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TAXONOMIC STRUCTURE OF AGRICULTURAL LANDSCAPES OF CONNECTED AREAS IN VINNYTSIA REGION ECONETWORK

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Охарактеризовано сучасний стан напівприродних фітоценозів деяких районів Вінницької обл. Під час дослідження флори регіону встановлено її загальний видовий склад, здійснено систематичний, біоморфологічний та еколого-ценотичний аналізи. Визначено, що фіторізноманіття досліджуваних територій налічує 268 види, які належать до 168 родів, 52 родин. Встановлено, що за екологічною приналежністю рослинність агроландшафтів відноситься до лучного, лучно-степового, лісового неморального угруповань. Наявність в цих угрупованнях апофітних та рідкісних видів рослин свідчить про цінність вказаних територій для збереження рослинного різноманіття.

Ключові слова: *агробіорізноманіття, екомережа, напівприродні фітоценози, біота, адвентивні види.*

In recent years the plant cover of our country is being transformed under the influence of anthropogenic factors. Preservation of floral and landscape diversity is an instrument of ecological balance maintaining in biosphere [1]. Ecological network brings together all branches of biodiversity into a single spatial system. Structural elements of ecological network are key areas (natural nucleus), connecting areas (ecological corridors), buffer zones, renewable areas (zones of natural landscapes renaturalization) [2]. On the territory of Vinnytsia region structural elements of the ecological network have three levels: national, regional and local. The last is formed within the limits of administrative districts and that is mostly river valleys and forest belts. From literary sources it is known that the area of Vinnytsia region is located within the most cultivated region — Right-Bank of Forest Steppe of Ukraine, where leading place belongs to agrarian landscapes [2, 3]. According to the assessments of Yu. Odum, optimal ratio between natural and anthropogenic landscapes should be 60% to 40% [4].

Within the investigated areas under natural vegetation is about 30% of the area that shows non-optimal landscape and ecological structure of the territory. The share of natural landscapes of the Vinnytskyi district — 31.9%, Zhmerynskyi — 34.5%. The smallest share of natural landscape is in Mohyliv–Podilsky and Tyvrivsky areas — 17.6% and 27.4% respectively [5]. As result of literature data analysis we found that in Vinnytsia region the following types of vegetation as forest, meadow, steppe, rock-steppe and wetland are presented. Therefore the purpose of our study was to determine the species composition of plant communities of seminatural phyto-

coenoses of agricultural landscapes, and also provide systematic, biomorphological, ecological–coenotic analysis of the region flora.

MATERIALS AND RESEARCH METHODS

The study was conducted in seminatural phytocenoses of agricultural landscapes (meadows, pastures, field fragments and forest belts), connecting areas of ecological network in Vinnytsia region. We have selected certain districts and settlements of Vinytsia region, namely: Zhmerynskyi district (outskirts of Zhmerynka city and the following villages: Leliaky, Brailiv, Mohylivka), Vinnytskyi district (Bokhonyky and Luka–Meleshivska villages), Tyvrivskyi district (Hnivan town, Selyshche and Yaryshivka villages), Mohyliv–Podilskyi district (following villages: Yaryshiv, Sloboda-Yaryshivska, Nemiia and Ozaryntsi). Overview field researches and detailed route surveys were conducted during the most optimal term — during the flowering and maturing periods of the main plant species. Researches were carried out on the basis of generally accepted methods [6–9]. In the seminatural phytocenoses we laid down a land plot of 100 m × 1 m in size, with which were connected all further accountings within a given territory. Along the length of rectangle we laid 10 accounting land plots of 1 m^2 in size each one. Description of phytocoenoses was carried out by standard geobotanical methodology [7]. Besides the key areas we conducted incomplete descriptions beyond their boundaries in order to clarify the distribution and plant species composition within the limits of agricultural landscapes. All Latin names of taxons are listed in accordance with the current commonly used system by S.L. Mosyakin, M.M. Fedoronchuk [10]. Annotated list is drawn up according to the system of requirements in compliance with the International Code of Botanical Nomenclature [11].

RESULTS AND DISCUSSION

As a result of conducted researchers it was found out that species diversity of investigated phytocoenoses includes 268 species, 168 genera, which belong to 52 families. The systematic structure of flora is given in Table 1.

By analyzing the data in Table 1, it can be concluded that the dominant in systematic structure of flora is a *Magnoliophyta* department — 256 species (88.5%, and 78.8% of them — *Magnoliopsida* and 9.6% — *Liliopsida*). Vascular spore and gymnosperm plants play an insignificant role in the formation of region's flora and constitute only 13 species (4.5% of the total), which to some extent is typical for flora of temperate latitudes. To the leading families by the number of species belong: *Asteraceae*, *Poaceae*, *Fabaceae*. *Asteraceae*

Table 1

Flora systematic structure of investigated areas in Vinnytsia region

Department, class	Families		Genera		Species	
	1	2	1	2	1	2
Lycopodiophyta	1	1.9	1	0.6	1	0.4
Eguisetophyta	1	1.9	1	0.6	4	1.5
Polypodiophyta	2	3.8	2	1.1	3	1.1
Pinophyta	2	3.8	2	1.1	4	1.5
Magnoliophyta	46	88.5	162	96.4	256	95.5
Magnoliopsida	41	78.8	156	92.8	247	92.1
Liliopsida	5	9.6	6	3.6	9	34
Total:	52	100	168	100	268	100

Note: 1-quantity, units; 2 — share from total number.

family includes 54 species (22%), *Poaceae* — 31 species (12%), *Fabaceae* — 25 species (5.4%), *Rosaceae* — 22 (7.1%), Apiaceae — 14, *Lamiaceae* — 12, *Brassicaceae*, *Caryophylaceae*, *Boraginaceae* — 11 species each one and *Scrophulariaceae* — 10 species. General quantitative analysis of family spectrum of investigated areas is presented in Table 2.

The largest number of families in the course of investigations was found in Mohyliv-Podilskyi — 110 (65.4%) and Zhmerynskyi — 78 (46.2%) districts belonging to 46 and 37 families respectively. This is due to the fact that studied types of phytocenosis were meadows, and meadow plants are known to be varied syntaxonomically. Tyvrivskyi and Vinnytskyi districts are characterized by a high degree of arable lands, as evidenced impoverished floristic composition of agricultural landscapes.

By analyzing phytobiota of investigated areas special attention was devoted to biomorphological and ecological–coenotic structure (Table 3).

Biomorphological structure. During the adaptation to environmental conditions life forms are being formed. Nowadays two directions of life forms classification are distinguished: ecological–morphological and biomorphological. The basis of the biomorphological analysis is a linear system of life forms by which ecobiomorphe can be compared according to any parameters [9, 12].

According to the data of conducted studies, in the spectrum of biomorphe according to the duration of the life cycle such species dominated as polycarpicae — 121 species (45.1%), monocarpicae represented by 51 species (19%), one-year biomorphe — 34 species (12.7%).

Table 2

Species structure of investigated areas in Vinnytsia region

Investigated area	Family (described)		Genera (described)	
	Quantity, units	share from total number, %	Quantity, units	share from total number, %
	Zhmerynskyi district			
Zhmerynka city	27	52	54	32.1
Leliaky village	31	59.6	57	34
Brailiv village	37	71.1	78	46.2
Mohylivka village	34	65.3	63	37.5
	Tyvrivskyi district			
Hnivan city	25	48	39	23.1
Selyshche village	19	36.5	41	24.4
Yaryshivka village	29	55.7	21	12.5
Mohyliv-Podilskyi district				
Nemiia village	35	67.3	69	41
Ozaryntsi village	46	88.4	110	65.4
Yaryshiv village	33	63.4	57	34
Sloboda-Iaryshivska village	31	59.6	49	29.1
	Vinnytskyi district			
Luka-Meleshivska village	27	52	40	23.8
Bokhonyky village	26	50	33	19.6

Table 3

Typological characteristic of phytobiota of investigated agricultural landscapes in Vinnytsia region

	Ecological group		Quantity	% share from total number
Basic biomorphe	Polycarpicae	Pk	121	45.1
	Monocarpicae	Mka	51	19
	One-year biomorphe	Mkb	34	12.7
	Bush	Frt	5	1.9
	Tree	Ar	19	7
Ecobiomorphe	Phanerophyton	Fr	21	7.8
	Khamai-phytes	Ch	6	2.2
	Hemikryptophytes	Hk	113	42.1
	Geophytes	Hf	10	3.7
	Gelophytes	Hl	5	1.9
	Hydrophytes	Hd	4	1.5
	Terophytes	Te	65	24.2
Heliomorphe	Heliophytes	H	97	36.2
	Heliosciophytes	Hs	64	23.8
	Scioheliophytes	Sh	55	20.5
	Sciophytes	S	4	1.5
Hydromorphe	Xerophytes	Ks	10	3.7
	Xeromesophytes	Km	90	33.6
	Mesoxerophytes	Mk	57	21.3
	Mesophytes	M	38	14.2
	Hygrophytes	H	16	6
	Hydrophytes	Hd	4	1.5

In general, the results of biomorphological analysis of phytobiota indicate its typicality for temperate latitudes. According to the classification of K. Raunkiyer the ecological and morphological analysis of phytobiota, which is based on adaptive features, was conducted [12]. Biomorphological analysis of phytobiota of investigated area in terms of bourgeon location restoration relative to the surface substrate indicates the predominance of hemikryptophytes — 113 species (42.2%). Also it is necessary to note a significant role of terophytes — 65 species (24.3%), phanerophytons account for 21 species (7.8%). The lowest number of species belongs to hydrophytes — 4 types (1.5%). Geophytes are represented by such types as *Elytrigia intermedia* (Host.) Nevski., *Cirsium arvensis* (L.) Scop., *Tussilago farfara* L., *Cirsium vulgare* (Savi) Ten., *Paris quadrifolia* L. etc., and among gelophytes there are *Cicuta virucosa* L., and *Stachus palustris* L., the representatives of hydrophytes are *Urticularia vulgaris* L., *Nuphar lutea* (L.) Smith.

Also, it should be noted that during the investigations we could find such adventitious plant species as *Ambrosia artemisiifolia* L., *Artemisia annua* L., *Ballota nigra* L., *Bidens fron-*

dosa L., *Bromus arvensis* L., *Iva xanthiifolia* Nutt., *Conyza canadensis* (L.) Cronq., *Cuscuta campestris* Yunck., *Xanthium strumarium* L.

The share of adventitious species in seminatural phytocenoses, despite being rather small, is already an evidence that these species could soon dominate in communities which are now widespread there, and are able to crowd out the local flora, reducing the population and capturing the territory [13]. Just a few years ago they were found very rarely. Whereas this year on investigated areas *Ambrosia artemisiifolia*, *Iva xanthiifolia*, *Xanthium strumarium* are presented. Today these species displace apophyte group of local flora and extend to large areas very quickly. These species were spread almost on the whole territory of studies. This fact in turn causes concern regarding their further dissemination and expansion.

Ecological-coenotical structure. According to literature data [6, 7], ecological structure is a reflection of species distribution in different ecological groups depending on environmental conditions and appropriate reaction on them by organisms. Ecological-coenotical structure of phytobiota displays the proportion of vegetation species that belong to certain groups of phytocoenoses. Analyzing the data in Table 3 we can say that in relation to the light regime heliophytes — 90 species (36.2%) dominated. It is connected with the predominance of open herbaceous vegetation types over forests. Indicators of heliosciophytes are 64 species (23.8%) and scioheliophytes — 55 species (20.5%) points to the presence of ecotypes with a considerable level of illumination. Sciophytes have significantly lower share in agricultural landscapes (less than 2%) that to a greater extent is typical for forest cenosis.

The important natural factor during the distribution of phytobiota is water regime in the areas of species site. The first place occupy xeromesophytes — 90 species (33,6%), mesoxerophytes have the second place — 57 species (21.3%). Typical representatives of xeromesophytes are *Achalillea ochroleuka* Ehrh, *Taraxacum officinale* L., *Antennaria dioica* (L.) Gaerth., *Cicorium intybus* L., *Equisetum sylvaticum* L. etc.

CONCLUSIONS

Field researches for determining taxonomic affiliation of plant communities of phytocoenoses in connecting areas of ecological network in Vinnytsia region were conducted. In the result of analysing agricultural landscapes phytobiota of certain areas in Vinnytsia region we identified its systematic, biomorphological and ecological and coenotic structure. It has been determined that species wealth of investigated phytocoenoses includes 268 species, 168 genera, which belong to 52 families. To ten leading families according to the number of species belong: *Asteraceae*, *Poaceae*, *Fabaceae*, *Rosaceae*, *Apiaceae*, *Lamiaceae*, *Brassicaceae*, *Caryophylaceae*, *Boraginaceae*, *Scrophulariaceae*. Analysis of phytobiota according to the indicators of bourgeon location restoration relative to the surface substrate indicates predominance of hemikryptophytes — 113 species (42.2%), terophytes — 65 species (24.3%), phanerophytons account for 21 species (7.8%), hydrophytes — 4 types (1.5%). According to biomorphological structure dominate polycarpicae — 121 species (45.1%), monocarpicae — 51 species (19%), one-year biomorphe — 34 species (12.7%). The ecological–coenotic phytobiota analysis was conducted and it was found that in ecomorphe spectrum in relation of species to water regime dominated xeromesophytes — 90 species (33.6%), in terms of the ratio of species to the illumination of sites predominate heliophytes — 90 species (36.2%). According to ecological belonging the vegetation of agricultural landscapes is a part of meadow, meadow–steppe, forest–nemorose type. A considerable part of investigated phytobiota of agricultural landscapes can be described as a transitional xeromesophytes-like. The presence of apophyte and rare species in phytocenoses points to the value of these areas in plant diversity preservation. This in turn allows us to say that these areas are included into structural elements of the ecological network, which functioning contributes to improving species habitats and provide moderate influence of

anthropogenic factors on agricultural landscapes. It should also be mentioned about the presence of adventitious plant species in the investigated phytocenoses.

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