Bulgarian Journal of Agricultural Science, 19 (2) 2013, 218–221
Agricultural Academy

SCI "ZAPADNA STARA PLANINA AND PREDBALKAN" – FLORISTIC STUDIES ON XEROTHERMIC OAK FORESTS

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Abstract

GEORGIEVA, N., K. PACHEDJIEVA and M. LYUBENOVA, 2013. SCI "Zapadna Stara Planina and Predbalkan" – floristic studies on xerothermic oak forests. *Bulg. J. Agric. Sci.,* Supplement 2, 19: 218–221

The main aim in the present study is to identify the floristic diversity of xerothermic oak forests with predomination of *Quercus cerris* L. and *Quercus frainetto* Ten. in SCI "Zapadna Stara planina i Predbalkan". The inventory of the floristic complex resulted in more than 100 species of higher plants that belong to almost 80 genera and 40 families represented in the Bulgarian vascular flora. The biological spectrum made based on Raunkiaer's life forms shows the predominance of hemicryptophytes and takes an intermediate position between the spectrums of the forests in the temperately warm and temperately cold zone. The phytogeographical spectrum shows the predominance of European-Asian and subMediterranean floral elements which are represented equally (about 20% each). They are followed be the European, European-Mediterranean and sub-Boreal floral elements (about 11% each). The anthropophytes are also discussed. The results of the present study will be a fundament of a further complex investigations of the xerothermic oak forests in the protected site and will be useful for the defining of succession processes in the discussed forests.

Key words: flora, SCI, xerothermic oak forests
Abbreviations: SCI – site of community importance, ZSpP – Zapadna Stara planina i Predbalkan, RFD – Regional Forest Directorate, SF – State Forestry, WFM – West Frontier Mountains

Introduction

Floristic analysis in forest ecosystems is a good basis for syntaxonomical and phytoecological investigations and an essential prerequisite for taking concrete conservation measures. In this connection, the present study aims to identify the floristic diversity of xerothermic oak forests with predomination of *Quercus cerris* L. and *Quercus frainetto* Ten. in SCI "ZSpP". They correspond to habitat 91M0 in Annex I of the Habitats Directive – Pannonian-Balkanic turkey oak-sessile oak forests. Being subjected to strong anthropogenic pressure, they are included in the Red Data book of the Republic of Bulgaria (Volume 3) as endangered habitat (Tzonev et al., 2011).

Methods and Object

SCI "Zapadna Stara planina and Predbalkan" BG0001040 is designated in accordance with Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. The site covers the western parts of the Balkan range and a part of the ForeBalkan (Figure 1). It falls within the temperate climatic region with average annual sum of precipitations between 750 and 1000 mm (Velev, 2002) and is a part of the European deciduous forest region and the Illyrian (Balkan) province (Bondev, 2002). Species with European and Euro-Asian distribution are character for its vegetation.

The floristic investigation was carried out during the vegetation season of 2012. The site was visited twice in order to

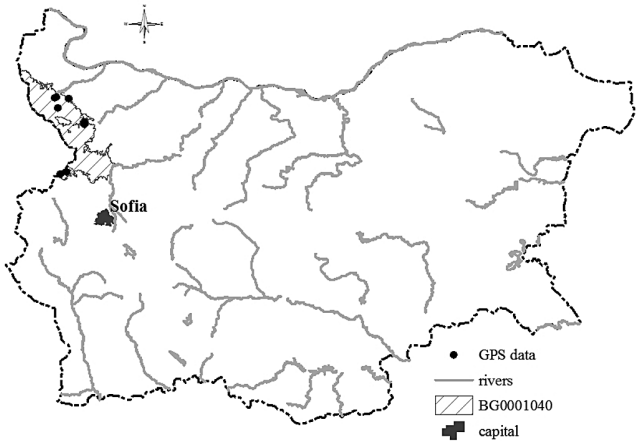

Fig. 1. Location of the investigation region

be taken into consideration the different aspects of vegetation. The terrain work was concentrated at the territory of RFD Berkovitsa within the boundaries of SF Govezhda and SF Chuprene where the main areas of xerothermic oak forests in Western Balkan range were distributed. These forests take slopes in the lower parts of the mountain at 250–350 m a.s.l. on haplic Luvisols.

Taxa of higher plants are determined according to the Bulgarian floras (Jordanov, 1963–1979; Velchev, 1982–1989; Kozhuharov, 1995) and guides (Kozhuharov, 1992; Delipavlov and Cheshmedzhiev, 2003). Floral elements follow the classification of Assyov and Petrova (2006) and life forms are determined according to Raunkiaer (1934). The determination of antropophytes follows Stefanoff and Kitanov (1963). The antropophyte element is discussed according to the concept accepted by Petrova and Vladimirov (2002).

Results and Discussion

The inventory of the flora of xerothermic oak forests in SCI "ZSpP" of 2012 resulted in the establishment of 113 species of vascular plants (without mosses) belonging to 79 genera and 36 families (Table 1). Their relative participation has been calculated based on 3997 species, 889 genera and 147 families identified in the Bulgarian flora (Assyov and Petrova, 2006).

Among the higher taxa *Magnoliopsida* takes the leading position with 94 species, 64 genera and 30 families. *18 species, 14 genera and 5 families represent Liliopsida*. Class *Pinopsida* is represented very weakly – only by the species *Pinus nigra, which* is artificially planted. The absence of *Polypodiopsida* and *Equisetopsida* corresponds with the ecological conditions of the warm and dry *Q. frainetto-Q. cerris* woods of the lower altitudes.

The leading families in the flora of the investigated xerothermic oak forests are *Rosaceae* (17 species) and *Fabaceae* (12 species). They are followed by *Asteraceae* and *Poaceae* presented by 7 species each, *Fagaceae* and *Liliaceae* (5 species each). With the exception of *Fagaceae* and *Liliaceae* the other are among the largest families in the flora of pubescent oak forests in the WFM (Gogushev, 2009) and in the flora of

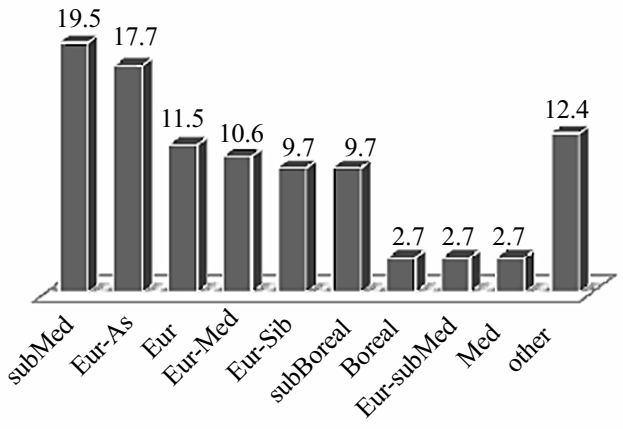

Fig. 2. Distribution of floral elements

Table 1

Taxonomic structure of the flora of xerothermic oak forests in SCI "ZSpP"

Taxonomic units	Families			Genera			Species		
	Number of taxons in Bulgaria	Number of taxons in the studied xerothermic oak forests	%	Number of taxons in Bulgaria	Number of taxons in the studied xerothermic oak forests	%	Number of taxons in Bulgaria	Number of taxons in the studied xerothermic oak forests	%
Equisetopsida	1	–	–	1	–	–	8	–	–
Polypodiopsida	18	–	–	27	–	–	61	–	–
Pinopsida	4	1	25	6	1	17	17	1	6
Magnoliopsida	107	30	28	663	64	10	3188	94	3
Liliopsida	17	5	29	192	14	7	723	18	2
Totally	147	36	24.5	889	79	8.9	3997	113	2.8

Table 2

Biological spectrum of the flora of xerothermic oak forests in SCI "ZSpP"

Type of vegetation	Raunkiaer's life forms, %				
	Ph	Ch	H	Cr	Th
Xerothermic oak forests in SCI "ZSpP"	33	3	52	11	2
Pubescent oak forests in WFm (Gogushev, 2009)	14	2	55	7	22
Q. cerris–Q. frainetto communities in Bulgaria (Lyubenova et al., 2009)	12	3	56	12	18
Forests in the temperately warm region (Pavlov, 2006)	54	9	24	9	4
Forests in the temperately cold region (Pavlov, 2006)	10	17	54	12	7

Q. cerris-Q. frainetto communities in Bulgaria (Lyubenova et al., 2009). *Quercus* is the genera with the greatest number of species (4). The genera *Viola, Trifolium, Acer, Prunus, Lathyrus, Hieracium* and *Carex* are presented by 3 species each. More than half of the genera are represented by one species only. This could be due to the comparatively low number species as a whole and the fact that the investigated flora is not a local flora (Tolmachev, 1974) but flora of a concrete type of vegetation.

The phytogeographical spectrum of the flora of xerothemic oak forests shows the prevalence of the sub Mediterranean and European-Asian geoelements. The distribution of floral elements showed in Figure 2 corresponds to the phytogeographical position of SCI "ZSpP" at the territory of the Illyrian Province and the European Broadleaved forest region. The great number of sub Mediterranean elements is explained with the warm and dry conditions of the xerothermic oak habitat from the low altitudes. About one third of the species in the group of sub Mediterranean and the European-Asian floral element are secondary elements (apophytes and antropophytes). The discussed proportions well correspond to the shares character for *Q. cerris-Q. frainetto* communities in Bulgaria with some differences. The Mediterranean and the Boreal elements have bigger proportions in the flora of the turkey oak-sessile oak forests in Bulgaria, which are much richer of species and secondary elements than the studied in the present research spatially limited woods.

As a complex expression of the adaptations of the species to the unfavorable conditions of the year, the spectrum of Raunkiear's life forms shows the typical for the flora of the temperate latitudes prevalence of hemicryptophytes (Table 2). The percentages of the different life forms remain close to the percentages character for *Q. cerris – Q. frainetto* dominated forests in Bulgaria as a whole. The greater percentage of phanerophytes here (33%) is probably connected with the mild microclimatic conditions on one hand and the ecological and spatial limits of the habitat which determines lower species diversity – on the other. As it might be expected, the spectrum takes an intermediate position between the spectrums of forests of the temperately cold and temperately warm region.

The secondary elements represented by the antropophytes and apophytes are 34.8% together. Comparing to the flora of the country (Petrova and Vladimirov, 2002) the typical antropophytes take almost the same share (13.4%). Among the typical antropophytes are also two adventive for the Bulgarian flora species – *Mahonia aquifolium* (Pursh) Nutt. and *Quercus rubra* L.

Conclusion

The established 113 species, 74 genera and 35 families in the flora of xerothermic oak forests in SCI "ZSpP" during the vegetation season of 2012 represent respectively 2.8% of the species, 8.9% of the genera and 24.5% of the Bulgarian flora. This diversity is almost five times lower than the species diversity of *Q. cerris – Q. frainetto* communities in Bulgaria and emphasizes the spatial limitation of the investigated habitat within the boundaries of one floristic region. The distribution of species among higher taxa of vascular plants well corresponds to the character for the temperate latitudes prevalence of *Magnoliopsida* and points out the mild and warm microclimatic conditions of the lower altitudes with the absence of *Equisetopsida* and *Polypodiopsida.* With the prevalence of sub Mediterranean, European-Asian elements, and the relatively high percentages of the European, European-Mediterranean, European-Siberian and sub Boreal elements, the distribution of floral elements confirms the phytogeographic position of the studied forests – southeastern-European xerothermic oak forests of the foothills and low mountains. The absence of Balkan endemic species is indicative of the narrow spatial limitation of the investigation at the territory of one floristic region and shows that the xerothermic oak forests are not distribution center of endemic species. The biological spectrum with the character for the temperate latitudes prevalence of hemicryptophytes and the increased percentage of phanerophytes indicates the mild microclimatic conditions of the turkey oak-sessile oak forest. The share of antropophytes is the same as that for the Bulgarian flora (above 10%) which evidences the vulnerability of these forests being under anthropogenic impact.

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