## Role of Lipids and Essential Fatty Acids on the Commercial Fry Production of Nile Tilapia

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It is well-known fact that nutritional status affects maturation of broodfish and the development of gonads, and thereby production of viable sperms and ova, egg fertilization, hatching and the survival of larvae. These all are directly or indirectly associated with seed quality and seed output. As Nile tilapia females breed repeatedly or once a month, a regular and adequate supply of nutrients is required to make ready for the subsequent breeding. Otherwise, it immediately affects frequency of spawning, clutch size i.e. number of eggs per spawning and the quality of eggs/fry and consequently the total seed output.

Various attempts have been made to determine optimum dietary nutrient levels for broodstock. Specific commercial feeds for broodstock are not available in the market due either to the lack of specific information or the low volume of feed that could be sold. Usually a small number of broodfish is required in the case of other species but in tilapia a large number of broodstock are required. For example, 60,000 – 100,000 broodfish are needed to produce 5-10 million fry per month, requiring about 2-4 tonnes of feed per month for broodstock alone. This will increase as many hatcheries are emerging around the world due to rapidly growing tilapia culture in different systems ranging from freshwater to seawater, from rice-fields and ditches to highly intensive tanks and ponds. At the moment, most of the hatchery operators either prepare diets by themselves or use feeds prepared for nursing or fattening of the same species or other species depending upon the availability and their prices. Farm-made aquafeeds are usually sinking type because extruders are normally not affordable by the farmers. Feed monitoring is difficult with these feeds, therefore, uneaten feed creates problems in the culture systems. Use of floating feeds already available in the market is a better option. As these feeds are not formulated considering the specific requirements of broodfish, supplementation of various nutrients appears necessary. However, which nutrients or ingredients should be supplemented is not known.

**Fig. 1. Collection of seed from the mouths of tilapia broodfish bred in large nylon hapas installed in fertilized ponds of the commercial farm.**

Among the dietary nutrients, recently lipids and essential fatty acids (EFAs) have been receiving greater importance as significant amounts of lipids, especially highly unsaturated fatty acids (HUFAs), are mobilized during vitellogenesis and embryonic development. HUFAs are the main source of energy that is required for the rapid development of gonadal cells and embryos. Some other forms of lipids are also needed for formation of cell membranes. In freshwater fish ω–3 fatty acids are considered to be essential, however, there is controversy in case of tilapia which seems to be in need of ω-6. Various authors suggest that there are optimum ratios for these fatty acids (ω-3/ω-6) for each fish species depending upon the culture condition which are to be researched.

Various works have shown the importance of lipids, mostly in cold

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***Role Lipid...***

water fish such as salmonids, but apparently very few attempts have been made to study it in tropical fish such as tilapia making their roles still unclear. AARM launched a project in collaboration with the Institute of Aquaculture (IoA), University of Stirling, UK in 2001. This project evaluated the efficacy of supplementation of anchovy, tuna, linseed and soybean oils (6%) sprayed onto floating pellets, a locally available commercial diet prepared for catfish. The project was funded by Agribrands Inc. (USA), now a part of Cargill Inc., which produces livestock and fish feeds, and distributes worldwide.

Under the agreement of the project, a feeding trial was conducted on a commercial tilapia hatchery (Nam Sai Farm) located in Prachinburi Province, Thailand. A total of 36.5 million seed (eggs and yolk-sac fry) was produced during the trial period of five months using 14,400 broodfish (1:1 sex ratio) bred in 20 hapas installed in four ponds (Fig. 1). The total seed output, seed output per $m^2$ of hapa space, number of seed per female, per kg female, total clutches, no. of clutches per spawning, egg viability, hatching rate, survival during incubation and larval rearing were assessed for each oil treatment. Moreover, samples of ovary, muscles, eggs and fry were collected and preserved in chroroform: methanol (1:1) solution under freezing condition. They were sent to Stirling University and analyzed for total lipids, lipid classes and the essential fatty acids using standards methods.

**Fig. 2. Weighing of seed and trial for the incubation of eggs in locally made hatching jars with colored treatment code (Red or T for Tuna, White or C for Control, Orange or S for Soybean, Bule for A Anchovy, or L Green for Linseed).**

Interesting results have been obtained. Overall performance of anchovy (main source of EPA – 20:5,ω-3) and soybean (main source of 18:2, ω-6) oils was better than linseed oil (main source of 18:3, ω-3) indicating that tilapia broodfish cannot utilize or elongate low carbon fatty acids. More interestingly, high seed output was obtained from the experimental ponds compared to the other ponds in the farm that were stocked with the same source of broodfish using the similar techniques during the same period. It is hypothesized that the oil supplement was spread over the surface of water which was up-taken by algae (enriched plankton) and the algae was consumed by the broodstock of all the hapas , including those of the control hapas. As an impact of the trial, the commercial hatchery has decided to use oil (mainly anchovy) as a means to boost egg production. However, further research in separate ponds or tanks is necessary to prove this. If it is true then there is a need to determine the optimum level of oil supplementation for maximum seed production.