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A SYSTEMATIC ANALYSIS OF FLORA UNDER RESTORATION OF MEADOW VEGETATION ON FALLOW LANDS OF DIFFERENT DEMUTATION STAGES INTO THE FOREST-STEPPE OF UKRAINE

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The changes of meadow vegetation in the Forest-steppe of Ukraine into different demutation stages and their floristic composition has been investigated. The flora structure of the higher rank were identified. The main taxa which include the plant species were established. Analysis of the leading families that participate in the restoration of meadow vegetation and flora of fallow lands of different demutation stages were conducted.

Introduction. Significant changes of vegetation of Forest-steppe of Ukraine, due to the fact, that this area is the oldest center of agriculture in Ukraine. [14] Nowadays a high degree of tillage is into the forest-steppe – more than 82% of the land fund of which about 30% are anthropogenically disturbed and damaged lands. So, the problems of meadow vegetation restoration in this region, order to balance between natural and anthropogenically transformed ecosystems, are extremely important [1–3, 6–9, 12, 14].

The purpose of research – to establish floristic composition of meadow plants into fallow lands and identify changes that occur in anthropogenically affected areas into Forest-steppe of Ukraine and systematize the spectrum of families and genera of meadow flora by species number.

Research methodology. Geobotanical and floristical investigation of natural and anthropogenically affected communities of meadow vegetation were studied using by direct and indirect methods [2, 3, 10, 15, 16, 18, 21, 25, 28–31] include materials from.

Herbarium of Botany Department of NULaES Ukraine and M. G. Kholodny Institute of Botany National Academy of Sciences of Ukraine (KW). Identification of species structure were conducted [20] and aligned with the modern nomenclature from check-list of vascular plants of Ukraine [36].

The floristic structure of restore meadow vegetation on fallow lands of different demutation station within Kyiv-Sviatoshyno, Vasylkiv, Fastiv and Boryspil districts of Kyiv region has been analised.

Results. 428 plant species which belonging to a higher sporous and seed plants

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(Table 1) have been found. This number is much smaller then total number of species in the region. According to analysis of systematic affiliation about 42 species of bryophytes, 6 – lycopsids, 8 – horsetails, 25 – ferns, 9 – gymnosperms and 1292 species of flowering plants [30] grow on the meadows, plains and swamps of Forest-steppe zone.

The *Magnoliopsida* class, which include 363 species and represented by 84.6% of all plants are dominated within *Magnoliophyta* division. However species of *Liliopsida* comprising only 60 representatives, or 14.2% from total number of species.

The systematic structure of flora of higher rank is divided as follows: *Magnoliopsida* includes 7 divisions – *Ranunculidae, Caryophyllidae, Hamamelididae, Dilleniidae, Rosidae, Lamiidae, Asteridae*, and represented only *Liliopsioda* subclass *Liliidae.* Subclass *Ranunculidae* is composed of 3 family (*Ranunculaceae, Papaveraceae, Fumariaceae*) and 12 species. *Caryophyllidae* includes 5 family (*Portulacaceae, Caryophyllaceae, Amaranthaceae, Chenopodiaceae, Polygonaceae*) and 32 species. *Fagaceae, Betulaceae, Juglandaceae* belong to a *Hamamelididae* subclass and comprise by 5 species. *Dilleniidae* brings together nine families (*Hypericaceae* or *Guttiferae, Primulaceae, Violaceae, Salicaceae, Brassicaceae, Malvaceae, Moraceae, Urticaceae, Euphorbiaceae*) and 39 species. Subclass *Rosidae* also has nine families (*Rosaceae, Fabaceae, Aseraceae, Linaceae, Oxalidaceae, Geraniaceae, Balsaminaceae, Polygalaceae, Apiaceae*) and 93 species, so are most numerous. *Lamiidae* has 8 families (*Rubiaceae, Asclepiadaceae, Solanaceae, Convulvulaceae, Boraginaceae, Scrophulariaceae, Plantaginaceae, Lamiaceae*) and 70 species. Subclass *Asteridae* unites two families (*Asteraceae, Campanulaceae*) and 85 species.

As results from the table.1 *Magnoliopsida* comprise 55 families, of which only nine include from 10 to 79 species for each one, one family comprises only eight species, two families have by 6 species, the next 5 families – by four species for each one, in the four families of four species, 3 – of three, two species include thirteen families by each one and 19 families have only one species for each one. *Liliopsioda* presented by 8 families, only one of the most numerous – 44 species, by eight species comprise in the one family, by 2 species – into two families for each one and only four families have one species for each one. *Equisetophyta* contains one family and four species from *Equisetaceae, Pinophyta* – one family and one species.

Systematic analysis of families. The results of the field investigation have shown that three largest families by number of species are *Asteraceae* (79 species), *Poaceae* (44

Table 1. The systematic structure of meadow vegetation flora on fallow lands of different demutation stages into the Forest-steppe zone of Ukraine (Kyiv region)

Taxonomical rank	Total number						Generic coefficient	Family coefficient
	Species		Genuses		Families			
	un.	%*	un.	%	un.	%	4,00	4,00
1.Equisetophyta	4	0,9	1	0,4	1	1,5	1,00	1,00
2.Pinophyta	1	0,2	1	0,4	1	1,5	1,72	6,73
3.Magnoliophyta	423	98,8	247	99,2	63	96,9	1,72	6,72
4.Magnoliopsida	363	84,6	211	84,7	55	83,0	1,69	6,78
5.Liliopsida	60	14,2	36	14,5	8	13,9	1,72	6,60
Total:	428	100,0	249	100,0	65	100,0		

* percent from the total number of species

species) and *Fabaceae* (40 species), which composed from 163 species or 37.9% of the total. This figure is closed to data given for Flora of Ukraine [29], and for the northwest of Russian Federation [4, 17].

The main role for genesis of any regional or specifically floras, including flora of fallow lands, also their zonal affiliation belongs to the first 10 families by number of species. First 10 families are important in the assessing of the floristic diversity, which has 297 species and representing 69.4% of the total species number (Table 2). The remaining 55 families is only 30,6%, which is typically for such anthropogenically disturbed lands. This figure is higher than the similar data for Ukraine, which is associated with the transformation of vegetation into fallow lands through the fallow-stages and randomisation this habitats of apofites and antropofites species [35].

As noted above, the first three families composed 38% (163 species), and the other ten families from the range – 31.4% (124 species), which is typical for Eastern Europe and for the whole Holarctic [11].

The feature of the range of 10 dominance family of flowering plants is a structure of their placement. The representatives of *Asteraceae* family occupies by the first position (79 species), which is ordinary for the flora of Ukraine. The *Poaceae* family has second position (44 species) and the third – *Fabaceae* (40 species), which indicates that plant communities into investigated fallow lands which have reached the climax stage of meadow vegetation genesis.

The *Fabaceae* family has specific position and occupies the third position in the families range and together with the *Lamiaceae, Scropnulariaceae, Caryophyllaceae* and *Brassicaceae* shows that the level of continental climate are increased. Also this families demonstrate a genetic relationships of studied flora with the ancient Mediterranean. All of this is typical both for the flora of Steppe zone of Ukraine [13] and its separate regions [19].

However a large part in the families range has *Poaceae* (position 2) and *Ranunculaceae* (position 10), which presence among the leading families are typically for the ranges of boreal floras. It causes that the plant communities of studied area has ecotone location, intrazonale character of vegetation and antropogenic impact on the natural areas [35].

To pay attention that *Cyperaceae* family, which typically occurs high positions in the

Table 2. The range of leading families of restoring meadow vegetation flora into Forest-steppe zone of Ukraine

Families	Number of species		Number of genuses	
	Total, un.	Percent, %	Total, un.	Percent, %
1.Asteraceae	79	18,5	41	16,7
2.Poaceae	44	10,3	27	11,0
3.Fabaceae	40	9,4	15	6,1
4.Rosaceae	25	5,8	16	6,5
5.Lamiaceae	24	5,6	15	6,1
6.Scrophulariaceae	24	5,6	8	3,3
7.Caryophyllaceae	20	4,7	13	5,3
8.Brassicaceae	16	3,7	14	5,7
9.Apiaceae	15	3,7	14	5,7
10.Ranunculaceae	10	2,3	6	2,4

family ranges of boreal floras, does not include into the range of the leading families. It demonstrates both the transitional character and genetical relationship of the studied flora with the flora of steppe regions and selective presence of plant species into habitats of investigated fallow lands.

Analysis of the genuses range. An important indicator for the analysis of flora is the genuses range, that reveals of floristic diversity of restore meadow vegetation on investigation fallow lands (Table 3).

The most numerous genuses of studied fallow lands are: *Veronica* – 12 species, *Trifolium* – 8, *Carex, Festuca* – to 7, *Artemisia, Vicia, Centaurea* – 6, *Campanula, Galium, Euphorbia, Rumex, Ranunculus* and *Plantago* – 5. By four species are represented into genuses: *Medicago, Poa, Achillea, Agrostis, Prunus, Acer* for each one.

Representatives of these families are the dominants and subdominants in a meadow phytocoenoses and define the species composition, structural organization, environmental, and economic values of phytocoenotic and basic patterns of differentiation flora on restore meadow vegetation of fallow lands into Forest-steppe zone. Other genuses (*Bidens, Carduus, Carlina, Erigeron, Helianthus, Inula, Lactuca, Solidago, Sonchus, Taraxacum, Tragopogon, Lathyrus, Melilotus, Sambucus, Quercus, Salix, Ulmus, Dianthus, Polygonum, Salvia, Stachys, Bromus, Setaria, Lepidium , Sisymbrium, Urtica, Lavatera, Solanum, Lysimachia, Malus, Rubus, Allium*) represented only by two species for each one, but their participation in the restoration of meadow vegetation are also important. The rest 183 genuses containe only one species for each one.

Conclusions. Thus, 428 species of plants had been found on the fallow lands of different demutation stages. Representatives of Magnoliopsida dominate within the limits of Magnoliophyta, -

Table 3. The range of leading genuses of flora of restoring meadow vegetation into Forest-steppe zone of Ukraine

Genus	Number of species	
	Total, units	Percent, %
1.Veronica	12	2,8
2.Trifolium	8	1,87
3.Carex	7	1,64
4.Festuca	7	1,64
5.Artemisia	6	1,4
6.Vicia	6	1,4
7.Centaurea	6	1,4
8.Campanula	5	1,17
9.Galium	5	1,17
10.Euphorbia	5	1,17
11.Rumex	5	1,17
12.Ranunculus	5	1,17
13.Plantago	5	1,17

363 species from 55 families, smaller part belongs to Liliopsioda – 60 species, nine families, which is typical of any regional floras Holarctic temperate zone.

Ten leading renewable families of flora meadow vegetation covering 297 species by Magnoliophyta (69,4% of the total), the first three of which are the most numerous

family - Asteraceae (18,5%), Poaceae (10,3%), Fabaceae (9.4%) covering 163 species (38.2%). High positions of these families are typical for natural flora meadow land of Ukraine and witnss a gradual recovery of natural vegetation of disturbed areas.

The composition of floral patterns of renewable meadow communities includes 247 genera, species richness of different families is only 7.3%, a significant number (183 families or 74.1% of total) represented only by one view that shows the incompleteness of the formation floral patterns replacement of meadow vegetation.

Regular changes of floral patterns happen at different fallow demutation stages, which become zonal distinctive features and

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АНОТАЦІЯ

Якубенко Б.Є., Ярмоленко А.К. Чурілов А.М. *Систематичний аналіз флори за умов відтворення лучної рослинності на перелогах різних років демутацій в лісостепу України //Біоресурси і природокористування. – 2015. – **7**, № 3–4. – С. 5–10.*

Наведено флористичну структуру лучної рослинності Лісостепу України на фітоценозах різних років демутацій. Встановлено її видовий склад за умов відновлення і проведено систематичний аналіз. Систематизовано структуру флори більш високого рангу. Встановлено основні таксони, до яких відносяться види. Проведено аналіз провідних родин, що беруть участь у відтворенні лучної рослинності та флори перелогів різних років демутації.

АННОТАЦИЯ

Якубенко Б.Е., Ярмоленко А.К., Чурилов А.М. *Систематический анализ флоры в условиях воспроизведения луговой растительности на залежах разных лет демутации в лесостепи Украины // Биоресурсы и природопользование. – 2015. – **7**, № 3–4. – С. 5–10.*

Представлены флористические изменения луговой растительности в Лесостепи Украины на фитоценозах разных лет демутаци. Показан видовой состав в условиях востановления луговой растительности и проведен систематический анализ обнаруженных видов. Систематизирована структура флоры более высокого ранга. Проанализированы основные таксоны, к которым относятся виды. Проведен анализ основных семейств, участвующих в воспроизведении луговой растительности и флоры залежей разных лет демутации.