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AQUACULTURE

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Letter from the Director

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Aloha,

As we reflect on all that we are thankful for this year, I would like to express my sincere gratitude to the many stakeholders who continuously volunteer their time to help CTSA achieve our program goals. The dedicated members of our Industry Advisory Council, Technical Committee, and Board of Directors (BoD) work together to ensure that CTSA-supported projects produce meaningful impacts throughout our region and beyond. Last week, I met with the new CTAHR Dean & Director Dr. Nicholas Comerford, who will serve as the new Chair of the CTSA BoD. I look forward to working with him and the rest of the BoD to create meaningful impacts through our program.

I would also like to extend my appreciation to our PI's -- and their host institutions -- for their diligent work to improve regional aquaculture through research, demonstration, and outreach activities. We are in the midst of conducting our biannual project update conference calls with PI's and their industry liaisons. These conference calls allow us to monitor... **Read More**

CTSA Project Update: Using local agriculture by-products to produce fungal protein for aquatic feeds

Microbial proteins, such as fungal biomass produced on low-cost feedstock, have gained significant attention as feed ingredients due to cost effectiveness and long-term sustainability. Fungal process is a low-cost and simple process for animal feed production, as fungi are known to grow extensively on diverse organic feedstocks under optimal conditions. Hawaii produces a large quantity of fruit and food/agri by-products and waste products that may have the potential to be upgraded into protein enriched value-added products. The ongoing CTSA-funded project "Utilization of local agri-processing by-products to produce fungal protein for aquatic feed production" is investigating this potential in products including molasses, cassava, papaya waste, and microbrewery waste.

The Year 1 objectives of this project were to maximize the yield of edible fungus, *Rhizopus*

oligosporus, on molasses, damaged papaya and taro wastes, develop a cost effective fungal biomass production process, characterize the nutritional quality of fungal biomass, and formulate test diets with the fungal protein for tilapia or shrimp. Filamentous fungi *R. oligosporus* is an ideal organism for animal feed applications due to its edible nature.

The research team, led by Dr. Samir Khanal at the University of Hawaii at Manoa (UHM) and Dr. Zhi Yong Ju at the Oceanic Institute of Hawaii Pacific University (OI), initiated the two-year project in November 2016. The UH team first acquired and then characterized molasses from HC&S Maui, which contained total sugar of 49%. Upon a review of existing literature, it was determined that the molasses needed acid hydrolysis pretreatment prior to fungal fermentation. This involved a 20-fold crude molasses dilution and addition of 0.2% sulfuric acid with heat treatment of 121oC for 30 minutes. Utilizing these innovative methods, researchers achieved fungal growth with molasses media. In order to test out the viability of commercially available molasses, both small batch and bench-scale studies were conducted. Initial testing using a 2.5L bubble column bioreactor with a 3-day growth cycle resulted in 10.4g of dry biomass, and a 2-day growth cycle resulted in 10.2g of dry biomass, which showed no significant difference in biomass production. Subsequently, a 20L bioreactor was setup to scale up the process and results showed that a 3-day cycle has a higher yield when compared with a 2-day cycle in the 20L bioreactor (3 day: 48.25g dry weight, 2 day: 8.65g). A test sample (~5kg) of the freeze-dried biomass product was provided to OI for nutritional analysis and a feeding trial.

The OI team established a nutritional profile of *R. oligosporus* fungal biomass by determining the proximate contents and amino acid and fatty acid profiles of the sample provided by UH. The *R. oligosporus* sample was found to have around 42% crude protein, 6.4% crude lipid, and 15.3% ash. This indicated that the fungal sample had a high protein content after fungal fermentation. Further analysis found that the fungal biomass is rich in contents of essential amino acids, accounting for >50% of the total amino acids; in particular, the levels of lysine and methionine were high with 8.6% and 2.5% (dry wt.) of total amino acids respectively. These results suggest that *R. oligosporus* fungal biomass is a valuable protein feed ingredient for replacement of fishmeal in aquafeeds. OI is currently preparing a shrimp feeding trial using the biomass as an ingredient, and will run additional digestibility and feeding trials during Year 2.

In consideration of the large amount of papaya waste product available in Hawaii, the UH team also assessed the ability of *R. oligosporus* to utilize nutrients in damaged papaya... **Read More**

AquaClip: Indigo Seafood brings new aquaculture expert to Palau

When Jenn Fortier was in sixth grade, she read a book about a scientist named Eugenie Clark. Nicknamed "The Shark Lady," Clark was a giant in the field of shark study, and a pioneer in the use of SCUBA diving for research purposes. Fortier was hooked, and she immediately told her teacher about her new life goal. "I told Mrs. Anderson that I wanted to be an ichthyologist,

On Sunday, Fortier followed her dream a little farther - about 10,000 miles, to be exact. She is now on the tiny western Pacific island of Koror, the most populated of the hundreds of islands that make up the nation of Palau.

For the next three to six months, Fortier will work with a company called Indigo seafood. Throughout her career, Fortier has researched ways to make aquaculture cleaner and more efficient. Fortier's background made her a perfect candidate for Indigo Seafood, a company working to promote the use of aquaculture in Palau. The island nation heavily regulated its traditional fishing industry to protect its native species from overharvesting.

Founded by scientists who have worked in Palau since the 1970s, Indigo plans to build sustainable, on- and off-shore aquaculture facilities and train local students and fishermen to operate them.

The goal is to "fully develop the entire aquaculture industry in Palau," the Indigo website says. "We will grow only high-value fish and will export them to live seafood markets in Hong Kong, China and Tokyo."

In a chance encounter, Fortier's boyfriend's mother met one of the company's founders, who read Fortier's resume and invited her to the island.

Source: The Ellsworth American / **Read Article**

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The Center for Tropical and Subtropical Aquaculture (CTSA) is one of five regional aquaculture centers in the United States established and funded by the U.S. Department of Agriculture's National Institute of Food and Agriculture (NIFA) under grants 2012-38500-19566, 2014-38500-22241, and 2016-38500-25751. The regional aquaculture centers integrate individual and institutional expertise and resources in support of commercial aquaculture development. CTSA was established in 1986 and is jointly administered by the Oceanic Institute of Hawaii Pacific University and the University of Hawaii.