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## **ANTHROPOGENIC CONVERSION OF PHYTOCENOSES OF GRASSLAND ECOSYSTEMS AT IMPACT OF PASTORAL ECONOMIC ACTIVITIES**

**The purpose.** To study a spectrum of synanthropic flora of grassland ecosystems subjected to anthropogenic transformation as a result of pasturage of cattle. **Methods.** Geobotanical researches using Brown-Blank procedure, method of synphyto-indicational scales, statistical with the use of software package Statistica 6. **Results.** The extent of anthropogenic transformation of flora of the 31-st pastoral ecosystem on the level of synanthropization, apophytization, terrophytization and archeophytization of plant communities is evaluated. Ecological structure of synanthropic sorts is specified and the extent of man-impact tolerance of probed pastoral ecosystems is fixed. **Conclusions.** The significant level of synanthropization and apophytization of the studied phytocenoses is determined. That testifies to the high level of adaptability of plants to propagation and growth in ecotopes changed by man and man-impact tolerance of probed phytocenoses.

**Key words:** grassland ecosystem, plant community, extent synanthropization, apophytization, terrophytization, anthropogenic conversion.

Anthropogenic human activity leads to the destruction of the vegetation of the Earth and violates the dynamic equilibrium of the planet. Simultaneously with the depletion and unification of the regional flora intensively there is an invasion of synanthropic species that are most often naturalized in the affected ecotopes [1-3]. Synanthropes are an integral part of anthropogenic ecosystems and their research with the aim of forecasting changes, modeling the development and optimization of the greenhouse ecosystem is extremely relevant [4-8]. Currently, the study of synanthropic species is required in accordance with the requirements of the Convention on

the conservation of biodiversity (Rio de Janeiro 1992), the United Nations Convention on the Non-Proliferation of Species (UN / Norway Convention 1996), the International Forum on Ecological Problems of phyto-invasions (4th International Conference on Ecology of Invasion of Alien Plants, Berlin, Germany, 1997) and the corresponding international strategy (Global Strategy on Invasive Alien Species Montreal, 2001) [9]. Pastoral-type meadow ecosystems refer to intensively transformed phytocoenoses; therefore, the study of the intensity and direction of the transformation processes of their phytocoenoses is of great importance for the conservation of biodiversity and the conduct of business activity. Therefore, the study of the synanthropic flora of meadow ecosystems deserves special attention now, since it is the sinontropization of phytocoenoses that often leads to their degradation [7, 10, 11]. The purpose of the research is to investigate the spectrum of synanthropic flora of meadow ecosystems of the Chernivtsi region, which are subjected to anthropogenic transformation as a result of cattle breeding. The following tasks were set: • to identify synanthropic plant species in the foliar groups of the studied meadow ecosystems; • to evaluate the anthropogenic transformation of the flora of pastoral ecosystems of the Chernivtsi region in terms of synanthropization, apopitisation, terrorization and archeophysiation; • to investigate the spectrum of synanthropic flora of investigated pastoral ecosystems in relation to moisture and intensity of light.

Materials and methods of research. Plant samples were taken from the herbarium at the stage of fetal growth in the vegetation groups of the investigated pastoral ecosystems (on the 1st plant of each species of 4 elementary plots with an area of 100 m<sup>2</sup>). Subsequently, a taxonomic analysis of plant groups was carried out and isolated synanthropic species [10]. The research was carried out in accordance with the physico-geographical regionalization of LI Voropay [12], which distinguishes within the studied territory the following physical and geographical zones: Prut-Dniester - the plain northern part of the territory, Prut-Syretsky - Pre-Hyrcanian hill, the central part of the orographic composition of the territory, and the Bukovyna Carpathians - a mountain zone located in the south of the

territory. The level of synantropy of plant communities of investigated pastoral ecosystems was estimated using the modified method [13]. The level of syntopey phytocenosis was determined by the following formula:

$$Kd = (Pd/Pf) \cdot 100,$$

where **Kd** is an indicator of the level of synantropy of phytocenosis, **Pd** is the total projective coverage of synanthropic species, **Pf** is the total projective coverage of phytocenosis. The degree of apophytisation was defined as the proportion of apophytes from the total number of synanthropic species [13]; the degree of archeophysiation was estimated by the proportion of archeophytes among synanthropic plants [13, 14]; the degree of terrorization was determined by the proportion of the tetraphytes in the synanthropic fraction of the investigated plant groups [6]; the ecological structure of the synanthropic fraction of plant communities of the investigated pastoral ecosystems was evaluated with respect to moisture and intensity of light [2]. Research results. Synanthropy of phytocenoses has become significant in scale and is a consequence of human activity. It manifests itself in the impoverishment and unification of flora, which leads to negative environmental and evolutionary processes [5, 15]. Among the studied ecosystems, the share of synanthropic species exceeded 10%, which, according to the classification of phytocenoses [1], according to the degree of synantropy (Table 1), indicates that 100% of natural phytocenoses are absent among the studied meadows. Degree of synantropy of plant communities of pastoral ecosystems of Chernivtsi region. shown in tab. 2. The synanthropy index of the studied phytocenoses varies widely (29-100%). In addition, it was found that up to the 2nd class of anthropogenic transformation with weak synanthropy of groups (11-30%) within the boundaries of Chernivtsi region. belongs to the 1 pastoral ecosystem (village Shepit). To the 3rd class of anthropogenic transformation with an average degree of synanthropy (31-50%) 8 of the investigated pastoral ecosystems (Zarozhany village, Valia Kuzmina village, Mikhalch village, Dubovka village, Stebnyk village, p. Lopusna, Dolishny Shepit village, Ust-Putila village).

## 1. Класифікація фітоценозів за ступенем синантропізації [8]

Частка синантропних видів в угрупованні, %	Типи рослинних угруповань за ступенем синантропізації	Класи за ступенем антропогенної трансформації
≤10	Природна рослинність	1
11–30	Слабкий ступінь синантропізації угруповання	2
31–50	Середній ступінь синантропізації угруповання	3
51–80	Високий ступінь синантропізації	4
80<	Синантропне угруповання	5

## 2. Показник ступеня синантропізації, апофітізації і терофітізації рослинних угруповань лучних екосистем фізико-географічних зон Чернівецької обл.

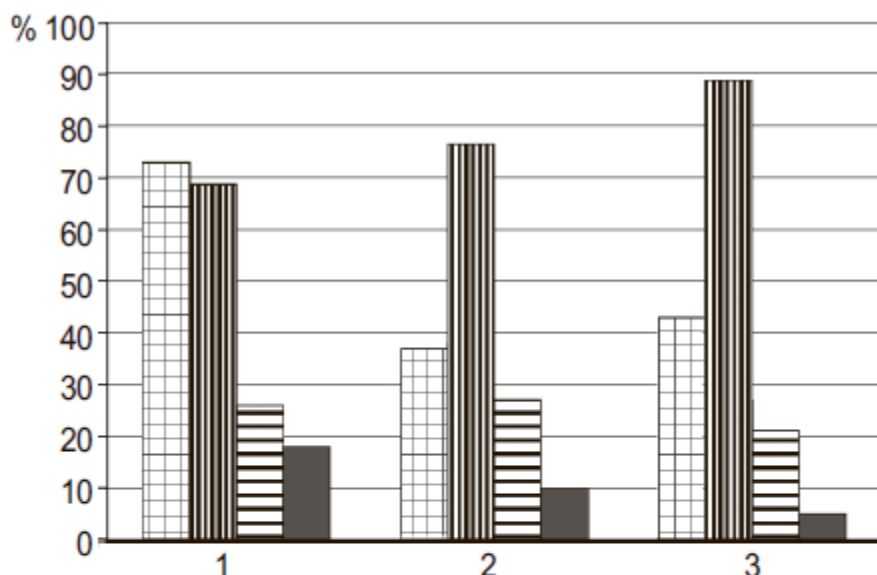
Лучна екосистема	Синантропізація	Апофітізація	Терофітізація	Археофітізація
	%			
<i>Прут-Дністровська зона</i>				
с. Вікно	80	88	24	19
с. Хрещатик	86	58	29	25
с. Лужани	61	86	13	0
с. Поляна	88	86	8	14
с. Чорнівка	63	80	26	0
с. Зелена	89	13	23	50
с. Ставчани	63	60	27	20
с. Вовчинець	100	70	27	10
с. Грушівці	59	69	46	13
с. Михалкове	78	36	42	36
с. Магала	67	81	36	13
с. Зарожани	50	100	6	13
<i>Прут-Сіретська зона</i>				
с. Тернавка	64	100	9	0
с. Горбова	53	63	42	19
с. Валя Кузьміна	50	79	12	0
с. Михальча	50	100	32	0
с. Червона Діброва	54	73	52	27
с. Дубове	41	71	22	14
с. Костинці	65	67	18	13
с. Брусниця	60	67	8	0
с. Черешенька	60	100	7	0
с. Банилів-Підгірний	54	87	30	7
с. Красноільськ	57	54	32	15
с. Старий Вовчинець	57	59	55	24
<i>Буковинські Карпати</i>				
с. Стебник	44	86	9	14
с. Лопушна	38	80	18	10
с. Долішній Шепіт	42	100	21	0
с. Усть-Путила	37	100	8	0
с. Селятин	56	78	34	0
с. Шепіт	29	100	28	0
с. Перкалаб	54	79	28	11





The high degree of synantrophy of phytocoenoses - the 4th class of anthropogenic transformation (51-80%) has 18 among the studied pastoral-type ecosystems, in particular, with. Window, p. Luzhany, p. Chornovka, with. Stavchani, p. Grushivtsi, p. Mikhalkov, p. Magala, p. Ternavka, p.

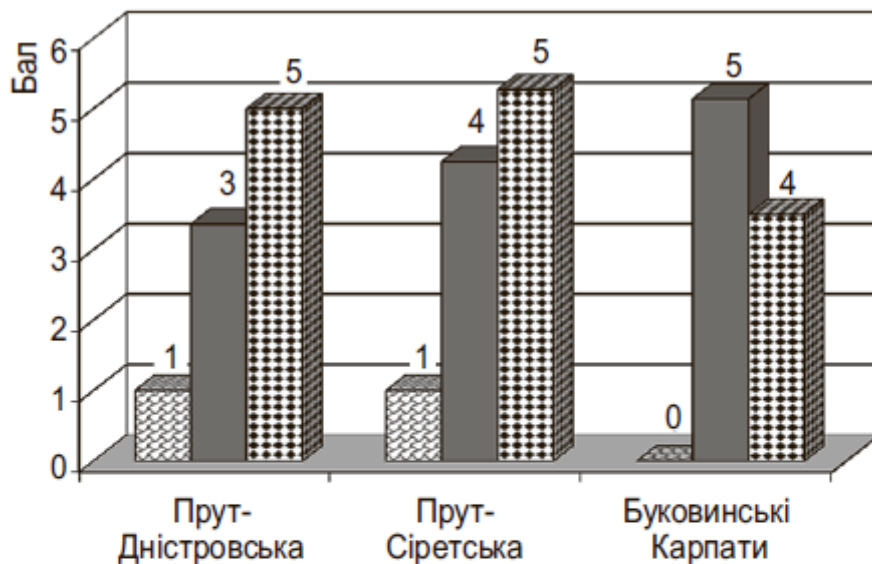
Gorbova, p. Chervona Dibrova, p. Kostinky, p. Brusnitsa, p. Chereshenka, p. Banilov-Podgorny, p. Krasnoilsk, p. Old Vovchinets, p. Selyatin, p. Perkalaba Up to the 5th grade included 4 pastoral ecosystems with synanthropic groups (<80%) - p. Khreshchatyk, p. Polyana, p. Green, p. Vovchynets.




The averaged values of the synanthropy index of vegetation groups of pastoral ecosystems for each of the physical and geographical zones of the Chernivtsi region. showed that the ecosystems of the pastoral type of the Prut-Siret zone and the Bukovynian Carpathians are characterized by the average degree of synanthropy of plant communities (Fig. 1). In the Prut-Dniester zone, a high degree of synanthropy of plant communities of pastoral ecosystems was detected (73%). Interestingly, all ecosystems of the highest degree of anthropogenic transformation are located precisely in the Prut-Dniester physico-geographic zone of the Chernivtsi region. Degree of apophytization of plant communities of pastoral ecosystems of Chernivtsi region. shown in tab. 2. This indicator reflects the adaptation of an aboriginal flora to anthropogenic impact, or the degree of anthropo-tolerance of the latter. In general, in the studied ecosystems, the degree of apopitisation varies from 13% (from Green) to 100% (Zarozhany village, Ternavka village, Mihalch village, Chereshenka village, Ust-Putila village, Dolishny Shepit village , village Shepit). The high degree of apoptisation of plant groups is characteristic of 94% of the investigated pastoral ecosystems. These data indicate a high degree of adaptation of local species to the growth of human-modified ecotops, which characterizes high anthropo-tolerance of investigated phytocoenoses. Summing up the averaged values of the degree of apophytization of plant communities of pastoral ecosystems in different physical-geographic regions of Chernivtsi region. made it possible to build such a number of growth in the anthropolotrance of the aboriginal flora of the investigated pasture depending on the anthropogenic influence: Prut-Dniester zone <Prut-Siretska zone <Bukovynian Carpathians (see Figure 1), which indicates an increase in the level of adaptation of plant species the passage while traveling from the plain area to the mountainous area of Chernivtsi

region. The index of terophilization of the investigated plant communities is another indicator of anthropogenic changes in the ecosystem. In general, the proportion of tetrophyte species among synanthropic species of phytocoenoses studied varies from 6 to 55% (see Table 2). High values of the degree of thermophilization (> 50%) indicate that there is a significant anthropoping on pastoral ecosystems. Chervona-Dibrova and with. Old Vovchynets Chernivtsi region and about the partial loss of zoned rice with indigenous flora. The averaged values of the index of sterilization of vegetation groups of pastoral ecosystems in different physical and geographical zones of Chernivtsi region. fluctuate within the range of 21 - 27% (see Figure 1), which in general is a low indicator.



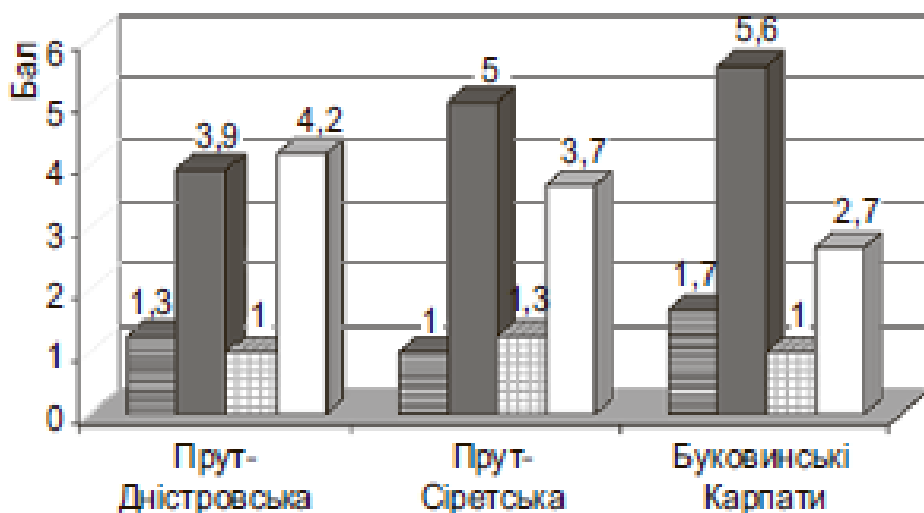
**Рис. 1.** Усереднені значення показника синантропізації, апофітизації, терофітизації та археофітизації рослинних угруповань пасторальних екосистем різних фізико-географічних зон Чернівецької області: 1 – Прут-Дністровська; 2 – Прут-Сіретська; 3 – Буковинські Карпати;  – синантропізація;  – апофітизація;  – терофітизація;  – археофітизація







**Рис. 2. Екологічна структура синантропної флори пасторальних екосистем для кожної з фізико-географічних зон Чернівецької обл. за відношенням до інтенсивності освітлення:**  — геліосциофіти;  — сциогеліофіти;  — геліофіти

Degree of archeophysing of investigated phytocoenoses of pastoral ecosystems for Chernivtsi region. shown in tab. 2. Traditionally, the term "archeophyte" is an element of the classification of species of adventitious plants at the time of entry into the local flora, however, it has a dual meaning for many authors: on the one hand, it characterizes the time of entry, on the other - a high degree of naturalization [12, 13] . According to the conducted studies (see Table 2) within the pastoral ecosystems of Chernivtsi region. the degree of archeophysing of plant groups is from 0 to 50%. For pastoral ecosystems with a high proportion of archeophytes among synanthropic species (village Zelena, Mikhalkovo village), a high degree of naturalization of plant phytocenoses is characteristic. Averaged values of the degree of archeophilization of plant communities of pastoral ecosystems in different physical and geographical zones of the Chernivtsi region. (see Fig. 1) indicate a decrease in the level of naturalization of the adventitious fraction of vegetation groups of pastoral ecosystems during the movement from the plain to the mountainous zone of Chernivtsi region. It was determined that by the degree of adaptation to the intensity of illumination the most numerous in

the spectrum of the synanthropic flora of the pastoral type ecosystems in the Chernivtsi region. is a group of heliophytes. On average, heliophytes and scygeleophytes are dominant for the physiographic and geographic areas of this region in the ecological structure of the synanthropic flora of pastoral ecosystems (see Figure 2).



**Рис. 3. Екологічна структура синантропної флори пасторальних екосистем для кожної з фізико-географічних зон Чернівецької обл. за відношенням до вологи:  — гідрофіти;  — мезофіти;  — мезоксерофіти;  — ксеромезофіти**

In the case of moving from the plain zone to the mountains the number of scygeleophytes increases, and heliophytes - decreases. In the ecological spectrum of the synanthropic flora of the investigated pastoral ecosystems in relation to the moisture in the first place - a group of mesophytes and xeremosophytes. A large proportion of mesophytes and xeremosophytes in the ecological spectrum testifies to arisation of the territory and xerophilization and mesophytisation of the vegetation under the influence of anthropogenic factor [10, 17]. Investigation of ecological structure of synanthropic flora of pastoral ecosystems in physical and geographical zones of Chernivtsi region. (Fig. 3) showed the domination of mesophytes and mezokserofitov. When moving from the plain zone to the mountainous number of mesophytes in the spectrum of synanthropic flora of the pastoral type ecosystems increases, and xeremosophytes - decreases.

## Conclusions

Among the studied ecosystems, the share of synanthropic species exceeded 10%, which indicates the absence of natural phytocoenoses among the studied meadows. It was established that among pastoral ecosystems of various physical and geographical zones of Chernivtsi region. The highest degree of synantropy has the cenoses of the Prut-Dniester zone (73%). A high degree of apophytisation of the investigated plant groups has been revealed, which indicates a high degree of adaptation of local species of investigated pastoral ecosystems to the growth in human-modified ecotope species, which characterizes high anthropo-tolerance of investigated phytocoenoses. High values of the degree of terrorization of pastoral ecosystems are shown with. Chervona-Dibrova and with. The old Vovchynets of Chernivtsi region, testifying to the presence of significant anthropoping and a partial loss of zonal rice with indigenous flora. The decrease of the level of naturalization of the adventitious fraction of plant groups of pastoral type ecosystems during movement from plain to mountainous areas of Chernivtsi region was revealed. The dominance of heliophytes in the spectrum of synanthropic flora of pastoral type ecosystems in Chernivtsi region was established. by the degree of adaptation to the intensity of illumination, as well as of mesophytes and xeremosephytes - by the ratio to moisture. It is noted that with the transition from the plain physico-geographical zone of Chernivtsi region. to the mountainous number of mesophytes and scygeleophytes in the spectrum of synanthropic flora of pastoral-type ecosystems increases, and xeremosophytes and heliophytes decreases.

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