PhD School on Agriculture, Environment and Bioenergy

(http://sites.unimi.it/dottorato_aab/)

(XXXIV cycle, 2018-20)

Project draft

1. Field of interest

Agricultural Chemistry (AGR13), Biology, Ecology

2. Project title

Integrated Algae bio refinery: nutrient and carbon recycling from waste

3.Tutor (membro del Collegio dei Docenti): Fabrizio Adani

- Eventually:

4. Relevance of the topic and state of the art:

Microalgae production involves huge consumption of water and fertilizers representing more than the 20%of the total production costs. In recent years, the price of nitrogen and phosphorus fertilizers have consider-ably increased, translating into higher costs of algal biomass yield:for economic feasibility, the production costs should be reduced by 20–25 fold. As a consequence of that, the reuse of wastewaters and other liquid streams rich in nutri-ents could represent good substrates to support algal biomass production. Large amounts of wastewaters from industries processing agricultural raw materials, livestock and wastewa-ters from domestic treatment plants are annually discharged to aquatic ecosystems worldwide. Uncontrolled discharging of such liquid sewage into the environment often causes water pollution, damaging the ecosystems and causing severe environmental problems such as eutrophication. Some authors have already shown the high efficiency of algae in removing nutrients from anaerobic digestate, so algae can be proposed as an appropriate system for nutrient removal and recovery.

5. Layout of the project (draft)

Project aims at developing microalgae-based biorefinery for the production of biostimulants, biopesticides and feed additives using water and nutrients from wastewaters (sewage, centrate and pig manure).

5.1. Materials & Methods: da mezza pagina ad una pagina massimo

The objective of this project is to characterize the most promising strains to be used in large scale-production according to its capacity to produce biostimulants or biopesticides, and tolerance to be produced under outdoor conditions using marine water and wastewaters (sewage, centrate, manure). Microalgae strains belonging to Chlorella and Scenedesmus genera will be involved in the characterization of the best biostimulating strains. In the case of cyanobacteria group, similarly, strains such as Oscillatoria, Chlorogloea, Arthronema, Calothrix, Nostoc, Anabaena or Tolypothrix genera will be characterized for the selection of most active against plant fungal and bacterial diseases. Bioactivity will be evaluated as concerns the production of substances involved in biological control processes.

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5.2. Schedule and major steps (3 years): mezza pagina max

- Algae growth on different substrate: pig slurry, digestate, wastewater (1 y).
- Characterize the most promising strains to be used in large scale-production according to its capacity to produce biostimulants or biopesticides (1 y);
- Set up of idoneus biostimulant test (2 y)
- Testing biostimulant and other properties (2 y)
- In search for biostimulant activities (3 y)

6. Available funds (source and amount)

SABANA- H2020-BG-2016-1- Sustainable Algae Biorefinery for Agriculture and Aquaculture. ID 727874

6. Literature: max 10 citazioni

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