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Eco-biological characteristics of the flora in the floodplain forests of the protected area “Nahodishte na blatno kokiche” the Village of Vinica, Parvomay (Bulgaria)

ABSTRACT

The present study examines the flora in the protected area “Nahodishte na blatno kokiche”, Vinitza village, region of Plovdiv, situated in the middle course of the Maritsa River. The received data is based on three-year research in the floodplain forests in the protected area and analyses of the literary sources. Eco-biological characteristic of the higher plants is made, and the species are distributed by biological groups, by life forms, by floral elements, and by time of flowering. The plants are classified by ecological groups according their regard towards the water, the light and the heat as a factor. Conclusions for the presence by percentage of medicinal flora in the protected area are made, as well as their anthropogenic influence and the perspectives regarding security and business use.

Key words: Protected area “Nahodishte na blatno kokiche”, floristic characteristic, ecological characteristic, and conservation species

Introduction

The purpose of the current research is to make floristic analysis and ecological and biological characteristic of the plants within the borders of the protected area (PA) “Nahodishte na blatno kokiche”, Vinitza village, region of Plovdiv based on terrain study and literature data.

The object of the research is the flora in the protected area “Nahodishte na blatno kokiche” Vinitza village, municipality of Parvomai (18.6 ha), located in the middle reaches of Maritsa River. The protected area is stated with Order № 1938/ 03.07.1970 from Ministry of Forests and Environmental Protection (MFEP) with the main motive of protecting the *Leucojum aestivum* L.

The protected area is located in the field of Plovdiv of the Upper Thracian Plain. According to phytogeographical subdivision (Bondev, 1991) the territory of the commented object is at the borders of the floristic region Thracian Plain.

According to the physiographic division of Bulgaria (Galabov, 1982) the examined territory falls in the Kraishtensko – Tundjanska (transitional) zone, region of the

upper Thracian Plain, in the Western sub-region which is in the field of Plovdiv.

The climatic zoning of the country (Galabov, 1982) pertains the protected area “Nahodishte na blatno kokiche”, Vinica village to the Eastern Thracian sub-region of the climatic region of Eastern Central Bulgaria, Transitional – continental climatic sub-region of the European – continental climatic region. It is characterized with relatively mild winter and hot summer, with well-defined drought especially in the months August-September, which are the driest months of the year. The annual rainfall is presented in Table 1. The average annual rainfall is 551 l/km², which defines the area as a place with little annual rainfall (Galabov, 1982). The average annual temperature is around 12.1°C, which matches the indicated temperature for the country between 11 and 12°C (Galabov, 1982). The average air humidity is 72% and matches the average for the country (Galabov, 1982).

The soils are mainly alluvial meadows, where at some places are mixed with clay and black resinous.

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Table 1. Average monthly amount of rainfall in Sadovo station.

Months	Liters per 1 sq. m.
January	42
February	35
March	38
April	45
May	61
June	68
July	48
August	31
September	36
October	43
November	52
December	52
Annual amount	551

Materials and Methods

The diversity of medicinal flora in PA “Nahodishte na blatno kokiche” Vinitza village is studied by systematic observations and collecting of material during the vegetative seasons of 2010-2012. The periodicity of the visits is conformed to the climatic conditions in the region and the determined by their phyto-rhythmic. The earliest aggregates are form the beginning of February 2010, and the latest – from the end of September 2012. This allows the most complete taxonomic diversity of the medicinal flora in the reserve and its seasonal dynamics. The determination of the species is made by means of Flora of Bulgaria (Yordanov, 1963-1979; Velchev, 1982-1989), Flora of Bulgaria (Kozuharov, 1995), and Flora of Bulgaria (Stoyanov et al., 1966-1967), Identifier of Trees and Shrubs in Bulgaria (Gramaticov, 1992), Identifier of Plants in Bulgaria (Delipavlov et al., 2011).

The processing of herbarium materials and characteristics of medicinal flora were carried out by standard methods (Stanev, 1976; Vassilev & Andreev, 1992; Gusev et al., 2004). Characteristic of medicinal plants was done according to biological types and life forms of Raunkiaer (1934). Floral elements were characterized by the classification of B. Stefanov (1943) and the adapted to the flora of Bulgaria classification of Walter (Asyov & Petrova, 2006). The identified taxa are divided into ecological groups in terms of the most important ecological factors – water, temperature

and light. An account and analysis of the flowering period for all identified species were done. The names of the plants are by The Euro + Med PlantBase – the information resource for Euro-Mediterranean plant diversity (2011), Qualifier of Plants in Bulgaria (Delipavlov et al., 2011).

Results and Discussion

The results from the resent analysis summarize the data from the research of Pavlov (1990), Tashev (1991) and our terrain studies in PA “Nahodishte na blatno kokiche” Vinitza village. After the floristic studies on the territory of PA “Nahodishte na blatno kokiche” Vinitza village were found 222 species higher plants from 168 genera and 58 families. Out of these species only one belongs to higher spore plants *Equisetum arvense* from Equisetophyta division and the rest 221 species belong to the Magnoliophyta division. 46 species belong to Class Liliopsida distributed in 31 genera and 11 families, and 175 species belong to Class Magnoliopsida distributed in 136 genera and 46 families.

Systematic list of the higher plants in PA “Nahodishte na blatno kokiche” Vinitza village

Equisetophyta

Equisetaceae: *Equisetum arvense* L.

Magneliophyta

Liliopsida: Alliaceae: *Allium atroviolaceum* Boiss. A. *cyrilli* Ten., A. *rotundum* L., A. *scorodoprasum* L.; Amaryllidaceae: *Galanthus elwesii* Hook. f., *Leucojum aestivum* L.; Araceae: *Arum maculatum* L.; Cyperaceae: *Carex acutiformis* Ehrh., *C. caryophyllea* Latourr., *C. flacca* Schreber, *C. melanostachya* Bieb. ex Willd., *C. sylvatica* Huds., *C. tomentosa* L., *Pycneus glomeratus* (L.) Hayek, *P. longus* (L.) Hayek; Dioscoreaceae: *Tamus communis* L.; Iridaceae: *Gladiolus communis* L., *Iris graminea* L., *I. pseudacorus* L.; Juncaceae: *Juncus effusus* L.; Liliaceae: *Muscari tenuiflorum* Tausch, *Ornithogalum sibthorpii* Greuter, *O. umbellatum* L., *Polygonatum latifolium* Desf., *P. odoratum* (Mill.) Druce; Poaceae: *Agrostis stolonifera* L., *Alopecurus myosuroides* Huds., *Anthoxanthum odoratum* L., *Arrhenatherum elatius* (L.) J. Presl & C. Presl, *Brachypodium sylvaticum* (Huds.) Beauv., *Bromus commutatus* Schrader, *B. sterilis* L., *Cynodon dactylon* (L.) Pers., *Dactylis glomerata* L., *Echinochloa crus-galli* (L.) Beauv., *Elymus repens* (L.) Gould, *Festuca altissima* All., *Hordeum murinum* L., *Lolium perrene* L., *Phragmites*

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australis (Cav.) Trin. ex Steud., *Poa annua* L., *P. nemoralis* L., *P. pratensis* L., *Sorghum halepense* (L.) Pers.; Smilacaceae: *Smilax excelsa* L.; Typhaceae: *Typha angustifolia* L.

Magnoliopsida: Aceraceae: *Acer campestre* L., *A. tataricum* L.; Apiaceae: *Angelica sylvestris* L., *Anthriscus sylvestris* (L.) Hoffm., *Bifora radians* M. Bieb., *Chaerophyllum bulbosum* L., *C. temulentum* L., *Eryngium campestre* L., *Heracleum sibiricum* L., *Myrrhoides nodosa* (L.) Cannon, *Torilis arvensis* (Huds.) Link; Araliaceae: *Hedera helix* L.; Aristolochiaceae: *Aristolochia clematitis* L.; Asteraceae: *Achillea millefolium* L., *Anthemis arvensis* L., *Arctium lappa* L., *Artemisia vulgaris* L., *Bellis perennis* L., *Carduus acanthoides* L., *Carlina vulgaris* L., *Centaurea solstitialis* L., *Cichorium intybus* L., *Cirsium arvense* (L.) Scop., *Conyza canadensis* (L.) Cronq., *Crepis pulchra* L., *Inula hirta* L., *Lactuca serriola* L., *Lapsana communis* L., *Matricaria trichophylla* (Boiss.) Boiss., *Onopordium acanthium* L., *Sonchus arvensis* L., *Taraxacum officinale* F. H. Wigg., *Tragopogon pratensis* L.; Boraginaceae: *Anchusa officinalis* L., *A. procera* Besser, *Buglossoides purpureocaerulea* (L.) I. M. Johnst., *Cynoglossum officinale* L., *Lithospermum officinale* L., *Myosotis cyanea* (Boiss. & Heldr.) Peev et N. Andreev, *M. ramosissima* Rochel, *M. sylvatica* Ehrh. ex Hoffm., *Symphytum officinale* L.; Brassicaceae: *Alliaria petiolata* (M. Bieb.) Cavara & Grande, *Arabidopsis thaliana* (L.) Heynh., *Capsella bursa-pastoris* (L.) Medic., *Cardamine matthioli* Moretti, *Cardaria draba* (L.) Desv., *Erysimum cuspidatum* (Bieb.) DC., *Erophila verna* (L.) Chevall., *Hesperis sylvestris* Crantz, *Rorippa sylvestris* (L.) Besser, *Thlaspi alliaceum* L.; Cannabaceae: *Humulus lupulus* L.; Campanulaceae: *Campanula rapunculus* L.; Caprifoliaceae: *Sambucus ebulus* L., *S. nigra* L.; Caryophyllaceae: *Cerastium arvense* L., *Myosoton aquaticum* (L.) Moench, *Stellaria media* (L.) Cirillo; Celastraceae: *Euonymus europaeus* L.; Chenopodiaceae: *Chenopodium album* L.; Convolvulaceae: *Calystegia sylvatica* (Kit.) Griseb., *Convolvulus arvensis* L.; Cornaceae: *Cornus mas* L., *C. sanguinea* L.; Corylaceae: *Corylus avellana* L.; Dipsacaceae: *Cephalaria transsilvanica* (L.) Roemer & Schultes, *Dipsacus fullonum* L.; Euphorbiaceae: *Euphorbia cyparissias* L., *E. palustris* L., *E. villosa* Waldst. & Kit. ex Willd.; Fabaceae: *Amorpha fruticosa* L., *Coronilla scorpioides* (L.) W. D. J. Koch, *Galega officinalis* L., *Lathyrus hirsutus* L., *L. pratensis* L., *L. sylvestris* L., *Lotus corniculatus* L., *Melilotus albus* Medic., *Ononis spinosa*

subsp. *hircina* (Jacq.) Gams, *Robinia pseudoacacia* L., *Trifolium pratense* L., *T. repens* L., *Vicia angustifolia* Grufb., *V. cracca* L., *V. grandiflora* Scop., *V. serratifolia* Jacq., *V. tetrasperma* (L.) Schreber, *V. varia* Host; Fagaceae: *Quercus robur* L. subsp. *pedunculiflora* (K. Koch) Menitsky, *Q. robur* L. subsp. *robur* L.; Fumariaceae: *Corydalis solida* (L.) Clairv., *Fumaria officinalis* L.; Geraniaceae: *Erodium cicutarium* (L.) L'Her., *Geranium dissectum* L., *G. macrorrhizum* L.; Hypericaceae: *Hypericum perforatum* L.; Lamiaceae: *Ajuga reptans* L., *Ballota nigra* L., *Clinopodium vulgare* L., *Galeopsis ladanum* L., *Glechoma hederacea* L., *Lamium maculatum* (L.) L., *L. purpureum* L., *Leonurus cardiaca* L., *Mentha aquatica* L., *M. pulegium* L., *Prunella vulgaris* L., *Teucrium scordium* L.; Malvaceae: *Althaea officinalis* L., *Lavatera thuringiaca* L., *Malva sylvestris* L.; Moraceae: *Morus alba* L., *M. nigra* L.; Oleaceae: *Fraxinus angustifolia* subsp. *oxycarpa* (Willd.) Franco & Rocha Afonso, *F. ornus* L., *Ligustrum vulgare* L.; Onagraceae: *Epilobium hirsutum* L.; Papaveraceae: *Chelidonium majus* L., *Papaver rhoeas* L.; Plantaginaceae: *Plantago lanceolata* L., *P. major* L.; Polygonaceae: *Persicaria hydropiper* (L.) Opiz, *Polygonum patulum* M. Bieb., *Rumex acetosella* L., *R. conglomeratus* Murray, *R. crispus* L.; Primulaceae: *Lysimachia nummularia* L.; Ranunculaceae: *Clematis vitalba* L., *C. vitisella* L., *Consolida regalis* S. F. Gray, *Ficaria verna* Huds., *Ranunculus acris* L., *R. repens* L.; Rhamnaceae: *Frangula alnus* Mill., *Paliurus spina-chrysti* Mill.; Rosaceae: *Agrimonia eupatoria* L., *Crataegus monogyna* Jacq., *Geum urbanum* L., *Malus sylvestris* (L.) Mill., *Potentilla argentea* L., *P. erecta* (L.) Rausch., *Prunus cerasifera* Ehrh., *P. mahaleb* L., *P. spinosa* L., *Rosa canina* L., *Rubus caesius* L.; Rubiaceae: *Cruciata laevipes* Opiz, *Galium aparine* L., *G. verum* L.; Salicaceae: *Populus alba* L., *P. canescens* (Ait.) Sm., *P. nigra* L., *Salix fragilis* L.; Scrophulariaceae: *Gratiola officinalis* L., *Pseudolysimachium orchideum* (Crantz) T. Wraber, *Verbascum blattaria* L., *Veronica anagalis-aquatica* L., *V. hederifolia* L., *V. polita* Fries, *V. triloba* (Opiz) A. Kerner; Solanaceae: *Datura stramonium* L., *Physalis alkekengi* L., *Solanum dulcamara* L., *S. nigrum* L.; Tiliaceae: *Tilia platyphyllos* Scop.; Ulmaceae: *Ulmus laevis* Pallas, *U. minor* Mill.; Urticaceae: *Parietaria officinalis* L., *Urtica dioica* L.; Valerianaceae: *Valerianella carinata* Loisel.; Verbenaceae: *Verbena officinalis* L.; Violaceae: *Viola jordanii* Hanry, *V. odorata* L.; Zygophyllaceae: *Tribulus terrestris* L.

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Most species in the protected area are from families: Asteraceae with 20 species, Poaceae with 19 species, Fabaceae with 18 species, Lamiaceae – 12 species, Rosaceae – 11 species etc. The genera with most species are *Carex* and *Vicia* with 6 species each, after that with 4 species each are the genera *Allium* and *Veronica* etc.

The distribution of the taxon according to biological types shows that with the most significant presence are the perennial herbaceous species – 117 or 52.7% of all the medicinal plants, followed by the annual – 43 species (19.4%), trees – 14 species (6.3%), shrubs – 12 species (5.4%). The rest of the species belong to the transitional biological types (Table 2).

Table 2. Distribution of the higher plants from PA “Nahodishte na blatno kokiche” Vinitsa village according to biological types.

Biological type	Number of taxa	% from P in PA “Nahodishte na blatno kokiche” Vinitsa village
tree	14	6.3
tree-shrub	3	1.3
shrub-tree	6	2.7
shrub	12	5.4
perennial	117	52.7
biennial-perennial	8	3.6
biennial	7	3.1
annual-perennial	2	0.9
annual-biennial	10	4.5
annual	43	19.4
Total	222	100

According to the biological spectrum of the studied species (Table 3), most are hemicryptophytes (H) – 91 species or 41.0% of the total number of plants in the protected area, followed by phanerophytes (Ph) – 32 species (14.4%), cryptophytes (Cr) – 26 species (11.7%), therophytes (Th) – 43 species (19.4%) and chamephytes (Ch) which are 3 species (1.3%). The remaining species are of transitional life forms – among them the most – 16 species (7.2%) are these which can be therophytes or hemicryptophytes (Th-H), depending on the habitat conditions.

Table 3. Biological spectrum of higher plants from PA “Nahodishte na blatno kokiche” Vinitsa village.

Biological form by Raunkiaer (1934)	Number of taxa	% from P in PA “Nahodishte na blatno kokiche” Vinitsa village
Phanerophytes (Ph)	32	14.4
Chamephytes (Ch)	3	1.3
Hemicryptophytes (H)	91	41.0
Cryptophytes (Cr)	26	11.7
Therophytes (Th)	43	19.4
Therophytes to hemicryptophytes (Th-H)	16	7.2
Hemicryptophytes to therophytes (H-Th)	11	5.0
Total	222	100

The distribution of higher plants in phytogeographic centers according to the classification of Stefanov (1943) shows that the greatest part – 30.8% are thermophytes from the Southern Continental Center, followed by the thermophytes and mesotherms from the Mountainous Center – 23.0%, the thermophytes from the Northern Continental Center and the mesotherms of Silvo-boreal Center with 19.8% each, the thermophytes from Mediterranean Centre – 4.1%. Finally plants from other phytogeographic centers – 2.5% (Figure 1).

According to their mobility the analyzed plants are distributed as follows: the stationary species are 65 (29.3%), the moving ones with secondary broadened areas are 60 species (27.0%) and the species that have appeared by secondary displacement – 97 plants (43.7%) (Stefanov, 1943). These data is evidence of significant anthropogenic interference within the territory of the reserve in the past.

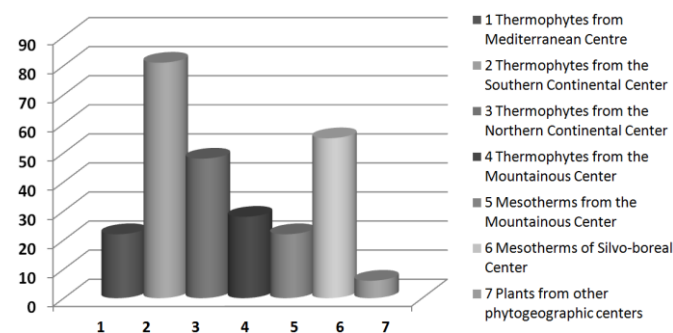


Figure 1. Distribution of higher plants in phytogeographic centers (Stefanov, 1943).

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Analyzing higher plants by floral elements, distributed according to the classification of Walter, shows that geoelements with European component – 120 species, 54.1% are the greatest part, as among them most are Euro-Asian (*Eur-As*) – 49 species (22.0%), Euro Mediterranean (*Eur-Med*) – 34 species (15.4%), European (*Eur*) and Euro-Siberian (*Eur-Sib*) with 14 species (6.3%) each. Second is the group of species with Mediterranean component – 78 species or 35.1 %, among them most are Euro Mediterranean (*Eur-Med*) with 34 species (15.4 %), followed by sub-Mediterranean (*subMed*) with 20 species (9.0 %), Pontic-Mediterranean (*Pont-Med*) – 9 species (4 %), and Mediterranean (*Med*) – 5 species (2.2 %). Cosmopolitan (*Kos*) and boreal (*Boreal*) species are almost equal in number – 20 and 17 species respectively, etc. (Table 4).

Table 4. Distribution of higher plants from PA “Nahodishte na blatno kokiche” Vinitza village by floral elements according to the adapted classification of Walter (Asyov & Petrova, 2012).

Floral elements by Walter (2006)	Number of taxa	% from P in PA “Nahodishte na blatno kokiche” Vinitza village
<i>Adv</i>	6	2.7
<i>Bal-Anat</i>	1	0.5
<i>Boreal</i>	17	7.7
<i>Eur</i>	14	6.3
<i>Eur-As</i>	49	22.0
<i>Eur-Med</i>	34	15.4
<i>Eur-Med-As</i>	2	0.9
<i>Eur-OT</i>	4	1.8
<i>Eur-Sib</i>	14	6.3
<i>Eur-subMed</i>	3	1.3
<i>Kos</i>	20	9.0
<i>Med</i>	5	2.2
<i>Med-As</i>	3	1.3
<i>Pont</i>	3	1.3
<i>Pont-Bal</i>	1	0.5
<i>Pont-Med</i>	9	4.0
<i>Pont-Sib</i>	1	0.5
<i>Pont-subMed</i>	1	0.5
<i>subBoreal</i>	14	6.3
<i>subMed</i>	20	9.0
<i>subMed-As</i>	1	0.5
Total	222	100

The distribution of the studied plants according to their period of flowering shows that the most active period is from

May to September. During this period 109 taxa blossom, 90.0 % of all the plants. Among them, most species blossom in May-August – 15 species, June-August – 14 species, May-June and June-September – 13 species each, etc. (Table 5).

According to their relation to heat the species are divided into only 2 groups. Thermophytes go to the bigger group with 130 species (68.90 %), and the remaining – 57 species (31.10 %) refer to the group of mesotherms (Table 7). The dominance of thermophilic species is directly related to the influence of the Mediterranean climate, penetrating along the river Tundzha (Galabov et al., 1982).

Table 5. Distribution of plants from PA “Nahodishte na blatno kokiche” Vinitza village according to their period of flowering.

Flowering period, months	Number of flowering species	% from P in PA “Nahodishte na blatno kokiche” Vinitza village
I-III	1	0.5
I-XI	1	0.5
I-XII	1	0.5
II-III	2	0.9
II-IV	2	0.9
II-V	3	1.3
III-IV	8	3.6
III-V	3	1.3
III-VI	1	0.5
III-VIII	1	0.5
IV-V	16	7.2
IV-VI	15	6.7
IV-VII	7	3.2
IV-VIII	1	0.5
IV-IX	5	2.2
IV-X	1	0.5
V	3	1.3
V-VI	22	9.9
V-VII	22	9.9
V-VIII	22	9.9
V-IX	12	5.4
V-X	4	1.8
VI-VII	12	5.4
VI-VIII	24	10.7
VI-IX	22	9.9
VI-X	2	0.9
VII-VIII	2	0.9
VII-IX	5	2.2

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The fact that the PA “Nahodishte na blatno kokiche” Vinitza village is related to the floodplain forests determines the significant presence of water-dependent species. In the flora of the reserve the mezophytes dominate, represented by 134 species (60.3%), followed by the hygromezophytes – 27 species (12.2%), the hygrophytes – 21 species (9.4%) and the mezohygrophytes – 12 species (5.4%). 27 (12.2%) species can be related to Xeromezophytes (Table 6).

Table 6. Distribution of higher plants from PA “Nahodishte na blatno kokiche” Vinitza village according to their relation to water.

Ecological groups	Number of taxa	% from P in PA “Nahodishte na blatno kokiche” Vinitza village
Hydrophytes	21	9.4
Hygromezophytes	27	12.2
Mezohygrophytes	12	5.4
Mezophytes	134	60.3
Xeromezophytes	27	12.2
Xerophytes	1	0.5
Total	222	100

The analysis of higher plants distribution in terms of the light factor shows prevalence of heliophytes that are more than half of the species – 134 (60.3%), followed by the groups of hemi-scyophytes with 52 species and schyophytes represented with 36 species (Table 7).

Table 7. Distribution of higher plants from PA “Nahodishte na blatno kokiche” Vinitza village according to their relation to light.

Ecological groups	Number of taxa	% from P in PA “Nahodishte na blatno kokiche” Vinitza village
Heliophytes	134	60.3
Hemi-scyophytes	52	23.5
Scyophytes	36	16.2
Total	222	100

According to their relation to heat the species are divided into only 2 groups. Thermophytes go to the bigger group with 170 species (76.5 %), and the rest 52 species (23.5 %) refer to the group of mesotherms (Table 8). The dominance of thermophilic species is directly related to the influence of the Mediterranean climate, penetrating along the Maritsa River (Galabov, 1982).

Table 8. Distribution of higher plants from PA “Nahodishte na blatno kokiche” Vinitza village according to their relation to the thermal regime.

Ecological groups	Number of taxa	% from P in PA “Nahodishte na blatno kokiche” Vinitza village
Microtherms	-	-
Mesotherms	52	23.5
Thermophytes	170	76.5
Total	222	100

From the higher plants in the protected area only two species are conservation significant:

Leucojum aestivum L., which is in the category “vulnerable” in “Bulgarian Red Lists of vascular plants” (Evstatieva, 2009) and it is included in Appendix 4 of the Biodiversity Act of Bulgaria (2002).

Galanthus elwesii Hooker f., is in the category “endangered” in the “Red Book of Republic of Bulgaria. Volume 1. Plants and fungus” (2011), in Appendix №2 of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and in Appendix 3 of the Biodiversity Act of Bulgaria (2002).

As a result of the current research it is established that in PA “Nahodishte na blatno kokiche” Vinitza village are 121 species medicinal plants from 100 genera and 48 families, which represents 3.0 % of the species, 11.2 % of the genera and 32.6 % of the families in the Bulgarian flora (Asyova, Petrova, 2012). These plants represent 16.2 % from the species included in Appendix 1 of the Law for the Medicinal Plants (2000, 2006).

Conclusion

The research held in the period 2010-2012 of the medicinal plants in PA “Nahodishte na blatno kokiche” Vinitza village shows that there are 222 species plants from 168 genera and 58 families. Among these plants the majority are the perennial herbaceous species, the hemicryptophytes, the species with European and Mediterranean origin, the thermophytes, the mezophytes and the heliophytes which mainly blossom in the period May-September. The comparatively big participation of secondary and cosmopolite plants within the borders of the examined area is evidence for the considerable anthropogenic interference in the processes occurring in the plant cover of the protected area. The

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presence of xerophytisation processes is evident by the occurring xeromezophytes and xerophytes. In spite of that in PA “Nahodishte na blatno kokiche” Vinitsa village is kept significant gene pool of valuable plants, used in the traditional and official medicine.

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