Natural matrix biocapsules as base to specificity biocenocomplexes

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Introduction

The paradoxical situation appears as a rule at analysis of biocenocomplexes. On the one hand, effect of the shaping of such biological systems is a determination of the certain balances promoting firm development of populations and providing biovariety. On the other hand many alive organisms often being included in these complex, render the negative influence to growing, development and productivity of the agricultural crops. Under different sort of load on ecosystems (chemical, termal, and others) the essential changes appears to shaping the ecological niches, interaction inside of biocenocomplexes , appearance new adaptive to negative factor of the encirclement alive organism. This in total can bring the change the structure of biocenosis and activations the consumption of substratum. One of the example of the shaping biocenocomplexes and activations biodestraction natural substratum (in particular, celluloses filament pat-product in its raw state) is an ecological niche forming on the base of the separations (the excretions) aphids on the cotton plant (fig1).

Fig.1. Aphis gossypii.

In ecologically unsuccessful regions cultivated and wild plants are exposed to intensive attack from insects. It is connected at least with two conditions: with loss of tolerance of plants to the environmental conditions, essentially changed in zones of ecological crisis, also with high adaptability of insects to changing factors of an inhabitancy, and with reduction of period of resistance beginning to chemical and biological means of plants protection.

Generally, at attack of insects on various organs of plants is found discharge, consisting of intermediate products of their metabolism. This discharge, apparently, can serve as a substrate for reproduction of the insects and also favor the process of their development, acting as a nutrient medium.

This environment can be a substratum for various species of microorganisms at the same time. Study of theoretical and practical aspects of the microorganisms dissemination dynamics, being formed in zones of ecological crisis, their identification and classification are of interest.

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Results and Discussion

In analogy with polymeric systems, we consider aphid's secretion as passive nanostructures (natural matrix biocapsules), possessing specific adhesive durability; and this durability, on the one hand, is provided by the changeable nature of substrate (for example: surface of a leaf depending on its age) and adhesive – in our case it is insects secretion. On the other hand, adhesive durability is provided by adhesive's penetration in leafs pores with sizes from 15 to 20 nanometers. We think that along with the known mechanism of leaf dehydration owing to cotton aphid eating feed cellular we can realize other processes resulting in dehydration of plant parts. One of these ways is penetration of secretion nanoparticles in the pores of a leaf, their blockage and "break" of cell walls. In microbiota which is formed on insects' secretion there can live microorganisms ferment systems of which can work for destruction (biological degradation) of cellulose and its derivatives up to oligosaccharides with different molecular mass and their monomers. We believe that dehydration process in a leaf and biological degradation of cellulose and its secondaries can be considered as risks connected with realization of natural nano-technologies, consisting in formation of secretion – nanomucus of biological systems and ecological niches, their interaction with plants that can lead to imbalance of physiological and biochemical processes occuring in plants' bodies at different stages of their growth and development. We think that the risks connected with realization of such natural nano-technologies will increase in line with the increase of extreme environmental factors (temperature, salinization, drought, etc.), and also irrationalism of different agrotechnical actions in changeable environment conditions. It can result in "selection" of microorganisms resistant to bad environmental factors and their activation to nutritious substratum – cellulose and its derivatives.

Studying the role of insects' secretion, (cotton aphid in our case), formation of microbiota in destruction process of cotton wool cellulose, and also the character of recycling of mono-, di-, tri, - and polysugars we saw it was necessary to research the microorganisms settled on secretion, and process of their transport from cotton parts to cotton wool. The researched cotton had been grown in the crisis Aral zones. Microorganisms-biological destroyers are rather numerous in the nature where there is organic substratum. The biggest group is ammonific microorganisms. This group has a huge variety of fermental systems and high metabolism lability. Occupying natural substratum, they carry out mineralization of proteic substance; many groups of microorganisms lead decomposition of albuminous connections to end-product of disintegration (ammonia, hydrogen sulphide, mercaptan etc.). On aphid secretion we have found not more than 15 kinds of ammonific microorganisms that let us consider their kind variety as poor (10^5 cells in 1 ml have been registered). Among ammonific microorganisms we can mark a group of bacilli - spore-forming bacterium which carry out disintegration of difficultly oxidized organic substance and works as the indicator of its presence. This group differs is very resistant to external factors. It transforms proteic substance which can not assimilate non-sporiferous bacteria. Proteolysis is connected with their use as nitric food. We found 3-4 kinds of these microorganisms on aphid secretion, and see that their kind variety is poor as well (10^3 cells in 1 ml have been registered). Transformation of anazotic substances in the nature are carried out by yeast microorganisms. They widely exist in epiphytic microflora. Yeast cells are large and contain a lot of sugar. Aphid's secretion contains moderate biodiversity of yeast: some cultures were found (10^3 cells in 1 ml have been registered). Cellulose-fermenting microorganisms are widely presented in the nature; cellulose decomposition is especially active in aerobic conditions. We studied the microbic landscape of cellulose-fermenting bacteria. Microscopy of destruction zones enables us to make the conclusion that aphids' secretion is a good envirinment for the following colonies of cellulose bacteria: light-yellow bacteria (Celvibrio vulgaris) and pink bacteria (Cytophaga rubra) with a little specific filling.

The dried materials of aphid's excrements have 95% carbohydrate and 3% (or 1-1,3% to the total weight) protein (the Smiths, 1948; Kaucis, 1956). For the revealing the qualitative composition of the albumens in the aphids excrements it was used the method of electrophoresis. This method possesses a big allowing ability whereas, division of the protein mixtures goes on charge not only, but also on size and form of the particles. Use of disk-electrophoresis in polyacrilamid helium adds hereto effect of concentration that allows to conduct division a proteins from diluted solution.

The electrophoresis conducted in the tubules on instrument of the company Reanal in 7% polyacriamid helium (fig.2,3).This analysis by means of electrophoresis of the water extraction has shown presence of two proteins factions. But because of low contents of the albumens in composition of the separations shade (3%) they are not revealled in data condition experience. The acknowledgement of this serves finding in composition of the separations by means of method of the electrophoresis of glutamatdehidrogenas, malik-ferment and polyphenoloxidas. The results of the studies were submitted for drawing 1,2. In connection with active vital activity microorganism on like substratum can be revealled and the other ferments of their metabolism. The role of these ferment in composition of the separations will be realized in the further study since is not excluded possibility that some of them can be a product to vital activity of the sheet, enterring in fluid ambience of the separations. The Intensive manifestation of phenoloxidasing activities is connected with separation of phenol join and including gossypol of cotton plant as defensive reaction from certain types influence. Malik-ferment is one of the key ferment, catalysis the reactions of carboxil and organic acids with prevalence of the reactions of decarboxilsания. In these cases apple acid in process of the reduction to acidity is used not for resyntheses a carbohydrate, but as substratum of the breathing in the form keto-acetic acids, forming as a result of oxidation decarboxilis.

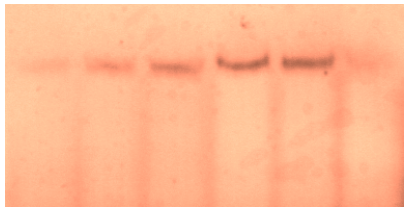

Fig2. Electroforegramms of glutamatdehidrogenas (different amount of extract – of 1 till 2 ml)

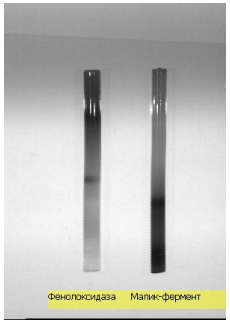

Fig.3. Electroforegramms of phenoloxidas and malik-ferment

Glutamatdegidrogenaza (NAD- depending) realizes desamination glutamic acid. Fenoloksidaza oxidizes the phenolses before hinons. Thereby, in the course of called on studies of the composition of the aphids separations is identified row ferment, catalyzing the key kvasychemistry reactions inside plants. Use of such natural "traps" will allow to build natural models of interaction of microorganisms in one nutrient medium, to establish its selectivity to the certain species of microorganisms, to determine by the tests their activity and possible aggressiveness to some species of cultivated plants. This will also allow to develop new selective nutrient mediums for microbiological practice and for the solving of set of biotechnological problems.

Conclusions

So, microbiocenose formed in aphid secretion concentration (natural matrix biocapsules**)** and creating biological niches is characterized by specific microbiota. And well presented microbiota dominates in microorganisms' successions. This microbiota is accompanied by bacteria and yeast microorganisms. We need to say that being formed on a certain substratum (natural matrix biocapsules**)** they (as a power source) use various nature organic substances (sugar and protein). And it is quite obvious, that it is a special group of microorganisms, capable to destroy cellulose and lead to loss of its technical characteristics. Besides, we know the way of "transportation" of these microorganisms to cotton wool. Aphid's secretion (natural matrix biocapsules**)** has some viscosity and fluidity, and together with biological destroyers of cellulose it "flows down" from a leaf when it is properly bent and turned and get to cotton wool. Then the mechanism enzymatic hydrolysis of cotton wool cellulose which, evidently, occurs in some stages and different kinds of microorganisms-biological destroyers should take part in the process in each stage. If we understand the process of biological degradation as a comprehensive whole, and also know the sequence of its stages, we can minimize the risks related to loss in quality of agricultural production. Besides, the choice of the active varieties of microorganisms can use for salvaging the miscellaneous of the sort departure accumulating as a result of the person activity. In this direction at reception of the varied biological material - an extremofills microorganisms it is possible there use with the other technology of peeling the ecosystems.

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