Plant waste bioconversion by indigenous micromycetes

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Abstract:

Institute of microbiology developed the biotechnology of industrial and house-hold sewage treatment with association of microorganisms and higher water plants (water lettuce and water hyacinth) (HWP). Pollutants impact structure of microbial complex, total number of microorganisms and their diversity. Different physiological groups of microorganisms actively participate in redox processes and play significant role in utilization of pollutants. Microorganisms jointly with HWP effectively cleanse sewage from pollutants. As result a huge amount of biomass is accumulated at cleansing facilities. Since HWP biomass contains pollutants it is not utilized now. But biochemical value and high yield of HWP biomass represents interest in terms of plant wastes bioconversion. The biomass contains protein, cellulose, lipids, and water-soluble polysaccharides and is characterized by relative low lignin content as well. It may serve as perfect substrate for microorganisms' development. Isolation from natural biocenosis of microorganisms capable to destruct cellulose and optimization of cultivation conditions for these cultures may result in development of biotechnology for biofuel production. Biomass of HWP was used to isolate microbial strains with high cellulase activity and natural resistance to certain pollutants. It was established that process of sewage treatment is characterized by increased total number of micromycetes inhabiting waste biomass and by changes in fungal diversity. Certain groups of microorganisms were prevailing in stress condition of increased pollutants' concentration in sewage. Micromycetes isolated from HWP biomass were mainly presented by representatives of *Aspergillus* and *Penicillium* genera. Density of *Aspergillus* species was 2-3 times higher compared to plant biomass yielded from that cultivated on clean water. Strains with high cellulose degrading activity were identified as *Aspergillus niger*, *A. terreus*, *A. flavus*, *Penicicillium griseo-roseum*. Maximum cellulase activity was observed at *A. terreus* strain. The stable increase of endoglucanase activity was observed at cultivation of micromycetes on media with HWP biomass. It was proposed that application of indigenous microorganisms on HWP biomass may serve as a ground for development of plant biomass conversion technology.

Key words: bioconversion, cleansing facilities, micromycetes, plant biomass