Effect of salinity on the production of biogas from the macroalgae *Caulerpa prolifera*

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INTRODUCTION

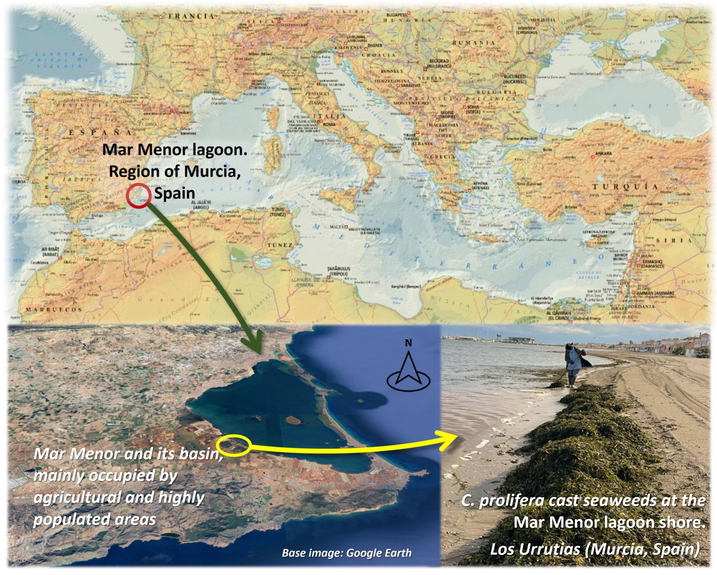
The Mar Menor lagoon

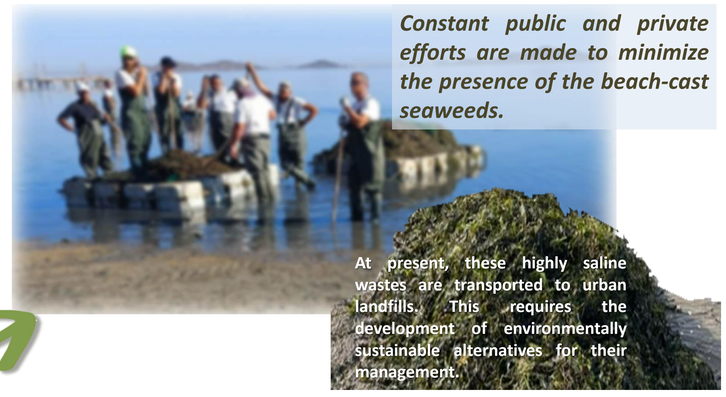
Located on the Mediterranean coast of SE Spain, it is an extensive hypersaline lagoon (170 km^2 with 73 km coastline) with shallow depth (3.6 m average and 7 m maximum), artificially connected with the Mediterranean Sea at several points (IEO, 2020)

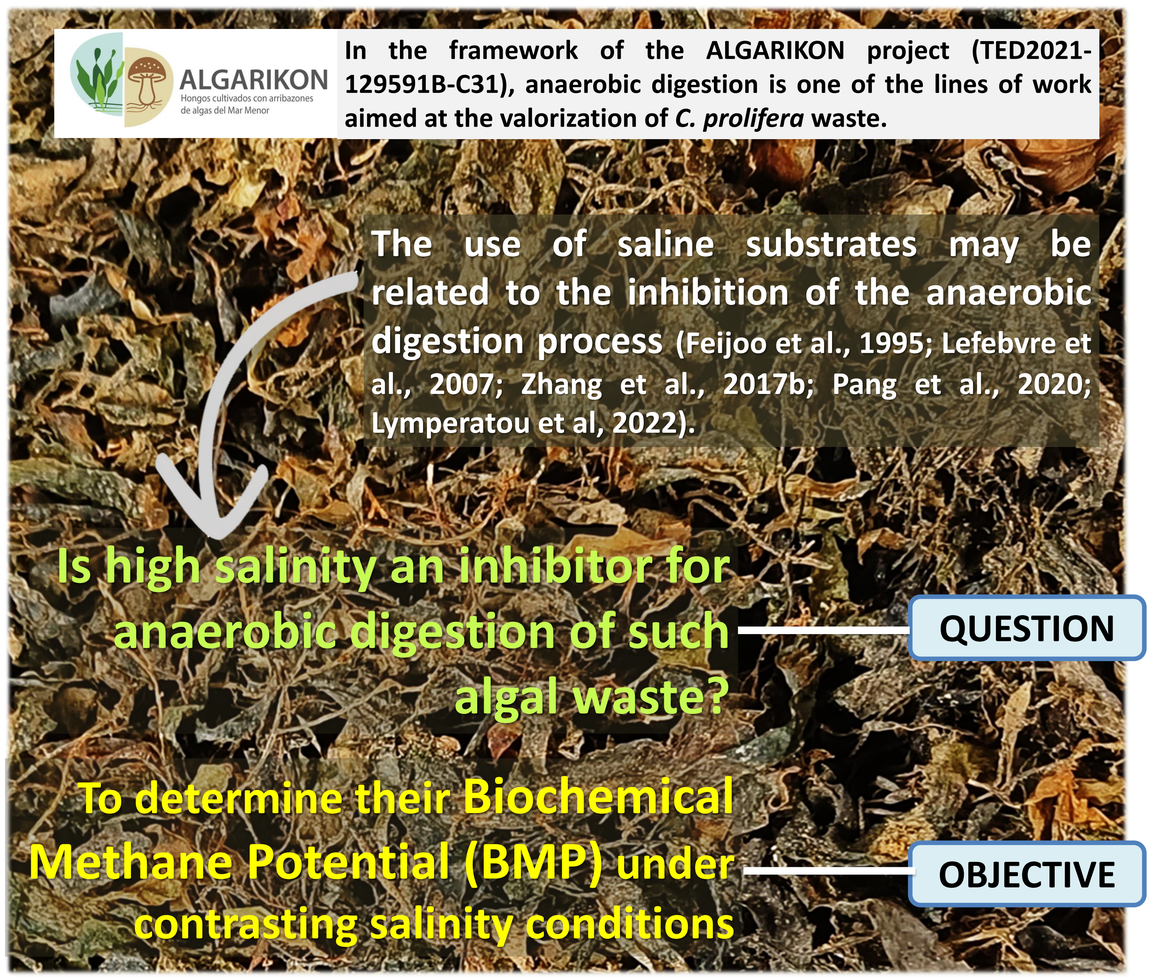
Environmental issue

Since the 1980s, the Mar Menor has received large polluting flows, particularly from intensive agriculture (IEO, 2020).

The eutrophication and mixing with the less saline waters of the Mediterranean Sea, favors an overpopulation of micro and macroalgae. Among them, the high biomass of green macroalgae ***Caulerpa prolifera*** stands out.







MATERIALS AND METHODS

C. prolifera waste sampling

BMP test implementation

HIGH

MEDIUM

LOW

LOW	MEDIUM	HIGH
suspension with deionized water until EC=100 µS cm^{-1}. 4 mm sieving	suspension with tap water until EC=1000 µS cm^{-1} and 4 mm sieving	No treatment other than 4 mm sieving. EC=25000 µS cm^{-1}

AMPTS II® equipment included in the Soil Conservation and Remediation Unit Laboratory (CIEMAT)

500 ml digesters.
3 per treatment, and inoculum

The widely used AMPTS II® device based on a batch-type anaerobic digestion system, was applied for this purpose, allowing test standardization of biochemical methane potential (BMP) .

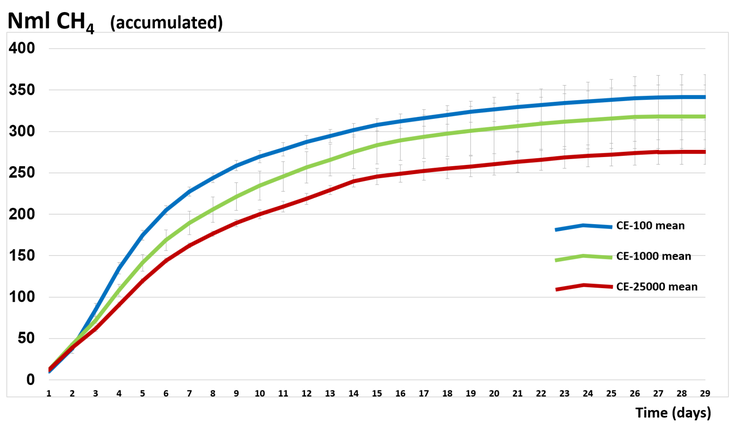
The VDI 4630 standard was used as a reference.

The BMP tests were carried out at 37ºC (mesophilic). The inoculum used in the tests came from the wastewater treatment plant of *Arroyo Culebro Cuenca-Sur* (SE Madrid).

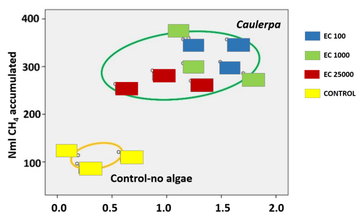
RESULTS

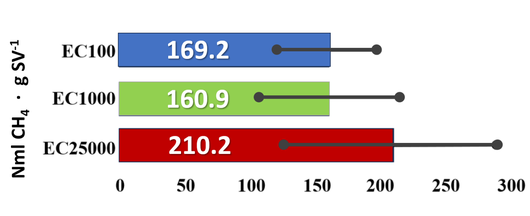
According to accumulated biogas production during BMP test, EC100 produced the highest average (341.4 Nml CH_4), followed by EC1000 (317.8 Nml CH_4), and EC25000 (275.2 Nml CH_4).

BMP tests were developed until <1% of the cumulative total biogas is released each day.



Specific methane production (relative to the SV consumed), shows the absence, from this preliminary test, of significant differences between treatments. A higher yield per volatile solids (%SV) was unexpectedly associated with the sample lacking any washing treatment. The high variability in intra-treatment production must be also highlighted.





CH_4 (Nml; accumulated) | **CH_4 production vs. SV consumption** | **Specific CH_4 production (Nml per g SV)**

CONCLUSIONS

The first results of this research suggest that *C. prolifera* wastes are a suitable substrate for biogas production through anaerobic digestion, even when not washed to remove salts and mud residues. This can lead to significant savings of valuable freshwater resources, particularly in the dry and semi-arid climates of the circum-Mediterranean regions.
The use of these biomasses to produce renewable energy can be integrated into the global solution to the serious problem of eutrophication of the Mar Menor and other similar scenarios.

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