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CULTIVATION OF EUGLENA GRACILIS ON RESIDUES FROM A FOOD INDUSTRY

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Abstract – *Euglena gracilis* is a photosynthetic flagellate able to grow in mixotrophic conditions. Its biomass can accumulate high-value molecules. Relevant concentrations of twenty amino acids, nine types of minerals, fourteen varieties of vitamins, fatty acids and chlorophyll can be found in *Euglena* biomass. Still, maybe the most important stored compound is paramylon, a linear β -glucan acting as immune support and cholesterol reducing agent, exclusive to *Euglena* species. In 2017, paramylon was approved as a novel food ingredient by the US Food and Drug Administration and the market value for β -glucans is estimated over 0.5 million USD per ton. The cost for *Euglena* production is very high, and is especially related to the cost of the required carbon source. The present research is being carried out to optimize at lab-scale (4 L photobioreactors, 1.5 L working volume) the cultivation of *Euglena* using as substrates industrial residues from a firm processing food commodities. Considering the needs of *Euglena*, the liquid fraction of the anaerobic digestion of residues was used and mixed, at different ratios, with a sugar-rich vinasse. Different working pH were tested. As the aim of *Euglena* production is to use its biomass in pet feed formulations, it was also important to check contamination, especially by eumycetes, which find favorable growth conditions in the presence of nutrients and sugars and at low pH. As the accumulation of paramylon reaches its maximum in a short time (24–72 hours), different cultivation times were also tested in batch (up to 216 hours) and compared with semicontinuous cultivation process (Hydraulic Retention Time = 10 days). All the results were compared with those from blank tests, carried out in the same conditions but using Cramer Myers synthetic growth medium. The best results were obtained in batch, at pH 5, using the liquid fraction of anaerobic digestate enriched with 2.5 % of vinasse: at 48 h the TSS growth rate was 160 mg/L/day (higher than in the blank test), the removal of total N and PO₄-P were 48 % and 31 %, respectively, the algal count was 2.12*10⁵/mL and TSS and VSS concentrations 0.81 and 0.71 g/L, respectively. Paramylon concentration in the biomass was 35 % and no contamination occurred. The experimentation is going on testing and comparing HCl and CO₂ to control pH and performing analyses on pigments and fatty acids in the biomass. Based on the obtained results, the production rate of paramylon would be 56 mg/L/d, and this is promising for the use of *Euglena* biomass for pet food production. Further, the possibility of growing *Euglena* exclusively on the effluent from anaerobic digestion and on the vinasse from the factory is being confirmed, and this is very interesting from the economic point of view, involving a consistent saving on cultivation costs. In the end, the relevant uptake of nutrients is also important, as in case of disposal the effluent should be treated to meet the required quality for discharge. This kind of cultivation should thus be considered as an important element of circular economy.

Keywords – *Algal biomass; food commodities; lab-scale testing; paramylon.*

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