



Adisseo: Nutritional Crisis Management - Making Aquafeeds Perform With Less Fat & Energy

The past two years of the pandemic have disrupted the social and economic lives in most countries and changed the conduct of business.

The most worrisome disturbance for the feed industry has been a sharp increase in commodity prices that continue to rise in the wake of the recent Ukraine-Russia war.

Among some of the most affected could be vegetable oils and lecithin prices. Crude palm oil and soybean oil prices have about doubled in these last two years, and Brazil soy lecithin rose from US\$400/MT in March 2020 to above US\$1,000/MT in December 2021 (i.e., by more than 2.5-fold, while soybean meal increased by about 50%). These trends hurt aquafeed producers who rely heavily on lecithin in shrimp feed and vegetable plant

oils like palm oil to relieve cost pressure from high fish oil prices in all types of aquafeeds.

Needless to say, such drastic price increases are very difficult to overcome. Hence, aquafeed nutritionists are searching for strategies to reduce formulation costs without affecting performance.

AQUALYSO®, a lysophospholipid-based (LPL) digestibility enhancer developed for application in fish and shrimp, is proposed as a solution to relieve cost pressure from oil and lecithin prices.

LPLs have long been recognised for their excellent emulsifying properties, which are due to their mixed lipophilic and hydrophilic characteristics that allow them to interact closely with both water molecules and lipidic molecules.

LPLs are derived from phospholipids, the essential component of cell lipidic membranes, which are good emulsifiers of water-in-oil conditions but poor emulsifiers of oil-in-water conditions (the condition found in the gut of fish and shrimp).

LPLs are produced by the controlled hydrolysis of phospholipids. A phospholipase removes one fatty acid, making the molecule more hydrophilic and a superior emulsifier of lipids in the aqueous environment of the shrimp and fish gut (Figure 1).

The superior emulsifying properties of LPLs boost the digestion and absorption process of lipids as sources of energy (tri-, di- and mono-glycerides), as well as essential lipidic molecules like poly-unsaturated fatty acids, cholesterol and fat-soluble vitamins A,



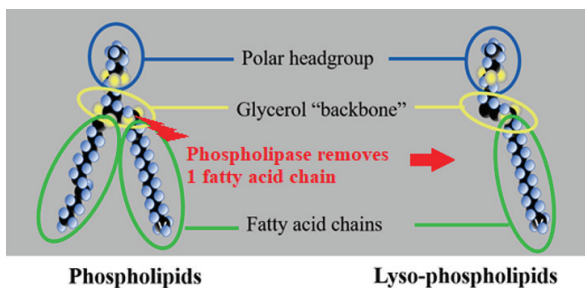


Figure 1. Structure of phospholipids and lysophospholipids (LPLs). LPLs are obtained by enzymatic hydrolysis of phospholipids. The removal of one fatty acid increases the hydrophilicity and therefore, LPLs serve as better oil-in-water emulsifiers than phospholipids

D and E.

Additionally, LPLs improve the transport and processing of lipidic nutrients in the intestine and liver. Such metabolic optimisation is also key in supporting the replacement of oil and lecithin inclusion in aquafeeds.

As an industrial LPL producer, Adisseo developed an LPL-based additive with a profile and specification that are highly adapted to the needs of aquaculture species.

Adisseo is also a leader in LPL research

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with over 15 years of experience focusing on shrimp and fish and addressing specific challenges and application strategies, particularly around the aim of lecithin and oil replacement.

In shrimp, AQUALYSO® can significantly reduce the requirements for soy lecithin while boosting feed performance (Figure 2A).

Strategies have also been developed to optimise formulation costs through the reduced inclusions of lecithin and fish oil combined (Figure 2B). Currently, these two application strategies will reduce the

formulation cost of shrimp feeds and ensure growth performance and feed efficiency at lower fat and energy levels.

In fish, AQUALYSO® also supports the formulation of reduced fat and

energy levels. A recent feed trial in pangasius fish demonstrated an effective replacement of fish oil and palm oil with AQUALYSO® (Figure 2C). From a formulation point of view, this means that the additive helps to reduce minimum oil inclusion constraints or cut down the equivalent in digestible energy without affecting performance.

The application of AQUALYSO® has been studied in other fish species including tilapia, salmon, trout, seabass and seabream. The outcomes of this research have been key to establishing the optimal inclusion dose and better understanding the formulative applications for every species.

In conclusion, within the current context of record lecithin and oil prices, aquafeed formulators can count on AQUALYSO® to make aquafeeds perform with less fat and energy levels and therefore achieve significant cost reductions.

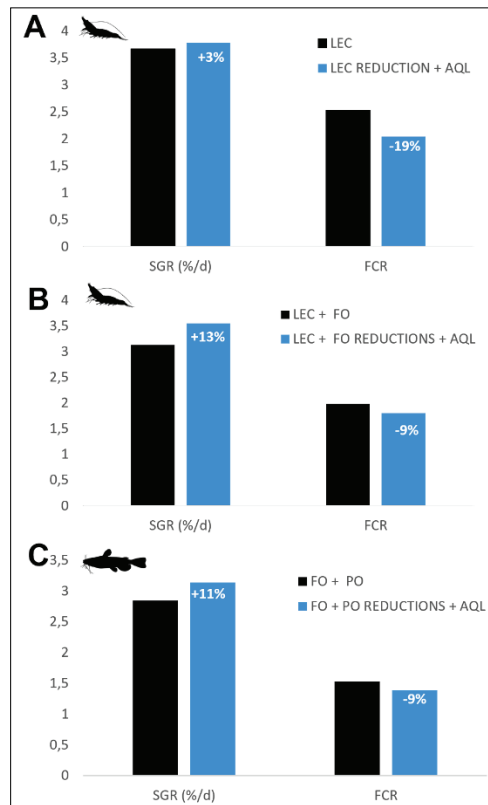


Figure 2. Specific growth rate (SGR) and feed conversion ratio (FCR) of shrimp (A and B) and pangasius fish (C) under oil and lecithin replacement strategies supported by lysophospholipid-based AQUALYSO®. LEC: soy lecithin; FO: fish oil; PO: palm oil; AQL: AQUALYSO®. The additive shows efficacy to support the performance of aquafeeds formulated with reduced levels of fat and energy.

In addition, Adisseo's Service Platform on Aqua Nutrition combines formulation experience and species-specific research on AQUALYSO® application strategies and provides advice and services related to aquafeed formulation and processing.

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