Nano-filtered acid casein whey as a potential medium for the cultivation of freshwater microalgae Tetradesmus obloquus and Chlorella vulgaris

HOSSEIN K. (1), KARA F. (1), AZIMI YOUSHANLOUEI Y. (2), LI Y. (1), HALIM R. (1)
1 University College Dublin, Dublin, Ireland
2 University of Tehran, Tehran, Iran

During the production of acid casein followed by diafiltration, a large volume of clean and clear whey permeate is generated which is rich in minerals. Due to high mineral and salt content along with low carbon content, it is difficult to utilize or treat this by-product while it still cannot be discarded untreated to the environment. Microalgae can grow without the need of carbon source while they capture atmospheric CO2 and convert it to a high value biomass, normally rich in omega-3 oil and protein. In this study, autotropic microalgae growth of freshwater microalgae Tetradesmus obliquus (TO) and Chlorella vulgaris (CV), on whey permeate was investigated. The effect of cultivation on the protein, nitrate, ammonium, and phosphate concentration of the medium was studied. Changes in cell growth pattern were also investigated by light microscopy and flowcytometry. The results showed that CV can uptake nitrate sharply while TO utilizes phosphate with higher rates. At the initial stages, all the cultivation biomass production was mainly due to cell division while at the final stages, the cells tend to grow in their size. Both flowcytometry and microscopic analysis confirmed that the largest population number was observed for CV followed by TO. Since microalgae could utilize the atmospheric CO2 as their carbon source, the wastewater streams used in this study favored the growth of microalgae. Therefore, it can be concluded the application of microalgae cells for nitrate and phosphate recovery from acid casein by-products is a promising method for wastewater treatment. The obtained biomass can be further separated for other applications such as feed or high value food to address a circular bioeconomy approach and sustainable biomass production.