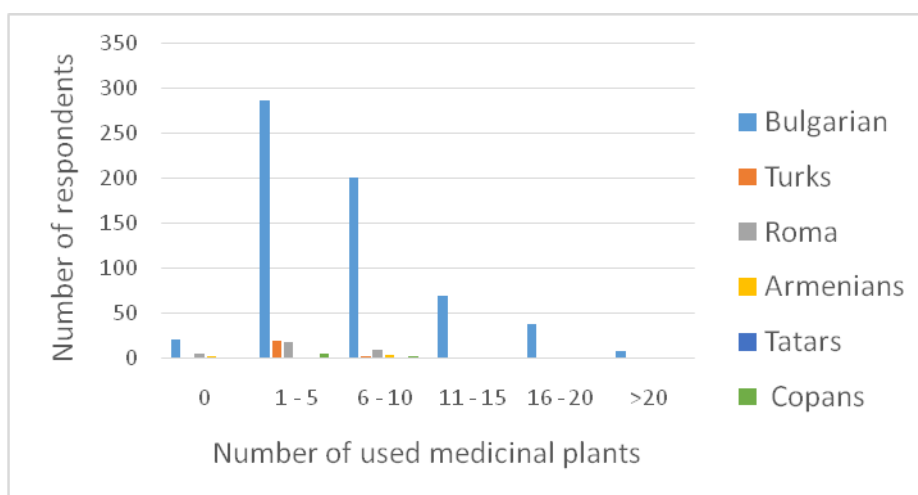**Figure 3: Number of medicinal plants used according to respondents' ethnicity**

To determine the correlation between the variables 'ethnicity' and 'number of medicinal plants used', a correlation analysis is performed. The correlation coefficient (r=-0,120) shows a negative correlation between the ethnicity and the number of species of medicinal plants that respondents use in human medicine. The

results obtained are statistically reliable given that the marginal level of significance (P=0.04) is less than the standard assumed (P<0.05).

The local population uses the same species of medicinal plants regardless of ethnicity. We have not received information about medicinal plants that are used only by a particular ethnic group. This means that different ethnic groups have similar knowledge about the distribution and healing properties of plants. The reason for this is that ethnic groups do not live in isolation and exchange information among themselves.

The distribution of respondents from the Northern Black Sea coast region by **age groups** is approximately even (Table 2). Exceptions are the last two age groups - from 71 to 80 years and over 80 years. In all age groups of the studied area, the use of a small number of medicinal plants is prevalent - from 1 to 5 species and from 6 to 10 species (Figure 4).

Table 2: Age composition of the respondent groups

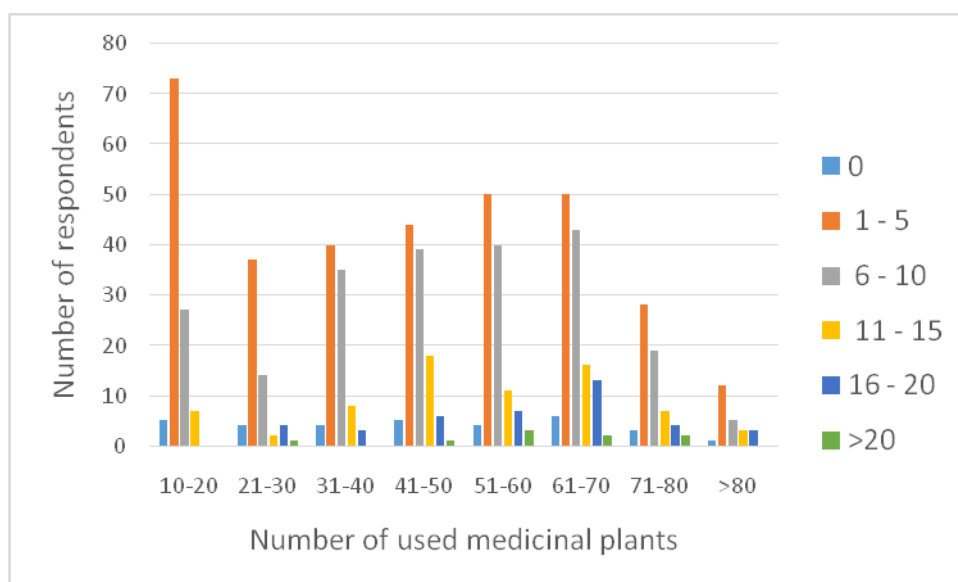| Age group	10-20 years	21-30 years	31-40 years	41-50 years	51-60 years	61-70 years	71-80 years	Over 80 years
Percent	16	12	12	16	13	19	9	3

Figure 4: Number of medicinal plants used according to respondents' age

After the correlations we made, we found a positive correlation (r=0.179). The results are statistically reliable as P=0.005. Similar results have been reported for the population of wetland regions along the Northern Black Sea coast [10] as well as for the interior of the country [2].

There are a markedly large number of responses for the use of medicinal plants from 1 to 5 species of all age groups, with the highest share among young people under the age of 20. The use of more medicinal plants (6 to 10 species) is bigger with increasing age of respondents. This relationship is due to the greater use of medicinal plants by older respondents. They have longer time to collect and accumulate knowledge about medicinal plants on the one hand, and on the other hand gathering herbs in the wild is cheaper than buying pharmaceutical products.

A total of **209 men (29.48%) and 500 women (70.52%)** participated in the survey. The greater participation of women is due to the fact that they are more often involved in taking part in surveys. What is noticeable is the larger number of species of medicinal plants used by women compared to men (Figure 5). This is due to the fact that women traditionally take care of and children's health and upbringing in the family.
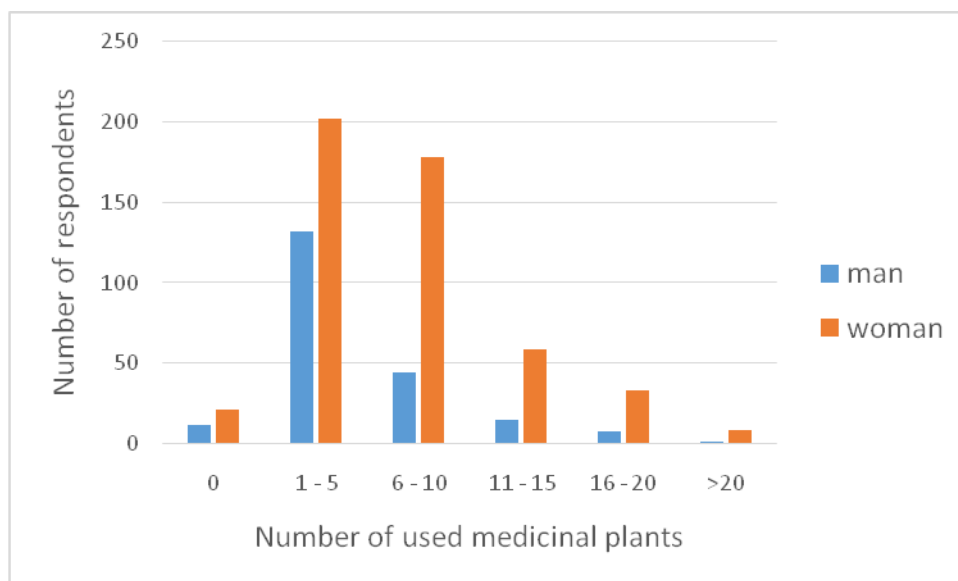
Figure 5: Number of medicinal plants used according to respondents' gender

The expected results were that the relationship between gender and the number of medicinal plants used would be of significant value. After the analysis and correlation we made, we concluded that the ratio in the use of medicinal plants and the respondent's gender has a weak positive correlation (r=0.183). The results obtained are statistically reliable (P=0.006). The weak correlation is due to the fact that a predominant part of the respondents uses a small number of medicinal plants - from 1 to 5 species, regardless of gender. Unlike men, women use more species of medicinal plants. Similar results are reported by Cherneva [10] for the wetlands of the Northern Black Sea Coast region and Kozhuharova [2] for the interior of the country.

When analyzing the respondents' **level of education**, we concluded that the majority of respondents (51%) have secondary education, followed by respondents with elementary school education (28%) and people with higher education (17%). The lowest is the number of respondents with primary school education (2%) and those with no degree of education at all (2%). Respondents without educational degree are people who are representatives of Roma and Turkish ethnicity, and those with primary degree of education are Bulgarians aged over 80.

The distribution of respondents according to the level of education and the number of medicinal plants used is shown in Figure 6. The analysis of the results confirms our hypothesis that people with higher education tend to use more medicinal plants in human medicine. The correlation between 'level of education' and 'use of medicinal plants' shows a weak positive correlation (r=0.194). The results are considered reliable because P=0.03. The correlation value is slightly higher in towns, as there are a higher percentage of respondents with higher education.
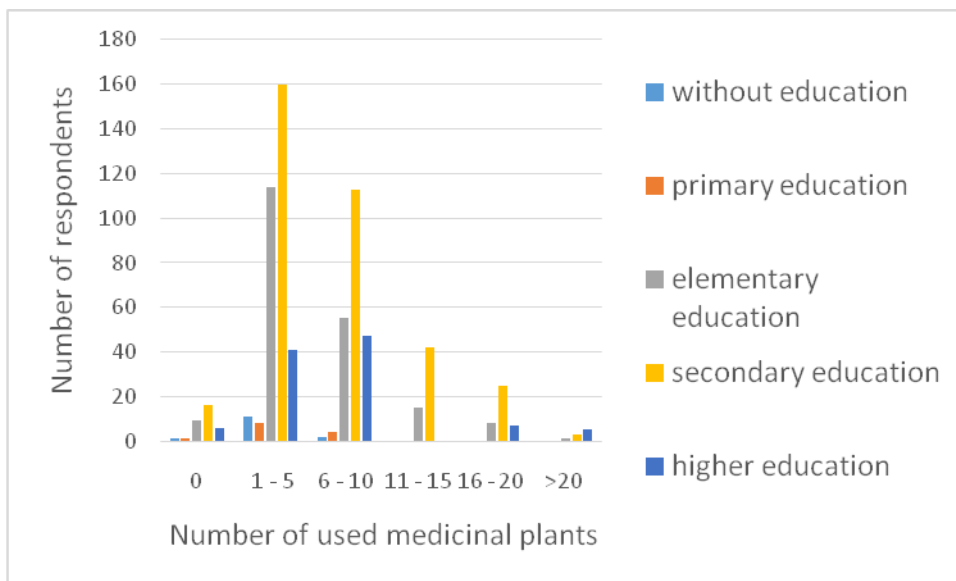
Figure 6: Number of medicinal plants used according to respondents' level of education

People with higher education use medicinal plants more frequently. This result is explained by the fact that well educated people value highly and more often seek a healthy lifestyle and apply herbs to treat and prevent certain diseases. The weak link also means that the knowledge about medicinal plants is probably not acquired in the educational process but is due to family traditions. For comparison, Cherneva [10] quotes close to the present results of a stable positive attitude towards the use of medicinal plants in the wetlands area along the Northern Black Sea coast. Similar results are reported by Kozhuharova [2] for the interior of the country.

According to the **employment criterion**, the highest number of respondents surveyed are employed - 371 people (52.33%), followed by pensioners - 192 people (27.08%), students - 112 people (15.80%) and unemployed - 34 people (4.79%). The working hypothesis that older people (retirees) and the unemployed use more medicinal plants as they have more free time is not confirmed. After analyzing the results, we found out that the largest percentage was for the employed respondents who used medicinal plants (Figure 7).
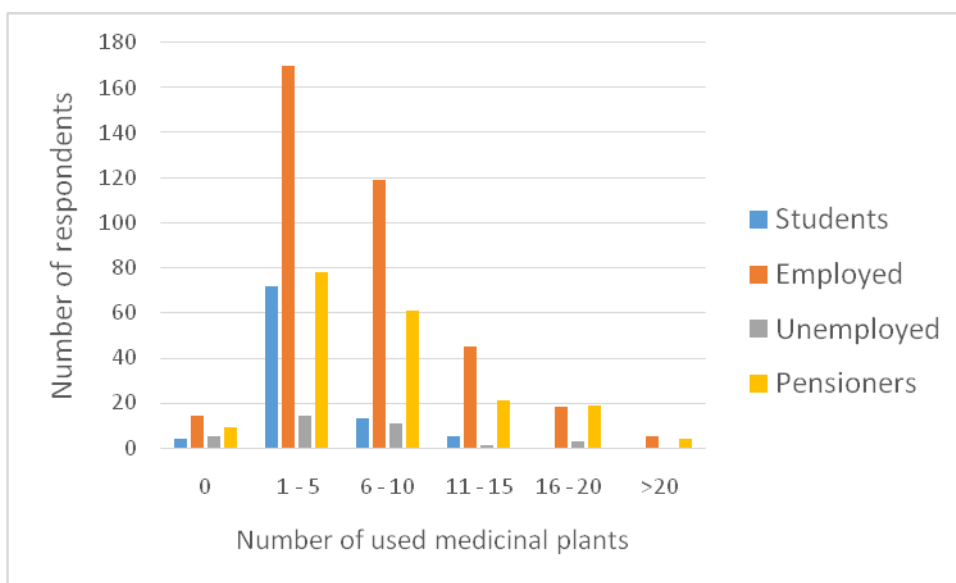

Figure 7: Number of medicinal plants used, according to respondents' employment state

The probable reason for this result is the fact that they are active people who raise children and use herbs to treat family members and prevent diseases. The correlation dependence in employment/number of medicinal plants used shows a weak positive correlation r=0.189. This result, however, is statistically unreliable (P=0.09).

A significant part of the medicinal plants used by the local population are considered poisonous to a different extent plants. The poisonous plants used for healing purposes are represented by 112 species from 98 genera from 54 families. The greatest number, 36 species (32.14%) of these plants represented are the plants that cause contact dermatitis. Poisonous plants that would cause poisoning if used at a higher dose than the recommended one are 25 species (22.32%). The poisonous plants are 21 species (18.75%), including: *Aesculus hippocasanum* L., *Galanthus elwesii* Hook.f., *G. nivalis* L., *Robinia pseudoacacia* L. and others. The highly poisonous plants are 7 species (6.25%), among which are: *Arum maculatum* L., *Atropa bella-dona* L., *Ecballium elaterium* L., *Helleborus odorus* Waldst. & Kit. ex Willd., *Viscum album* L. A large number of poisonous plants are really popular and widely used by the local population but usually people have no idea of their poisonous effects. At the same time, when conducting the survey, we did not find a person injured by inappropriate use of medicinal plants.

The local population has the necessary knowledge to apply the most useful part of the medicinal plants for a specific health problem. Most common is the use of the stalk (37 species), fruit (36 species), flower (31 species), and leaves (28 species). In these groups are the most common medicinal plants used in human medicine by the local people, e.g. *Hypericum perforatum* L., *Matricaria chamomilla* L., *Origanum vulgare* L., *Tilia tomentosa* Moench. This explains the greater number of responses about the use of those particular plant parts. Fewer responses are given for the use of other plant parts: seeds (14 species), tubers (8 species), whole plant (7 species), roots (6 species), and juice (6 species). These herbs are either less popular or used for particularly less common conditions or incidents. It is relatively rare for some plant species to be used with more than one part of the plant (leaf/flower, leaf/fruit, etc.) at the same time, and only a few answers are given about that.

The most frequent use of medicinal plants is during a certain season (50.74%), and it is in winter. This fact indicates that a significant part of the respondents do not often use herbs. The use of medicinal plants for prophylactic purposes is relatively small - daily (13.1%) and weekly (5.91%). Most people living in the villages and older people use herbs daily or weekly. An interesting fact is, for example, the not so frequent use of medicinal plants in general (17.96%). This is associated with a precisely defined incidental condition, such as an insect bite, or treating or rinsing of surface wounds, or fomenting, and so on. The high percentage of these responses refers to the widespread use of medicinal plants in emergency situations. This factor is determined by the economic development and remoteness of small communities from medical facilities. Only 31 of all respondents (4.37%) report of their non-using of medicinal plants at all. In other similar studies [8, 10] it was reported that the highest number of responses obtained were for a year-round use of medicinal plants (53.91% and 48.65%, respectively) and for a necessity (48% and 44.86% respectively). Cherneva [10] reports 9.19% of the answers received for seasonal use of medicinal plants. These results are significantly different from the current ones.

A curious fact is that the majority of herbs are gathered in the wild (54.17% of the answers). This is an example of a well-kept relationship between local people and the nature. On the other hand, this fact is evidence of a poorly developed economy. If people are busy, they will find it harder to take the time to gather herbs, dry them, preserve them and prepare medicine from them.

The cultivation of medicinal plants also has a significant share (16.16% of responses). This is related to a person's practical side - medicinal plants are therefore easily accessible and always 'available'. Another benefit of cultivation is that this preserves the natural spreading of medicinal plants. Unfortunately, this is not a motive for the cultivation of medicinal plants.

Medicinal plants are gathered more often by villagers, and mostly by women. Urban residents and younger people prefer to buy herbs (19.52% of responses) or ready-made products (10.13% of responses).

The results obtained are similar to other studies conducted in the country. Ploetz and Orr [3] report that 72.1% of respondents gather plants in the wild, 25.6% grow plants and 14.4% buy them. The results

obtained by Cherneva [10] for the wetlands along the Northern Black Sea coast region differ from the present ones. She reports that 68.11% of respondents buy herbs, 49.19% gather medicinal plants in the wild and 24.86% grow medicinal plants. The contrast is probably due to the differences in the ratio among respondents of various age groups in the two surveys and the difference in the number of respondents.

Regarding the source of information on the use of medicinal plants, most answers show that the knowledge was acquired from older relatives of respondents (35.12%) or at their discretion (35.10%). This indicates intergenerational continuity with regard to traditional medicine on the one hand, and on the other hand, the use of herbs at a person's discretion is explained by the application of the most commonly used medicinal plants for which no specific recommendation is needed.

An interesting fact, for example, is that, according to the respondents surveyed, physicians rarely recommend the use of medicinal plants (2.98% of responses). Mass media such as newspapers (3.08% of responses), TV and the Internet (7.86% of responses), and books on medicinal plants (6.86% of responses) also have a surprisingly small contribution. At the same time, in some other areas, product advertisements determine demand, for example in the food and cosmetics industry, where we can find many plants as well.

People with higher education, as well as people from towns, more often use books as a source of information about medicinal plants.

The high percentage of answers (90.03%) that herbs do not have a substitute indicates the fact that people rely on them and would not substitute them for other species of treatment. On the other hand, there is low response rate (1.76%) on the question "Does the herb have a natural substitute?", which means that people don't have in-depth knowledge and cannot substitute a medicinal plant of one species with a plant from another one. Most commonly, information about replacing a medicinal plant with an artificial herb (5.71% of replies) or a synthetic product (2.5% of responses) is given by younger people and urban residents.

The results of the research demonstrate that the knowledge about the use of medicinal plants in human medicine among the people of the Northern Black Sea coast region is developing and changing. The traditional for the country collection of wildlife medicinal plants for individual use in the area under investigation is now a source for getting only half of the medicinal plants used. The study highlighted the use of a large number of plants, foreign to Bulgarian flora, which proves the effect of globalization on socio-cultural development, even with the use of medicinal plants. There is a tendency of uniformity in the attitude of residents of the studied area towards the use of medicinal plants. On the one hand, it is expressed in a similar species composition of the medicinal plants used in different ethnic groups. On the other hand, there are slight differences in the number of medicinal plants used in human medicine, when comparing the results of different demographic indicators.

Appendix:
Medicinal herbs useful in human medicine

Family	Scientific Name	Bulgarian Name	MPA	Origin	Usable part	Poiso-ning	NEW
Amaranthaceae	*Beta vulgaris* L.	Tsveklo		4	5		*
Amaryllidaceae	*Allium cepa* L.	Luk		4	1	2	
Amaryllidaceae	*Allium porrum* L.	Praz		4	15	2	
Amaryllidaceae	*Allium sativum* L.	Chesan		4	1	2	
Amaryllidaceae	*Allium ursinum* L.	Levurda, leorda	*	1	10		*
Amaryllidaceae	*Galanthus elwesii* Hook.f.	Kokiche	*	1	11	3	
Amaryllidaceae	*Galanthus nivalis* L.	Kokiche	*	1	11	3	
Amaryllidaceae	*Leucojum aestivum* L.	Blatno kokiche		1	11	3	*
Amaryllidaceae	*Nectaroscordum siculum subsp. bulgaricum* (Janka) Stearn	Samardala, div chesan	*	1	1		*
Anacardiaceae	*Cotinus coggygria* Scop.	Tetra, smradlika, tatyurk	*	1	10	2;3	
Apiaceae	*Anethum graveolens* L.	Kopar	*	1	13	2	
Apiaceae	*Apium graveolens* L.	Tselina		4	1	2	
Apiaceae	*Coriandrum sativum* L.	Koriandar	*	3	13	2;3	
Apiaceae	*Daucus carota* L.	Morkov		4	1	2	
Apiaceae	*Foeniculum vulgare* Mill.	Rezene	*	1	9;13	2	*
Apiaceae	*Eryngium campestre* L.	Polski vetrogon	*	1	9	3	
Apiaceae	*Eryngium maritimum* L.	Morski vetrogon	*	1	9		*
Apiaceae	*Levisticum officinale* W.D.J.Koch	Lyushtyan, devisil		4	9	1	
Apiaceae	*Petroselinum crispum* (Mill.) A.W.Hill.	Magdanoz, merudiya		4	1	2	
Apiaceae	*Pimpinella anisum* L.	Anason		4	13	2	
Araceae	*Arum maculatum* L.	Zmiyarnik, zmiyska hurka	*	1	5	4	
Araliaceae	*Panax quinquefolius* L.	Zhenshen		2	2	1	*
Asparagaceae	*Asparagus officinalis* L.	Zaycha syanka	*	1	9	1;2	*

Asparagaceae	*Ornithogalum umbellatum* L.	Garvanski luk		1	4		*
Asphodelaceae	*Aloe arborescens* Mill.	Aloe		2	15	1;2	*
Asphodelaceae	*Aloe vera* (L.) Burm.f.	Aloe		2	15	1	
Aspleniaceae	*Phyllitis scolopendrium* (L.) Newman	Volski ezik	*	3	10	3	*
Aspleniaceae	*Asplenium trichomanes* L.	Strashniche	*	1	10		*
Asteraceae	*Achillea clypeolata* Sm.	Zhalt ravnets	*	1	11		*
Asteraceae	*Achillea millefolium* L.	Byal ravnets	*	1	11	1;2	
Asteraceae	*Arctium lappa* L.	Repey, butrak	*	1	10		*
Asteraceae	*Arnica montana* L.	Arnika		2	11	1;2	*
Asteraceae	*Artemisia absinthium* L.	Obiknoven pelin, byal pelin	*	1	9	1;2	
Asteraceae	*Artemisia alba* Turra	Pelin	*	1	9	2	*
Asteraceae	*Artemisia annua* L.	Sladak pelin	*	1	9	2	*
Asteraceae	*Artemisia dracunculus* L.	Estragon, taros		2	9	2	*
Asteraceae	*Artemisia pedemontana* Balb. ex Loisel.	Pelin		1	9	2	*
Asteraceae	*Artemisia sp. diversa*	Pelin		1	9	2	
Asteraceae	*Bellis perennis* L.	Parichka	*	1	11		
Asteraceae	*Calendula officinalis* L.	Neven, zhalta ruzha		2	11	2	
Asteraceae	*Carduus acanthoides* L.	Magareshki bodil	*	1	11		
Asteraceae	*Cichorium intybus* L.	Tsikoriya, sinya zhlachka	*	1	9;11	2	
Asteraceae	*Cirsium arvense* (L.) Scop.	Palamida		1	9	1	*
Asteraceae	*Echinacea angustifolia* L.	Ehinatseya		2	11		*
Asteraceae	*Helianthus annuus* L.	Slanchogled		4	11		*
Asteraceae	*Helianthus tuberosus* L.	Guliya, zemna yabalka, eralma		2	5		*
Asteraceae	*Inula helenium* L.	Byal oman	*	1	11	2	*
Asteraceae	*Matricaria chamomilla* L.	Layka, laykuchka	*	1	11	2	
Asteraceae	*Solidago virgaurea* L.	Zhalt entchets, zhalta prachitsa	*	1	11	3	*
Asteraceae	*Silybum marianum* (L.) Gaertn.	Byal tran	*	1	11	1	*

Asteraceae	*Stevia rebaudiana* (Bertoni) Bertoni.	Stevia		2	9		*
Asteraceae	*Tagetes erecta* L.	Kamshitsa, turta		2	11	2;3	
Asteraceae	*Tagetes patula* L.	Kamshitsa, turta		2	11	2	
Asteraceae	*Tanacetum balsamita* L.	Kaloferche		2	11		*
Asteraceae	*Tanacetum vulgare* L.	Vratiga	*	1	11	2;3	*
Asteraceae	*Taraxacum officinale* F.H.Wigg.	Gluharche, radika	*	1	1	1;2	
Asteraceae	*Tussilago farfara* L.	Podbel	*	1	10	1	
Berberidaceae	*Berberis vulgaris* L.	Kisel tran	*	1	2	1	*
Betulaceae	*Betula pendula* Roth.	Breza	*	1	10		
Betulaceae	*Corylus avellana* L.	Leska, leshnik	*	1	10;11		*
Boraginaceae	*Symphytum officinale* L.	Cheren oman, zarasliche	*	1	2	3	
Brassicaceae	*Armoracia rusticana* G.Gaertn., B.Mey. & Scherb.	Hryan		4	2	1	
Brassicaceae	*Brassica oleracea* L.	Zele		4	10		*
Brassicaceae	*Brassica rapa* L.	Ryapa		4	5		*
Brassicaceae	*Capsella bursa-pastoris* (L.) Medik.	Ovcharska torbichka	*	1	9		
Brassicaceae	*Sinapis alba* L.	Byal sinap		4	13	2	*
Brassicaceae	*Sinapis nigra* L.	Cheren sinap		4	13	2	*
Buxaceae	*Buxus sempervirens* L.	Chemshir		2	8	4	*
Cannabaceae	*Cannabis sativa* L.	Div konop		1	9	1;2	*
Cannabaceae	*Humulus lupulus* L.	Hmel		1	11	1;2	*
Caprifoliaceae	*Sambucus ebulus* L.	Trevist baz, byal baz, bazak, trambaz	*	1	12	1	
Caprifoliaceae	*Sambucus nigra* L.	Darvesen baz, cheren baz, svirchna, svirhovina, svirchok, bazolin, mumuer	*	1	11	1	
Caprifoliaceae	*Valeriana officinalis* L.	Valeriana, dilyanka	*	1	9	1	
Chenopodiaceae	*Chenopodium quinoa* Willd.	Kinoa		2	13		*
Commelinaceae	*Callisia fragrans* (Lindl.) Woodson	Kaliziya		2	10	3	
Cornaceae	*Cornus mas* L.	Dryan	*	1	12		

Family	Species	Local name					
Crassulaceae	*Crassula sp. diversa*	Durvoto na zhivota		2	15		
Crassulaceae	*Kalanchoe daigremontiana* Raym.-Hamet & H.Perrier	Kalanhoe		2	15	3	*
Crassulaceae	*Sempervivum sp. diversa*	Debelets		1	15		
Crassulaceae	*Citrullus vulgaris* Schrad.	Dinya		4	12		*
Cucurbitaceae	*Cucumis melo* L.	Papesh		4	13		*
Cucurbitaceae	*Cucurbita pepo* L.	Tikva		4	13		
Cucurbitaceae	*Ecballium elaterium* L.	Luda krastavitsa	*	1	12	4	
Cupressaceae	*Juniperus communis* L.	Hvoina, smrika		3	12	3	*
Dioscoreaceae	*Tamus communis* L.	Brey	*	1	3	2;3	
Ebenaceae	*Diospyros kaki* L.	Rayska yabalka, kaki		2	12		*
Equisetaceae	*Equisetum sp. diversa*	Hvosht, svirchovo bile, lisicha opashka		1	9		*
Equisetaceae	*Equisetum arvense* L.	Polski hvosht	*	1	9	2;3	*
Equisetaceae	*Equisetum palustre* L.	Blaten hvosht	*	1	9	3	*
Ericaceae	*Arctostaphylos uva-ursi* Spreng.	Mecho grozde	*	3	12	1	
Ericaceae	*Vaccinium myrtillis* L.	Cherna borovinka	*	3	12		
Ericaceae	*Vaccinium vitis-idea* L.	Chervena borovinka	*	3	12	1	
Fabaceae	*Aspalathus linearis* (Burm.f.) R.Dahlgren	Roybos		2	10		*
Fabaceae	*Cassia acutifolia* Delile	Maychin list		1	10	1	*
Fabaceae	*Melilotus officinalis* (L.) Pall.	Komuniga	*	1	9	3	
Fabaceae	*Ononis spinosa* L.	Gramotran	*	1	2		*
Fabaceae	*Phaseolus vulgaris* L.	Fasul, bob		4	12	3	*
Fabaceae	*Robinia pseudoacacia* L.	Akatsiya, salkam, kalach		2	11	3	
Fabaceae	*Trigonella caerulea* (L.) Ser.	Sminduh, sminoduh, poy	*	1	9		*
Fabaceae	*Trigonella foenum-graecum* L.	Sminduh, sminoduh, poy	*	1	9		*
Fagaceae	*Castanea sativa* Mill.	Obiknoven kesten		3	12		*
Gentianaceae	*Centaurium erythraea* Rafn.	Cherven kantarion		1	11		*
Geraniaceae	*Geranium macrorrhizum* L.	Zdravets	*	1	10	1	

Geraniaceae	*Pelargonium roseum* Willd.	Indrishe, mandrishanka		2	10		
Geraniaceae	*Pelargonium zonale* (L.) L'Her.	Mushkato		2	10		
Ginkgoaceae	*Ginkgo biloba* L.	Ginko		2	10	2;3	
Grossulariaceae	*Ribes nigrum* L.	Kasis		4	12		*
Hippocastanaceae	*Aesculus hippocastanum* L.	Konski kesten	*	3	12	3	
Hypericceae	*Hypericum perforatum* L.	Zhalt kantarion, kalachevo, pozaritsa, kisikolu	*	1	9;11	1	
Juglandaceae	*Juglans regia* L.	Oreh	*	1	12		
Lamiaceae	*Agastache rugosa* Kuntze	Koreyska menta, agastache		2	10		*
Lamiaceae	*Clinopodium vulgare* L.	Koteshka stapka	*	1	9;11		
Lamiaceae	*Lavandula angustifolia* Mill.	Lavandula		2	9;11		
Lamiaceae	*Melissa officinalis* L.	Matochina, limonche	*	1	9;10	1	
Lamiaceae	*Mentha piperita* L.	Menta		4	9		
Lamiaceae	*Mentha spicata* L.	Dzhodzen, gyuzum, yuzum, chiriz, naane	*	1	9	2	
Lamiaceae	*Ocimum basilicum* L.	Bosilek		2	10		
Lamiaceae	*Origanum vulgare* L.	Rigan	*	1	9;11	1	
Lamiaceae	*Rosmarinus officinalis* L.	Rozmarin		2	9	1;2	
Lamiaceae	*Salvia hispanica* L.	Chiya		2	9		*
Lamiaceae	*Salvia officinalis* L.	Salviya		2	9;10	1;2	
Lamiaceae	*Salvia verticillata* L.	Salviya, kakula	*	1	9;10	1;2	
Lamiaceae	*Satureja hortensis* L.	Chubritsa, chubrika		2	9		
Lamiaceae	*Sideritis scardica* Griseb.	Mursalski chay	*	3	9;11		
Lamiaceae	*Teucrium chamaedrys* L.	Cherveno podabiche	*	1	9	3	
Lamiaceae	*Thymus sp. diversa*	Mashterka	*	1	9;11		
Lauraceae	*Cinnamomum zeylanicum* Blume	Kanela		2	6	2	
Lauraceae	*Laurus nobilis* L.	Dafinov list		2	10	2	
Linaceae	*Linum usitatissimum* L.	Len		1	9;11	1;2	*

Malvaceae	*Hibiscus sabdariffa* L.	Karkade		2	11			*
Malvaceae	*Malva sylvestris* L.	Slez, kambuleshnik, kambulesh, kamilyak	*	1	9;11			
Malvaceae	*Tilia tomentosa* Moench.	Lipa	*	1	11			
Moraceae	*Ficus carica* L.	Smokinya, taban	*	1	12;15	2		
Moraceae	*Maclura pomifera* (Raf.) C.K.Schneid.	Maklura		2	12	2		*
Moraceae	*Morus alba* L.	Byala chernitsa		2	12			*
Moraceae	*Morus nigra* L.	Cherna chernitsa		2	12			
Myristicaceae	*Myristica fragrans* Houtt.	Indiysko orehche		2	13	1		*
Myrtaceae	*Syzygium aromaticum* (L.) Merr. & L.M.Perry	Karamfil		2	11	2		
Oleaceae	*Jasminum polyanthum* Franch.	Zhasmin		2	11			*
Oleaceae	*Olea europaea* L.	Maslina		2	12;16	2		
Paeoniaceae	*Paeonia peregrina* Mill.	Bozhur	*	1	2;11	3		*
Papaveraceae	*Chelidonium majus* L.	Zmiysko mlyako	*	1	9;15	3		
Pedaliaceae	*Sesamum indicum* L.	Susam		2	13	2		*
Phytolacca	*Phytolacca americana* L.	Vinoboy		2	12	4		*
Pinaceae	*Pinus nigra* Arn.	Cheren bor		1	10			
Piperaceae	*Piper nigrum* L.	Cheren piper		2	13			*
Plantaginaceae	*Plantago lanceolata* L.	Tesnolit zhivovlek	*	1	10			
Plantaginaceae	*Plantago major* L.	Shirokolist zhivovlek	*	1	10			
Platanaceae	*Platanus hybrida* Brot.	Chinar, platan		2	10			*
Poaceae	*Cymbopogon sp. diversa*	Limonova treva		2	10	2		*
Poaceae	*Cynodon dactylon* (L.) Pers.	Troskot, trosak		1	3			
Poaceae	*Oryza sativa* L.	Oriz		4	13			*
Poaceae	*Zea mays* L.	Tsarevitsa, mamul		4	11;13			
Polygonaceae	*Fagopyrum sp. diversa*	Elda		4	13	2		*
Polygonaceae	*Polygonum aviculare* L.	Pacha treva	*	1	9			*

Portulacaceae	*Portulaca oleracea* L.	Tuchenitsa, palzyasht shtir, svinski shtir	*	1	9		*
Primulaceae	*Cyclamen coum* Mill.	Tsiklama, boturche	*	1	5	3	*
Punicaceae	*Punica granatum* L.	Nar		2	12	2	
Ranunculaceae	*Helleborus odorus* Waldst. & Kit. ex Willd.	Kukuryak	*	3	2	4	
Ranunculaceae	*Nigella arvensis* L.	Chelebitka, cheren kimion	*	1	13		*
Rhamnaceae	*Paliurus spina-christi* Mill.	Draka	*	1	12		*
Rosaceae	*Agrimonia eupatoria* L.	Kamshik	*	1	9	1;2	
Rosaceae	*Aronia melanocarpa* Elliot.	Aroniya		2	12		*
Rosaceae	*Amygdalus communis* L.	Badem		2	12		*
Rosaceae	*Crataegus pentagina* Waldst. & Kit. ex Willd.	Cheren glog	*	1	12		*
Rosaceae	*Crataegus monogyna* Jacq.	Cherven glog	*	1	12	1;2	
Rosaceae	*Cydonia oblonga* Mill.	Dyulya		4	12;13		
Rosaceae	*Fragaria vesca* L.	Diva yagoda	*	1	10		*
Rosaceae	*Malus domesica* Borkh.	Yabalka		4	12;13		*
Rosaceae	*Malus sylvestris* (L.) Mill.	Diva yabalka	*	1	12;13		*
Rosaceae	*Mespilus germanica* L.	Mushmula		1	12		
Rosaceae	*Potentilla reptans* L.	Ochibolets	*	1	10;11		
Rosaceae	*Prunus armeniaca* L.	Kaysiya		4	12		*
Rosaceae	*Prunus avium* (L.) L.	Cheresha		4	12		*
Rosaceae	*Prunus cerasus* L.	Vishna		4	12		*
Rosaceae	*Prunus spinosa* L.	Tranka, trankoslivka, kucheshka sliva	*	1	12		
Rosaceae	*Rosa canina* L.	Shtipka, shtipni dupe		1	12		
Rosaceae	*Rosa damascena* Mill.	Kazanlashka roza		4	11		
Rosaceae	*Rubus idaeus* L.	Malina		4	12		
Rosaceae	*Rubus sp. diversa*	Kapina		1	10;12		
Rosaceae	*Sorbus domestica* L.	Skorusha	*	1	12		*
Rubiaceae	*Galium aparine* L.	Lepka	*	1	9		*

Rubiaceae	*Galium verum* L.	Enyovche	*	1	9		
Rubiaceae	*Rubia tinctorum* L.	Brosh	*	1	9	1	*
Rutaceae	*Citrus limon* (L.) Osbeck	Limon		2	12		
Salicaceae	*Salix babylonica* L.	Placheshta varba		2	8		*
Santalaceae	*Viscum album* L.	Byal imel	*	1	9	4	
Sapindaceae	*Acer platanoides* L.	Shestil	*	1	10		*
Sapindaceae	*Acer pseudolplatanus* L.	Yavor		1	10		*
Scrophulariaceae	*Verbascum densiflorum* Bertol.	Lopen	*	1	11	1	
Scrophulariaceae	*Verbascum sp. diversa*	Lopen		1	11	1	*
Solanaceae	*Lycium barbarum* L.	Zhiv plet, merdzhan		2	8;12	1	*
Solanaceae	*Atropa belladonna* L.	Ludo bile	*	3	10	4	*
Solanaceae	*Physalis peruviana* L.	Fizalis, mehunka		2	12	3	*
Solanaceae	*Nicotiana tabacum* L.	Tyutyun		4	10	2;4	*
Solanaceae	*Lycopersicon esculentum* Mill.	Domat		4	12	2	*
Solanaceae	*Solanum tuberosum* L.	Kartof		4	5	2;3	
Theaceae	*Camellia sinensis* (L.) Kuntze.	Zelen chay		2	9	1	
Urticaceae	*Urtica dioica* L.	Kopriva		1	9	2	
Vitaceae	*Vitis vinifera* L.	Loza		1	10;15		
Violaceae	*Viola tricolor* L.	Temenuga	*	1	11	1	
Zingiberaceae	*Zingiber officinale* Roscoe.	Dzhindzhifil		2	5	2	
Zingiberaceae	*Curcuma longa* L.	Kurkuma		2	5	2	
Zygophyllaceae	*Tribulus terrestris* L.	Babini zubi	*	1	9	3	

Legend:

MPA: The Medicinal Plants Act of the Republic of Bulgaria, with asterisk are marked species which listed in the Appendix to MPA

Origin: 1 - A plant of the indigenous flora; 2 - A plant of the flora of Bulgaria; 3 - A plant foreign for Bulgaria; 4 - A cultivated plant

Usable part: 1 - whole plant; 2 - root; 3 - rhizome; 4 - bulb; 5 - tubers; 6 - crust; 7 - wood; 8 - twig; 9 - stalk; 10 - leaves; 11 - flower; 12 - fruit; 13 - seed; 14 - resin; 15 - juice; 16 – oil

Poisoning: 1 - poisoning at a higher dose; 2 - causes contact dermatitis; 3 - poisonous; 4 - very poisonous

NEW: medicinal plants which are not mentioned by the researchers of the ethnobotanical studies which we found

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