Science, Technology, Research and Innovation for Development (STRIDE)

Pilot Scale Production of *Halymenia durvillei Bory de Saint-Vincent*: Post-harvest Evaluation of Phycobiliproteins and Lambda-Like Carrageenan in *H. durvillei*

GRANTEE: University of the Philippines Diliman (UPD)

PRINCIPAL INVESTIGATOR: Dr. Marco Nemesio Montano

INDUSTRY PARTNER: Plentex Philippines, Inc.

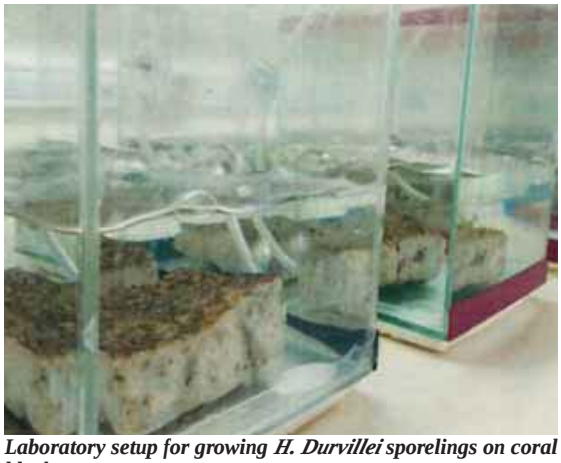
GRANT PERIOD: September 1, 2015 to November 15, 2016

GRANT AMOUNT: Php 4,150,844.64 (approximately USD88,316)

Red algae as source of bioactive agents

The Philippines is home to hundreds of seaweed species, making it one of the world's leading exporters. The abundance of seaweeds makes the country a potential source of high-value natural products, because seaweeds are used in the food, medicine, and cosmetics industries. The three kinds of seaweeds abundant in the Philippines are the reds, the greens, and the browns.

The research conducted by Marine Environment and Resources Foundation, Inc. (MERF), UPD in collaboration with Plentex Philippines, Inc., with support from USAID STRIDE, focused on the red seaweed, *Halymenia durvillei Bory de Saint-Vincent* (*H. durvillei*). Its red or violet-red color is due to the accessory pigment phycoerythrin, used as a natural coloring in cosmetics, pharmaceuticals and food. Red seaweeds have sulfated polysaccharides in their cell walls called carrageenan, used as natural gelling agents, thickeners, and stabilizers for products such as ice cream, milk, shampoo, lotions, etc.



Laboratory setup for growing H. Durvillei sporelings on coral blocks

The pilot-scale production of *H. durvillei* biomass and the processing/production of the natural products from the seaweed, lambda-like carrageenan and r-phycoerythrin, is aimed to help provide a new biomass source for phycobiliproteins from *H. durvillei*. Phycobiliproteins have a huge number of applications ranging from food, pharmaceuticals, cosmetics, diagnostic tools, to fluorescence-based therapeutic applications (Sekar and Chandramohan, 2008). In the Halymeniaceae family, these phycobiliproteins are extracted from *Halymenia floresii*.

However, no studies have been undertaken yet in the Philippines on *H. durvillei*. Thus, profiling the phycobiliprotein content found in *H. durvillei* through extraction and partial characterization aims to establish the source of lambda-like carrageenan and eventually determine a potential source of sulfated polysaccharide. The study aims to provide industries sufficient supply of lambda-like carrageenan to reduce importation and manufacturing costs. A sustainable and steady local source, in the long run, will likewise benefit seaweed farmers and their communities.

Milestones

The milestones of the project include the following:

- Monitoring and extraction of the phycobiliproteins and lambda-like carrageenan from the farmed *H. durvillei*;
- Partial characterization of the physicochemical properties of crude lambda-like carrageenan extracted from *H. durvillei* through viscometry, light scattering detection, infrared (IR) spectroscopy, mass spectrometry (MS), and nuclear magnetic resonance spectrometry (NMR); and
- Partial characterization of the crude phycobiliprotein content using IR spectroscopy, ultraviolet visible spectrophotometry, MS, and NMR.

Members of the project team weigh the seaweed as part of monitoring

Results obtained from the experiments are promising. It was established that single net treatments produced the highest yield of phycobiliproteins and fertile seaweeds produced the highest yield of lambda-like carrageenan. Knowledge of the physiochemical properties of both substances are relevant in finding suitable applications of phycobiliproteins that can be adapted by local manufacturers.

Moving forward

For future directions, the research team provided the significant recommendations: a) extensive and proximate analysis of the cultured *H. durvillei*; b) development of a method for the extraction of the lambda-like carrageenan and the pigments for biorefinery applications; and c) development of a method for the stabilization of pigments with the use of enzymes.