Algal Biotechnology

Background

It has been known that Spirulina has significantly potential as sources of protein and high-value chemicals such as essential fatty acids, e.g. linoleic acid and g-linolenic acid (GLA), including the photosynthetic pigments e.g. chlorophyll a and phycocyanin. Currently, Spirulina has more widely markets for health food, animal food, cosmetics and pharmaceutical product.

The Algal Biotechnology research group at KMUTT has started an interest in Spirulina around 1987 since the discovery of Spirulina growing profusely in a stabilization pond of tapioca starch wastewater and Thailand climate is suited in large scale for Spirulina cultivation. With financial support from the National Center for Genetic Engineering and Biotechnology (BIOTEC), the research begun from the use of tapioca starch wastewater as (a) substrate for cultivation in order to reduce production costs. Since then the research group has focused on developments of mass cultivation techniques to obtain high productivity, extraction processes of lipid/phycocyanin in pilot scale, and also understanding the physiological factors influenced biomass and high value chemicals, and molecular biology.

Spirulina consortium was set up in 2002 by BIOTEC, Nation Science and Technology Development Agency (NSTDA) and Algal Biotechnology Laboratory, King Mongkut’s University of Technology Thonburi. The purpose of Spirulina consortium is to bring together the private sectors who involve in cultivation, trading and the research in order to help strengthen the private sectors.

Goals and Objectives

- To develop technologies needed for microalgal cultivation and also develop suitable strains for commercial purpose.
- To understand the biosynthesis of high value chemicals from Spirulina.
- To use Spirulina as a plant model for the study of stress response, photosynthesis and respiration.
- To promote university-industry linkage in algal biotechnology.

Current R&D

1. Mass cultivation of Spirulina and microalgae

- Obtain the maximum benefit from the product by manipulation of culture conditions

- Study the physiological factors stimulating biomass and high value chemical production and develop the mathematic model to predict the interest products.

- Obtain the suitable strains for outdoor cultivation according to the photosynthetic characteristics

- Develop the mathematic model to predict biomass

2. High value chemicals

- Study on stress response

- Extraction of lipid and phycocyanin in pilot scale techniques

3. Molecular biology

- Mechanism of the desaturase enzyme and phycocyanin

- Proteomic

- Genomic

- Transformation

Technology Transfer

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Outdoor mass cultivation of Spirulina at commercial scale

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High value chemical production/extraction from Spirulina

Products and Services

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Consulting

With a strong background and research experience in algal technology, our group is in a unique position to offer consulting and knowledge transfer to private organizations. The scope of consulting ranges from mass cultivation techniques and lipid/phycocyanin extraction processes to the design of reactors.

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Training Courses

Training courses in the field of algal technology are regularly offered to both the academic and private sectors. Top researchers in the field from overseas are often invited as guest speakers in these courses. The topics most commonly covered are physiology and biotechnology especially for mass cultivation of microalgae and uses of Spirulina biomass and its high valued chemicals.

Publications

National Journal

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Prommeenate, P., Kurdrit, P. Sirijuntarut, M. and Hongsthong, A. 2007 “Expression of Fatty Acid Desaturase Enzymes from Cyanobacterium Spirulina platensis in Yeast Saccharomyces cerevisiae” Kasetsart J. (Nat. Sci.) 41 (1):130-135.

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Chirasuwan, N., Chaiklahan, R., Ruengjitchatchawalya, M., B. Bunnag and Tanticharoen, M. 2005 “Anti HSV-1 Activity of Spirulina platensis Polysaccharide” Kasetsart J. (Nat. Sci.) 41(2): 311-318.

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Ruengjitchatchawalya, M., Kovács, L., Mapaisansup, T., Sallai, A., Gombos, Z., Ponglikitmongkol, M. and Tanticharoen, M. 2005 “Higher plant-like fluorescence induction and thermoluminescence characteristics in cyanobacterium, Spirulina mutant defective in PQH2 oxidation by cytb6/f complex” Journal of Plant Physiology, 162: 1123-1132.

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