PrAEctiCe

Funded by the European Union

Maseno and Gothenburg Universities are conducting an experiment to biofortify Black Soldier Fly Larvae with DHA-rich marine zooplankton, transforming them into a super Aquafood

One of the less visible but highly significant issues in aquaculture is the nutritional quality of farmed fish, particularly with respect to essential fatty acids. While tilapia and catfish are good sources of protein, they are often deficient in long-chain omega-3 fatty acids, especially docosahexaenoic acid (DHA). DHA plays a critical role in brain development, cognitive function, cardiovascular health, and immune support in humans, and is particularly important for children and pregnant women. In fish, DHA is essential for proper growth, stress tolerance, reproduction, and overall health. In natural aquatic ecosystems, fish obtain DHA largely through the food web, beginning with marine or freshwater microalgae and zooplankton. However, in intensive aquaculture systems, this natural pathway is disrupted, and DHA levels in farmed fish depend heavily on feed composition.

Victor Lobanov and Jacob Ouya are conducting experiments on the culture of Aurantiochytrium mangrovei

Traditionally, fishmeal and fish oil have been the primary sources of DHA in aquafeeds. Yet these ingredients are expensive, increasingly scarce, and environmentally unsustainable due to overfishing and competition with

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other livestock sectors. As a result, many commercial feeds in Kenya contain little or no DHA, leading to nutritionally "diluted" fish products. Addressing this challenge requires innovative, locally adapted solutions that improve feed quality while reducing dependence on imported or environmentally damaging inputs.

As part of PRAEctiCe research activities in Living Lab 1, Maseno University and the University of Gothenburg jointly conducted a high-level investigation focused on enriching Black Soldier Fly Larvae (BSFL) through dietary supplementation with DHA-rich marine zooplankton, *Aurantiochytrium mangrovei*. This work seeks to bridge research with practical, community-oriented solutions for nutrition-sensitive aquaculture. The experiment involved culturing *Aurantiochytrium mangrovei* in bucket bioreactors, harvesting the biomass, and using it to enrich Black Soldier Fly larvae and *Artemia*. Growth was monitored through daily measurements, while enriched substrates were fed to larvae to assess DHA transfer and enrichment efficiency.

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Set up for the culture of Aurantiochytrium mangrovei in the lab at Maseno University.

Black Soldier Fly Larvae have already gained considerable attention in East Africa as a sustainable alternative protein source for animal and fish feeds. While BSFL are rich in protein and lipids, they naturally contain low levels of DHA. This research addresses this limitation by enriching BSFL through controlled feeding with *Aurantiochytrium mangrovei*, a marine microalga known for its exceptionally high DHA content. *Aurantiochytrium mangrovei* is one of the primary natural producers of DHA, serving as a foundational food source for marine zooplankton. By introducing this DHA-rich organism into BSFL diets, the research aims to

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“Biofortify” insect-based feeds, transferring essential omega-3 fatty acids up the food chain in a sustainable and locally manageable way.

Set up for the production of BSFL(a) and Enrichment of brewers' waste with A. mangrovei (b)

An important strength of this initiative is the potential for local adoption. Both BSFL and *Aurantiochytrium* can be cultured at small to medium scales, creating opportunities for farmers, youth groups, and women’s enterprises to engage in feed ingredient production. This decentralization of feed resources reduces costs, shortens supply chains, and keeps value within local economies. Moreover, the enrichment experiments under PRAEctiCe also include tests using *Artemia* (brine shrimp), a live feed widely used in hatcheries. This creates additional opportunities for coastal communities in Kenya, particularly those with access to salt ponds.

The implications of this work extend beyond aquaculture productivity. By improving the DHA content of farmed tilapia and catfish, the project directly contributes to better human nutrition. Fish enriched with omega-3 fatty acids can help address “hidden hunger” caused by micronutrient and essential fatty acid deficiencies, especially in low-income and fish-dependent communities. Improved fish quality also enhances market value, potentially increasing incomes for farmers and traders.

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Prof. Joyce Alysa (University of Gothenburg), Dr. Erick Ogello, and Jacob Ouya at the Maseno University laboratory

Enriched fresh BSF Larvae cultured for 11days using the marine zooplankton

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