Newsletter

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> EDITORIAL

The current situation of the world food supply calls for supreme efforts to ensure the increasing requirements of the growing world population for staple diets and high-quality food, as well as to bridge the widening gap in food demand and food supply especially in the developing world. Setbacks in any food production sector will place greater pressure on other sectors for supplying the increasing urban and rural populations, particularly in the less developed countries. Around one billion people are dependent on fish as their main protein resource, and their number is likely to increase further, since world population is increasing with an estimated annual population growth rate of 2.0%. Aquaculture now provides more than 22% of consumable aquatic products. Most of the aquaculture production occurs in developing countries, mainly in Asia. Between 1987 and 1996, aquaculture production of food fish increased by 148%, while livestock meat and fisheries have grown yearly only by 3% and 1.6% respectively. Aquaculture is at present the only growing sector within the fishing industry and is also reputed as the fastest growing food production sector in the world. Yearly growth rates of around 10% since the early 1980s were reported for the aquaculture sector, but it has increased much more rapidly in the developing world, due to the development in Asia, than in the developed countries. There is recently growing awareness of both consumers and producers for a responsible and sustainable aquaculture, also in the field of the much debated shrimp production in South East Asia (Feedinfo, 2005). Public opinion and regulation authorities in most of the export countries focusing now on the misuse of antibiotics in aquaculture and public attention have shifted towards production methods.

Convince yourself on the following pages with BIOMIN's solutions for modern aquaculture… the natural way!

Christian Lückstädt

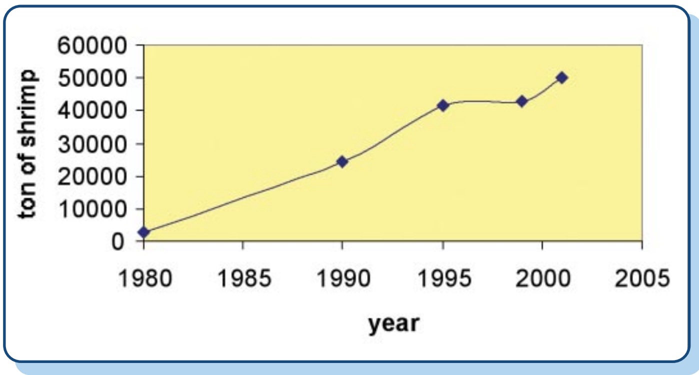
Biomin® Aqua Specials productline

Consumers all around the world ask for safe aquaculture products free of any harmful substances. The recent rejection of imported shrimp containing antibiotic residues in the EU sets an additional pressure on farmers. Therefore, the demand for solutions, which can offer farmers a safe and economical production of aquatic animals is rising.
To cope with the demand of both producers and consumers, BIOMIN has recently increased its product portfolio. A new range of aquaculture products, including premixes, nutraceuticals as well as probiotics for pond treatment, shrimp hatcheries and pond grow out is a sustainable solution for modern aquaculture.

Biomin® Aqua Specials – a new product range for sustainable aquaculture

Modern shrimp feed currently contain around 40%-50% crude protein. Essential amino acids for shrimps are arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, valine, threonine, and tryptophane.

The crude lipid content shall be between 10-12% for shrimp grow-out, best with high amounts of highly unsaturated fatty acids (HUFA) of n-3 series, while carbohydrates made up around 20% of the diet, mostly to satisfy energy requirements, but also used for feed binding. The energy content of such diets shall be at around 2850 – 3700 kcal / 1 kg of diet. However in order to withstand the high stocking densities in shrimp production (hatcheries and pond grow-out), and related stress situations (water parameters, e.g. low dissolved oxygen contents early in the morning) directly fed probiotics are a promising additive to stimulate shrimp growth and secure a low disease response.



Shrimp production in Vietnam, between 1980 and 2001

STARTgrow A Probiotic premix for **Shrimp hatcheries**

- Enhances survival of larvae
- Inhibits pathogenic bacteria (Aeromonas, Pseudomonas, Vibrio, Streptococcus, …)
- Enhances the immune system
- Cleans water
- Promotes resistance to diseases
- Ensures rapid growth of post larvae

GROWout A Probiotic premix for **Shrimp pond grow-out**

- Prevents and treats intestinal disease
- Inhibits pathogenic bacteria (Aeromonas, Pseudomonas, Vibrio, Streptococcus, …)
- Enhances the immune system
- Promotes resistance to diseases
- Ensures rapid growth

PONDlife A Probiotic premix for **Pond treatment in shrimp grow-out**

- Improves water quality
- Reduces organic waste
- Eliminates toxic substances and gases
- Reduces level of biological oxygen demand and chemical oxygen demand
- Increases dissolved oxygen

Biomin®, a global player in the international feed additive business, supporting the "natural way" for more than 20 years, has recently developed out of its own R&D facilities a new line of products for modern sustainable aquaculture - Biomin® Aqua Specials, including probiotics for shrimp hatcheries, pond grow out as well as pond water treatment. The products contain single-strain fermented bacteria strains and cell wall fragments for immune support and were field tested in South East Asia.

The concept of probiotics in aquaculture is outlined in the following:

Mode of action of probiotics in aquaculture

• Production of inhibitory compounds

Probiotics bacteria release chemicals which have a bactericidal or bacteriostatic effect. Some of these chemicals are: Bacteriosins, lysozyme, proteases, organic acid (pH-change) or diacetyl

• Competition for available energy (nutrients)

Competition for organic substrates (carbon and energy sources) in the intestinal tract of shrimp. By adding probiotic bacteria to the diet of shrimp these bacteria consume nutrients in the intestinal tract which would otherwise be available for the growth of pathogenic bacteria.

• Competition for adhesion sites

Bacteria compete for gut adhesion sites. Adhesion is a prerequisite to be able to colonize in the intestinal tract. By applying a high number (1012) of beneficial bacteria (probiotics) harmful bacteria (pathogens) are not able to adhere and thus cannot proliferate.

• Enhancement of immune response

There are many publications on immune stimulating substances available. Most of them derive from cell walls of various microorganisms, like ß-Glucans, Lipopolysaccharides (LPS) and Peptidoglucan (PG). These substances are the first thing that the shrimp’s immune system sees in response to invading microorganisms.

• Improvement of water quality

This is usually associated with Bacillus sp. In comparison to gram negative bacteria gram positive strains (e.g. Bacillus subtilis) are better converters of organic matter back to CO_2. Therefore there are less residues in the pond, so the BOD (Biological oxygen demand) and the COD (Chemical oxygen demand) is reduced.

• Enzymatic contribution of digestion

Certain bacterial species (Bacillus subtilis) are known to produce and release enzymes (e.g. amylase, protease) that are able to improve the digestive process in shrimp.

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Education: 1990 – 1996 M.Sc. Fisheries and Aquaculture, Humboldt-University Berlin Germany
1996 – 2003 PhD Animal Nutrition, University of Hohenheim, Germany;
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M.Sc. Thesis: Investigations about the shrimp and prawn fishery at the Western Baltic

PhD Thesis: Investigations into the feed intake and feed utilization of juvenile milkfish (Chanos chanos Forsskål) in commercially managed ponds in the Philippines

2000-2002: Research Assistant, University of Hohenheim, Department of Aquaculture Systems and Animal Nutrition: Development of verified stomach content models for the quantification of feed intake in fish

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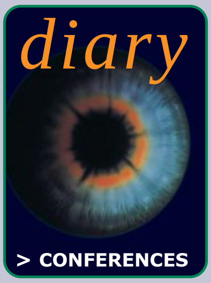

Aquaculture Europe	August 5th-9th, 2005, Trondheim, Norway
VIV Turkey	August 25th-27th, 2005, Istanbul, Turkey
Space 2005	September 13th-16th, 2005, Rennes, France
Aqua 2006	May 9th-13th, 2006. Florence, Italy

> LITERATURE

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… available on request

> IMPRESSUM

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