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TAXONOMIC AND ECOLOGIC STRUCTURE OF COMMUNITIES OF EDAPHIC ALGAE FROM THE AGROPHYTOCENOSES OF THE NORTHERN DISTRICTS OF MOLDOVA

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Abstract: In this work was to establish the taxonomic and ecologic structure of algocenoses from different agricultural cultures and the conservation „in situ” through the separation in pure cultures of trunks of nitrogen fixation algae that can be used in the process of soil fertility increase, as a source of nitrogen. It is worth studying the ecologic structure of algae communities, reflected by vital forms.

Key words: edaphic algae, agrophytocenoses, ecobiomorphs.

Introduction

In the last years, edaphic algae are the object of study of a number of specialists because these organisms have an important role in stimulating soil fertility [1, 2, 3]. The study of edaphic algae is determined by their degree of participation in soil processes (the circuit of biogenic substances), in the creation of relations between different representatives of the micro-flora and superior plants. Thus, it is possible to diagnose the processes of soil creation and regulation of the agrophytocenosis productivity. On the other hand, based on the taxonomic structure and ecologic structure of the algoflora, especially with the help of some specific species of algae from the green algae phyla, cyanophyta or xantophyta that serve as test-cultures, we can appreciate the changes that occur under the influence of different factors, including the anthropogenic ones [1].

The main purpose of this work was to establish the taxonomic and ecologic structure of algocenoses from different agricultural cultures and the conservation „in situ” through the separation in pure cultures of trunks of nitrogen fixation algae that can be used in the process of soil fertility increase, as a source of nitrogen.

Materials and methods

The edaphic algae communities have been analyzed from samples collected in 2007 from the chernozem occupied by different agricultural cultures: wheat, barley, sunflower, oats, sugar beet, corn etc. from the northern districts of Moldova. The collection and processing of soil samples have been carried out using the methods accepted in modern algology [2].

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Results and discussions

The investigations made on algae communities have shown a varied algaeflora, both by the taxonomic structure and by the biologic particularities of species, which includes a total of 63 species and genera of algae from 10 families and 22 genera. The largest number of algae has been detected on agricultural lands occupied by barley, sunflower and corn cultures, and the minimum value has been identified in wheat and sugar beet cultures. If we speak about the structure of phyla, the development of green-blue algae is predominant in all the cultures.

The second place by the variety of species is held by bacillariophyta that vegetate actively in the soil occupied by barley and potato cultures. The relatively high diversity is probably due to the use of water from reservoirs for irrigation. Thus, these two groups make up from the number of algae.

The most sensible are the xantophyta algae that are present only in the fields of wheat and soya, which shows the lack of pollution with chemical substances (pesticides, herbicides, etc.). The *Euglenophyta* have disappeared from the list of species, which proves that they are not typical of agocenoses from the soil (tab. 1).

Table 1

Taxonomic structure of algae communities that vegetate the agocenoses in the north of Moldova.

Fields with cultures Groups of algae	Potato	Soya	Sunflower	Corn	Barley	Wheat	Sugar beet	Lucern
<i>Cyanophyta</i>	11	12	15	13	20	7	7	12
<i>Chlorophyta</i>	1	-	1	1	2	1	3	1
<i>Xantophyta</i>	-	1	-	-	-	2	-	-
<i>Bacillariophyta</i>	2	2	1	2	5	2	-	2
<i>Euglenophyta</i>	-	-	-	-	-	-	-	-
Total no. of sp.	14	15	17	16	27	12	10	15

Data from the previous table on the distribution of species by phyla show that the established laws are generally maintained:

Cyanophyta (46) – *Bacillariophyta*(6) – *Xantophyta* (3) – *Chlorophyta* (8) — *Euglenophyta* (missing). The field with sunflower culture is predominantly occupied by cyanophyta, soya has two species of diatom from the *Navicula* variety, as compared to agocenosis from the wheat culture that includes all the representatives of phyla (tab. 1), a proof of the optimal conditions for the development of edaphic algae.

By comparing the structure of predominant species in cultivated crops and non-cultivated crops, we can see that there are differences. For instance, agocenoses with cultivated crops are dominated by *Phormidium* species (*Ph. molie*, *Ph. jadinianum*, *Ph. foveolarum*) and *Nostoc*, the non-cultivated crops are dominated by *Phormidium* species and by *Lyngbia* species (*L. cryptovaginata*, *L. attenuata*, *L. martensiana*), the intensive development creates a gelatinous film on the soil surface. Thus, the action of mechanic soil processing creates unstable and diverse

conditions, creating preconditions for the development of algae species of different groups: *Phormidium*, *Oscillatoria*, *Nostoc*, *Cylindrospermum*, *Navicula*, *Hantzchia*, *Symploca* etc.

It is also worth mentioning that species of nitrogen fixation algae that exercise an obvious action on the balance of nitrogen from the soil that is required for the growth of superior plants. The presence of a sufficient number of species is a proof of natural soil fertility. Some trunks of species have been selected in pure cultures: from the soya field - *Nostoc* sp., *Cylindrospermum* sp. and from the sunflower field - *Nostoc punctiforme* (Quitze), that develop intensely on different nutritive media and fix to a large extent the free nitrogen in atmosphere to be then proposed as sources of enrichment of the soil with nitrogen with a view to increase its fertility.

It is worth studying the ecologic structure of algae communities, reflected by vital forms. The distribution of algae by ecobiomorphs is represented in figure 1.

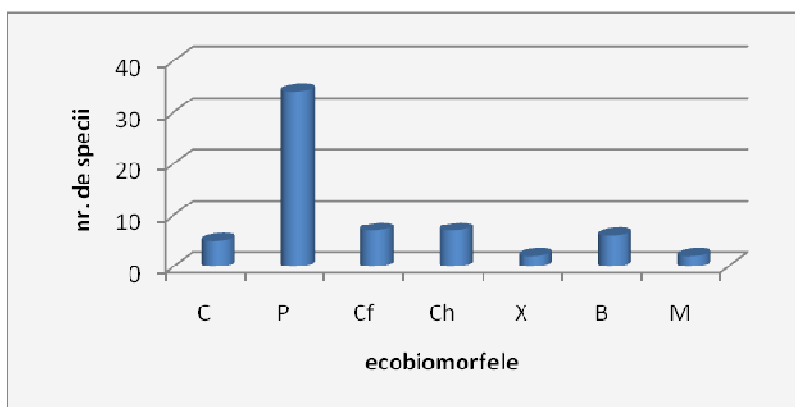


Fig. 1. Distribution of algae from the agrocenoses of the northern region of Moldova by ecobiomorphs.

A specific particularity of agrophytocenoses is the full predominance of P forms making up 80% and are represented by *Oscillatoria*, *Phormidium*, *Symploca* și *Lyngbya* genera that are found in all the agricultural cultures.

An important role of the ecologic state of soils is usually held by xantophyta algae that represent species of algae resistant to shadow, but sensible to draught and extreme temperatures. The most typical for the studied agrocenoses are the species *Chlorellidium tetrabotrix*, *Chlorocloster terrestris*. The nitrogen fixation species from *Nostoc*, *Anabena*, *Cylindrospermum* genera are close to this group and are joined in ecobiomorph. Cf. Overall, these forms are represented by 7 species that make up about 11% of the total number of species, a proof of natural soil fertility.

Conclusion

The complex analysis of edaphic algoflora from agrocenoses has demonstrated that specific environment conditions are created in these soils, in relation to the use of irrational agricultural technologies. These conditions are reflected in the change of the structure of algae group species and in the modification of the relation between the main phyla of algae. These are the reasons for the number of green and blue algae and the considerable reduction of the diversity of *xantophyta* algae in most of the cultures.

References

1. ȘALARU V., 2001 – Algele edafice din fitocenozele Republicii Moldova. *Analele științifice ale Universității de Stat din Moldova. Chișinău*: 162-168.
2. ȘALARU V., CHICU N., DUDNICENCO T., 2004 – Algele și rolul lor în sporirea fertilității solului. *Culegeri de lucrări științifice, Chișinău*, Tip. "Sirius": 113-121.
3. ȘALARU V., 2001 – Rolul algelor edafice în sporirea fertilității solului. *Lucrările conferinței științifice cu participare internațională "Solul și viitorul", Chișinău*: 292 p.
4. ГОЛЛЕРБАХ М., ШТИНА Э., 1969 – Почвенные водоросли. Л.: Наука, 228с.