Ecological functions of soil actinomycetes of Mongolia

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Introduction

Mongolia is a developing country for which agricultural production is very important. Actinomycetes are involved in the processes of humus formation; the products of their vital activity have a certain complex-forming and structure-forming ability. They determine the acid-base and oxidation-reduction state, mobility of elements and antipathogenic function of soils. Of great importance in the transformation of substances in the soil is the information function of microorganisms, concluded in the interrelationships of microorganisms with the properties of soils and factors of the external environment, in the adequacy and speed of the response of the microbiological population of the soil to external influences. From our point of view, the influence of microorganisms on the genesis and fertility of soils is due, first of all, to the following factors: the energy content in the biomass of microorganisms; their quantity and activity in the transformation of rocks, organic and mineral parts of the soil. Of great importance is the antipathogenic function of microorganisms, the stimulating ability of their exmetabolites, the ability to lower the activation energy of reactions and selectivity for individual reactions (Savich et al., 2007; Norovsuren, 2009).

In this paper we present a search for actinomycetes synthesizing biologically active substances with antagonistic activity against phytopathogenic fungi, bacteria and other test organisms.

Material and method

The samples of soils of mountain-forest, steppe and desert-steppe ecosystems of Mongolia served as objects of the study. For the most complete isolation of actinomycetes from the soil, a combined method of Humus - vitamin agar and casein - glycerol agar, consisting of selective methods aimed at suppressing the growth of non-micellar bacteria, fungi, was used. Chemotaxonomic prizes of actinomycetes were observed in the hydrolysates of whole -cells LL- or meso-DAP (diaminopimelic acids) and the antagonistic activity of actinomycetes was determined. For the species identification of streptomycetes, cultural, morphological and physiological-biochemical indices were used, according to the determinant of Gause. The phytopathogenic fungi and bacteria stored in the State Collection of Microorganisms VIZR and RSAU-MTAA, as well as other test organisms stored in the IGEB of MAS, were used as a test object.

Results and discussion

Soil fertility is largely determined by the structural interrelationships between soil properties, in the soil-plant system and the environment, in the soil system - microorganisms, in the soil, as in a biocosm body. In this case, microorganisms wich carry out the most rapid transfer of information, are necessary link in the implementation of the biocossoil functions of soils.
Microorganisms (actinomyces) in separate horizons of soils play the role of selective geochemical barriers. Microorganisms in different parts of the catena, in the landscape perform the role of selective geochemical barriers of a higher hierarchical level and determine the development of the whole biogeocenosis.

For microbiological and enzymatic processes in various conditions, the main direction is the introduction of certain microorganisms into the root zone of plants, injecting them with roots or leaves not only substantially increase the yield, but also contribute to the plant's resistance to certain diseases.

For the plant protection from pathogens and pests, it is necessary to create conditions in which soil accumulates antagonists of pathogens under agricultural crops and increases the participation of microorganisms of various groups in soil processes.

The main producers of antibiotics in the fight against plant pathogens are actinomycetes of the genus *Streptomyces*. The number of reports of new antibiotics produced by actinomycetes is increasing every year. In addition, actinomycetes are able to form antibiotic substances that inhibit enzymes, and also are immunomodulators, herbicides, insecticides. They can synthesize other biologically active compounds.

The biological method of combating pathogens is the use of microorganisms with antagonistic properties or products of their vital activity for the destruction or inhibition of the development of pathogenic organisms. This method is receiving increasing attention in forest and especially agricultural phytopathology, since the widespread use of chemical compounds becomes harmful to human health and disrupts a number of important processes in living nature. However, the currently known biological methods in practice are very limited (Savich et al., 2007, 2010; Norovsuren, 2009).

An antagonism of microorganisms plays an important role in the formation of genesis and fertility of soils. According to our data, strains of actinomycetes isolated from the soil suppress the growth of the following microorganisms: *Bacillus subtilis*, *Escherichia coli*, *Staphylococcus aureus*, *Saccharomyces cerevisiae* and *Aspergillus niger*, strains of streptomycetes suppress the growth of *Xanthomonas campestris pu. Campestris*, *Alternaria raphanii brassicae*, *Alternaria solani*, *Alternaria alternata*, *Botrytis cinerea*, *Colletotrichum lagenarium*, *Sclerotinia sclerotiorum*, *Sphaeropsis malorum*, *Fusarium culmorum* and *Fusarium oxysporum f.sp. lycopersici*.

Summing up, it is necessary to emphasize that as a result of the work done, prospective strains have been identified for further study in connection with their pronounced antagonistic action against test organisms. Microbiological preparations based on highly effective strains, unlike synthetic preparations - pesticides - are less toxic, rapidly decompose, do not accumulate in food, are hypoallergenic, cheap and convenient for industrial application.

**Conclusion**

The strains studied can serve as a basis for the development of new, practically valuable antibiotic drugs that can be used in medical practice, as well as for the creation of environmentally safe biologics for combating phytopathogenic fungi and bacteria of agricultural plants and subsequent preservation of the crop.

**References**

