# MATHEMATICAL SIMULATION OF ADAPTIVE PROCESSES IN THE BACTERIAL POPULATIONS INVOKED BY BOUNDEDNESS OF NUTRIENT RESOURCES IN SOIL NICHES

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Researches of soil dynamic processes include a learning of a systematic component of microbiologic wavering in soil. Difficulties of these researches concerned with the fact that in the experiments only the sum of the random and determined processes is controlled. Therefore for selection of a required systematic component it is necessary to use the indirect methods, which are based on mathematical modeling. In offered mathematical model specifics of a surviving of bacteria in the conditions of deficiency of a feed were considered. In these conditions of a bacteria are forced to use the most economic and complex strategy of a surviving characterized by following four functional states. The first group of cells in the active state uptakes of substrate nutrition in the size necessary for their division. The second group of cells in the passive state uptake substrate nutrition in size, sufficient only for maintenance of the vital functions. The third group of cells is in the autolysis state. Fragments of last cells supplement a pool of a nutrient substrate in a soil niche. The fourth group of cells is in the state of deep anabiosis which is characterized by freezing of all endocellular processes. It is supposed, that between active, passive and autolysis processes the routed circulation of cells to change of the common predominant state of bacterial population. For exposition of these processes the system from 5 ordinary nonlinear differential equations has been created. This system presents processes of interacting of two bacterial populations in an environmental niche with limited nutrient resource. For model verification the experimental data submitted by Department of Microbiology of the Moscow State University have been used. These data contained two-month dynamics of quantity of bacteria in soil samples. Quantity of cells was defined with help two methods: a direct microscopic method and sowing on a nutrient medium. Parametric and functional identification of model has been spent. With help of mathematical model have been carried out analysis of a stability of biosystem and character of singular point of system (nonresistant locus) is defined. This work was done at a support of the grant of the Russian Federal Property Fund-09-04-00907-a.