Proceedings of the LXIV SIGA Annual Congress
Online, 14/16 September, 2021
ISBN: **978-88-944843-2-8**

Poster Communication Abstract – 6.08

IDENTIFICATION OF GREEN MICROALGAE (CHLOROPHYCEAE) FOR BIOREMEDIATION OF DAIRY COW MANURE

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diary cow manure, nitrogen recovery, phycoremediation, agricultural waste management

Environmental pollution is one of the major concerns of modern society and in this context the rapid global growth of the livestock industry results in the release into the environment of large quantities of manure or slurry. The environmental impact of livestock manure is mainly due to their high content in organic matter, antibiotics, heavy metals, and mineral nutrient mainly nitrogen compounds that may leach in the water bodies causing seriously eutrophication and human health issue. The presence of large nitrogen amounts in livestock waste released directly and indirectly into the environment led to the updating of the European "Nitrates" directive which stated that the amount of slurry spread on the ground must not exceed 170 kg of N per hectare per year in nitrate vulnerable zones.

Several approaches have been applied to remove and recover nutrients from this waste including microorganisms based biological treatments. Microalgae have been proposed as a valid alternative to remove and recovery nutrients from several agricultural and industrial wastewater. However, the use of these photosynthetic microorganisms for the cow manure nutrient recovery has been only recently applied.

The goal of this study was to identify microalgae species able to grow in the cow manure and reduce the nitrogen content. Different experimental strategies have been adopted for the selection and identification of microalgal accessions capable of growing in cow livestock slurry at different concentrations. Four microalgae accessions have been identified to tolerate manure up to 40 %(v/v) belonging to Botryococcus, Chlorella, and Scenedesmus genera. In order to obtain microalgae adapted to grow in this agricultural waste, these 4 microalgae accessions grew in cow manure at 10% (v/v) by weekly inoculation for six months. The content of photosynthetic pigments, carotenoids, polyphenolic compounds, and the nitrogen concentration were evaluated. The results have shown that the microalgae growth was related to manure dilution. They are able to reduce the content of nitrogen by 30-60% when cultured either in vivo or in vitro condition. The Botryococcus strain is the best candidate to phycoremediate the manure waste and might be successfully integrated in a circular economy process.