

Urbanisation and development of technological support for human life in the Arctic; Development of low temperature algal bioprospection

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Under present climatic changes, the Arctic brings new opportunities for industrial developments (oil and gas resources, fish and fisheries management, shipping in the Arctic Ocean, etc.). Urbanisation and development of all technological support for human life is one of the most globally urgent tasks for future. Development of low temperature biotechnology is the challenge for Czech Science. Development of novel technologies for low-temperature environments is crucial for minimalization of impacts of human activities and settlements on the pristine Arctic environment. Algal biotechnology based on local algal and/or cyanobacterial strains is one of the tools for the long-term sustainable development of the Polar Regions. A novel type of the photobioreactor for the polar environments with sun-tracking cuvette rotation was developed to receive as much solar energy as possible. After successful operation and performance tests in winter and spring conditions in the Czech Republic, the photobioreactor was transported to the Czech Arctic Research Station in Longyearbyen, Svalbard. During the cultivation, the environmental parameters (air and suspension temperatures, photosynthetically active radiation and pH) were recorded automatically in 10 min intervals as well as the absorbance at 720 (A720) and 680 (A680) nm as biomass proxies and the effective quantum yield (Φ_{PSII}) as proxy of photosynthetic activity. In addition, once a day, the A720 and A680 were measured manually together with the maximum quantum yield (FV/FM) and the OJIP transient. Once a week, a bulk sample of volume of 3 L was taken for biochemical analyses.