Method of Bacterial Cellulose Production from Plant Waste Substrates

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The problem of polyethylene pollution provides a solid basis for the creation of the new eco-friendly materials, such as bacterial cellulose. Objective of this project is to increase the efficiency of bacterial cellulose production via new strain inoculation and optimization of culture medium. The morphology of producer, Medusomyces gisevii, with the addition of cellulose-producing bacteria strains, namely Gluconobacter oxydans and Gluconacetobacter hansenii, was examined by light microscopy. As the next step I developed 5 types of culture medium made of organic waste. Using spectrophotometry I determined sucrose concentration in each substrate sample – 56-57 g/l. All the substrates with the inoculated cultures of producer were placed in thermostat for 72 hours, then cellulose films were removed and weighted. Considering the weighing results, the most productive culture mediums were identified: 1) organic waste with acetic acid; 2) molasses. There is on average 36-38 g/l of cellulose synthesized on these substrates in 72 hours (the obtained data is analyzed using the Student's t-test). Using obtained biofilms I determined period and optimal conditions of bacterial cellulose degradation – 2,5 month in moist soil at a temperature of 15-25°C. The cost of the raw material – 1 UAH for 1 ton, therefore the cost of a ton of bacterial cellulose does not exceed 30 USD. Thus, with this project the productivity of bacterial cellulose synthesis notably increased compared to previous researches (38 g/l vs 22 g/l). Versatility and eco-friendliness of the obtained material were experimentally proved.

Awards Won:
Fourth Award of $500