

## Surface cultivation of fungi of the genus *Fusarium* and *Trichoderma* with continuous supply of nutrition components

© Anton A. Shagaev,<sup>+</sup> Natalia A. Zelenova, Evgenia N. Dmitrieva,  
Alexey A. Belov,<sup>\*</sup> and Nikolay S. Markvichev

Mendeleev University of Chemical Technology of Russia. Department of Biotechnologies. Heroev Panfilovcev St, 20. Moscow, 125480. Russia. Phone: +7 (499) 978-95-15. E-mail: shagaev.anton.94@mail.ru

<sup>\*</sup>Supervising author; <sup>+</sup>Corresponding author

**Keywords:** metabolism, root exudates of plants, continuous cultivation, phytopathogenic microorganisms.

### Abstract

One of the important stages in the development of biological preparations of plant protection agents is the screening of strains of microorganisms, which influence the pathogenic microflora. The basis of the screening on the interaction of microorganisms with their growth on aggressive environments. The results of the interaction of microorganisms with such methods quite difficult to interpret, since in this way the cultivation the results are influenced by several factors; microorganisms develop on the nutrient media, does not correspond to neither the composition nor the concentrations in those environments, which are formed in the rhizosphere of plants due to the allocation of root exudates. The growth of microorganisms when cultivated on Petri dishes describes the periodic laws of growth, while exudation of plants is a continuous process. In addition, in the rhizosphere of the plant root system itself is at some stage the substrate, which is metabolized by phytopathogenic microorganism. All this often does not accurately predict the behavior of the biological agent in the real world, and as a result the effectiveness of the drug based on it is not always high. In the current study there were developed methods of cultivation of microscopic fungi, one of the "standard" of phytopathogenic fungi *Fusarium oxysporum* and antagonist fungus *Trichoderma viride* on the surface section of phases with simultaneous supply of substrate to the surface of the cultivation was also investigated the growth of fungi when cultured in this system and studied their interaction. These results proved that the developed system is suitable for surface cultivation of fungi of the genus *Trichoderma* and *Fusarium*. The results of the cultivation of microorganisms on the surface of the ceramic reactor in the attached state with a constant supply of power components allows a new approach to the study of interaction of microorganisms and to consider this model as a model of the interaction of microorganisms on the surface of the root system in the metabolism of exudates.

### References

- [1] A.M. Sharicov. The study of antibiotic activity of metabolites of fungi of the genus *Trichoderma* against bacteria of the genus *Vibrio*. *Actual Problems of Humanitarian and Natural Sciences*. **2010**. Vol.10. P.27-29. (russian)
- [2] N.V. Pen'kov. The kinetics of the processes of growth, reproduction and death of microorganisms. *Successes of Modern Science*. **2011**. No.1. (russian)
- [3] The Fundamental Phytopathology. Under the editorial Yu.T. Dyakov. *Moscow: Krasand*. **2012**. 512p. (russian)
- [4] L.V. Kravchenko, etc. specific features of the composition of root excretions of plants and changes in the rhizosphere under the influence of the soil microflora. *Agricultural Biology*. **2011**. No.3. P.71-75. (russian)
- [5] Patent PД 52.24.421-2007 Chemical oxygen demand in waters. Methodology of measurement by titrimetric method. (russian)
- [6] A.A. Belov. Textile fabrics containing immobilized hydrolases for medical and cosmetic purposes. Getting. Properties. *Application. LAP LAMBERT Acad. Pub., GmbH &Co. KG, Germany*. **2012**. 242p.

- Full Paper** \_\_\_\_\_ A.A. Shagaev, N.A. Zelenova, E.N. Dmitrieva, A.A. Belov, and N.S. Markvichev
- [7] A.A. Belov. Development of industrial technologies for obtaining of new medical materials based on modified fibre-forming polymers containing biologically active protein substances. *PhD thesis of the Tech. Sciences. Moscow: MUCTR. 2009.* P.385. (russian)
- [8] T.K. Ghose. Measurement of cellulase activities. *Pure and Applied Chemistry. 1987.* Vol.59. No.2. P.257-268. (russian)
- [9] A.A. Shagaev et al. study of the growth of *Trichoderma viride* and *Fusarium oxysporum* on solid microbiological media containing exudates of cucumber plants. *Advances in Chemistry and Chemical Technology. 2016.* Vol. 30. No.9. P.39-41. (russian)
- [10] M.N. Manakov etc. Membrane bioreactors in biotechnology. *Biotechnology. 1988.* Vol.4. P.22-29. (russian)
- [11] M.N. Manakov etc. Research of influence of conditions of cultivation of bacteria *L. Acidophilus* in *Membrane Bioreactor on Energy Costs. 1990.* P.59-63. (russian)