AQUACULTURE OF MICROALGAE IN NEW-CALEDONIA

AMICAL

N. COULOMBIER [a], L. CHIM [b], L. LE DEAN [c], N. MOREZZI [a], P. BRUN [b], F. MALO [b], K. NAKAGAWA [a], M. DUCROCQ [a], A. RIVATON [a], F. COLIN [d]

[a]ADECAL TECHNOPOLE 1 Bis rue Berthelot – Doniambo / B.P.2384, 98 846 Nouméa cedex – New Caledonia

[b]IFREMER, Unité de recherche Lagons, Ecosystèmes et Aquaculture Durable en Nouvelle Calédonie B.P. 2059, 98846 Nouméa, New Caledonia.

[c]IFREMER, Laboratoire de Physiologie et de Biotechnologie des Algues. Rue de l'Ile d'Yeu BP 21105, 44311 NANTES cedex 03

[d]IRD CEREGE-Nouméa 98848 Cedex

AMICAL is a partnership program of research and innovation between ADECAL TECHNOPOLE (New Caledonia innovation and technology park) and IFREMER with the objective to initiate the development of a microalgae industry in New Caledonia, based exclusively on selected local strains.

AMICAL *relies on two laboratories owned and managed by ADECAL TECHNOPOLE with the scientific support of IFREMER:*

- The Laboratory for MicroAlgae study (LEMA), whose scientific management is provided by the laboratory of Physiology and Biotechnology of Algae (PBA, IFREMER, Nantes), dedicated to microalgae applied studies at laboratory scale. The LEMA is set up in Nouméa and has been in operation since May 2013.
- The Laboratory for MicroAlgae Technology (LTMA) with pilot scale production facilities. The LTMA, located in Koné, started indoor culture in 2015 and outdoor large culture in 2016.

New-Caledonia is a special collectivity of France located in the southwest Pacific Ocean, 1,210 km (750 mi) east of Australia and 16,136 km (10,026 mi) east of Metropolitan France. The territory features many competitive advantages for the development of a blue economy industry and especially for microalgae culture :

- tropical climate with good solar resource;
- biodiversity hotspot;
- well developped aquaculture sector;
- strong research and development capacity (University, IFREMER, IRD, ADECAL Technopole...)

AMICAL *program and results:*

WP 1 - Bioprospection and selection of caledonian microalgae for their production at commmercial scale. Since 2013, the program has collected around 200 seawater samples from fifty sites along the coast of New Caledonia. From these samples, to date, 30 species of microalgae have been isolated and selected for their growth rate by the original method of «exclusion competition» developed by Ifremer. The AMICAL «strain banks» of these microalgae species are kept in both laboratories LEMA and LTMA. The selected species are mostly either not listed in genomic library or adapted to specific environmental conditions of New Caledonia. Therefore the «strain bank» represents a considerable product innovation potential.

As part of this WP, collaboration is established with the IRD (Institut de Recherche pour le Développement) that conducts research on cyanobacteria collected in the south Pacific ocean.

WP 2 - Health and Nutrition of aquatic animals. In this framework, a research project is planned, with studies in nutrition and health of shrimp and fishes cultured in New-Caledonia. Research will focus, in particular, to microalgae as a source of lipids and essential fatty acids for breeding, larval rearing and grow-out in pond or cages of these target species. This research will be conducted in collaboration with laboratories specialized in nutrition and lipids.

WP 3 – Research of bioactive metabolites: the aim of this WP is to find original molecules from AMICAL microalgae collection. A doctoral thesis funded by ADECAL began in 2016, is carried out in collaboration with the laboratory of physiology and biotechnology of algae (IFREMER, Nantes), the laboratory of natural substances of the University of New Caledonia (UNC) and the laboratory AMES of LIENSs, a join research unit under the CNRS and La Rochelle University authorities. This thesis has two main objectives, (i) the purification and description of new antioxidant molecules from microalgae of AMICAL «strain bank» and (ii) identify the optimal conditions of culture of selected microalgae for synthesis of antioxidant molecules. The WP3 includes work on other bioactive properties of microalgae especially against UV, anti-inflammatory, antibacterial, etc. Collaborations are under discussion with public and private laboratories to carry out this priority research project of AMICAL.

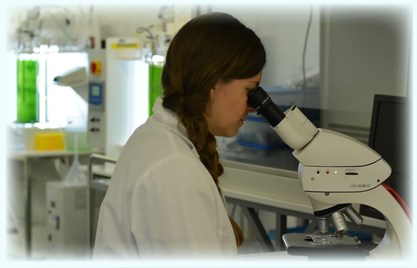
WP 4 – Carbon nutrition and lipid metabolism. This WP has 2 objectives: first to optimize the use of CO_2 and secondly, to study the possibility of using industrial CO_2 from mining industry in microalgae intensive culture. This work is done in collaboration with Glencore, one of the world's leading companies in nickel industry.

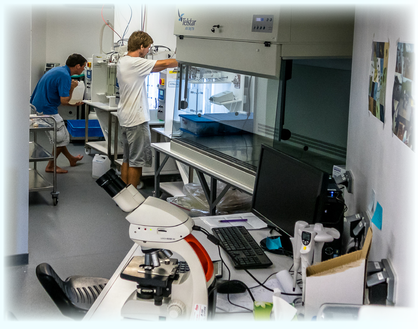
WP 5 - Technical and economic studies at pilot scale. this WP will be carried by the LTMA laboratory, which has indore culture bags (300 liters) and outdoor raceway tanks (6 m^3); LTMA started full operations in 2016.

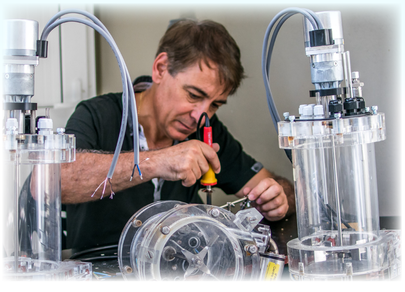
WP 6 - Technological development for research and production. In this context, a CO_2 distribution system was developed (Nakagawa et al., 2016; poster number 503)

LTMA

LEMA







ADECAL TECHNOPOLE NOUVELLE-CALÉDONIE

Ifremer

Contacts

ADECAL : noemie.coulombier@adecal.nc
nicola.morezzi@adecal.nc

IFREMER : lietchim@ifremer.fr
loic.le.dean@ifremer.fr

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