MEDICAL UNIVERSITY
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ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS IN THE REGION OF THE NORTH BLACK SEA COAST

ABSTRACT

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Varna, 2021

The dissertation is written on 177 pages, illustrated with 68 figures, 14 tables and contains 8 appendices. The literature includes 354 titles (172 in Cyrillic and 182 in Latin), 12 legislative documents (7 in Cyrillic and 5 in Latin) and 16 websites (14 in Cyrillic and 2 in Latin).

The public defense of the dissertation will take place on 08.10.2021 from 11.00 am, through the electronic platform of MU - Varna. The defense materials are available at the Dean's Office of the Faculty of Pharmacy, 84 Tsar Osvoboditel Blvd., Varna.

Content

List of abbreviations used
MP - medicinal plants
VM - veterinary medicine
NBSC - Northern Black Sea Coast
NSI - National Statistical Institute
PF and BG - pet food and bee grazing

I. Introduction

Globally, due to the trend of globalization, traditional knowledge, including that of medicinal plants, is declining and some of it is irretrievably lost. The use of synthetic and artificial products is increasing, as is the use of foreign plant species, which are replacing traditionally used plants (Koleva et at., 2015). This determines the relevance and importance of conducting ethnobotanical research in order to study store and update this knowledge. The current state of traditional knowledge in Bulgaria is the subject of scientific interest of researchers from various scientific fields.

Bulgaria is rich in natural plant resources, with 4102 species of higher plants described on its territory (Asyov et al., 2012). The total number of medicinal plants in Bulgaria is 842 species, belonging to 444 genera and 118 families. Despite the presence of such a great wealth of medicinal plants, the region of the North Black Sea coast is unexplored in ethnobotanical terms.

The aim of the present work is to make an ethnobotanical study on the use of medicinal plants for prevention, treatment and in

the life of the locals from the Northern Black Sea coast of Bulgaria. To achieve it, the following tasks were set:

1. To study the knowledge of the locals in the North Black Sea coast regarding the application of medicinal plants: in human and veterinary medicine, in cosmetics, for culinary purposes, for pet food and bee grazing, for decorative purposes, for household purposes , for sale, for weather forecasting, in folk traditions and customs.

2. To study the popular names used by the local population, as well as interesting or little-known practices in the use of medicinal plants.

3. To compare the number of used medicinal plants and their possible applications with the data for other regions in Bulgaria.

4. To establish the connection between the demographic indicators and the knowledge about the use of the medicinal plants by the locals.

5. To establish the quantitative ethnobotanical indicators of the obtained results.

II. Material and methods

1. Time and place

The study was conducted on the territory of the Bulgarian Nothern Black Sea Coast (Fig. 1) in the period 2014 - 2021.

Locals from 32 settlements were interviewed, of which 8 towns and 24 villages located in the NBSC

> **Towns**: Varna, Beloslav, Kavarna, Shabla, Aksakovo, Byala, Balchik, and Obzor.
> **Villages**: Bozhurets, Balgarevo, Vaklino, Gorun, Durankulak, Ezerets, Kamen Bryag, Kichevo, Krapets, Kumanovo, Poruchik Chunchevo, Sveti Nikola, Topola, Tyulenovo, Hadji Dimitar, Ezerovo, Kazashko, Osenovo, Blizanci, Kranevo, Kamenor , Goritsa, Topoli.
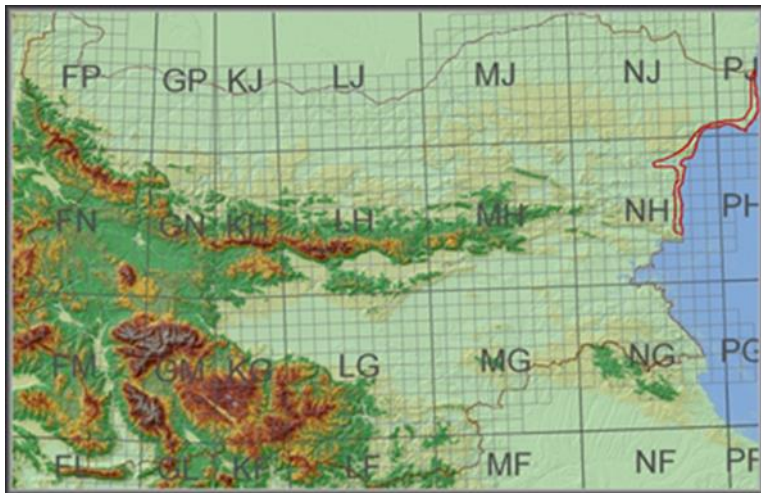

Fig. 1. Geographical location of the studied area

(The boundaries of the area are marked with a red outline)

2. Methods for collecting and processing primary information

To achieve the research goal and to solve the formulated tasks, the following methods are applied:

2.1. Documentary method

It was used in the analysis of the literature sources, the normative documents, as well as in the analysis of the results obtained during the survey.

The data from the last census of the NSI (https://www.nsi.bg/) were used for the demographic indicators, as well as the official websites of the municipalities: Aksakovo, Balchik, Beloslav, Byala, Varna, Kavarna, Nessebar and Shabla.

To determine the MP species different sources were used: "Determinant of plants in Bulgaria" (Delipavlov et al., 2011), "Flora of the Republic of Bulgaria" (items I-IX, 1963-1989) and "Flora of the Republic of Bulgaria" (items .X – XI, 1995-2013). The names of the taxa are adopted according to the International Plant Names Index. The list of families is structured according to APG IV (Angiosperm Phylogeny Group, 2016).

To identify the origin of the species, the "Summary of the higher flora in Bulgaria" was used (Asyov et al., 2012). The determination of the cultural types of MP is according to Kitanov (1986). Species considered as cultivated plants, which are intentionally introduced and grown for: medicinal and culinary purposes, ornamental, afforestation, timber production or other economic interests.

The conservation status is presented using the following documents: Annexes II and V to Council Directive 92/43 / EEC on the conservation of natural habitats and of wild fauna and flora, Annex I of the Convention on the Conservation of European Wildlife, Fauna and Natural Habitats (Bern

Convention), Annex II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Red Data Book of the Republic of Bulgaria, Vol. 1. Plants and fungi (Peev et al., 2011), IUCN Red list for Bulgaria (Petrova & Vladimirov, 2009), Annexes III and IV to the Biodiversity Act (2002).

2.2. Sociological method

The sociological survey method was applied for registration of the primary information. It was used to collect and analyze data on the use of medicinal plants by locals in selected settlements.

709 local residents from different settlements in the NBSC participated in the survey. The face-to-face interview technique is also used in other ethnobotanical studies (Koleva et al., 2015; Cherneva, 2017; Zahariev & Radeva, 2020). The survey was conducted only with local residents at random. It does not include seasonal workers, tourists and temporary residents. Most often the interviews are conducted outdoors: in the square (for the villages), in front of the house or in the yard of the house. Samples of plants were provided by the respondents or collected from locations in the wild, indicated according to their instructions. The field ethnobotanical research was conducted through a specially created questionnaire on paper. It included the following information:

➢ General information: location, date of the survey.
➢ Personal data of the respondent: names, ethnicity, age, gender, education, employment.
➢ Information about the used medicinal plants.
➢ Application of medicinal plants (10 different applications are included): 1. Human medicine; 2. Veterinary medicine; 3. Cosmetic purposes; 4. Culinary purposes ; 5. Pet food and bee grazing; 6. Decorative

purposes; 7. Household purposes; 8. Sale; 9. Weather forecasting; 10. In folk traditions and customs.

2.3. Statistical methods

They are used to reveal the nature, dependencies and tendencies of the observed phenomena and to interpret the obtained results (Arkadiev, 1999; Cholakov, 2002; Radilov et al., 2010). The following methods are applied:

➢ Non-parametric analyzes

They are used to test hypotheses in abnormally distributed quantitative and qualitative quantities. For this purpose are selected:

- χ2 to check the conformity of the empirical frequency distribution with a given theoretical model. Calculated by the formula:

$$\chi^2 = \sum_{i=1}^{n} \frac{(x_i - t_i)^2}{t_i}$$

where χ is the empirical frequency and t is the theoretical frequency.

- Pearson's criterion for comparing empirical and theoretical distributions and multiple tables.

The Pearson coefficient (r) at interval scales was used to measure the bond strength.

The significance level (α) of the null hypothesis is P <0.05 with a 95% confidence interval. The main measure of the strength of the dependence is the correlation coefficient (r). The verification of the statistical significance of the correlation coefficient is performed by the Significance threshold. When it is less than α (the risk of error is 0.05), then the calculated

correlation coefficient can be accepted as a reliable estimate and considered statistically significant. Its value is interpreted on a standard scale.

2.4. Quantitative indices for ethnopharmacological and ethnobotanical research

Several indices have been used in the analysis of the large amount of information (Hoffman & Gallaher, 2007; Heinrich et al., 2009):

> ➢ Analysis of quantitative data that introduce the level of homogeneity of the information presented by different Fic informants (IAR), using the coefficient of consensus of the respondents. Calculated by the formula:

$$F_{IC} = \frac{n.UR - n.taxa}{nUR - 1},$$

where n is the number of respondents, UR are the answers for the use of a medicinal plant.

A high value (close to 1) indicates that relatively few taxa (more common species) are used by most informants, while a low value indicates that informants use different taxa within a particular MP application. Therefore, if informants use few taxa, then a high degree of consensus is reached and thus the traditional use of MP is considered well defined. (Faruque et al., 2019).

> ➢ The fidelity level index (FL) indicates the choice of respondents for a potential plant that treats a disease or is used for a specific use (Tsioutsiou et al., 2019). It is calculated by the following formula:

$$FL\,(\%) = \frac{Np}{N} \cdot 100,$$

where Np is the number of responses for use for a particular plant species in a given category of application, and N is the total number of respondents who indicated the plant for any use. FL quantifies the significance of a species for a given purpose.

➢ Importance Value Index (IVs)

$$IV_s = \frac{n_{is}}{n},$$

where n_{is} is the number of respondents who use medicinal plants, n is the total number of respondents. This index measures the share of respondents who consider a species to be the most important. Values range from 0 to 1 (Hoffman & Gallaher, 2007).

3. Research hypotheses

At the beginning of our study we formulated the following working hypotheses:

➢ The local population of the NBSC has ethnobotanical knowledge about the use of medicinal plants for therapy and prevention in human medicine, as well as knowledge about other applications of medicinal plants.

➢ Older people (retirees) as well as the unemployed use MP more often because they have more free time.

➢ Ethnobotanical knowledge about medicinal plants decreases with each succeeding generation.

> Older people have more knowledge about the application of medicinal plants in folk traditions and customs.

4. Research support

III. Results and discussion

1. Application of medicinal plants in human medicine

Of the 709 locals surveyed, 678 (95.63%) answered that they use medicinal plants in human medicine. Only 31 people (4.37%) do not use MP in human medicine. In this case, the importance value index is very high (IVs = 0.95).

For treatment and prevention in human medicine in the study area we found that 205 species of medicinal plants from 165 genera and 71 families are used. Of these, 88 species from 77 genera and 41 families are included in the Medicinal Plants Act of the Republic of Bulgaria. The other species are listed as medicinal in the specialized literature on MP, published in Bulgaria.

The locals use 101 species of MP from 86 genera and 45 families, which are naturally distributed in the NBSC. This is only 17.71% of the species composition of medicinal plants in the region. This fact shows a low level of knowledge among local people about the possibilities of using MP in human medicine. With regard to habitats, we found almost complete lack of use of MP, typical of coastal sands (psamophytes).

For treatment and prevention in human medicine, locals use 6 species of MP with conservation status.

The distribution of the used MP according to their origin is as follows: 101 species are distributed in the floristic subregion of the Bulgarian NBSC, 8 species are from other floristic regions of Bulgaria, 23 species are foreign to Bulgaria, 70 species are grown as cultivated plants and 3 species are adventive (Fig. 2).

The obtained results show that the most preferred is the use of MP (wild or cultivated), which can be found in the area where the respondents live.
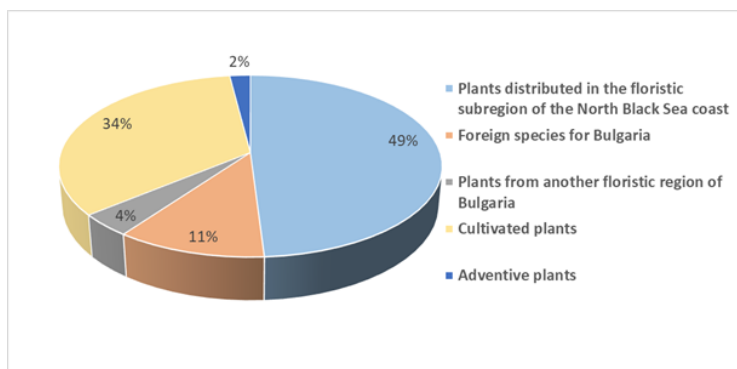
Fig. 2. Distribution of the used medicinal plants in human medicine according to their origin

For the most part, the respondents have personal experience in the treatment with herbs and have ethnobotanical knowledge, being inherited from older members of the family or obtained as a result of their search for information on the use of MP.

Among the used medicinal plants with the most genera are the families Asteraceae, Rosaceae, Lamiaceae, Apiaceae and Fabaceae. These include the most commonly used MP by the local population, such as: *Achillea millefolium* L., *Anethum graveolens* L., *Matricaria chamomilla L.*, *Mentha sp.* diversa,

Origanum vulgare L., *Thymus sp*., *Rosa canina* L., *Crataegus monogyna* Jacq., *Taraxacum officinale* F.H.Wigg. and others. They coincide with the species mentioned by other authors as the most used in the interior of the country (Kozuharova et al., 2013; Kultur & Sami, 2009; Dragoeva et al., 2015). Some of them such as: *Sambucus nigra* L., *Hypericum perforatum* L., *Tymus sp*., *Tilia tomentosa* Moench. and *Rosa canina* L. are also mostly used by the local population along the Turkish Black Sea coast (Yesilyurt et al., 2017).

When comparing the results of the present study with other regions of Bulgaria, the significantly larger number of plants indicated by us for use in human medicine is impressive. This is due to some regional differences of the local population in the knowledge about the use of medicinal plants, and it should be taken into account that this study for the first time makes such an extensive ethnobotanical study in the area of the NBSC.

The data show that there is a stability of the information flow, which has been transmitted and preserved over the years. The thesis proved that there is continuity in the people's knowledge about the application of MP. The use of different types of MP, for which we received information in the present study, testifies to the development and renewal of knowledge about medicinal plants.

An interesting fact in processing the results of the present work is the use of typical spice plants used for medicinal purposes, which are not described for use in human medicine in other studies in Bulgaria, such plants are: *Allium ursinum* L., *Nectaroscordum siculum* subsp . *bulgaricum* (Janka) Stearn. and *Trigonella caerulea* (L.) Ser.

In the present study, 98 species have been identified that are new to Bulgaria in ethnobotanical terms, used by the local

population for treatment and prevention. Most of them are part of the flora of Bulgaria (45 species): *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., *Viscum album* L., *Verbascum densiflorum* Bertol., *Tribulus terestris* L. and others. The rest are foreign to Bulgaria or are grown as cultivated (53 species): *Coriandrum sativum* L., *Helianthus tuberosus* L., *Tagetes patula* L., *Pelargonium roseum* Willd., *Lavandula angustifilia* Mill., *Lycium barbarum* L., *Rosmarinus officinalis* L., *Lycopersicon esculentum* Mill. and others.

Two of the types of medicinal plants mentioned by the respondents, which are part of the natural flora of Bulgaria, have so far not been described not only in publications for ethnobotanical research in Bulgaria, but also in the literature on medicinal plants in Bulgaria. These are: *Artemisia pedemontana* Balb. and *Ornithogalum umbellatum* L.

1.1. According to the size of the settlement

The use of MP in human medicine among the locals of the Bulgarian Northern Black Sea coast does not depend on the size of the settlement. From the inhabitants of the towns 515 people (95.72%) answered that they use MP in human medicine, and from the inhabitants of the villages - 163 people (95.32%). After analyzing the results obtained, we found that the inhabitants of the towns use a larger number of medicinal plants - 167 species than the inhabitants of the villages - 125 species.

 The higher number of medicinal plants used by the inhabitants of the towns, compared to the villages, is due on the one hand to the higher percentage of surveyed inhabitants of the towns (75.88%) than in the villages (24.12%). On the other hand,

people in larger settlements use foreign species of MP such as: *Panax quinquefolius* L., *Chenopodium quinoa* Willd., *Callisia fragrans* Delile., *Aspalathus linearis* (Burm.f.) R.Dahlgren. etc., which are not indicated by the inhabitants of the villages. This dependence is due to the more frequent use of modern, alternative methods of treatment by urban residents. On the other hand in many towns such as: Balchik, Kavarna, Aksakovo and other, the local population grows in their yards foreign to Bulgaria MP such as: *Diospyros kaki* L., *Salvia officinalis* L., *Cymbopogon* sp. Naturally distributed MP in the floristic subregion of the NBSC, which are indicated only by the urban population, are: *Foeniculum vulgare* Mill., *Eryngium campestre* L., *Ornithogalum umbellatum* L., *Berberis vulgaris* L., *Corylus avellana* L., *Capsella bursa-pastoris* (L.) Medic. and others.

The average number of MP used by the locals of the NBSC is 6.49 species per person. The number of used MP in the towns in all cases exceeds that in the villages.

1.1. According to ethnicity

The ethnic composition of the respondents is rich and includes all ethnic groups that participated in the survey. The largest share of Tatars - 100% of respondents use MP in human medicine, followed by Bulgarians (96.18%), Roma (94.59%), Turks (91.30%), Armenians (88.89%)) and Copanari (77.78%). The number of used MP according to the ethnicity of the respondents is presented in Fig. 3. Regardless of ethnicity, most respondents use between 1 and 5 species of MP. Exceptions are respondents of Armenian origin, most of whom use 6 to 10 species of MP in human medicine.
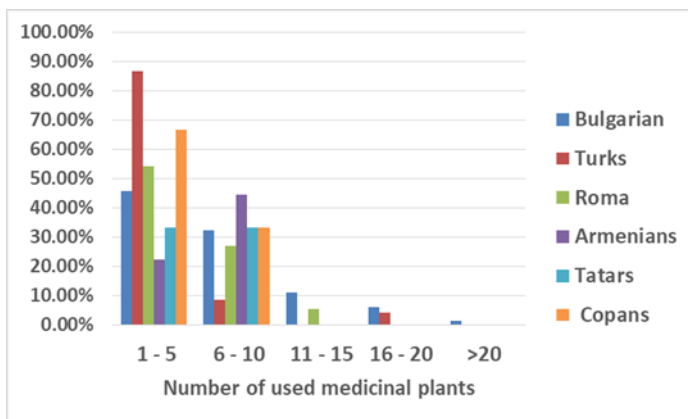
Fig.3. Number of medicinal plants used in human medicine
according to the ethnicity of the respondents

The local population uses the same types of medicinal plants, regardless of ethnicity. This means that different ethnic groups have equally good knowledge of the distribution and healing properties of plants. On the other hand, this means that ethnic groups are not isolated and exchange information with each other. This is evidenced by the fact that we did not receive information about treatment with herbs that are used only by a certain ethnic group.

1.2. According to age

As a result of the survey, we found that all age groups use MP in human medicine. The share of respondents who do not use MP is below 5% in all age groups. The use of between 1 and 5 species of medicinal plants in all age groups predominates (Fig. 4).
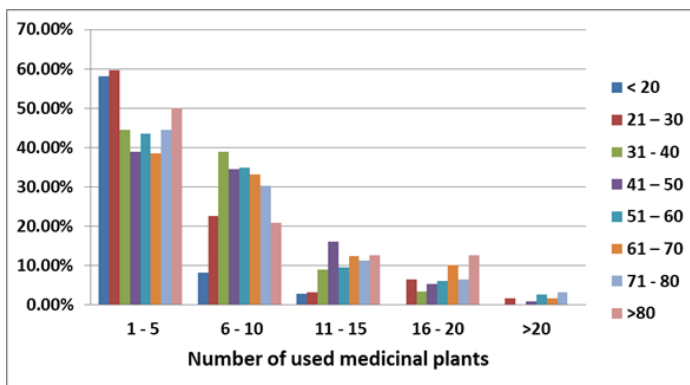
Fig. 4. Number of medicinal plants used in human medicine
according to the age of the respondents

The use of more MP (over 6 species) is better represented in the age groups over 30 years. This connection is due to the greater use of medicinal plants by older respondents because they had a longer time to gather knowledge about MP. On the other hand, collecting herbs from nature is cheaper than buying pharmaceuticals.

Correlation analysis showed a weak positive relationship (r = 0.18) between the number of MP used in human medicine and the age of the respondents. The results are statistically significant (P = 0.005). Similar results have been reported for the wetland population of the NBSC (Cherneva et al., 2017), as well as for the interior of the country (Kozuharova et al., 2013).

1.3. According to gender

Almost all respondents use MP in human medicine - 95.80% of women and 94.26% of men. The higher number of species of medicinal plants used by women compared to that of men is impressive, except for the respondents using a small number of species (from 1 to 5) (Fig. 5). This is due to the fact that

women traditionally take care of the upbringing and health of the children in the family.
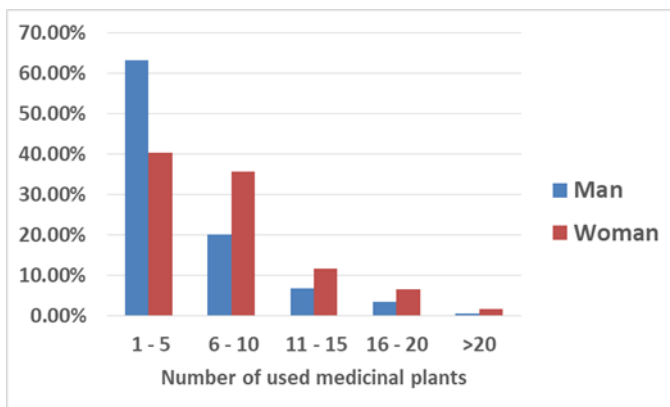
Fig. 5. Number of medicinal plants used in human medicine according to the gender of the respondents

The expected results were that the relationship between gender and the number of medicinal plants used would be significant. The weak correlation is due to the fact that the predominant part of the respondents use a small number of medicinal plants - from 1 to 5 species, regardless of gender. Similar results were reported by Cherneva (2017) for the wetlands of the NBSC and Kozhuharova (2013) for the interior of the country.

1.4. According to education

A very high percentage of respondents from each group in terms of education use MP in human medicine. The results showed that 92.86% of locals without education use MP; 92.31% of the residents with primary school education; 95.54% of the respondents with middle school education; 95.56% of the respondents with secondary education and

95.04% of the locals with higher education use MP in human medicine. The analysis of the results confirms our hypothesis that people with higher education use more MP in human medicine.

People with higher education are more likely to use more types of medicinal plants. This result is explained by the fact that higher educated people appreciate and more often look for an environmentally friendly lifestyle and more often apply herbs for the treatment and prevention of certain diseases. The weak connection means that the knowledge about MP is most likely not acquired in the process of receiving education, but is due to family traditions. For comparison, Cherneva (2017) points to close to the current results of the stable positive attitude towards the use of MP in the wetland area of the NBSC. Similar results were reported by Kozhuharova (2013) for the interior of the country.

1.5. According to employment

The distribution of local residents who use MP in human medicine according to their employment is as follows: 80.37% of the surveyed students use MP; 96.23% of the employees; 85.29% of the unemployed and 95.31% of retirees use MP for therapy and prevention of health problems. The working hypothesis that older people (retirees) as well as the unemployed use more MP has not been confirmed for the use of MP in human medicine. After analyzing the results, we found that the largest number of MP are used by working respondents. A probable reason for this result is the fact that these are active people who raise children and use herbs for the treatment and prevention of their family members.

The performed correlation analysis between the ratio of the number of used medicinal plants and the demographic

indicators of the surveyed residents, we found that there is a weak relationship on all indicators (Table 1.)

Table. 1. Correlation between the number of medicinal plants used and the demographic indicators of the respondents

	Value of the correlation coefficient (r)	Significance level P (α ≤0,05)	Interpretation of the power of dependence
Size of settlement	0,07	0,02	weak
Ethnos	-0,1	0,04	weak
Age	0,18	0,01	weak
Gender	0,18	0,01	weak
Education	0,19	0,03	weak
Employment	0,19	0,09	weak

1.6. Comparison of the frequency of use of medicinal plants

A total of 4604 responses were received, as one respondent typically used several MP. Various questions were asked during the survey.

The question "**How often do you use medicinal plants?**" was answered, which shows that the most frequent use of medicinal plants is during a certain season (50.74%) and this is winter. This fact shows that a significant part of the respondents do not use herbs often. The use of medicinal plants for prophylactic purposes is relatively small - daily (13.1%)

and weekly (5.91%). Most often, people from villages and the elderly use herbs daily or weekly (Fig. 6). The use of medicinal plants "less often" (17.96%) is associated with a specific incident condition such as: insect bites, washing and treatment of wounds and others. This speaks of the wide application of MP in emergencies, which is determined by the weak economic development and the remoteness of small settlements from medical institutions. The people who do not use MP are 31 people (4.37% of all respondents).
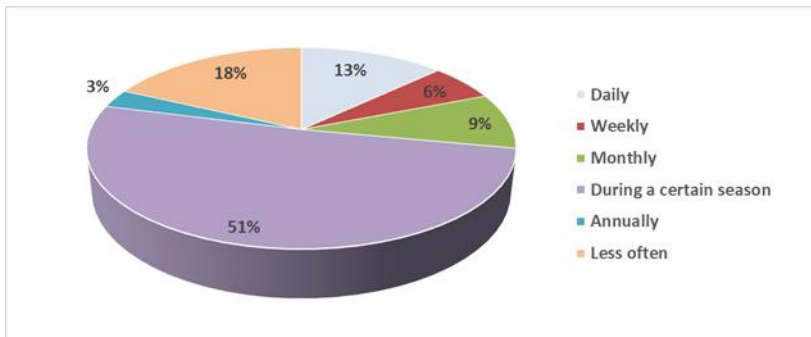
Fig. 6. Frequency of use of medicinal plants in human medicine

In other similar studies (Dragoeva et al., 2015; Cherneva, 2017) it is reported that most responses were obtained for year-round use of MP (53.91% and 48.65%, respectively) and, if necessary, 33, 48% and 44.86%). Cherneva (2017) reported that 9.19% of respondents use medicinal plants seasonally. These results differ significantly from the current ones, which is probably due to the larger number of possible answers, as well as the larger number of respondents in the present work.

To the question "**Where do you get medicinal plants from?**" the respondents answered that the predominant part of MP is collected from nature (54.17%) (Fig. 7). This is an

example of the preserved connection of local people with nature. On the other hand, this fact indicates a poorly developed economy. If people are busy, they will find it harder to take the time to collect herbs themselves, dry them, store them and prepare medicine from them.

Cultivated MP have a significant share (16.16%). This is due to the practicality of people - so medicinal plants are easily accessible and are always "available". Another benefit of cultivation is that it preserves the natural populations of medicinal plants. Unfortunately, this is not a motive in the cultivation of medicinal plants.

During the surveys we found that medicinal plants are collected more often by the villagers, mostly women. Town dwellers as well as younger people prefer to buy herbs (19.52% of the answers) or finished products (10.13% of the answers).
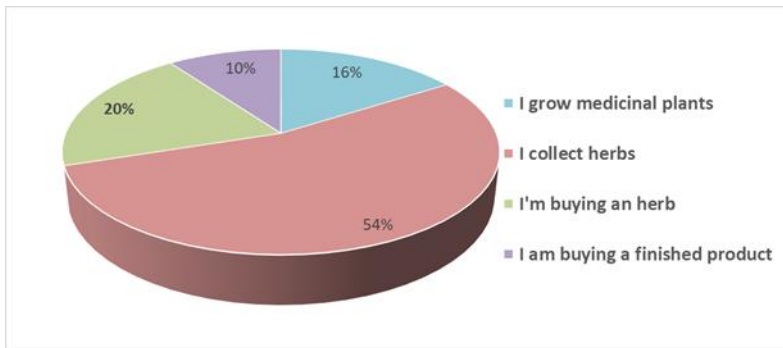

Fig. 7. Sources for obtaining medicinal plants used in human medicine

The results obtained are similar to other surveys conducted in the interior of the country. Ploetz (2000) reported that 72.1% of respondents collect MP from nature, 25.6% grow it, and 14.4%

buy it. Different results have been obtained for the wetlands of the Bulgarian Red Cross (Cherneva, 2017): 68.11% of the respondents buy herbs, 49.19% collect from nature and 24.86% grow medicinal plants. The reasons for the differences between these surveys are probably due to the different number of respondents and the different ratio between the respondents from different age groups.

The answers to the question **"On whose recommendation do you use the medicinal plant?"** Show that the knowledge obtained from older relatives (35.12%) is important (Fig. 8). This speaks of intergenerational continuity with regard to traditional medicine. Most of the respondents answered that they use MP at their own discretion (35.10%). This answer indicates whether the respondents remember the source of information about the use of a particular type of medicinal plant. We find that a significant number of them do not remember what the source of information is.

An interesting fact is, for example, that according to the respondents, doctors rarely recommend medicinal plants. The media (newspapers, television and the internet) and even medicinal plant books also make surprisingly small contributions. At the same time, in other areas, product advertising determines demand - for example in the food industry and in cosmetics, and they also contain many plants.

The use of books as a source of information about MP is more common among people with higher education, as well as from urban residents.
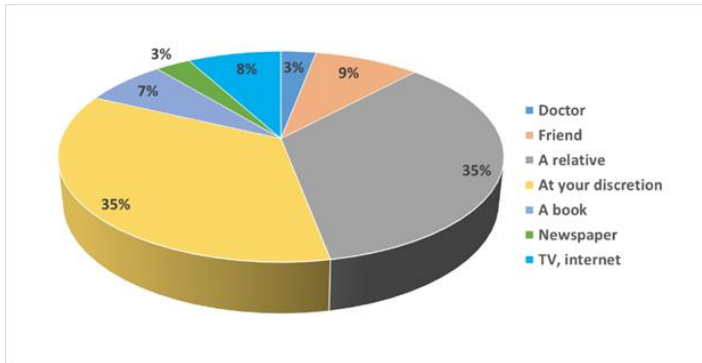
Fig. 8. Sources of information on the use of medicinal plants in human medicine

To the question **"Is there a substitute for the medicinal plant**?" Almost all respondents (90.03%) answered that herbs have no substitute. This shows that people rely on them and would not replace them with other treatments (Fig. 9). On the other hand, the low percentage (1.76%) of answers to the question "**Does the herb have a natural substitute?"** means that people do not have in-depth knowledge and can not replace MP of one species with another. Most often, the replacement of an herb with an artificial or synthetic product is done by younger people and city dwellers.

From the study we found that the most commonly used medicinal plants in human medicine by the local population are: *Tilia tomentosa* Moench., *Matricaria chamomilla* L., *Tymus sp*., *Cotinus coggygria Mentha x piperita* Scop., *Hypericum perforatum* L., *Rosa canina* L., *Sambucus nigra L., Crataegus monogyna Jacq., Achillea millefolium L.*
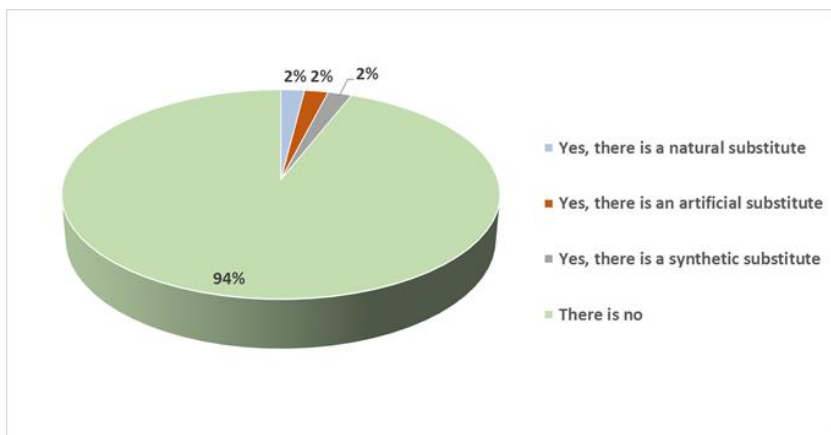
Fig. 9. Substitutes of medicinal plants used in human medicine

1.7. Quantitative ethnobotanical analysis

According to the respondent's consensus ratio, the largest number of plants are used to treat respiratory diseases (Fic = 0.98) (Table 2). These are most often seasonal, flu-like illnesses with a characteristic seasonal application of MP. Followed by cardiovascular disease (Fic = 0.97) and skin disease (Fic = 0.96).

One of the reasons for the high number of MP for the treatment of skin diseases is the fact that this group of diseases includes wounds and inflammations, insect bites, burns, warts and other skin formations. A smaller number of plants, compared to the previous groups of diseases, we report in the treatment of urogenital, nervous and metabolic diseases. The number of MP for the treatment of musculoskeletal diseases is the lowest. For comparison, in an ethnobotanical study for the region of Central Macedonia, Greece (Tsioutsiou et al., 2019) similar results were obtained. Others, close to our results, were

published in an ethnobotanical study for the region of Southern Kosovo (Hajdari et al., 2018), where the answers of the

Table. 2. Respondent's consensus ratio

Groups of diseases	Answer (UR)	Taxon	F_{IC}
Respiratory	2231	25	0,98
Cardiovascular	508	11	0,97
Dermatological	597	18	0,96
Gastrointestinal	340	21	0,93
Urogenital	183	19	0,89
Metabolic	119	17	0,85
Nervous	112	20	0,82
Musculoskeletal	21	10	0,52

locals from 6 settlements obtained high values of consensus coefficient for skin (Fic = 0, 88), gastrointestinal (Fic = 0.74) and cardiovascular (Fic = 0.71) diseases.

2. Application of medicinal plants in veterinary medicine

Of the 709 local residents surveyed by the Bulgarian NBSC, 94 people (13.26%) answered that they use medicinal plants in veterinary medicine. The remaining 615 people (86.74%) do not use medicinal plants to treat animals. We report a relatively low index of importance value (IVs = 0.13).

For treatment and prevention in veterinary medicine in the study area are used 45 types of MP from 41 genera and 28 families. As in human medicine, so here MP of the local flora are represented by the largest number - 29 species. This represents 4.89% of the total number of medicinal plants in the

floristic subregion of the North Black Sea coast. Examples are: *Cotinus coggygria, Matricaria chamomilla, Plantago major* L., *Taraxacum officinale, Juglans regia* L. and others.

Of the medicinal **plants foreign to the Bulgarian flora**, only 1 species is used - *Melaleuca alternifolia* (Maiden & Betche) Cheel.

Medicinal plants, distributed in **other floristic regions of Bulgaria** - 1 species: *Helleborus odorus* Waldst. & Kit. ex Willd.

Of the **cultivated plants**, 14 species are used - *Aesculus hippocastanum* L., *Allium cepa* L., *Allium sativum* L., *Petroselinum crispum* (Mill.) A.W.Hill., *Helianthus annuus* Thel., *Cucurbita moschata* Duchesne ex Poir., *Cucurbita sp., Cydonia oblonga* Mill., *Secale cereale* L., *Triticum sp., Aloe vera* (L.)Burm. f., *Pelargonium roseum* Ehrh., *Calendula officinalis L., Salix babylonica* L., *Zea mays* L. и *Nicotiana tabacum* L.

Ethnobotanical research from other regions of Europe reports results close to ours. For example, the local population in Transylvania, Romania uses 26 species of medicinal plants to treat animals, 18 species of which are wild and 8 species of cultivated plants (Bartha et al., 2015). An ethno-veterinary study in South-Eastern Italy identified 31 species (Pieroni et al., 2004), and in the region of South-Western Spain (Viegi et al., 2001), 33 species of medicinal plants were used for veterinary use.

The lower use of medicinal plants in veterinary medicine compared to human medicine is determined by the relatively small number of people (94 people) who keep animals. Also important is the fact that locals prefer to use ready-made pharmaceuticals to treat their animals.

Respondents who answered that they use medicinal plants in veterinary medicine are mostly residents of smaller settlements that keep farm animals. People who keep pets (dogs, cats, etc.) are mostly urban dwellers and rarely use medicinal plants to treat them. They prefer to use ready-made chemicals to treat their animals.

The knowledge about the use of medicinal plants in veterinary medicine people have acquired from their older relatives. There are no disadvantages for the medicinal plants used. Locals do not comment on the reason for this: whether because the animals tolerate them well or because people do not care what the animal feels.

Two practicing veterinarians participated in the survey, one from the town of Shabla and one from the town of Obzor. Both state that they use medicinal plants in their veterinary practice. In addition to treating internal diseases, medicinal plants are used as a repellent against external parasites in various farm animals or are used to treat the premises in which the animals are kept. Such plants are: *Artemisia sp. and Sambucus nigra.* This application has been reported by older residents of small settlements who keep farm animals. The use of *Melaleuca alternifolia* Cheel. is indicated by residents of Varna who use tea tree oil as a repellent against ectoparasites in dogs and cats. Another interesting application is mentioned by a resident of the village of Topoli, who describes the use of *Pelargonium roseum* as an antipyretic in sheep with high fever.

Regarding the use of MP for the treatment of different groups of animals, most species of MP are used for the treatment of cattle - 26 species, followed by pigs - 25 species, goats and sheep - 24 species, horses and donkeys - 23 species , dogs and cats - 19 species, birds - 11 species and rabbits - 10 species. Most often, the same type of medicinal plant is used in

different groups of animals, which means that the locals from the NBSC are well acquainted with the healing properties of herbs. Such plants are: elderberry, tetra, chamomile, onion, nettle and others. The most common diseases of animals in which MP is used are: colds; lactation-related conditions in cattle, goats and sheep; wounds and skin diseases; against internal and external parasites in different groups of animals.

From the study of the application of MP in VM in the area of the NBSC, we found that all MP indicated for use are described in the literature for the treatment of animals. According to the use of the usable part of MP, we found the following results: the most common is the use of a stalk, indicated for 12 species of MP, blossoms - in 6 species and seeds - in 5 species. Among these plants are the most frequently used MP in VM by the local population in the area of the NBSC: nettle, wormwood, chamomile, linden, pumpkin and others. For the other usable parts of the MP, between 1 and 4 responses were received.

The plants that cause contact dermatitis are represented by the largest number. Such plants are: onions, garlic, wormwood, nettle and others. Poisonous plants that would cause poisoning at a higher than recommended dose are: elderberry, aloe, valerian, tea tree and others.

The poisonous plants mentioned by the respondents are: *Cotinus coggygria, Senecio vulgaris* L., *Aesculus hippocasanum, Teucrium chamaedrys* L., *Melaleuca alternifolia, Lolium perenne* L., *Tribulus terrestris* L. Highly poisonous are 2 plants: *Helleborus odorus и Nicotiana tabacum. Cotinus coggygria* has a combined effect on the animal organism, for example contact dermatitis combined with a toxic effect when used internally. The plants that cause contact dermatitis and are poisonous at a higher dose are of 3

types: *Artemisia absinthium* L., *Taraxacum officinale* и *Agrimonia eupatoria* L. *Nicotiana tabacum* can cause contact dermatitis and is highly toxic

2.1. Demographics

According to the size of the settlement. Medicinal plants for the treatment and prevention of animals are used by 94 local residents of the NBSC. Of these, 59 people (62.77%) are residents of towns and 35 people (37.23%) are residents of villages. After analyzing the results obtained, we found that the inhabitants of towns and villages use an equal number of MP for treatment and prevention of animals.

The equal number of used MP in VM in towns and villages is due to the following reasons: on the one hand, the number of respondents in villages is significantly smaller than in towns, but they more often use herbal medicine in raising farm animals.

In smaller towns such as Shabla, Aksakovo and some districts of Varna (Vinitsa and Galata), some respondents keep farm animals in their yards and use MP if necessary. Raising pets (dogs, cats, etc.) is more common in towns, but herbal treatment is less common.

The **ethnic composition** of the respondents who use medicinal plants in veterinary medicine is relatively rich and includes 4 ethnic groups. Ethnic groups such as Armenians and Tatars do not indicate that they use MP in VM. This result is probably due to the smaller number of participants from these ethnic groups in the survey, as well as the fact that all members of the Armenian ethnic group are residents of Varna and if they keep pets, treat them with ready-made pharmaceutical products.

In terms of **age,** the largest number of respondents are in the age group 61-70 years - 19% and aged 51-60 years and 71-80 years - 16%. With increasing age (up to 70 years) the number of respondents using MP in VM also increases. Most answers - 24 were received from respondents aged 61 to 70. Respondents from both age groups 71-80 years and over 80 years are less likely to use MP in VM, because due to their age they rarely keep farm animals. The results prove the working hypothesis that the traditional ethnobotanical knowledge for the treatment of animals is preserved in the older inhabitants of the NBSC.

In terms of **gender,** MP in VM is used by 41 men (43.62%) and 53 women (56.38%). The greater use of MP by women is probably due to the fact that women traditionally have the knowledge and application of herbs.

Regarding **education,** the respondents using MP in VM have the largest share of those with secondary education - 56 people (59.57%), followed by people with primary and higher education - 18 people each (19.15%). The lowest number of people with primary school education is 2 people (2.13%). People without education do not use MP in VM. The obtained results show that the knowledge about the use of MP in VM does not depend on the education of the respondents and is most often acquired from other information sources.

In terms of **employment**, the distribution of respondents using MP in VM is as follows: with the largest participation are the employed (64.89%), followed by retirees (30.85%) and with the lowest participation are the unemployed (3.19%) and learners (1.06%).

Of the 94 people surveyed who use MP in VM, 93 answered that they use between 1 and 5 species of MP and only one person (retiree) uses 7 species of MP.

The performed correlation analysis between the number of used medicinal plants and the demographic indicators of the surveyed inhabitants confirms the working hypothesis that knowledge about the use of MP in veterinary medicine is more possessed by the inhabitants of small settlements than those in towns (Table. 3.).

Table. 3. Correlation between the number of medicinal plants used and the demographic indicators of the respondents

	Value of the correlation coefficient (r)	Significance level P ($\alpha \leq 0,05$)	Interpretation of the power of dependence
Size of settlement	0,31	0,02	moderate
Ethnos	-0,1	0,02	weak
Age	-0,08	0,01	weak
Gender	-0,18	0,05	weak
Education	0,08	0,03	weak
Employment	-0,03	0,02	weak

2.2. Quantitative ethnobotanical analysis

According to the index of the coefficient of consensus of the respondent, most MP are used for skin diseases in animals (Fic = 0.94) (Table 4). This result is reported due to the fact that skin diseases include ectoparasitosis, which is a common health problem in animals.

Table. 4. Respondent's consensus ratio

Groups of diseases	Answer (UR)	Taxon	F_{IC}
Dermatological	77	14	0,94
Respiratory	17	4	0,76
Gastrointestinal	18	10	0,44
Gynecological	3	2	0,33

The least species of medicinal plants are used in gastrointestinal (including endoparasitosis) (Fic = 0.44) and gynecological diseases (including birth and postpartum conditions) (Fic = 0.33). An ethnobotanical study in southern Kosovo, an area remote from the NBSC, reported results for the use of MP in veterinary medicine close to ours (Fic = 0.67) (Hajdari et al., 2018).

3. Application of medicinal plants in cosmetics

Of the 709 locals surveyed in the NBSC, 302 people (42.60%) answered that they use medicinal plants and 407 people (57.40%) answered that they do not use MP for cosmetic purposes. We report an index of importance value slightly below the average (IVs = 0.42).

For cosmetic purposes in the study area are used 55 types of MP from 51 genera and 35 families. In the present study with application in cosmetics are described 17 species of MP of 17 genera and 14 families distributed in the **floral subregion of the North Black Sea coast**: *Cotinus coggygria, Hedera helix* Lowe., *Achillea millefolium, Arctium lappa* L., *Matricaria chamomilla* and others. **Of the medicinal plants foreign to the Bulgarian flora**, 13 species are used: *Aloe vera* (L.) Burm.f., *Callisia fragrans* (Lindl.) Woodson, *Calendula*

officinalis L., *Helianthus tuberosus* L., *Ricinus communis* L. and others. *Medicinal plants*, distributed in **other floristic regions of Bulgaria** are 2 species: Helleoborus odorus and Veratrum lobelianum Bernh.). Of the **cultivated plants**, 22 species are used: Allium cepa, *Petroselinum crispum, Brassica oleracea* L., *Helianthus annuus* L., *Cucumis melo* L. и др.

The most commonly used medicinal plants for cosmetic purposes by the local population are *Urtica dioica* L., *Juglans regia* L., *Matricaria chamomilla, Mentha sp. diversa, Lavandula angustifolia* Mill., *Rosa damascena Mill.* Among the used medicinal plants with the most genera are the families Asteraceae, Lamiaceae and Rosaceae.

Regarding the usable part, the local population most widely uses plant oils such as: *Eucalyptus sp., Melaleuca alternifolia* (Maiden & Betche) Cheel*., Amygdalus communis* L., *Prunus armeniaca* L., *Argania spinosa* Skeels., *Rosmarinus officinalis* and others. This fact shows that the majority of the local population uses MP for cosmetic purposes as a finished product and is supplied with them through commercial network. A significantly smaller part of the respondents answered that they obtain MP for cosmetic purposes by collecting them from nature. These are mostly residents of smaller settlements.

The most common application of MP in cosmetics is for washing hair and face mask. For washing hair are most often used: nettle, walnut, ivy. An interesting fact in conducting the survey is the widespread use of ivy leaves for washing hair by residents of Byala. As a face mask are widely used fruits of plants such as: cucumber, tomato, pomegranate, peach, lemon, grape and others.

When comparing the results with other ethnobotanical studies, the significantly higher number of MP used for cosmetic purposes in the present study is impressive. This is due on the one hand to the fact that so far no ethnobotanical studies have been conducted in Bulgaria on the use of MP in cosmetics and on the other hand that the current study was conducted in a large number of settlements, with significantly more residents surveyed.

3.1. Demographics.

According to the size of the settlement. Of the respondents, 242 residents of towns (80.13%) and 60 residents of villages (19.87%) answered that they use MP for cosmetic purposes. After analyzing the results obtained, we found that urban residents use a larger number of MP in cosmetics - 48 species than rural residents - 34 species.

The higher number of medicinal plants used by urban residents compared to villages is due on the one hand to the higher percentage of surveyed urban residents (75.88%) than in rural areas (24.12%), as well as to some demographic characteristics of the population - in the towns there is a higher percentage of younger population. On the other hand, people in larger settlements are increasingly using foreign species of MP in cosmetics such as*: Eucalyptus sp., Melaleuca alternifolia, Argania spinosa, Aloe vera, Syzygium aromaticum* (L.) Merr. & L.M.Perry and other. Not mentioned by the villagers. This is due to the better information of the inhabitants of the towns. On the other hand, the possibility to obtain from the commercial network of ready-made herbal cosmetics base in the cities is much larger than in the villages. This fact was also confirmed during the fieldwork during the survey. It is noteworthy that the inhabitants of the villages more often use MP, collected from nature or grown in their yards, such as:

Hedera helix, Calendula officinalis, Matricaria chamomilla, Juglans regia, Urtica dioica and others. This use testifies to the preserved ethnobotanical knowledge among the inhabitants of the villages for the application of MP in cosmetics. The use of foreign types of MP has become widespread in the towns and the use of ready-made cosmetic products is much greater. Most respondents use between 1 and 5 species of MP, regardless of the size of the settlement. The use of 6-10 species of MP is significantly higher among urban residents.

The **ethnic composition** of the respondents who use medicinal for cosmetic purposes is rich and includes 5 ethnic groups. Only the representatives of the Tatar ethnic group do not report that they use MP for cosmetic purposes. This result is due to the smaller number of participants from this ethnic group, as well as the fact that they are male.

From the study we found that the population of the NBSC most often uses between 1 and 5 species of medicinal plants for cosmetic purposes, regardless of ethnicity. Impressive is the significant share in the use of MP for cosmetic purposes by Armenians, as well as the weaker use by ethnic groups such as Turks and Kopanars. The use of more medicinal plants in cosmetics - between 6 and 10 and over 10 species is present only in the Bulgarian ethnic group.

In all age groups of the studied area the use of between 1 and 5 species of medicinal plants prevails. The largest share is among young people under the age of 20. In the same age group, the answers for the use of more drugs (from 6 to 10 species) predominate. This fact shows that young people are better acquainted with the use of MP for cosmetic purposes.

According to **gender** In the survey, 30 men (9.93%) and 272 women (90.07%) answered that they use MP for cosmetic purposes. The significantly higher participation of women is

due to the fact that this application of MP is considered a priority for women. This also determines the higher number of types of MP used by women compared to men.

According to **education.** The majority of respondents have secondary education (39%), followed by respondents with primary (35%) and higher education (23%).

Respondents surveyed without education are representatives of the Roma and Turkish ethnic groups, and those with primary education are Bulgarians over the age of 80. The distribution of respondents according to education and the number of medicinal plants used is shown in Fig. 30.

In terms of **employment,** the largest number of respondents are employed - 154 people (50.99%), followed by: students - 84 people (27.81%), retirees - 47 people (15.56%) and the unemployed - 17 people (5.63%). After analyzing the results of the survey, we found that mostly working respondents use MP for cosmetic purposes, but the unemployed use a larger number of species.

The performed correlation analysis between the number of medicinal plants used and the demographic indicators of the surveyed residents confirms the working hypothesis that women have more knowledge about the use of MP for cosmetic purposes than men (Table 5).

Table. 5. Correlation between the number of medicinal plants used and the demographic indicators of the respondents

	Value of the correlation coefficient (r)	Significance level P (α ≤0,05)	Interpretation of the power of dependence
Size of settlement	-0,07	0,01	weak
Ethnos	0,16	0,02	weak
Age	0,15	0,03	weak
Gender	0,51	0,04	significant
Education	-0,11	0,8	weak
Employment	0,14	0,04	weak

3.2. Quantitative ethnobotanical analysis

For the use of medicinal plants for cosmetic purposes, 302 responses (UR) were obtained for 32 species of MP, and the consensus coefficient of the respondent was above the average value (Fic = 0.63).

4. Application of medicinal plants for culinary purposes

As MP with application for culinary purposes, we consider those plants that serve as food, spice, beverage, coloring and flavoring of beverage and preservative. Of the 709 locals surveyed, 707 answered that they use MP for culinary purposes. The high participation of respondents reports a high index of importance (IVs = 99) of the indicators.

The largest number of species are used for food - 86 species, followed by plants used as a spice - 53 species, beverage - 43 species, colorant - 41 species, flavor - 38 species and as a preservative are used 30 species of MP. 164 species of MP from 131 genera and 50 families are used for culinary purposes by the local population. Of these, 60 species from 47 genera and 27 families are distributed in the **floristic subregion of the NBSC**. The medicinal plants, distributed in **other floristic regions of Bulgaria**, are 5 species from 4 genera and 4 families. Of the foreign to the **Bulgarian flora MP** are used 17 species from 16 genera and 14 families. Of the **cultivated** MP, 78 species from 65 genera and 24 families and 4 adventitious species are used. Of the **adventitious** MP, 4 species are used - *Mahonia aquifolium* (Pursh)Nutt., *Robinia pseudoacacia* L., *Phytolacca americana* L. и *Lycium barbarum* L.

Respondents locals use only one type of medicinal plant that has conservation status - *Artemisia pedemontana.* Rock wormwood is included in *Annex III of the Biodiversity Act* and in the Red Book of the Republic of Bulgaria in the category "endangered". Its application is as a spice and flavoring. Its use was reported by 13 people (1.84%). Locals have no information that the plant is under protection. Wild species of medicinal plants used in the past for food by St. Ivan Rilski (Petrov et al., 1984), are still used today by the local population under the NBSC. This proves that there is a stability of the information flow, which has been transmitted and preserved over the years. The thesis is proved that there is continuity in the folk knowledge and ethnobotanical application of MP. Nedelcheva (2013) describes 88 species of wild plants used for food, ie. with 26 species more than those indicated in the present study. The smaller number of wild plants used for food in this study is due to the fact that it includes data from only one floristic subregion of Bulgaria. For the study area,

however, 5 species of MP characteristic of the local flora are described, which are not indicated by Nedelcheva (2013). These are: *Covolvulus arvensis* L., *Tilia platyphyllos* Scop., *T. tomentosa*, *Pinus nigra* Arn. and *Sorbus domestica* L. The use of these species was described by Stoyanov & Kitanov (1960). A study by (Kultur & Saami, 2009) for the area of the town of Isperih identified 11 species of MP used by locals for food. Of these, only *Pinus sylvestris* L. is not mentioned by the locals of the NBSC, probably because it is not naturally distributed in this area. A study by Cherneva (2017) described 15 species of MP, used with the two main culinary applications - as food and spice by residents near wetlands on the North Black Sea coast. In the same study, it was stated that 45.95% of the surveyed locals use MP for food. Apart from the difference in the number of MP used for culinary purposes, we also report a significant one difference in the number of respondents using MP. This is due to the fact that in the present study all applications of MP for culinary purposes were studied - a total of 6 in number. An ethnobotanical study of the local population on the Southern Black Sea coast of Turkey (Yesiliurt et al., 2017) yielded results close to ours, according to which 97.60% of the respondents use MP for food and spice.

The most responses to the use of MP for culinary purposes by the local NBSC population were obtained for *Rumex patientia* L. (FL 86.14), followed by *Urtica dioica* L. (FL 84.41) and *Vitis vinifera* L. (FL 61 , 39). All three species are used for food, and the vine is used not only for food but also as a preservative.

Application of MP for culinary purposes

For **food** the local population uses 86 species of MP, belonging to 62 genera and 31 families. We report a high importance value index (IVs = 0.99). The most commonly used medicinal

plants for food by the local population according to the NBSC are: *Urtica dioica* (FL 84.41), *Juglans regia* (FL 77.23), *Malus domestica* (FL 79.63), *Rumex patientia* L. (FL 75, 94). Some medicinal plants are used for food in the whole area of the NBSC, while others are used only in certain settlements or only by certain ethnic groups. For example, soups, salads and pasta with *Chenopodium album* L. and *Atriplex hortensis* L. have been reported in the town of Kavarna and nearby villages. These plants are also preserved frozen for food during the winter season. An interesting fact is that according to Pieroni et al. (2015) the local Tatar and Romanian population in Southern Dobruja (Romania) prepares pies and soups from *Atriplex hortensis*.

The plant is also popular among the locals of Northern Dobrudja (Kavarna and nearby villages) and is used in similar recipes. The use of Urtica dioica by the inhabitants of Dobrogea is similar both on the territory of Bulgaria and in Romania. It is used fresh for salads, soups and dishes, for making pies, also stored frozen or dry for food during the winter season.

The preparation of sarma with leaves of *Vitis vinifera* is considered traditional by the inhabitants of the entire Balkan Peninsula (Dogan et al., 2015, 2017).

The use of *Convolvulus arvensis* as food was reported by 4 people (FL 0.57%), residents of the village of Shkorpilovtsi. It is an interesting fact that according to Stoyanov & Kitanov (1960) in the past in the area of Svilengrad (Mezek) the locals prepared dishes and pies with leaves and stems of the same plant. The plant can be used for food only before flowering. After flowering, the poisonous glycoside convolvulin accumulates (Chesmedjiev et al., 1999).

As a **spice** in the study area are used 53 species of MP from 43 genera and 20 families. The importance value index is very high (IVs = 0.95). Most responses were obtained for the use of: *Petroselinum crispum* (FL 71.85), *Anethum graveolens* L. (FL 70.16), *Satureja hortensis* L. (FL 62.66), *Apium graveolens* L. (FL 35.64) and *Citrus limon* (L.) Osbeck. (FL 35.36). We found differences in the use of MP for spices in different parts of the study area. Such is, for example, the use of *Nectaroscordum siculum ssp. bulgaricum.* In the area of Shabla, Kavarna, as well as the surrounding villages, the local population does not know and does not use the plant, while the residents of Byala, Obzor, Aksakovo and some of the respondents from Varna often use the plant as a dry or fresh spice. In the dry state, the plant is used as an ingredient in the preparation of "colored salt".

Less common and unusual uses of MP as spices are: dried leaves of *Ficus carica* L., twigs of *Piper nigrum* L. and twigs of *Cydonia oblonga.* All are used to flavor meat.

For the preparation of **drinks** the population of the NBSC uses 43 types of MP from 34 genera and 20 families. We report a high importance value index (IVs = 0.71). Most responses were obtained for the use of: *Vitis vinifera* (FL 61.34), *Sambucus nigra* (FL 38.19), *Rubus sp.* diversa (FL 20.37). We did not find any differences in the use of MP as a beverage in the different settlements. *Sambucus nigra* flowers are most commonly used to make juice. It is often reported that syrup is made from the fruit of *Sambucus ebulus* L. In the villages of Hadji Dimitar, Gorun and the town of Shabla, juice from the flowers of *Carduus acanthoides* L is prepared. . For the production of wine and spirits (brandy and liqueurs) are used flowers and fruits of: *Vitis vinifera, Robinia pseudoacacia, Carduus acanthoides, Prunus cerasifera, Cornus mas, Juglans regia* and many types of cultivated plants. Freshly squeezed

juices are prepared from: *Daucus carota, Beta vulgaris* ssp. *vulgaris* var. *vulgaris* L., *Aronia sp.* and others. Beverages that replace coffee are prepared from the seeds of: *Phaseolus vulgaris* (St. Nicholas), *Secale cereale, Cicer orietinum* L., *Theobroma cacao* Tussac. and roots of *Cichorium intybus* L. and *Taraxacum officinale.* Residents of Varna and Aksakovo mentioned the preparation of juice from *Helianthus tuberosus*, which has a refreshing and toning effect.

Used as **flavoring** are 38 species from 28 genera and 16 families. We report an index for a value of importance above the average (IVs = 0.58). The most common is the use of indrishe to flavor compotes. Plants such as *Pelargonium roseum* (FL 46.98), *Citrus limon* (FL 35.36) and *Mentha piperita* (FL 27.84) are widely used as flavorings of various alcoholic and non-alcoholic beverages. Plants such as: *Sideritis scardica* Griseb., Dried fruits (oshav) of *Prunus armeniaca, Malus sp., Pyrus sp*. are often used to flavor alcoholic beverages. Plants such as *Artemisia sp., Thymus sp., Cydonia oblonga, Rosmarinus officinalis, Origanum vulgare* and others are used for washing and aromatization of barrels in wine production. An interesting application of *Coriandrum sativum* as a flavoring in the boiling of a pot for the production of brandy is indicated in the village of Hadji Dimitar, as well as the leaves of *Ficus carica* in the steaming of barrels in the village of Balgarevo.

41 species belonging to 30 genera and 20 families are used for **beverage coloring** in the study area. The importance value index (IVs = 0.56) is slightly above average. The most commonly used beverages for coloring beverages are: wood and bark of *Morus alba* L. (FL 20.51) and *M. nigra* L. (FL 43.56), *Quercus species* (FL 9.47), also *Cotinus coggygria , Cornus mas* L., dried fruits of *Malus sp*., *Cornus mas, Pyrus*

pyraster Medik. and others. Mostly alcoholic beverages are colored.

As a **natural preservative** in the region of the NBSC are used 30 species of MP, belonging to 24 genera and 17 families. The importance value index (IVs = 0.45) is slightly below average. Most commonly used: *Zea mays* (FL 28.43), *Armoracia rusticana* G.Gaertn., B.Mey. (FL 34.37) and *Sinapis nigra* L. (FL 26.87).

The use of leaves and twigs of fig, cherry, vine is significant. No difference was found in the use of plants as a preservative by the inhabitants in the different settlements. Despite the widespread use of local medicinal plants for food, there are modern trends in diet based on the use of natural products, as well as the desire to return the "urban man" to nature and sustainable use of natural resources, the use of " the forgotten old. " Forgotten but native plant species such as *Portulaca oleracea* L., *Taraxacum officinale, Chenopodium album* L., *Rumex acetosa* L. are used for food among the urban population. This trend, combined with global communications, human movement and the free entry of new plants products and foreign to Bulgaria medicinal plants such as: *Beta vulgaris var. cicla* (L.) Voss., *Sechium edule* Sw., *Chenopodium quinoa* Willd., *Cynara cardunculus var. scolymus* (L.) Benth and other determines a new and modern direction in the use of medicinal plants for food.

In recent years, there has been a growing interest in the consumption of wild plants. On the other hand, knowledge of plant diversity and the use of MP is essential for the conservation and safe use of food and herbal products.

4.1. Demographics.

According to the size of the settlement. Of the respondents, 536 urban residents (99.63%) and 171 rural residents (100%) answered that they use MP for culinary purposes. After analyzing the results obtained, we found that the inhabitants of towns and villages use a similar number of MP for culinary purposes.

Although the locals of the NBSC from the small and large settlements use approximately the same number of medicinal plants, we found that there is a certain difference in the species used. The medicinal plants that are used for culinary purposes only by the inhabitants of the villages are: *Fagus sylvatica* L., *Malus sylvestris* (L.) Mill., *Phytolacca americana* L., *Pinus nigra* Arn., *Rubus ideus* L., *Sorbus domestica* L. and others. It turns out that town dwellers often do not know these plants. The medicinal plants that are indicated for use only by the inhabitants of the towns are: *Sehium edule*, *Chenopodium quinoa*, *Beta vulgaris var. cycla* and other. The urban population knows and uses foreign to Bulgaria species of medicinal plants, which are increasingly entering the culinary world and which are not known to the inhabitants of small settlements. The urban population gets these plants from the trade network. We also found differences in the way of obtaining MP. For example, in the villages MP collected from nature are more often used, such as: *Urtica dioica, Vitis vinifera, Rumex patientia, Juglans regia, Coryllus avelana* L., etc., while the same plants are obtained by the residents of Varna from the trade network. . In addition, in smaller settlements, people have retained the names and knowledge of the use of wild medicinal plants as food. Local recipes using MP, used in the past, are also preserved.

Some of the well-known and traditional in the past MP, used for food, today are considered new and modern among the younger residents of Varna. Such plants are: *Portulaca oleraceae, Rumex acetosa* L., *Atriplex hortensis* and others. These residents usually have not preserved ethnobotanical knowledge about the use of wild MP in cooking.

A study by Cherneva (2017) for the region of the North Black Sea wetlands states that 43.3% of urban residents and 70% of rural residents use a total of 15 species of MP for food. This result differs significantly from ours, which can be explained by the wider scope of the present study and the fact that the questionnaire used by us lists all applications of MP for culinary purposes, which helps the respondents.

The ethnic composition of the respondents who use MP for culinary purposes is rich. It includes all ethnic groups involved in the study. Of the 709 local residents of the NBSC surveyed, only two people (0.32%) with Bulgarian ethnicity answered that they do not use MP for culinary purposes. In conducting the study, we found some differences in the knowledge and use of some people according to ethnicity. For example, the use of quince (*Atriplex hortensis*) for food is indicated by the inhabitants of the town of Kavarna and nearby villages, regardless of their ethnicity. At the same time, quinoa is used for food only by the Roma ethnic group in the towns of Beloslav and Aksakovo. Manguna (*Antriscus cerefolium* Hofm.) and amaranth (*Amaranthus sp*.) are used for food only by the Copanari residents of the town of Aksakovo. It is noteworthy that the representatives of Roma, Tatar and Kopanar ethnic groups from small settlements more often collect and use wild MP for culinary purposes. Their knowledge of the application of MP for culinary purposes is considerable and well preserved. This is probably due to the fact that they live in economically poorer settlements. On the

other hand, the diet of these residents is significantly healthier than that of urban residents. Culinary recipes typical for a certain ethnic group are also observed. This fact shows that there are still ethnically isolated ethnic groups that have preserved traditional culinary recipes with the use of MP. Among all ethnic groups, the use of 6-10 species of medicinal plants for culinary purposes predominates.

The age structure of the respondents who use MP for culinary purposes is presented by all age groups that took part in the survey. The two respondents who answered that they do not use MP for culinary purposes are under the age of 20. Their answers are probably due to the fact that they are not interested in the ingredients of the food and spices they consume.

For all age groups the largest is the use of 6-10 species, followed by the use of 1-5 species of medicinal plants.

Regardless of **age,** all respondents use MP for culinary purposes, taking into account some differences in the types and uses of MP according to age. For example, many young people under the age of 20 answered that they do not consume plants such as dock, nettle, sorrel, spinach, but prefer foods such as walnuts, hazelnuts, quinoa, artichokes and others. There is also a difference in the use of spices according to age, which is explained by differences in taste preferences. Respondents over the age of 40 more often use the traditional Bulgarian cuisine spices such as: savory, red pepper, black pepper, fenugreek, while respondents under the age of 30 prefer spices typical of foreign dishes, such as rosemary and curry.

A curious fact is the use of basil as a spice. Young people often use it to season pizzas and spaghetti, while older respondents do not use it as a spice because they associate its use with funeral customs.

According to **gender.** Of the 709 locals surveyed, 208 men (99.52%) and 499 women (99.80%) answered that they use MP for culinary purposes. One man and one woman replied that they did not use MP. In both genders, between 6 and 10 species of MP are often used.

Women give more answers about the use of MP for food and spice than men. This result is due to the fact that women traditionally prepare food in the household. On the other hand, men received more answers about the use of MP in the preparation, coloring and flavoring of beverages. This application of MP is mainly for the production of wine and spirits, which is typical for men. In the application of MP as a preservative, no differences were reported in the number of used MP depending on gender.

According to their **education,** the respondents who use MP for culinary purposes are divided into: without education - 14 people (2.63%), primary school education - 13 people (2.44%), middle school education - 19 people (3.57%), secondary school education - 365 people (68.61%) and higher education - 121 people (22.74%). And here is the largest number of locals who use between 6 and 10 species of MP.

Representatives of the Roma, Tatar and Kopanar ethnic groups, as well as older residents of small settlements, more often collect and use wild MP for culinary purposes. It is characteristic of them that these are people with lower education. On the other hand, young and educated people, residents cities are increasingly turning to healthy eating. Often these respondents use wild MP for food, but obtain it from the trade network. The knowledge about the use of MP for culinary purposes is not formed in the process of receiving education. It is transmitted from older to younger, thus preserving the

ethnobotanical application of MP or the information is new and received from the global network.

According to the demographic criterion "**employment**", the two respondents (1.64%) answered that they do not use MP for culinary purposes, they are students. In all groups and according to this demographic indicator the largest share has the use of 6-10 species of MP, followed by the use of 1-5 species of MP. The number of respondents from the group of students is close, respectively 52% and 59%.

The correlation between the number of medicinal plants used and the demographic indicators of the surveyed residents confirms the results of the survey that residents in large settlements have greater awareness and better ability to obtain MP for culinary purposes (Table 6.).

Table. 6. Correlation between the number of medicinal plants used and the demographic indicators of the respondents

	Value of the correlation coefficient (r)	Significance level P ($\alpha \leq 0,05$)	Interpretation of the power of dependence
Size of settlement	0,32	0,02	moderate
Ethnos	-0,07	0,05	weak
Age	0,02	0,03	weak
Gender	0,08	0,04	weak
Education	0,09	0,01	weak
Employment	-0,04	0,04	weak

4.7. Quantitative ethnobotanical analysis

As almost 100% of the respondents use MP for culinary purposes and the indicated types of MP are significant, the index of the respondent's consensus coefficient (Fic) for all culinary applications is extremely high (Table 7).

Table. 7. Respondent's consensus ratio

Application	Answer (UR)	Taxon	F_{IC}
Food	12245	73	0,99
Spice	7456	47	0,99
Drink	756	41	0,94
Beverage flavoring	597	41	0,93
Beverage colorant	610	42	0,93
Preservative	427	28	0,93

For comparison, the respondent's consensus ratio for the use of medicinal plants for food in the region of southern Kosovo (Hajdari et al., 2018) is lower (Fic = 0.76) than the current study. This difference is explained by the fact that for the region of the NBSC all culinary applications of medicinal plants are described, as well as the significantly larger number of surveyed locals.

5. Application of medicinal plants for pet food and bee grazing

Of the 709 locals surveyed in the NBSC, 156 answered that they use medicinal plants for PF and BG. We report a very low importance value index (IVs = 0.22). 39 types of medicinal plants from 36 genera and 18 families are used for PF and BG in the studied area.

Medicinal plants from the **local flora** are represented by 19 species. This represents 3.14% of the total number of medicinal plants in the floristic subregion of the North Black Sea coast. Examples are: *Amaranthus sp., Cynodon dactylon* (L.) Pers., *Urtica dioica, Portulaca, Trifolium sp., Taraxacum officinale* and others. Of the **cultivated plants**, 18 species are used: *Helianthus annuus, Hordeum vulgare* L., *Lavandula angustifolia, Secale cereale* L., *Triticum sp., Zea mays* and others. Medicinal plants **foreign to the Bulgarian flora,** as well as MP from **other floristic regions of Bulgaria** are not used for PF and BG. Two species of MP are **adventitious** - *Robinia pseudoacacia* and *Amorpha fruticosa* L.

Among the most commonly used MP by the local population for PF and BG are: *Amaranthus sp*. (FL 38.99), *Urtica dioica* (FL 37.11), *Portulaca oleracea* (FL 33.33), *Cynodon dactylon* (L.) Pers. (FL 30,19) and other.

It is noteworthy that for many of the types of MP a small number of responses for use have been received. This fact is due to the relatively small number of respondents who keep animals. Medicinal plants used for pet food can be divided into two groups: plants that feed farm animals (cattle, horses, donkeys, pigs, sheep, goats, birds, rabbits) and plants that serve for pet food (birds, hamsters, guinea pigs, rabbits, etc.). Ready-made food mixtures available on the market are most often used for pet food. For bee grazing, the local population of the

NBSC has hives near perennial or annual honey plantations such as: acacia, lavender, linden, sunflower, rapeseed, coriander. The use of pesticides in the intensive cultivation of field honey crops leads to the reduction or destruction of entire bee colonies. The loss of bee families has been reported by beekeepers in the town of Balchik.

The provision of pet food depends on the owner's knowledge of the diet of the kept animals. Knowledge of plants suitable for animal feed has been preserved among some older farmers. The advantage of using plants from the local flora is that no financial resources are needed, but it is associated with labor and time spent on collecting and storing food. In modern animal husbandry there is a tendency to use ready-made foods, artificially enriched with biologically active substances. Breeds of farm animals (chickens, turkeys) have been created, the breeding of which is unprofitable without the use of artificial foods. With the change in animal nutrition, the quality of the final animal product changes. On the other hand, the declining number of locals keeping farm animals and the absence of herbivores in rural areas is changing the herbaceous species composition of habitats, which is a prerequisite for the accommodation of invasive species such as *Erigeron annuus* (L.) Pers., *E canadensis* Ten., *Sorghum halepense* Pers., *Xanthium italicum* Morreti., *Ailanthus altissimus* (Mill.) Swingle, *Robinia pseudoacacia* and other. During the survey were reported such changes in the habitats of some almost depopulated villages in the NBSC (Gorun village, Topola village, Poruchik Chunchevo village).

For comparison, an ethnobotanical study for the town of Isperih (Kultur, 2008) lists 3 species of MP used for pet food. Two of them - *Zea mays* and *Cynodon dactylon* are described in the present study and one species - *Aesculus hippocastanum* is not mentioned by the residents of the NBSC, but we do not

think it is suitable for this purpose. The significantly higher number of MP used in our study is explained by the more in-depth study of the use of MP for by the local residents of the NBSC. The transition to intensive livestock farming, as well as the declining number of local people engaged in animal husbandry, are key prerequisites for the loss of local traditional knowledge about the application of MP for PF and BG.

5.1. Demographic indicators

According to the size of the settlement. The respondents who use MP for PF and BG are 67 inhabitants of the cities (46.85%) and 76 inhabitants of the villages (53.15%). After analyzing the results obtained, we found that the inhabitants of towns and villages use a similar number of MP.

The significantly higher percentage of respondents, residents of the villages, who use MP for PF and BG, in contrast to those in the towns, is impressive. This result is due, on the one hand, to the fact that farm animals and bees are still kept in the smaller settlements, and, on the other hand, to the fact that mainly pets (dogs and cats) are kept in the towns, whose menus do not include plant food.

Regarding the use of cultivated plants for pet food, the inhabitants of both towns and villages have good knowledge. The most commonly used seeds of cultivated plants of the family Poaceae (wheat, barley, oats, corn). We found some differences in the species of MP used for PF and BG according to the size of the settlement. For example, the species *Quercus sp., Vicia ervilia* (L.) Wild., *Pyrus communis, Mentha spicata* and others are listed for use only in villages, and species such as: *Sorghun sp., Panicum sp., Cucumis sativus* L. and others. are indicated for use in cities only.by the local residents of the NBSC.

The transition to intensive livestock farming, as well as the declining number of local people engaged in animal husbandry, are key prerequisites for the loss of local traditional knowledge about the application of MP for PF and BG.

 The ethnic composition of the respondents using MP for PF and BG and PP includes all ethnic groups except the Armenian one. The number of locals who use MP is 143 people, of which: Bulgarians - 112 people (78.32%), Turks - 10 people (6.99%), Roma - 9 people (6.29%), Kopanari - 9 people (6.29%) and Tatars - 3 people (2.10%). All representatives of the Tatar and Kopanari ethnic groups use MP for PF and BG. The result is due to the fact that these are residents of small and economically poorer settlements, where the local population makes a living by raising farm animals. The use of MP for PF and BG among the representatives of the Roma and Turkish ethnic groups is in the small settlements. The use of MP among the Roma ethnic group is only for pet food. Older respondents from the Bulgarian ethnic group, residents of small settlements, use MP for PF and BG, and younger residents of cities use MP only for pet food. After analyzing the obtained results, we found that there is no difference in the types of MP used according to the ethnicity of the residents of the NBSC.

As in other MP applications, 1 to 5 species are most commonly used. This is typical for all ethnic groups.

Representatives of all **age** groups responded that they use MP for PF and BG. The obtained results correlate with the working hypothesis that with increasing age the number of respondents who use MP for PF and BG increases, as these are mostly residents of small settlements that keep farm animals. The largest share is of respondents in active age (51-60 years). The most common is the use of 1-5 species of MP for all age groups.

According to **gender.** Unlike the other applications of MP, in the application for PF and BG the significantly higher participation of men is impressive - 58 men (27.75%) compared to women - 85 women (17%). The obtained results are explained by the fact that traditionally the procurement of PF and BG is considered a priority for men. Therefore, it is not surprising that men report 11 species of MP more than women. Here, too, between 1 and 5 species of MP are most often used.

In terms of **education,** the respondents using and MP, with the largest participation are those with primary education (30.77%), followed by those with secondary (26.43%), higher (16.53%), middle (10.83%) and without education (7.14%).

The distribution of the respondents using PF and BG and MP according to **employment** is as follows: with the largest participation are the employed - 68 people (47.55%), followed by the pensioners - 54 people (37.76%), the unemployed - 15 people (10.49%) and students - 6 people (4.20%). The degree of participation of the respondents in this demographic criterion is determined by the availability of free time.

An interesting fact is that the most active part of the local population - the workers, find time to raise animals.

The performed correlation analysis between the number of used medicinal plants and the demographic indicators of the surveyed residents reveals the strongest connection in the importance of MP for PF and BG only in some ethnic groups. (Table 8.).

Table. 8. Correlation between the number of medicinal plants used and the demographic indicators of the respondents

	Value of the correlation coefficient (r)	Significance level P ($\alpha \leq 0,05$)	Interpretation of the power of dependence
Size of settlement	0,21	0,02	weak
Ethnos	0,31	0,04	moderate
Age	0,28	0,04	weak
Gender	0,24	0,02	weak
Education	-0,1	0,05	weak
Employment	0,09	0,02	weak

5.2. Quantitative ethnobotanical analysis

The consensus coefficient has a high value (Fic = 0.93), because for the use of medicinal plants for PF and BG 585 responses (UR) were obtained for 40 species of MP.

6. Application of medicinal plants for household purposes

Of the 709 locals surveyed, 579 people (81.66%) answered that they use and 130 people (18.34%) answered that they do not use MP for household purposes. The importance value index is very high (IVs = 0.81).

61 types of medicinal plants from 45 genera and 28 families are used for household purposes in the study area. Of these, 53 species from 40 genera and 25 families are distributed in the **floristic subregion of NBSC** such as: *Cotinus coggygria, Juglans regia, Urtica dioica, Quercus sp., Salix sp*. and others. For domestic purposes - 3 species MP of **foreign species for the Bulgarian** flora. Medicinal plants from **other floristic regions of Bulgaria** are 2 species: *Helleborus odorus* and *Pinus sylvestris*. From the **cultivated plants** the species of 2 genera and 2 families are used: *Tagetes erecta* L. and *Vitis vinifera.* **Adventive** are 2 species of MP from 2 genera and families: *Robinia pseudoacacia* and *Phytolacca americana.*

The most commonly used medicinal plants for household purposes by the local population are: *Juglans regia, Lavandula angustifolia, species Quercus, Urtica dioica, Allium cepa.*

In the application of MP for household purposes is traced the use of MP as: dye, pesticide, for cleaning, making products, construction, heating.

6.1. Demographics

According to the **size of the settlement**. Of the surveyed respondents, 414 people, residents of cities and 165 people, residents of villages answered that they use MP for household purposes. This result shows that 76.95% of the surveyed urban residents and 96.49% of the surveyed rural residents use MP under this annex.

Impressive is the significantly higher percentage of respondents, residents of villages, who use MP for household purposes compared to those in cities. This result is due on the one hand to the fact that in the smaller settlements the knowledge of handicraft of some household items is still alive, a fact which is confirmed by the larger number of MP used in

the small settlements. On the other hand, the high percentage of MP use for household purposes in the villages is determined by the heating with wood, which is explained by the economic condition of the locals.

The **ethnic** composition of the respondents who use MP for household purposes is rich and includes all ethnic groups in the survey.

The local population in the NBSC most often uses between 1 and 5 species of medicinal plants for household purposes, regardless of their ethnicity. The use of more medicinal plants - between 6 and 10 and over 10 species was reported by 13 people of Bulgarian ethnicity.

It is an interesting fact that only the representatives of Kopanari have preserved the ability to make wooden spoons and troughs (diggers) from poplar or linden wood. However, this difference is too small to affect the overall correlation.

In terms of **age**, it is noteworthy that with increasing age, the number of respondents using MP for household purposes increases. This proves our working hypothesis that young people are less familiar with the applications of MP in the household. This fact is explained by the widespread use of modern ready-made, synthetic and technical means that have replaced the use of MP. The predominant number of used MP for household purposes is from 1 to 5 species.

After analyzing the results of the survey, we found that in both **genders** there is a significant use of MP for household purposes - 160 men (76.56%) and 419 women (83.8%). In some of the applications, such as cleaning and dyeing, the participation of women is higher, while in applications such as construction and making products, more responses are received from men. In the use of MP as a pesticide and heating there is

no difference in the number of MP used by the different sexes. The predominant number of used MP for household purposes is between 1 and 5 species.

According to their **education**, the local residents of the NBSC using household appliances for household purposes are divided into: without education - 14 people (100%), primary - 10 people (76.92%), middle - 189 people (97.42%), secondary - 268 people (73.02%) and with higher education - 98 people (80.99%). The results show that the use of MP is not determined by the education of the respondents, which is evidenced by the 100% use of MP in people without education. These are mainly respondents from Roma and Kopanar ethnic groups or from older residents of small settlements. The most common use is between 1 and 5 species of MP.

The distribution of the respondents who use MP for household purposes, according to employment, is as follows: students - 49 people (43.75%), employed - 314 people (84.41%), unemployed - 29 people (87.88%) and pensioners - 187 people (97.4%). Impressive is the low participation of students - a result due to the fact that young people are less likely to use MP for household purposes. In contrast, retirees retain ethnobotanical knowledge, but much of the MP they use for household purposes is a thing of the past. The use of MP in the unemployed and employed is close. The most common number of used MP for household purposes according to employment is between 1 and 5 species.

The performed correlation analysis between the number of used medicinal plants and the demographic indicators of the surveyed residents proves the working hypothesis that the older residents have more ethnobotanical knowledge. (Table 9.).

Table. 9. Correlation between the number of medicinal plants used and the demographic indicators of the respondents

	Value of the correlation coefficient (r)	Significance level P (α ≤0,05)	Interpretation of the power of dependence
Size of settlement	0,31	0,03	moderate
Ethnos	-0,07	0,02	weak
Age	0,51	0,01	significant
Gender	0,06	0,01	weak
Education	0,01	0,04	weak
Employment	0,09	0,05	weak

6.2. Quantitative ethnobotanical analysis

The highest value of the index of the consensus coefficient of the respondent (Fic) is received by the applications of MP for cleaning (Fic = 0,95), followed by the use for heating (Fic = 0,94) and application in construction (Fic = 0, 94) (Table 10).

The result differs from the working hypothesis that the most used are heating plants (such as wood). The high Fic score obtained for MP used for household cleaning is explained by the relatively high use by many respondents of the same plant species (lemon).

Table. 10. Respondent's consensus ratio

Applications	Answer (UR)	Taxon	F_{IC}
Cleaning	99	4	0,95
Construction	158	8	0,94
Heating	240	13	0,94
Making products	192	26	0,86
Dye	71	12	0,83
Pesticide	95	23	0,75

7. Application of medicinal plants for decorative purposes

As MP with application for decorative purposes, we consider those plants that are used to make fresh or dry bouquets, are grown as indoor or garden ornamental plants. Of the 709 locals surveyed, 375 people (52.89%) answered that they use and 334 people (47.11%) answered that they do not use MP for decorative purposes. The importance value index is slightly above average (IVs = 0.53). For decorative purposes in the study area are used 74 species of medicinal plants of 61 genera and 31 families.

There are 58 species of medicinal plants used for decorative purposes, distributed in the floral subregion of the NBSC. This represents 9.94% of the total number of medicinal plants in **the floristic subregion of the North Black Sea coast** (Zahariev et al. 2016). Examples are: *Galanthus nivalis* L., *G. elwesii* Hook.f., *Xeranthemum annuum* L., *Crocus sp*., *Syringa vulgaris* L., *Paeonia peregrina* Mill., *Primula veris* L. and others. The plants distributed in **other floristic regions of Bulgaria** are two: *Pinus nigra* Arn. and *Helleborus odorus*.

From the species of medicinal plants *foreign to Bulgaria*, 3 species are grown: *Pelargonium zonale, Laurus nobilis* L. and *Citrus limon*. Of the **cultivated plants**, 11 species are used: *Calendula officinalis, Tagetes erecta, Pelargonium zonale, Rosmarinus officinalis, Rosa centifolia* L. and others.

The high number (58 species) of MP used by the local flora for decorative purposes confirms the working hypothesis that the local population knows the decorative qualities of some of the plant species, as well as their habitats. On the other hand, the inhabitants of the Bulgarian NBSC are not familiar with the conservation status of conservationally important species such as: *Cyclamen coum* Mill., *Paeonia tenuifolia* L., *Galanthus elwesii*, *G. nivalis,* species of the family Orchidaceae. The collection of such plants is most often for bouquets or the whole plant is transferred for cultivation in private yards. Not to be overlooked is the fact that often collected plants that are not medicinal, but are included in various documents for the conservation of plant diversity, such as: *Limonium meyeri* (Boiss.) O. Kuntze, *L. gmelini* (Willd.) O Kuntze, *Stipa lessingiana* Trin. Rupr., *S. ucrainica* P.A. Smyrna., *Fritillaria pontica* Wahl. and others. The lack of information of the locals, as well as the lack of control are essential preconditions for the reduction of the populations and the destruction of rare and valuable plant species.

Most responses for use as ornamental plants were obtained for the use of the cultivated species *Pelargonium zonale* (L.) L'Her. (FL 75.46), *P. roseum* Willd. (FL 52.53), *Tagetes sp.* (FL 47.46) and the wild *Galanthus elwesii* and *G. nivalis* - a total of 228 (FL 60.8%) responses for both species of the genus *Galanthus*. Most of the surveyed locals grow *Galanthus elwesii* and *G. nivalis* in their yards, and the rest collect them for bouquets from their natural habitats. It is worth noting that both

species are included in Annex 3 of the Biodiversity Act and in the Red Data Book of the Republic of Bulgaria.

Regarding the use of medicinal plants for decorative purposes in Bulgaria, some settlements located in different parts of the country have been studied. An ethnobotanical study of medicinal plants in the region of Isperih (Kultur & Saami, 2009), which is located in the floristic region of Northeastern Bulgaria and is close to the study area, describes 9 species of medicinal plants used by the population for decorative purposes. Of these, only *Muscari neglectum* Guss. is not indicated by the local residents of the NBSC. In the present study, 82 species of more MP were found to be used for decorative purposes. An ethnobotanical study of the North Black Sea wetlands (Cherneva, 2017) states that 9.73% of the locals use 25 species of MP for decorative purposes. Of these, *Cotinus coggygria* is not indicated for use as an ornamental plant in the present study, nor is *Petunia sp.,* Which is not indicated as a medicinal plant. In the present study, 66 species more MP are used for decorative purposes. The significant difference in the number of MP used for decorative purposes in the area of the town of Isperih (Kultur & Saami, 2009) and in the North Black Sea Wetlands (Cherneva, 2017), compared to the present study, is due to the larger area, which is subject of our study, the larger number of settlements - by 12 more and the larger number of respondents - by 524 more people.

7.1. Demographics

According to the size of the settlement. The respondents who use MP for decorative purposes in the towns are 252 people (52.60%) and 92 people (53.80%) with villagers. After analyzing the results obtained, it was found that the inhabitants of towns and villages use a similar number of medicinal plants.

Almost always the number of MP used for decorative purposes, associated with some differences in knowledge of MP and the corresponding decorative qualities of the local dwellings compared to the **size of the settlement**. A significant difference is also observed in the types of MP, noticeable for decorative purposes, a fact that is determined by the presence of a yard. In processing the results of the established, which have a significant difference in the types of MP used for decorative purposes, relative to the size of the settlement.

Representatives of all **ethnic groups** responded if they used MP for decorative purposes. After processing the results, it was found that the locals of the NBSC most often use between 1 and 5 species of MP for decorative purposes. For the use of a larger number of species - between 6 and 10, as well as between 11 and 15 species of MP, with answers received only from the Bulgarians. The percentage of respondents from smaller ethnic groups is higher, but they use less MP species for decorative purposes. Bulgarians, who use more than 5 species of MP - 82 people (26.89%).

Representatives of all **age** groups use MP for decorative purposes.

Most responses were obtained for 1-5 species of MP in all age groups. Respondents under the age of 20 do not use more than 5 species of MP.

In terms of **gender**, of the 709 locals surveyed, 75 were men (35.89%) and 300 women (60%) answered if they used MP for decorative purposes. Twice the percentage of participation in women involving the facts, as they usually take care of the decoration of the household. And by this criterion, the largest is the use of 1-5 species of MP.

The answers that use MP for decorative purposes, according to the level of **education** is as follows: without education - 3 people (21.43%), with primary - 6 people (46.15%), middle - 103 people 53.09%), secondary - 198 people (53.95%) and higher - 65 people (53.72%). It is noteworthy that only in people without education use of MP for decorative purposes is the smallest. In the other groups, the use of MP for decorative purposes is close to more than half of the respondents. This fact means that the attitude of the locals to ornamental plants is not formed in school. It is most widely included in local homes, which use between 1 and 5 species of MP for decorative purposes.

According to **employment,** as the following: participants: - 51 people (45.54%), employed - 188 people (50.54%), unemployed - 20 people (60.61%) and pensioners - 116 people (60.42%). The highest rate for retirees and the unemployed is likely to depend on the facts to provide the most free time. The most common is the use of 1-5 species of MP.

The results obtained from the performance of a correlation analysis between the last reporting of the number of medicinal plants and the demographic indicators of the surveyed dwellings show the weak ones in all indicators, except for the age groups only. (Table 11.).

Table. 11. Correlation between the number of medicinal plants used and the demographic indicators of the respondents

	Value of the correlation coefficient (r)	Significance level P (α ≤0,05)	Interpretation of the power of dependence
Size of settlement	0,1	0,03	weak
Ethnos	-0,1	0,02	weak
Age	0,31	0,01	moderate
Gender	-0,03	0,01	weak
Education	0,13	0,02	weak
Employment	0,2	0,04	weak

7.2. Quantitative ethnobotanical analysis

After the calculations we found a high value of the consensus coefficient of the respondent (Fic = 0.75). The result shows lasting knowledge in the use of MP for decorative purposes.

8. Use of medicinal plants for sale

Of the 709 local residents of the NBSC surveyed, 16 people (2.26%) answered that they use and 693 people (97.74%) answered that they do not use MP for sale. The importance value index tends to zero (IVs = 0.02). 41 species of medicinal plants of 37 genera, belonging to 25 families, are used for sale in the region of the NBSC. Of these, 35 species from 31 genera and 21 families are distributed in the floristic subregion of

NBSC: *Cotinus coggygria, Juglans regia, Urtica dioica, Quercus sp*. and others. Of the cultivated plants, 6 species of 6 genera and 4 families are used: *Calendula officinalis, Tagetes erecta, Helianthus annuus, Salvia officinalis, Ginkgo biloba* L. as well as foreign species of MP. This fact is explained by the way of supply of MP - collection from nature and the financial benefit of the sale, which excludes resale.

The most commonly used MP for sale by the local population are: *Tilia tomentosa* (FL 62.50), *Galanthus nivalis* (FL 25) and *Jglans regia* (FL 18.75). According to the usable part of MP, the most commonly sold are: flowers, stalks, fruits and leaves.

The plants are sold for various purposes: as herbs for human medicine, as ornamentals, for food and spice, or as wood for heating. From the study we found that most species of MP are sold as herbs - 39 species. For decorative purposes, locals sell 5 species of MP, for food and spices - 4 species and for heating - 1 species.

The leading position of *Tilia tomentosa* among MP that are sold is due to the fact that 8 respondents work in the cleaning companies in the towns of Varna and Shabla. They collect fallen linden blossoms from the streets and hand them over to herb points. We interviewed two herbalists - one is a resident of Obzor and the other - in the village of Kumanovo. Both sell over 20 species of MP, most of which are collected from nature, and a small part are grown in their backyards. During the survey we did not find a person who produces and sells MP in larger quantities.

It should be noted the fact that part of the MP for sale as decorative are collected from nature. The local population has no information on the conservation importance of species such as *Ruscus hypoglossum* L. and *Galanthus nivalis*. During the field work we interviewed a seller of flowers from the central

flower market in Varna and a seller of flowers in the cemetery park of the village of Topoli. Flower traders at the flower market in Varna buy *Ruscus hypoglossum* on certain days of the week to arrange bouquets, and according to the season they are supplied by small traders with snowdrop, lilac and sunflower flowers. The merchants from the cemetery park sell tagetes, snowdrops and lilacs. Three people answered that they sell MP for food and spices and one person sells wood for heating.

The small number of respondents using MP for sale is explained by the fact that the local population of the NBSC does not rely on this type of activity to provide or support the household budget. The employment of the locals is provided mainly by the tourism industry.

The results obtained are close to those of a study of the North Black Sea wetlands (Cherneva, 2017), where it is stated that 1.08% of locals use MP for business.

8.1. Demographics

According to the **size of the settlement**. Of the 709 respondents surveyed, 13 urban residents (2.42%) and 3 rural residents (1.75%) answered that they use MP for sale.

Out of a total of 8 towns located on the NBSC, only in the towns of Varna, Obzor and Shabla are registered residents who sell MP. Only in two villages were found people selling MP - the village of Topoli (two respondents) and the village of Kumanovo (1 respondent). When comparing the obtained results for the towns and villages, no difference was found in the types and number of MP used for sale.

There are no **ethnic groups** such as Kopanari and Tatars in the ethnic composition of the local residents of theNBSC, who use

MP for sale. The significantly higher use of MP for sale among Turkish, Roma and Armenian ethnic groups compared to the Bulgarian one made an impression. This result is due to the fact that Bulgarians are much less likely to rely on income related to the sale of MP. Representatives of all ethnic groups sell from 1 to 5 species of MP. Two people, herbalists of Bulgarian ethnicity, sell herbs obtained from more than 20 species of MP.

In terms of **age**, MP are not used for sale by locals in the age groups: up to 20 years, 41-50 years and over 80 years. The absence of some age groups in this MP application confirms the fact that the sale of MP is almost not used as a source of income for households. The question remains whether this is because people do not have the necessary time to collect herbs or because they believe that this activity is not profitable?

According to **gender.** After analyzing the results of the survey, we found that in both genders there is insignificant use of MP for sale - only 4 men (1.91%) and 12 women (2.40%). Most often between 1 and 5 types of MP are sold. Only two men sell more than 20 species of MP. According to the type and quantity of MP for sale, we found differences in the sale of MP for men and women. Men selling MP are more likely to seek a steady and higher income, while women expect an additional lower income. This result is explained by the fact that a higher income requires investment. And the women who use MP for sale are from minority ethnic groups with lower education. The men who answered that they used MP for sale were: two herbalists, one selling walnuts and one wood. The women sell MP as decorative and deliver herbs to purchase points.

Regarding gender and the use of MP for sale, we report a difference in the results obtained in the present study and that for the North Black Sea wetlands (Cherneva, 2017). According

to Cherneva, 2% of men and 0.74% of women use MP for business, a result opposite to ours. The difference is explained by the fact that in the current study there are 16 people who sell MP, while in Cherneva's study there are two.

When conducting the field research, I noticed that less educated respondents more often use MP for sale. This result is explained by the fact that usually these people are either unemployed or have low incomes and thus supplement their income.

Table. 12. Correlation between the number of medicinal plants used and the demographic indicators of the respondents

	Value of the correlation coefficient (r)	Significance level P (α ≤0,05)	Interpretation of the power of dependence
Size of settlement	0,04	0,02	weak
Ethnos	-0,34	0,02	moderate
Age	0,47	0,06	moderate
Gender	0,53	0,02	significant
Education	-0,65	0,06	significant
Employment	0,59	0,07	significant

In terms of **employment**, the predominant use of MP for sale among the unemployed is due to the fact that they earn an income through this activity. The most common number of used MP for sale is between 1 and 5 species.

The obtained results of the performed correlation analysis between the ratio of the number of used medicinal plants and the demographic indicators of the surveyed residents show the importance of this application of MP for the respondents who use it. (Table 12.).

8.2. Quantitative ethnobotanical analysis

After the calculations we found that Fic = 0.47. The result correlates with the working hypothesis for a level below the average value of popularity of this application of medicinal plants.

9. Application of medicinal plants for weather forecasting

Of the 709 local residents of the NBSC surveyed, 71 people (10.01%) answered that they use and 638 people (89.99%) answered that they do not use MP for weather forecasting. The importance value index is very low (IVs = 0.1). 7 types of medicinal plants of 7 genera, belonging to 6 families, are used for weather forecasting in the region of the NBSC. In terms of their origin, 4 species are **distributed in the floral subregion of NBSC**: *Juglans regia, Syringa vulgaris, Malus sylvestris* and *Salix sp*. From the **cultivated** plants 2 species are used: *Helianthus annuus, Prunus cerassus* L. **Adventive** is 1 species of MP - *Robinia pseudoacacia*. Locals use 1 to 5 species of MP to forecast the weather.

Most responses were obtained to observe re-blooming in *Syringa vulgaris* (FL 67.61) and *Robinia pseudoacacia* (FL35.21). Regarding the usable part of the MP for the purpose of weather forecasting, the locals use flower, fruit and leaf.

In the study area, the knowledge of weather forecast is associated with the re-flowering of some plants, strong aroma during flowering, gutting and abundant fruiting. Regarding the

re-blooming, the locals believe that the coming winter will be colder than usual. This is the most commonly reported knowledge of the locals, and the observed plants are: acacia, lilac, apple, cherry. Colder winters are also expected when the walnut bears much fruit. A short-term forecast was reported by a resident of the village of Osenovo, according to whom the strong aroma of acacia during flowering portends rain. Another short-term forecast for rain is when the willow "cries". The examples shown show amazing observation for people who do not have in-depth knowledge of plant biology. An interesting fact is that we received information from older locals about the knowledge of weather forecasting by observing the behavior of some domestic and wild animals, as well as the change in some astronomical objects (moon, stars).

9.1. Demographics

According to the **size of the settlement**. 18 inhabitants of the villages (10.53%) and 52 inhabitants of the cities (9.67%) have knowledge for weather forecasting using MP. The close percentage of respondents, residents of towns and villages is explained by the fact that there is no significant difference in the knowledge of local residents about the use of MP for weather forecasting. The results are similar in the number of used MP: 5 species for towns and 6 species for villages.

In terms of **ethnicity,** we found interesting results. Representatives of only the Bulgarian ethnic group - 67 people (10.67%) and the Roma ethnic group - 4 people (10.81%) answered that they have knowledge of weather forecasting using MP. Representatives of the Turkish, Armenian, Tatar and Kopanar ethnic groups replied that they did not have the knowledge to predict the weather using plants, either because they did not pay attention to the phenological changes of plants

related to the change of weather, or because such knowledge was not preserved and transmitted..

Representatives of all **age groups** participated in the survey as follows. After analyzing the obtained results, we found that with increasing age, the number of respondents who rely on plants for weather forecasting increases. The clear relationship between the age of the respondents and the use of MP for weather forecasting means on the one hand that with increasing age more attention is paid to phenological changes in plants, and on the other hand that there is a loss of ethnobotanical knowledge in generations. An interesting fact is that this dependence is not affected by the size of the respondents' settlement.

In terms of **gender,** for weather forecasting 13 men (6.22%) and 58 women (11.60%) have knowledge related to changes in MP, showing a change in weather. Almost twice the percentage of women compared to men is due to the fact that locals most often predict the weather according to the re-blooming of some tree species, namely women more often pay attention to flowering species.

Uneducated people did not answer that they use MP for this purpose, probably because they do not recognize the changes in plants associated with the change of weather or do not rely on them. The working hypothesis that the knowledge of using MP for weather forecasting is not acquired during the education of the respondents is confirmed by the obtained results.

In terms of employment, a curious fact is the significant number of unemployed, which is probably due to the free time they have. All respondents use from 1 to 5 species of MP for weather forecasting.

Table 13 presents the relationships between the number of medicinal plants used and the demographic indicators of the surveyed residents in terms of knowledge about the use of MP for weather forecasting.

Table. 13. Correlation between the number of medicinal plants used and the demographic indicators of the respondents

	Value of the correlation coefficient (r)	Significance level P (α ≤0,05)	Interpretation of the power of dependence
Size of settlement	0,02	0,03	weak
Ethnos	0,1	0,01	moderate
Age	0,3	0,04	moderate
Gender	0,64	0,01	significant
Education	0,02	0,01	weak
Employment	0,25	0,03	weak

9.2. Quantitative ethnobotanical analysis

The established consensus ratio (Fic= 0.56) is slightly above average. The result proves the relatively low popularity of weather forecasting knowledge involving medicinal plants.

10. Application of medicinal plants in folk traditions and customs

From the conducted survey we found that a significant part of the respondents - 581 people (81.95%) have knowledge and use medicinal plants in folk traditions and customs. The

importance value index is very high (IVs = 0.81). In the study area, 44 species of MP from 40 genera and 30 families are used for this purpose. The largest number are the species distributed in the **floristic subregion of the NBSC** - 21 species. Such are, for example: *Cornus mas, Geranium macrorrhizum* L., *Juglans regia, Salix sp., Urtica dioica* and others. Of the **foreign species for the Bulgarian** flora, 6 species are used: *Buxus sempervirens* L., *Laurus nobilis* Pelargonium zonale, *Piper nigrum, Punica granatum* L. and *Syzygium aromaticum* (L.) Merr. & L.M.Perry.

Medicinal plants, distributed in **other floristic regions of Bulgaria**, are 4 species: *Abies alba* Mill., *Picea abeis* (L.) Karst., *Pinus nigrum* and *Pinus sylvestris* L. .

*Of the **cultivated plants**, 13 species are used: Allium cepa, Allium sativum, Malus domesica, Ocimum basilicum, Pelargonium zonale, Punica granatum, Triticum sp., Zea mays* and others. The highest number of responses to the use of medicinal plants were obtained for *Cornus mas* (FL 434) and *Geranium macrorrhizum* (FL 416).

Of this group of MP with conservation value is only *Paeonia peregrina.*

The higher percentage of inhabitants of the villages in comparison with those of the towns, using MP in the folk traditions and customs, is explained by the fact that in the smaller settlements the local population is older. Older people still have the knowledge of the use of MP on the one hand, and on the other hand the proximity to nature and natural sources of MP makes it much easier to provide them. Despite the close number of used types of MP, we found some differences in their use in small towns. Traditions and customs from the recent past are still known and observed in the villages, while

in the towns (mainly the town of Varna) traditions foreign to the local population are increasingly entering.

We have recorded some more interesting practices in the application of MP. For example, residents of the village of Balgarevo reported placing a "bunch" of nettles on the front door of St. George's Day. The locals of Balchik, Kavarna and the nearby villages celebrate Rusal Sunday with the use of wormwood stalks, walnut leaves and less often thyme. Cherneva (2017) also reported the use of walnut leaves during the Rusal Sunday for the inhabitants of the North Black Sea wetlands. Some residents of the town of Byala believe that a bay leaf in the purse "brings" luck and money. Horse chestnut seed "brings" luck to some of the residents of Varna. Locals in the town of Aksakovo report the use of a clove of garlic in the days between Christmas and Jordan's Day (dirty days). A practice that has remained in the past, but still alive in the memory of elderly residents of the town of Beloslav, is placing a clove of garlic on the newborn's basket against lessons. The same use of garlic by the Bulgarians in the 19th century was reported by Goev (2002). In the regions with developed viticulture and winemaking (town of Beloslav, town of Byala, town of Obzor) the vines are annually cut down during Trifon cut down and a wreath of vine twigs is woven. Some plants with dyeing and / or decorative qualities (onion flakes, brooch, parsley leaves) are often used to paint Easter eggs. The practice of collecting herbs before sunrise on Midsummer's Day is preserved in some villages (Kumanovo, Kichevo, Durankulak), while in the towns (Varna) it has lost its significance.

Quite often a dogwood twig (with buds) is used to prepare a traditional pie with good luck on the Christmas table. Significant use has a live Christmas tree, most often black pine, but also used white pine, spruce or fir for Christmas. A positive trend is the use of an artificial Christmas tree, but unfortunately

the motive of a small part of the locals is to preserve plant diversity. One of the most common practices for the use of MP among the Christian population is the use of a willow branch for Palm Sunday (Vrabnitsa). Usually the type of willow does not matter.

The use of geranium and boxwood is typical for rituals such as weddings, baptisms, funerals. In small towns, red geranium and basil stalks are used. Most often, the wrist of the Christian priest in performing various rites is made of these plants. The use of boxwood, basil, geranium is typical of funeral customs of the Christian population from smaller settlements. In towns, their use is less common because they have been replaced by various cultivated flowering plants, while people in small towns grow these plants in their backyards. Ritual use of geranium leaf for health has been reported to residents of Isperih (Kultur & Saami, 2009a).

Knowledge about the making and use of survaknitsi for the New Year is ubiquitous, both in large towns and in small towns, especially in households with small children. To make them people use: dogwood twig, corn (like popcorn), dried fruit, dried pepper. In contrast to the villages, in the towns the locals more often prefer to get survaknitsa, bought from the trade network, while in the small settlements, the locals prepare them themselves. It should be noted that due to the aging of the population in most of the small settlements, this knowledge has remained as a memory from the recent past. Residents of the town of Isperih (Kultur & Saami, 2009a), an area close to the NBSC, have also been reported for the preparation of survaknitsa. Information about the preparation of survaknitsa in different regions of Bulgaria was also published by Vakarelski (1977).

Among the inhabitants of Varna the celebration of holidays foreign to Bulgaria is more and more often noticed. From young people under 20 in the town of Varna we received an interesting answer about the use of MP in folk traditions and customs. They believe that the use of pumpkin on Halloween is part of Bulgarian folk traditions and customs. We think this is a very alarming signal.

The **ethnic** composition of the locals, who use MP in folk traditions and customs, is rich and includes all ethnic groups. And in this application the use of between 1 and 5 species of MP from all ethnic groups prevails.

After analyzing the results obtained, we found that there is no significant difference in the use of MP by ethnic groups such as Roma and Kopanari compared to Bulgarians, when they have the same religion - Orthodox Christianity. The same conclusion can be drawn for Muslim traditions - they are the same for Turks as well as for Roma and Tatars of the Muslim faith.

Some Armenian residents of Varna report an interesting tradition. They foretell a fertile year for the content and quality of pomegranate seeds (*Punica granatum*) on the New Year's table. A typical application for the Turkish ethnic group is the use of cloves (*Syzygium sp.*) in funeral customs.

Representatives from all **age** groups participated in the survey.

Impressive is the large number of responses to the use of MP between 1 and 5 species of all age groups, with the largest share among young people under the age of 20. The use of more MP (over 6 types) increases with age. This connection confirms our working hypothesis that older people have more knowledge about the application of medicinal plants in folk traditions and customs.

In terms of **gender**. The use of MP in folk traditions and customs is indicated by 166 men (79.42%) and 415 women (83%), local residents of the NBSC. Despite the close participation rate, knowledge between the genders is not uniform. The percentage of men is higher with the use of 1-5 species of MP, while the percentage of women is higher with the use of a larger number of species. This fact is explained by the understanding of the locals that much of the knowledge about the use of MP in folk traditions and customs is considered "women's work". Exceptions are some "typically male" holidays such as Christmas, Trifon Zarezan and Todorovden.

According to their **education**, the surveyed local residents of the NBSC, who use MP in folk traditions and customs, are: without education - 10 people (62.5%), primary education - 12 people (27.9%); middle - 155 people (77.5%); secondary - 305 people (85.71%) and higher education - 99 people (82.5%).

According to **employment.** A curious fact here is the significant participation of the unemployed in this application of MP. The result is probably due to the free time available to the unemployed, but it also means that they have the necessary knowledge about the use of MP in folk traditions and customs.

The most significant dependence in the use of MP on the demographic indicators of the respondents is registered in the employment indicator (Table 14).

Table. 14. Correlation between the number of medicinal plants used and the demographic indicators of the respondents

	Value of the correlation coefficient (r)	Significance level P (α ≤0,05)	Interpretation of the power of dependence
Size of settlement	0,1	0,02	weak
Ethnos	0,2	0,04	weak
Age	0,29	0,05	weak
Gender	0,19	0,06	weak
Education	0,21	0,03	weak
Employment	0,31	0,04	moderate

10.2. Quantitative ethnobotanical analysis

After the calculations we found a high value of the consensus coefficient (Fic = 0, 84). The result shows high knowledge in the use of medicinal plants in folk traditions and customs.

11. Comparative analysis of the used medicinal plants in the region of the North Black Sea coast

From the study we found that in the floral subregion of the North Black Sea coast, locals use 333 species of medicinal plants belonging to 251 genera and 89 families. Of these, 147

species from 127 genera and 57 families are included in the Medicinal Plants Act of the Republic of Bulgaria. The other 186 species are listed as medicinal in the available literature on medicinal plants, published in Bulgaria. The distribution of the identified 333 species by origin is as follows:

The present study describes 184 species from 38 genera and 58 families **distributed in the floral subregion of the NBSC**. The results show that the local population uses 30.86% of the species composition of medicinal plants in the area it inhabits. In terms of habitats, we found a low level of use of medicinal plants typical of coastal sands. Of this group of plants, only a few respondents indicated *Eryngium maritimum, Artemisia pedemontana* and *Limonium vulgare*. This has the advantage of preserving these habitats, which are of conservation importance and are part of the European ecological network NATURA 2000.

Of the **foreign MP** species, the local population uses 30 species belonging to 30 genera and 22 families. Foreign species of MP are 10.24% of the total number of MP used in the region. This result is explained by the fact that the local population adapts quickly and is oriented towards new knowledge.

The used MP from **other floristic regions of Bulgaria** are only 13 species from 11 genera and 8 families (3.91% of all used MP in the NBSC). This extremely low level of use indicates a weak knowledge of the possibilities of MP, spread in other parts of the country. One of the reasons for this is the poor supply in the trade network of Bulgarian MP, distributed

in other floristic regions, but absent in the floristic subregion of the NBSC.

Of the **cultivated MP,** 101 species from 82 genera and 31 families are used. The high share of used cultivated resources (29.21%) is due to the fact that the supply of them is easy and accessible.

Of the **adventitious** species of MP, the residents of the NBSC use 5 species from 5 genera and 4 families.

It should be noted that the popularity of MP with conservation status collected from their natural habitats is low with the exception of some species collected for ornamental purposes and sale such as: *Galanthus nivalis, Limonium vulgare* Mill. and *Ruscus hypoglossum.* Although these plants have a conservation status and their natural habitats are in the areas of the European ecological network "Natura", the population is either not aware of their status or control activities for their protection are not effective enough. This fact is essential for the conservation of species and their natural habitats.

The medicinal plants with the most frequent use in all applications by the locals of the study area are: *Urtica dioica* (FL 100), *Cornus mas* (FL 100), *Zea mays* (FL 100), *Capsicum annuum* (FL 100), *Juglans regia* (FL 99), *Citrus lemon* (FL 99), *Prunus avium* (FL 96), *Matricaria chamomilla* (FL 95), *Thymus sp*. diversa (FL 95), *Vitis vinifera* (FL 90). The species composition of the ten most commonly used MP in folk medicine differs from the most commonly used MP in all

applications in the study area. This result is due to the fact that some species are used in more than one application. For example, nettle has applications in human and veterinary medicine, cosmetics, such as food, pet food, in the household, for sale, as well as in folk traditions and customs. The number of medicinal plants mentioned only once in the questionnaires is 27 species. Among them are: *Polygonatum multiflorum* (L.) All., *Ruscus aculeatus* L., *Phyllitis scolopendrium* (L.) Newman, *Gypsophila paniculata* L., *Saponaria officinalis* L., *Ricinus communis* L., *Ononis spinos* L. and others.

The knowledge about the use of MP by the local residents of the NBSC is not equally preserved in all applications of MP (Table 15).

The degree of stored knowledge, the choice of the species and number (FL) of MP used, as well as the number of local people who use them, is determined by the importance (IVs) of the specific use of MP according to the respondents. Some applications of MP have remained in the past and are remembered only by the older residents of the area. Other applications of MP have been passed on to future generations, but have undergone development. New and hitherto unknown possibilities for the use of MP for both treatment and culinary purposes are entering.

Most species of MP are used with application in human medicine (205 types), followed by MP with application for culinary purposes (164 types). As the smallest number of MP species used, the locals indicated their use for weather

forecasting (7 species) and for pet food and bee grazing (39 species).

Table. 15. Distribution of the significance of the used medicinal plants and their applications

№	Application	Family	Genus	Species	Answers Received (UR)	IVs
1	Culinary purpose	50	131	164	707	0,99
2	Human medicine	71	165	205	678	0,95
3	Household purposes	45	28	61	579	0,81
4	Folk traditions and customs	30	40	44	581	0,81
5	Decorative	31	61	74	375	0,52
6	Cosmetics	35	51	55	302	0,42
7	Pet food and bee grazing	18	36	39	143	0,20
8	Veterinary Medicine	28	41	45	94	0,13
9	Weather forecast	6	7	7	71	0,10
10	For sale	25	37	41	16	0,02

This result correlates with the working hypothesis about the degree of significance in the applications of MP in the life of the local population, determined by the importance of good health and the importance of choosing and obtaining quality and easily available food (FA. and BG).The small number of

MP used in some of the applications is explained by the declining functions in the area of small private farms for livestock. For the other applications, the number of used MP occupies an intermediate position, as in some of the applications ready-made products are often used (cosmetics, veterinary medicine, household purposes).

The largest number of interviewed locals (707 people) answered that they use MP for culinary purposes, followed by those who use MP in human medicine (678 people). This result confirms the hypothesis that knowledge about the use of MP for food is best preserved and developed, despite the fact that some of this knowledge is returning as new and modern. On the other hand, a large part of the respondents use MP for culinary purposes without having knowledge of the healing properties of the plant. Of the applications of MP outside of human medicine, the smallest number of locals answered that they use MP for weather forecasting (71 people) and for sales (16 people). This result is explained by the fact that the respondents rely on the mass information for weather forecasting, as a result of which, according to this application of MP, we report a loss of ethnobotanical knowledge. With regard to the sale of MP, the locals consider that this activity is not considered sufficiently profitable and therefore almost not practiced.

IV. Conclusion

The present study describes 333 species of medicinal plants used in human and veterinary medicine, as well as in a large number of different applications in the life of the locals

from the Northern Black Sea coast of Bulgaria. The results show that part of the knowledge about the use of medicinal plants among the local population is stored and transmitted unchanged, and another part is developed and changed. There is a trend towards globalization, adaptation of the population to the use of new plants and their products and new applications of known plants and products and subsequent loss of some local ethnobotanical knowledge. The lack of intergenerational continuity and interest among young people, as well as the use of the global network and means of communication, are some of the reasons for the loss of local ethnobotanical knowledge.

The collected and documented data from the studied area can be used to preserve and promote ethnobotanical knowledge. The created rich database could be used for comparison with other ethnobotanical researches both in Bulgaria and abroad, especially in the countries of the Balkan Peninsula. Documented knowledge about the use of MP by the locals from the North Black Sea coast can serve as a basis for the development of new pharmaceutical products for human and veterinary medicine; creation of new and enrichment of existing cosmetic products; development of food supplements based on used MP for culinary purposes; protection of conservation-significant species of MP in the region of the North Black Sea coast.

V. Summary

1. The ethnobotanical knowledge about the use of MP in human medicine and for culinary purposes is the best preserved and significant for the locals of theNBSC. There is

interest in the use of natural remedies, including medicinal plants as a means of prevention, treatment and nutrition. We report a trend towards the return of the "forgotten old" as new and modern knowledge about the use of medicinal plants, mainly by young people living in large settlements.

2. A significant part of the ethnobotanical knowledge about the use of medicinal plants is stored by older people and by the inhabitants of small settlements. They are the source of folk names, as well as interesting or little-known practices for the use of medicinal plants.

3. The locals use a small part of the species diversity of medicinal plants, naturally distributed in the studied area and a large number of medicinal and foreign to the Bulgarian flora medicinal plants.

4. The number of used MP in the region of the NBSC is significantly higher than the used MP in other regions of Bulgaria. However, this result is due to the more extensive study in the present study and is not due to better preserved ethnobotanical knowledge by locals.

5. The results obtained from the quantitative ethnobotanical analyzes in the present study are similar to the results from studies in other countries of the Balkan Peninsula.

6. There is a tendency to standardize the use of medicinal plants. On the one hand, it is expressed in a similar species composition of medicinal plants used by different

ethnic groups. On the other hand, when comparing the results by different demographic indicators, small differences in the number and types of medicinal plants used are taken into account.

VI. Contributions

1. For the first time, an extensive ethnobotanical study (709 people from 32 settlements) was conducted on the use of medicinal plants by local residents in the floristic subregion of the NBSC.

2. For the first time, an up-to-date database on the local knowledge of the residents of the NBSC about the use of medicinal plants is provided and new and previously unpublished information on the application of medicinal plants is provided.

3. For the first time the quantitative ethnobotanical indicators of the used medicinal plants in the studied area are established.

4. 98 species of MP with application in human medicine have been registered, which are new for the region of the NBSC in ethnobotanical terms and have not been described in the available literature so far.

VII. Recommendations

1. Conducting targeted ethnobotanical studies in other regions of Bulgaria and comparing the results.

2. Creation of a national database with results from ethnobotanical studies.

3. In order to preserve and transmit ethnobotanical knowledge to initiate activities for their promotion. To be presented in an appropriate form and in accessible language to interested groups of the society - specialists, citizens, pupils, students.

4. Creating conservation strategies aimed at medicinal plants with conservation status. Conducting campaigns to raise the awareness of the local population in the NBSC about the conservation status of the used medicinal plants.

VIII. Publications related to the dissertation

1. Boycheva P, Zahariev D. Medicinal Plants used in Human Medicine in the Northern Black Sea Coast Region (Bulgaria). Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018; 9(6): 286-306. Web of Science.

2. Boycheva P, Ivanov D, Yaneva G. Application of medicinal plants for decorative purposes by the local populatuion on the North Black Sea coast (Bulgaria). Acta Scientifica Naturalis. 2021; 8(2): 28–43. doi: 10.2478/asn-2021-0016, Web of Science (CABI).

3. Boycheva P, Ivanov D. Comparative ethnobotanical analysis of the used medicinal plants in the region of the Northern Black Sea coast (Bulgaria). Acta Scientifica Naturalis. 2021; 8(2): 44–54. doi: 10.2478/asn-2021-0017, Web of Science (CABI).

IX. Participation in scientific forums related to the dissertation

1. Petya Boycheva. Ethnobotany of Medicinal Plants Used in Some Parts of the Northern Black Sea Coast Region (Bulgaria), 10 the Conference on Medicinal and Aromatic Plants of Southeast European Countries, May 20-24, 2018, Split, Croatia (poster).

2. Petya Boycheva, Jenny Cherneva, Dobri Ivanov. Medicinal plants used as a beverage colorant by the local population along the Northern Black Sea coast. Sixth Pharmaceutical Business Forum and Scientific and Practical Conference, October 25-27, 2019, Varna, Bulgaria.

3. Petya Boycheva, Dimcho Zahariev, Dobri Ivanov. Application of medicinal plants for culinary purposes in the region of the Northern Black Sea coast (Bulgaria). International Scientific Conference Plant Diversity: Sociocultural dimensions and interdisciplinary projections, November 21–22, 2019, Sofia, Bulgaria

X. ACKNOWLEDGMENTS