

# Editorial

The aquaculture industry has received a lot of bad press, often due to a lack of information or common misconceptions. One popular myth, for example, is that salmon is full of antibiotics. The facts, however, speak for themselves. A recent report by the Norwegian Veterinary Institute demonstrated that in Norway over the course of 2015, the domestic salmon industry used 273 kg of antibiotics, compared with 5850 kg for terrestrial livestock species. It should be noted that salmon production in Norway is four times higher than terrestrial animal production, which puts antibiotic use at 80 times lower in salmon culture. The Norwegian salmon industry has drastically reduced its antibiotic use over the years, largely through a combination of improved nutrition, rigorous biosecurity measures, stronger fry and the application of feed additives.

Feed (and water) additives have not only reduced the need for medicines; they have also enabled producers to improve pond management, feed efficiency and limit the negative effects of mycotoxins. In this issue of **Science & Solutions**, our first article focuses on the contribution of BIOMIN feed additives to a more sustainable aquaculture industry.

In order to maximize production, it is essential that our animals are given the best start in life. This is particularly true in aquatic species, where larvae are often under developed in terms of immunity. Our second article highlights how probiotics provide extra protection to shrimp during this critical period.

Happy reading!



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# Driving the Blue Revolution with Green Feed Additives

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Feed additives can help producers achieve better aquaculture practices that enhance growth, survival and feed conversion, increase tolerance to diseases and improve environmental conditions.

**W**ith an estimated two billion more mouths to feed by 2050, aquaculture will account for a greater share of a growing animal production industry: this is the blue revolution! Industry growth will not come without challenges: disease and environmental discharge are ever-present concerns. The increased price of key feed components has led to the adoption of alternative materials that can introduce contaminant and nutrition challenges. At the same time, consumers, retailers and regulators increasingly demand sustainable production practices, driving the growth of widely recognized certification schemes.

One thing can be guaranteed: sustainability will accompany the goal of long-term profitability in aquaculture. With an extensive portfolio of natural, or 'green', feed additives, BIOMIN is committed to driving sustainable aquaculture.

## Probiotics for improved pond management

Intensive farming produces large amounts of organic waste which accumulate in the pond environment. Oxidation of these organic waste compounds depletes the dissolved oxygen and leads to the formation of toxic metabolites. Considering the intimate relationship between aquatic animals and their environment, poor water quality is directly related to poor growth and poor health in fish and shrimp.

Probiotics are a useful, sustainable tool for managing

the pond environment. The BIOMIN AquaStar® line contains unique probiotic strains and enzymes which control pathogens, eliminate undesirable waste compounds and reduce pond sludge.

To support this, four earthen ponds in China were stocked with juvenile shrimp at a density of 50 shrimp/m<sup>2</sup>. Ponds were split into two treatments: control ponds with normal production operations and treatment ponds that received AquaStar® Pond and AquaStar® PondZyme. After 57 days the treatment pond soil was a yellow color which is regarded as the best bottom type, while control ponds exhibited dark grey and black soils—indicative of dead and decaying organic matter (*Figure 1*).

This is particularly dangerous in shrimp culture which, due to their biology, spend most of their time at the bottom of the pond. An improvement in pond sediments can manifest in improved shrimp growth. In the same trial, FCR was reduced by 9% and growth rate was increased by 36% in BIOMIN ponds.

## Phylogenics for improved feed efficiency

Given that feed generally constitutes over 70% of total production costs, many producers increasingly rely upon less costly protein sources and less nutrient dense diets. This typically entails greater use of raw materials with lower protein digestibility, higher amino acid imbalance, and higher carbohydrate and fiber content. These dietary changes can lead to inefficient use of nutrients in the feed, increased feed usage and a decline in animal performance.

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**Figure 1.** Pond sediments after 57 days of semi intensive shrimp culture with (a, b) and without (c,d) AquaStar® probiotics.

Photo: ideation90

## Scientifically-developed and field tested feed additives can be effective tools for feed aquaculture industry while meeting the demanding targets imposed by consumers and

**Table 1.** Growth performance parameters of juvenile *L. vannamei* after eight weeks of feeding experimental diets with and without Digestarom®.

Treatment	Fish meal (%)	Digestarom® P.E.P. MGE	Final Weight (g)	PER	Survival (%)	FCR	SGR (%/day)
FM25	25	0	15.36	2.52	98.66	1.02	6.78
FM22	22	22	12.31	2.04	98.67	1.26	6.37
FM22 + P.E.P.	22	200g/t	13.70	2.17	98.67	1.17	6.55
FM19	19	0	12.24	1.96	98.00	1.29	6.36
FM19 + P.E.P.	19	200g/t	13.45	2.10	96.67	1.17	6.54

Source: BIOMIN

**Table 2.** Growth performance and intestinal bacterial counts of pangasius after eight weeks of feeding control, Biotronic® or antibiotic diets.

	Control	Biotronic® (0.5g/kg)	Flavomycin (20mg/kg)
FCR	1.39	1.37	1.43
SGR	1.16	1.18	1.17
Total intestinal bacteria (CFU/g)	17 x 10 <sup>12</sup>	4 x 10 <sup>12</sup>	7 x 10 <sup>12</sup>

Source: BIOMIN

Phytogenics are known to stimulate digestive secretions and increase the abundance and length of mucosal folds. As a result, phytogenics can be used to improve feed digestibility and efficiency.

A recent trial in China demonstrated how to reduce fish meal levels in shrimp feeds without compromising growth performance or feed efficiency. Five diets containing varying levels of fishmeal were formulated and fed to Pacific white shrimp for eight weeks. Three levels of fish meal were used; 25% (FM25), 22% (FM22) and 19% (FM19).

Digestarom® P.E.P. MGE was supplemented to the reduced FM diets. The addition of Digestarom® P.E.P. MGE to shrimp diets improved growth performance even when fishmeal components were reduced, as seen by comparing FM19 + P.E.P. with FM22 (without P.E.P.): all performance parameters were improved (final weight = +8.5%; PER = +6%; FCR = -7%; SGR = +3%; Table 1).

### Acidifiers to reduce medicines

The use of antibiotic growth promoters (AGPs) is a major concern, as it allows bacteria to build transferable immune resistance, creating ‘superbugs’ that can endanger human health. Biotronic® Top3 is an enhanced acidifier combining three organic acids with phytochemical extracts which have quorum quenching properties. It also contains a unique permeabilizing complex which specifically targets Gram-negative pathogens, weakening the cell wall and enabling a greater bactericidal effect.

A trial was conducted in Thailand using pangasius, split into three treatments: control, flavomycin (20mg/kg) and Biotronic® PX Top3 (0.5g/kg). After eight weeks, growth performance and feed efficiency was slightly improved in the acidifier group. In addition, fish fed Biotronic® supplemented diets had a 76% reduction in total intestinal bacteria versus the control group and a 43% reduction versus the antibiotic group (Table 2).

millers, integrators and farmers to build a more sustainable certification organizations.

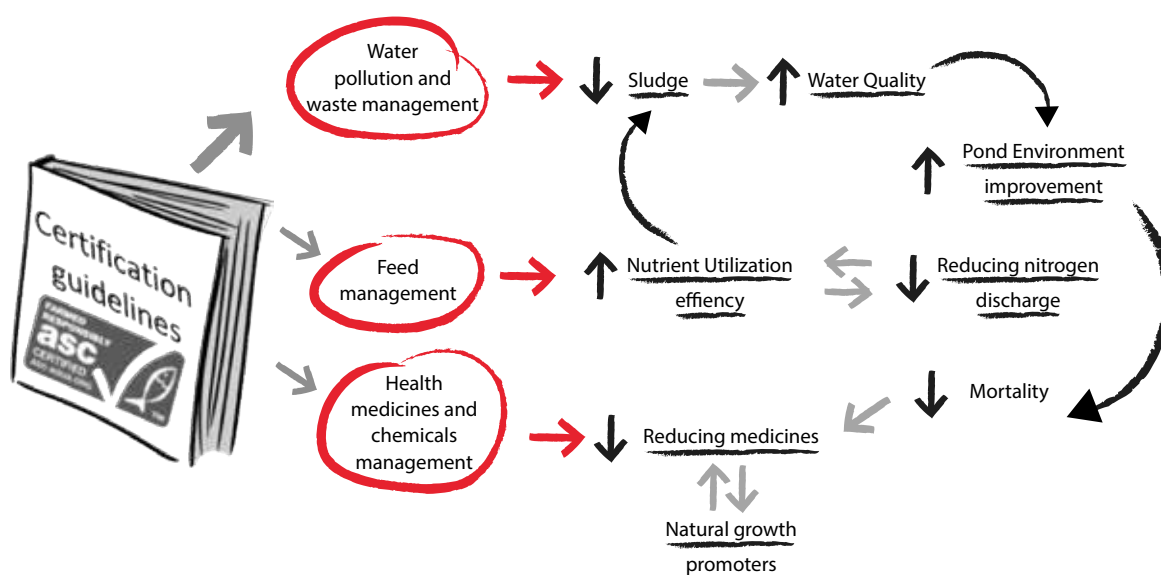


Figure 2. Simplified diagram demonstrating showing how sustainability issues are interlinked and the role feed additives have in improving fish and shrimp production.

### Mycotoxin risk management

With increasing levels of plant-derived materials in aquafeed formulations, the risk of animals' exposure to mycotoxins increases. It is difficult to directly observe the negative effects of mycotoxins in aquaculture species, as most of the symptoms are subclinical and hard to detect. Several studies have highlighted the negative effects of mycotoxin-contaminated feeds in aquaculture. These effects are varied and include reduced growth, increased production costs, poor feed conversion and immune suppression.

The incorporation of Mycofix® product line in aquafeeds can help mitigate the negative effects of mycotoxins that can lead to a poor growth performance and disease susceptibility.

Recently, Dr Xinxia and co-authors (2016) studied the sensitivity of yellow catfish to dietary AFB<sub>1</sub> contamination, and the efficiency of Mycofix® Secure in offsetting the negative effects of AFB<sub>1</sub>. The major impact

was observed in FCR, where the presence of AFB<sub>1</sub> in the diet at levels of 500 µg/kg or higher led to a significant increase in FCR. At maximum level of AFB<sub>1</sub> in diet (1000ppb), FCR increased 60% compared to control. When Mycofix® Secure was added to this diet, the FCR improved by 36%.

### BIOMIN and sustainable aquaculture

While specific additives bring their own individual benefits, many issues surrounding aquaculture sustainability are intertwined (Figure 2). For example, better nutrient digestibility leads to improved feed efficiency, lowers feed costs and reduces environmental discharges thus improving water quality. Scientifically-developed and field tested feed additives can be effective tools for feed millers, integrators and farmers to build a more sustainable aquaculture industry while meeting the demanding targets imposed by consumers and certification organizations.