# BIOSTIMULANT PROPERTIES OF *EUGLENA GRACILIS* BIOMASS GROWN ON PRE-TREATED EXHAUSTED DAIRY BYPRODUCTS

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## Introduction

Some by-products of the dairy industry, such as the exhausted whey from Bovine Ricotta cheese production ("scotta"), do not have real ways of valorisation like the bovine whole whey but, being still rich in nutrients, require adequate disposal not to impact on the environment. Current conventional treatment technologies are of hard management and feature high costs. Among the possible and more sustainable solutions, microalgae-based bioprocesses could be a valid alternative (Gramegna et al., 2020). *Euglena gracilis* is a microalga able to grow under heterotrophic and mixotrophic conditions, accumulating higher amounts of paramylon than under photoautotrophic conditions (Lewis et al., 2020). Paramylon can be used in many fields of commercial interest. Some studies also indicated biostimulant properties of this polysaccharide (Barsanti et al., 2019).

## AIM

**Assessing the ability of *E. gracilis* of growing on pre-treated dairy whey in order to obtain biomass which, for its biochemical properties, can be valorizable in agriculture as biostimulant agent**

## Materials and methods

### WHEY PRETREATMENT

**Recover of a sample of ricotta whey (COD of 55 g $L^{-1}$) from a dairy**

**Thermocalcic precipitation (according to Bosco e al., 2018)**

**Obtainment of a clarified phase (COD of 35 g $L^{-1}$)**

### ALGAL CULTIVATION

***E. gracilis* grown in 100-liter bubble column PBRs in batch mode for each assay**

**Harvesting and freeze-drying of the biomass**

**Biochemical analysis and phytotoxicity tests (according to Ronga et al., 2019) on *Lepidium sativum* L.**

Three different assays were performed each with a different growth substrate for growing *E. gracilis*:

i) Standard Cramer-Myers medium (SM, Cramer & Myers, 1952) with glucose, used as control (**SMG**);
ii) Clarified whey, diluted 1:3 with water (**TCW1**);
iii) Clarified whey, diluted 1:3 with water and previously subjected to microfiltration (0.2 µm) (**TCW2**).

All tests were conducted in duplicate, at 20-25 °C and with an irradiance of 80 µmol photons $m^{-2}$ $s^{-1}$, with a dark/light cycle of 12/12 hours.

## Results

### *E. Gracilis* growth

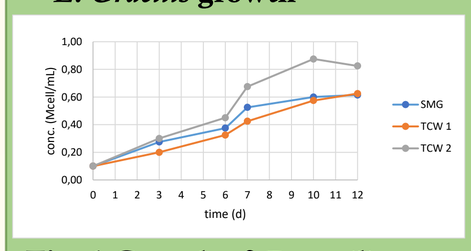


**Fig. 1** Growth of *E. gracilis*.
The highest concentration values were reached with euglena grown on clarified microfiltered whey (TWC2) 0.88 Mcell $mL^{-1}$ .

### COD load removal

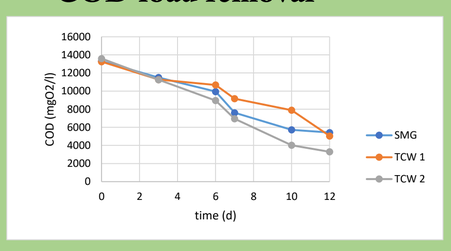


**Fig. 2** Curve of COD load removal.
On clarified microfiltered whey (TWC2) the reduction was about 75% after 12 days.

| | Protein % | Paramylon % | G.I % |
|---|---|---|---|
| ***E.gracilis* on control medium (SMG)** | 25.4 | 21.9 | 108.9 |
| ***E.gracilis* on clarified whey (TCW1)** | 49.8 | 9.7 | 96.8 |
| ***E.gracilis* on clarified microfiltered whey (TCW2)** | 49.5 | 12.0 | 150.9 |

**Tab. 1** Biochemical analysis and phytotoxicity test.
The culture tests of *E.gracilis* on exhausted whey showed a content of proteins almost 2-fold higher than the control.
On the contrary, the content of paramylon was 2-time higher in the control compared with the tests.
The results of phytotoxicity test revealed an interesting biostimulant effect on cress seeds of the TCW2 extract, with an average germination index of 150.9.

## Conclusions

- *E. gracilis* showed to be able to grow on a pre-treated and water-diluted exhausted whey without additional nutrient supplementation.
- The biochemical composition of the *E. gracilis* biomass grown on the dairy byproduct was found to be significantly different from the one grown on synthetic broth. In particular, the microalgal biomass grown on dairy byproduct, thus with lactose as source of carbohydrate and whey proteins and peptides as additional organic and nitrogen sources, showed a higher protein content, at the expense of paramylon and lipids.
- On the contrary, the *E. gracilis* biomass grown on synthetic medium, thus with glucose as the only organic source, showed a low content of protein and higher content in lipids and paramylon.
- The only biomass showing a biostimulant effects was that grown on TCW2.

## References


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