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Humidity influence on growth and development of soil streptomyces

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Organisms living in soils of arid zones, have different protection mechanisms against soil drought. Energy state of soil moisture, which is an important factor of the growth and development of microorganisms, characterized by the pressure of soil moisture and its activity is equal to the relative humidity of air in a state of thermodynamic equilibrium with soil moisture. Previously, there was a view that procaryotes are more demanding to the pressure of moisture than eucaryotes, and most of them can develop only at a pressure of moisture more than -4 megapascals (MPa) (at a_w > 0.95), while some fungi are able to develop even at P = -70 MPa (a_w = 0.60). However, by improving the method of investigation of moisture pressure influence on the development of actinomycetes, it was shown that spores of some arid mycelial bacteria can grow even at more low-level moisture and pressure (P = -96.4 MPa; a_w = 0.50) .

The aim of this work is the determination of patterns of spore germination, mycelium growth and passing of the various development stages of actinomycetes at low level of pressure on the thin layer (0.6 mm) of agar medium in equilibrium with water vapour.

At extremely low pressure of water (-96.4 MPa; a_w = 0.50) in a thin layer of agar nutrient medium arid spores of Streptomyces (*Streptomyces odorifer* and *S. rubiginosohelvolus*) germinate, seedlings growing in length, and after 5 days lateral branching of mycelium can be observed. At -22.6 MPa (a_w = 0.86) mycelium branch out within 2 days. At -2.8 MPa (a_w = 0.98) full-cycle of the spores development occurs within 5 days. Using the method of mathematical modeling the behavior of Streptomyces spores in a thin layer of agar medium under low humidity conditions was explored. The dynamics of spores germination obeys an exponential law, which allows to calculate the average spores life before germination and the time required for germination of 50% of viable spores.