



CarboRock applied research plan presentation:





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Medium:

The first objectif is the production and quality control of medium made of industrial wastes and other sources.

This includes different tasks: identifications of available source, their prices and CO2 balance analysis.

The different source composition will have to be completely analysed. The different source must then be conditioned to mix a recomposed standard medium.

Determination of the toxic threshold of each different contaminants will have to take place and purification devices tested whereas necessary.



The second objective is to test the recycling of used medium containing cells and cell fragments, carbonates particles and dissolved secondary metabolite using industrial system for water recycling.

Expected results

These experiments should allow determining the cost of production, transportation and the CO₂ balance for an industrial medium up to the final PBR site.

Strains characterization with standard laboratory PBR:

Basic experiments

Ordering of the different strain available from different sources world wide.

The long-term storage and routine liquid culture of the different strain will have to be arranged.

The maintenance for each strain in exponential growth phase will have to be done with standard medium under standard recommended condition.

The photon consumption, the CO₂ consumption, the mineral consumption, water consumption, the carbonate production, the oxygen production, the biomass production (including the total lipid content, total protein content and carbonic anhydrase concentration and a few crucial enzymes) should be continuously analyzed for each strain during exponential phase to compared with theoretical model and improve predictions.

Medium testing

The maintenance for each strain in exponential growth phase will have to be tested with the medium made of industrial waste under standard recommended condition.

The bioaccumulation analysis of different contaminants should then take place.

The analysis of the concentration of different contaminant in each purification fraction could be performed.

The nutritional quality of the protein and lipid fraction should be analyzed and its contamination level compared with organic food standards.

Biological quality control

The presence of other living organism in the culture will have to be analyzed and to guarantee comparable conditions for the experiments.

Set up of a standard protocol for viral monitoring and control are also necessary to guarantee comparable results.



Expected results

Upon this screening the best strain could be obtained and the specific laboratory data obtained could be used in an economical modeling of the project for theoretical financial projection.

PBR:

Experimental smallscale pilot plan

The objective is to set up a small-scale experimental PBR using fixed culture, light transmitting items, and solar ray concentrator. This experimental PBR should have the same measurements capacity as the regular laboratory PBR used for previous experiments. It should be placed outside for in field data acquisition.

This experiment includes also to set up of a small scale simple standard liquid culture system with the same measuring capacity placed under the same conditions outside for in field data acquisition and comparison with experimental fixed culture PBR model.

These experiments will be made using the industrial medium tested and the most promising strain from previous screening.

Expected results

This comparison should allow determining if for small-scale system, the increased cost of fixed culture, light transmitting item and solar collector is compensated by the increased productivity.

It should allow to compare economic, energetic and space use advantage of each system.

Industrial pilot plan

3D physical modeling based on biological, chemical and physical experimental data obtained from the in field experimental PBR should be created.

Expected results

This model should allow underlining scaling up limits for each system and generate solid financial prediction of the productivity, cost of construction, maintenance and recycling of each PBR system.

The CO₂ footprint analysis of the life cycle of each PBR system could then be complemented with a global virtual overview on site.



Biomass and carbonate treatments:

The first objective is to test biomass and carbonate collection in each system without the use of centrifugation system.

The separation protocol for the separation of biomass and carbonate should be tested.

The energetical cost of carbonate drying and conditioning should be analysed.

Protocole for industrial protein and lipid extraction should be tested and the cost of these separations evaluated. The energetical cost of total biomass extration drying and conditioning should be analysed.

Expected results

Samples of each different product with their complete characteristic should be available for commercial prospecting.