BIOLOGY

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CORRELATION OF SPECIES AND BIOMORPHOLOGICAL VARIETIES IN THE STRUCTURE OF PHYTOCOENOSIS

The relative biomorphological diversity reflects the proportion of life forms and species in phytocenoses. In extreme conditions a decrease in species diversity of plants in phytocenoses can be partly compensated by their biomorphological varienty, which has a positive effect on their stability.

Key words: *biodiversity, phytocenoses, species, life forms, biomorphs.*

Currently, the science of vegetation has developed methods and approaches to the study of species diversity, which are the basis of geobotanical research. Therefore as it develops, geobotany, with the practical task of studying the diversity syntaxonomic phytocenoses, is moving away from their physiognomic characteristics. This is natural as the analysis of species characteristics phytocenosises is more resultive to this problem, in comparison with the biomorphological analysis, including the fact that the identification of species is a much more objective process than the identification of biomorphic [1]. In general we can say that currently there is no closing of plants biomorphology and geobotany. These two branches of botany live their lives, "without interfering with each other". As a result, the whole bunch of scientific ideas about the biomorphological structure of plant was in fact "phased out" of the science of their communities, and as a consequence, sinmorphology, i.e. the science that studies the spatial organization of phytocenoses, their "physiognomy", according to B. M. Mirkin and L. G. Naumova [2] is currently the least developed section of phytocoenology. Moreover it is surprising how it happened in the USSR (and later on in Russia) – in the country where, thanks to the works by I. G. Serebryakov and his biomorphological research school became the leader in research of epimorfologicheskom structure of plants. There are a lot of approaches to the above mentioned development trends of biomorphology and geobotany, but one thing is evident: biomorphological and species diversity in plant communities are evolutionarily related aspects of its essence and it is logical not to oppose them but seek common features between them. One of these features can be a relative biomorphological diversity (RBD), which reflects the quantitative relations and the biomorphic forms in phytocenoses. However, RBD itself does not represent much value without the knowledge of the mechanism of its formation, as it may be due to different ratios of species and biomorphological varieties, which can be displayed in the form of the model shown in Fig. 1.

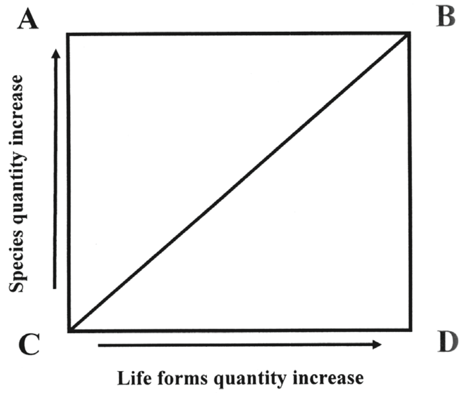

Fig. 1. Correlation of species- and biomorphological diversity in phytocoenosis

If in the model presented in the figure we draw a median from angle C, then in the communities located along it, there will be ever-increasing rates of species and biomorphological diversity whose ratio defines the same indicators of relative biomorphological diversity. For example, phytocenosises formed by ten species, belonging to two biomorphs and twenty species belonging to four biomorphs (2 / 10 = 4 / 20 = 0.2) will have the same RBD. Thus, the RBD coefficient in these phytocenoses will be equal to 0.2, but it is associated with a variety of quantitative indicators and biomorphic forms that can be reflected in the formula 0.2 (2 / 10) and 0.2, (4 / 20) respectively. It goes without saying, in various phytocenoses, in some way separated from the median, it is logical to expect different values of RBD. Aside from the set of transient variations, the extremes are the four corners of the relevant provisions of the rectangle: A – multispecies, but biomorphological poor communities (the coefficient of RBD decreases); B – multispecies and biomorphological rich community; D – less spread species but biomorphological diverse communities (the coefficent of RBD increases) and C – less spread species and biomorphological poor communities.

The most probable is the situation in which species diversity is higher than their phytocenosises biomorphological diversity (i.e. the ratio of RBD below one), but theoretically there might be a reverse situation. For example, in the phytocenosis there are two types, one of which is a vital form 1, and the second by biomorphological variability grows in the life forms 2 and 3, while the coefficient of RBD is equal to 1.5, and the ratio of biomorphs / views - 3 / 2.

It is known that biodiversity is an aspect that determines the sustainability of ecosystems and the biosphere as a whole. Long-term adaptive evolution of phytocenosises determines not only their species composition as a reflection of compliance with environmental niche of plants to hypervolume niche habitats, but also the functional roles of species in phytocenosis as a consequence of their packaging in the hypervolume of environmental space, in which their evolution took place. The external manifestation of this process is the distribution of roles in the formation of sinmorphological structure of phytocoenosis. Thus, biomorphological evolution is a reflection of the same tendency to most efficient use of the potential habitat biota, and the evolution of species as well. It is therefore logical that biomorphological and species diversity may partly compensate each other in the functional aspect of plant communities. Such compensation can be observed with a decrease in species diversity phytocenosises with tensions in the enviroment, for example, with increasing altitude in mountains. The decrease in species diversity may contribute to the growth of potential unfilled space hypervolume niche, which may be a prerequisite for growth of biomorphological diversity phytocoenosis.

Obviously there is a number of environmental factors influencing the diversity epimorphological structure of plants. Increasing extreme conditions manifested in the reduction of canopy and the height of layers, which reduces the role of phytocentral selection (increase of phytocentral selection promotes differentiation of ecological strategies of species-competitor (C), stress-tolerant (S) and reduces the prospects of their biomorphological evolution in the “closed” phytocoenosis), which probably contributes to the growth of biomorphological and species diversity phytocoenosis. In this case, the selective filter that determines the restriction of species diversity in the community is a hard ecotopic selection, which promotes the survival of the extremely small number of species with the strategy S. This allows them (in the absence of the influence of C-species) adapting to the diversity ecotopic conditions, including changes in life forms. In other words, in a very limited number of species, the community “fills” the hypervolume of ecological niche due to the biomorphological diversity.

High biomorphological diversity of the majority of “open” highland phytocenosises is a consequence of high spatial heterogeneity of habitat and climate dynamics, increasing with aridity and rise of sea level. This feature of the highlands is a prerequisite for the variety of strategies of plant adaptation is directly related to life forms.

Another prerequisite for the growth of RBD might be the increase of the role of vegetative propagation and respectively of the somatic activity of plants against reducing the value of generative reproduction in extreme environment (this is evidenced by the significant number of stolonforming alpine plants, plants with threadlike rhizomes with the resumption of weed forming rootstocks, creeping stems and other forms of vegetative mobility [4]). Thus, there are conditions that determine the trend of increasing diversity against decrease in species diversity at extreme habitat of plants in highlands. In this case, the increasing diversity of biomorphological phytocenosises may partly compensate for the loss of species diversity that may have a positive impact on their stability under extreme conditions.

In conclusion, we can note that the analysis of the relative biomorphological diversity is an important aspect, allowing relating the role of biomorphological and species diversity in the formation of the functional structure of various phytocoenosis. The requirement in such studies is the use of the system of life forms, adequately reflecting biomorphological plant diversity in the research area.

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СООТНОШЕНИЕ ВИДОВОГО И БИОМОРФОЛОГИЧЕСКОГО РАЗНООБРАЗИЯ В СТРУКТУРЕ ФИТОЦЕНОЗОВ

Относительное биоморфологическое разнообразие отражает количественное соотношение жизненных форм и видов в фитоценозах. В экстремальных условиях снижение видового разнообразия растений в фитоценозах может быть частично компенсировано их биоморфологическим разнообразием, что положительно сказывается на их устойчивости.

Ключевые слова: *биоразнообразие, фитоценозы, виды, жизненные формы, биоморфы.*

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