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Aim of the research

To identify bacteria and funguses existent in the preparation *Humate Green Ok* of humic substances.

Methods

Heterotrophic bacteria were enumerated by making serial dilutions of the humus preparation. The dilutions were surface-plated on the medium R2A for bacteria and on the malt extract agar (ME) for fungi. Petri plates were incubated at 22°C for 5-10 days. The amount of microorganisms was expressed as a number of the colony-forming units per ml (CFU/ml).

BBL Crystal™ Enteric/Non-Fermenter Identification (ID) system by Becton & Dickinson was used for the identification of aerobic gram-negative bacilli. *The Gram-Positive ID system* was used for the identification of Gram-positive bacilli. Identification of fungi was carried out on the basis of macroscopic and microscopic morphology.



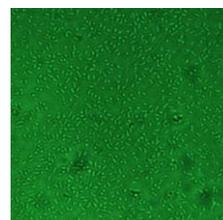
Petri plates

Results

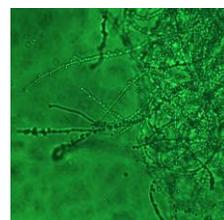
Average bacteria number in the humus preparation were $1,5 \times 10^4$ CFU/ml. Fungi number were $1,9 \times 10^3$ CFU/ml.

Three *Bacillus* species have been isolated from the humus preparation. *Bacillus circulans* was predominant. The preparation contains also *B. licheniformis* and *B. megaterium* as well as *Corynebacterium propinquum* and *Acinetobacter lwoffii*.

The predominant fungi belong to the genera of the *Trichosporiella* and *Penicillium*.



Corynebacterium propinquum



Trichosporiella spp.

Discussion

The isolated bacteria and fungi belong with the saprophytic microorganisms commonly found in the soil. They are chemoorganotrophic, mesophilic and obligate aerobic or facultatively anaerobic, capable of growth in the presence of oxygen.

Bacillus species are ubiquitous in the nature. *Bacillus* species produce highly resistant endospores to stressful environmental conditions and can stay dormant for extended periods. Their collective features include degradation of most of substrates derived from the plant and animal sources, including cellulose, starch, pectin, proteins, hydrocarbons, and others; antibiotic production; nitrification; denitrification; nitrogen fixation; facultative lithotrophy; acidophily; alkaliphily; thermophily; and psychrotrophy.

Many *Bacillus* species are used as the soil inoculants in agriculture and horticulture. The bacteria release vitamins, organic acids, plant growth promoters, natural antibiotics and improve mineral supply. They are releasing soil nutrients for the plant use, entering into symbiotic relationships with plant root systems and acting as the antagonistic organisms against plant pathogens.

Bacteria *Corynebacterium spp.* are involved in the degradation of sterols, waxes and hydrocarbons. Under certain conditions, they can accumulate polyphosphate in their cells.

Soil *Acinetobacter* species possesses ability to use complicated structure molecule, for example, aromatic compounds and thereby taking part in the bioremediation processes.

Species of *Penicillium* genus - ubiquitous in the soil, fungi prefer cool and moderate climate and they are commonly presented wherever organic material is available. They live mainly on the organic biodegradable substances.

The metabolism of *Trichosporiella spp.* presumably is involved in the transformation of different phenolic compounds and lipids, and in the detoxification of the soil environment. Moreover, all microbial cells contribute to the adsorption of heavy metal ions resulting in a decreased environmental toxicity.

Conclusions

The preparation *Humate Green Ok* of humic substances contains a considerable number of live saprophytic bacteria and filamentous fungi, which belong to beneficial soil microorganisms having significant role in the biodegradation of different organic substances and mineral cycle as well as in the plant growth stimulate.