The project comprises analyses of metabolic strategies adopted by unicellular algal cells, which are dependent on the availability of light and carbon with nitrogen forms in the environment. The choice of the strategy, i.e. a particular type of nutrition causes changes the growth kinetics and modifications of the course of metabolic processes of cells. Therefore, the major objective of the planned research will be to design molasses-based metabolic strategies and to determine the impact of molasses as a source of carbon and biostimulators in the culture medium on the kinetics of population growth and the course of metabolic pathways of *Chlorella saccharophila, Chlorella sorokiniana* oraz *Scenedesmus obliquus* species. As part of the research planned in the project, we will carry out a pre-culture of the selected green algal species and a proper culture conducted in BIOSTAT PBR 2S Sartorius Stedim Biotech photobioreactors on control and experimental media. To evaluate the effect of molasses supplementation on the kinetics of population growth, growth curves will be drawn taking into account growth phases and basic growth parameters. In turn, changes in the biochemical composition of algal cells will be assessed with the following analytical methods: spectrophotometric determination of simple sugars with the anthrone method will determine the content of carbohydrates; extraction-weighing determination of crude fat content will be used to determine the lipid content; and proteins in the cell biomass will be determined with the Kjeldahl method. The fatty acid profile, with special emphasis on C16-C18 acids, will be identified by chromatographic determination of higher fatty acids as methyl esters with the GC method, and the cell protein profile will be determined qualitatively and quantitatively with 2D - DIGE electrophoresis and MALDI/TOF mass spectrometry. In order to determine the energy potential of microalgae cells, parameters of assessment of energy raw material will be established. Additionally, cell elemental analysis will be determined. The research will complement the knowledge of the application of microalgal biomass and algal extracts characterised by richness of metabolites and renewable bioactive compounds, which is one of the leading trends in modern biotechnology. Cellular microalgal biomass is applied in food, chemical, cosmetic, and pharmaceutical industries as well as medicine and organic agriculture. Additionally, due to the current demand for energy and transport fuels and the reduction of crude oil extraction and climate change induced by CO2 emission, microalgal biomass is also used as an alternative source of energy. The research will be important for the production of microalgal biomass in both the laboratory and industrial scale, when selection of the culture medium is one of the key steps. An additional advantage of the research will be related to the assessment of the inexpensive and readily available carbon source, which may lower the cost of cell biomass cultivation and make it more environmentally friendly.