

THE GROWTH OF ORGANIC AQUACULTURE

Studies indicate that naturally sourced astaxanthin is a reliable source for feed manufacturers and fish producers to fulfill the pigmentation strategies of organic aquaculture markets around the world

By Dr. Stephen Hiu, Chief Technology Officer, Naturxan

Once found primarily at specialty retailers like Whole Foods Market, organic food has grown 5-20 percent each year over the last decade in the United States, Europe and Japan. Today, organic food is available at major retailers around the world, including Wal-Mart, Carrefour, Marks & Spencer, and Sainsbury's, with studies showing consumers are willing to pay a 20- to 100-percent premium for organic products that are environmentally friendly, contain natural ingredients and colors, and are made from renewable sources.

While organic certification for aquaculture has been in existence in Europe since the mid-'90s, when Naturland (Germany) and the Soil Association (U.K.) launched organic standards for farm-raised salmon and trout (FAO, 2002), the European Union recently consolidated these organic certification bodies and others under its own organic production logo (EU, March 2010) to simplify organic labeling efforts and address growing consumer demand for organic products.

With the rise of consumer interest in organic products and global demand for seafood exceeding supply, many fisheries, fish producers and feed manufacturers have begun adopting more sustainable practices, reducing overall fish meal content and purchasing naturally sourced feed ingredients instead of synthetic, non-renewable sources and have been able to command premium product prices in countries and markets where natural and organic standards exist.

THE ROLE OF ASTAXANTHIN IN AQUACULTURE

Salmon species represent the largest volume and contribute the most value to the global aquaculture industry, with flesh color and filet freshness the two most important consumer purchasing criteria (Sigurgisladdottir, et al 1997). Since salmon cannot synthesize the carotenoid astaxanthin, which is responsible for the red, orange and yellow hues in fish and crustaceans, it must be consumed as part of their diet from wild sources such as krill or as a supplemented feed ingredient (Bjerkeng, B. and Berge, G.M., 2000).

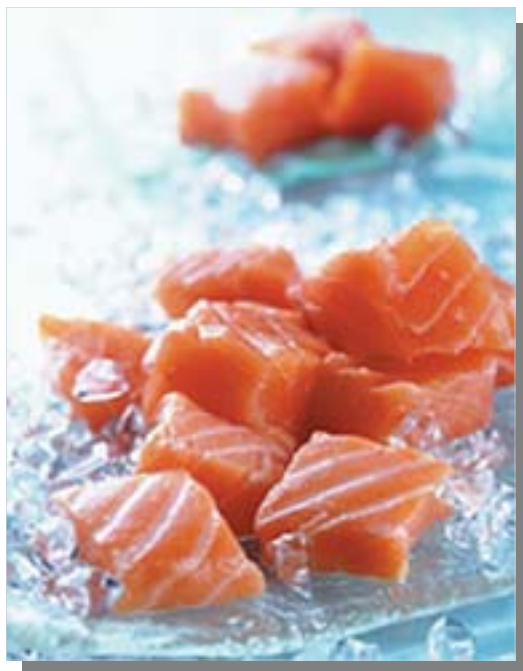


Photo: Scottish Salmon Producers' Organisation



As the leading provider of naturally sourced astaxanthin for the aquaculture industry for more than a decade, Naturxan works with feed manufacturers, animal nutrition specialists and salmon and trout farmers to help them achieve the signature pink color of wild salmon without the use of petrochemicals or recombinant DNA modification to the production organism.

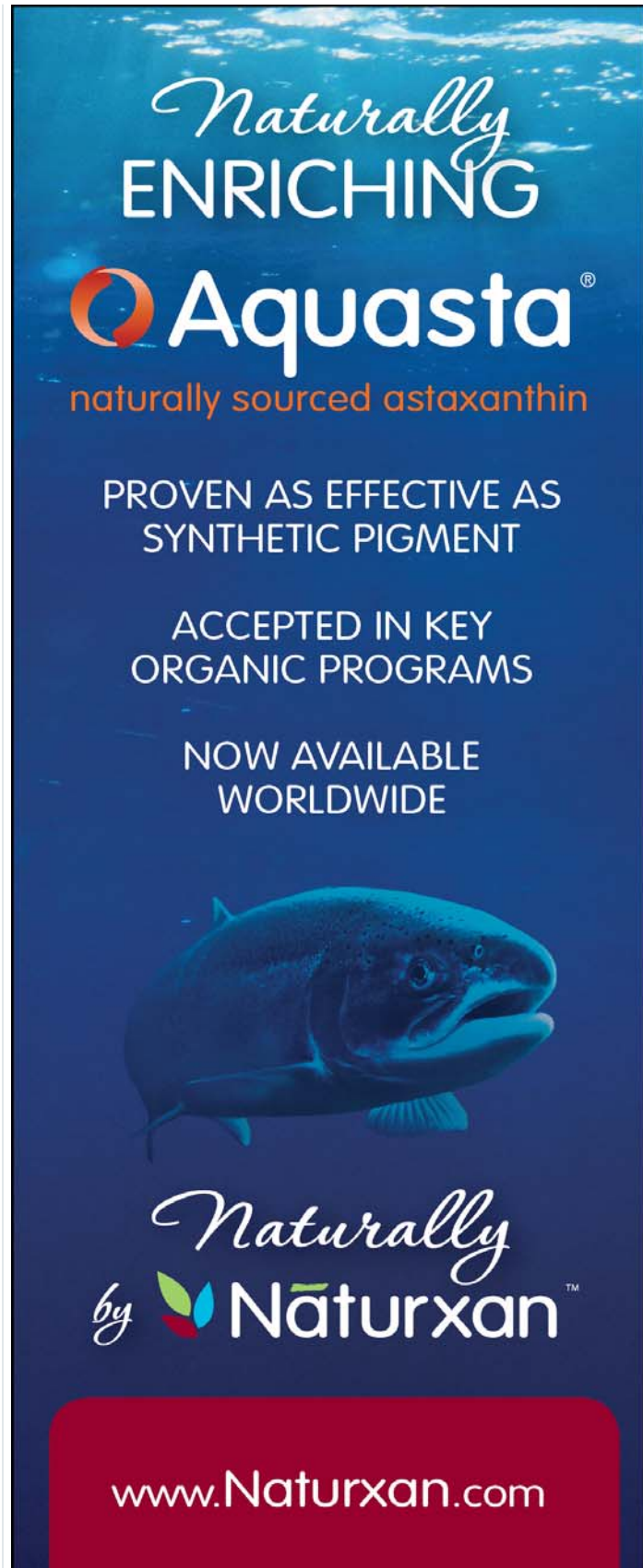
Aquasta by Naturxan is made from renewable ingredients, such as corn sugar, and satisfies the health and purchasing preferences of consumers and retailers that prefer naturally derived aquaculture products. Aquasta is accepted by key organic programs around the world, including Naturland, BioSuisse, DEBIO, KRAV, DEFRA, POSA, the Organic Food Federation, the Irish Organic Farmers and Growers Association and Agriculture Biologique among others.

AQUASTA IN THE FEED STUDIES

For technical buyers considering the use of a natural pigment source in the composition of their feed, Aquasta has been proven as effective as synthetic astaxanthin in flesh pigmentation and color expression through tests of various feed product extrusion processes, production timelines, storage temperatures, and in commercial field trials involving fresh, frozen and smoked fish such as Atlantic salmon, Coho salmon and Rainbow trout (Storebakken, 1998).

Aquasta is easily blended to homogeneity with other raw feed materials on a commercial scale, which has been confirmed by an HPLC analysis of 10 samples taken in triplicate.

Naturxan conducted a stability study during the feed production process, with Aquasta yielding an overall recovery of 94 percent from start to finish, including the conditioner, extruder and dryer process (Storebakken, et al 2004).




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naturally sourced astaxanthin

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Another stability study was conducted during the feed storage process at ambient room temperature (24° C to 11° C with an average of 17° C) using six samples of feed from seven periods (Day 0 to Day 90 with 15 days between each analysis), with Aquasta yielding a 99 percent astaxanthin recovery after 60 days of storage and a 91 percent astaxanthin recovery after 90 days of storage.

AQUASTA IN THE FISH STUDIES

In order to determine the effectiveness of naturally sourced astaxanthin on various sizes and species of fish, Naturxan has conducted the Aquasta Customer Satisfaction Program on millions of fish throughout many growing seasons. This database benchmarks astaxanthin retention and color expression of Aquasta at commercial-scale fish farms and is used to help feed manufacturers and fish producers achieve a desired color level upon harvest.

Astaxanthin retention can vary by mean weight, food conversion rate, sanitary status, pigmentation strategy and species, with the Aquasta study demonstrating average astaxanthin retention of 8-11 percent in Atlantic salmon, 20-25 percent in Rainbow trout and 15-20 percent in Coho salmon (Aquasta Customer Satisfaction Program, 2001-2008).

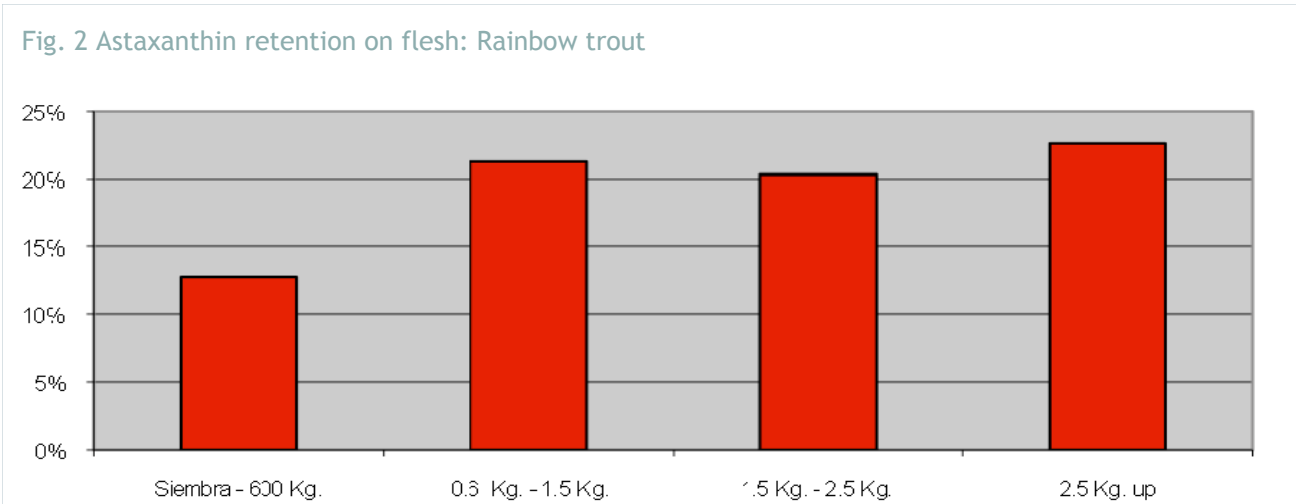
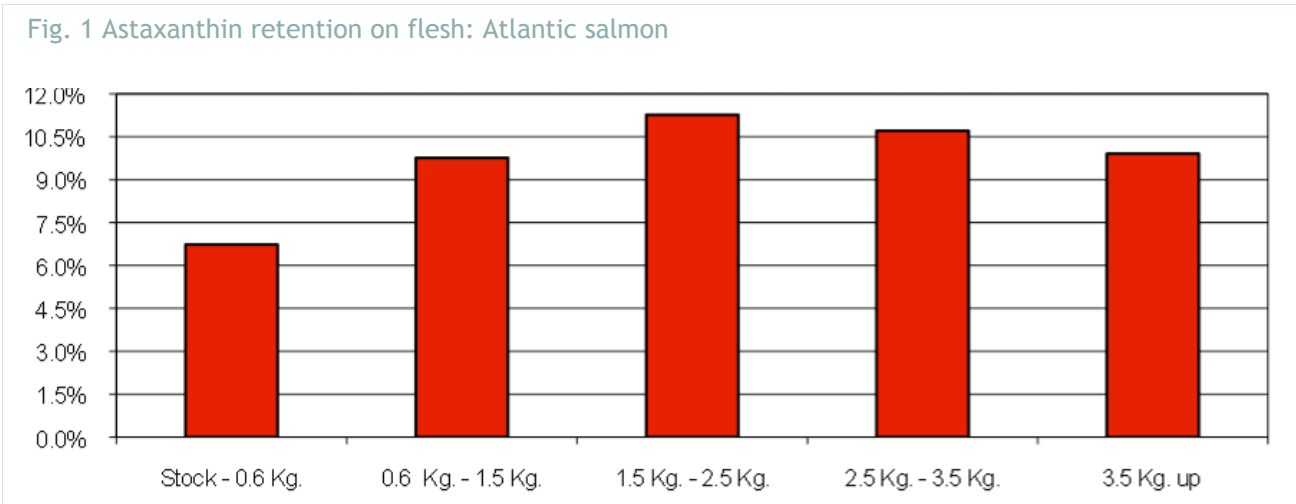
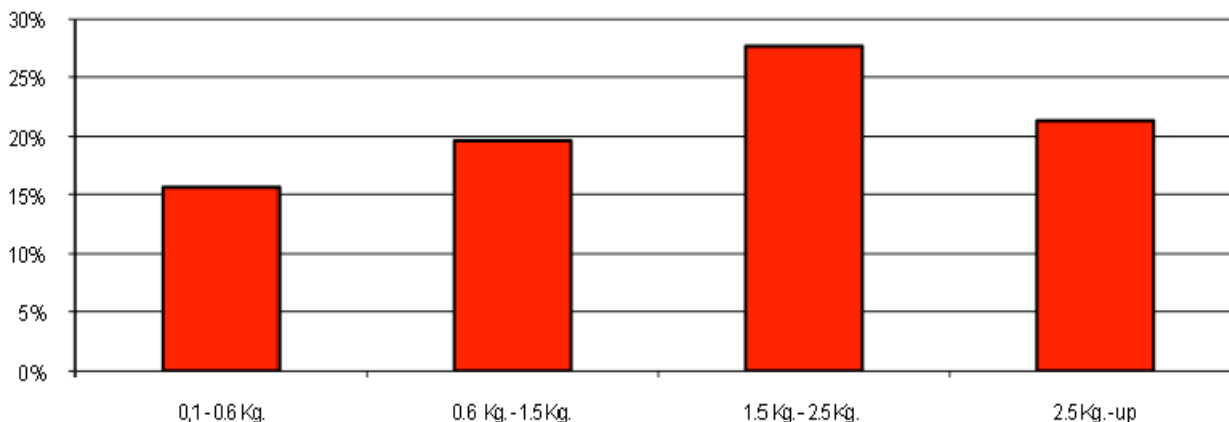
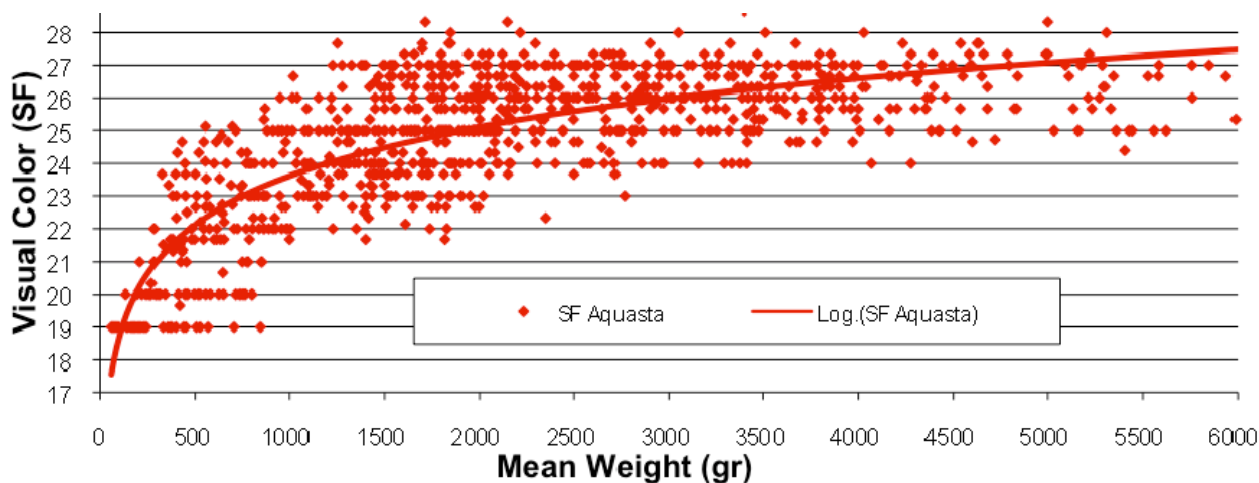


Fig. 3 Astaxanthin retention on flesh: Coho salmon



Acceptable color expression is determined by the demand found in the destination market for the aquaculture product and therefore is factored into the overall pigmentation strategy, with the Aquasta study indicating an average SalmoFan score of 26-28 in Atlantic salmon and 28-30 in large Rainbow trout and Coho salmon (Aquasta Customer Satisfaction Program, 2001-2008).

Fig. 4 Visual Color vs. Mean Weight: Atlantic salmon



Naturxan, LLC, a joint venture between Archer Daniels Midland Company and Igene Biotechnology, Inc., is the world's leading provider of naturally sourced astaxanthin from *Phaffia* yeast, serving customers large and small in aquaculture markets around the globe for more than a decade.

Naturxan recently completed an expansion of its production and distribution capabilities to provide worldwide availability of Aquasta, a naturally sourced astaxanthin made from *Phaffia* yeast for enriching and pigmenting salmon and trout consuming aquaculture feeds. Naturxan invested more than \$3 million of capital and dedicated significant science and engineering resources into scaling production capacity and inventory volume to fulfill ongoing customer demand. With customers in more than a dozen countries, along with export and distribution centers in North America, South America, Europe, Australia and Asia, Naturxan continues to meet worldwide demand for naturally sourced astaxanthin for use in both specialty and commercial-scale feed and fishing operations.



Fig. 5 Visual Color vs. Mean Weight: Rainbow trout

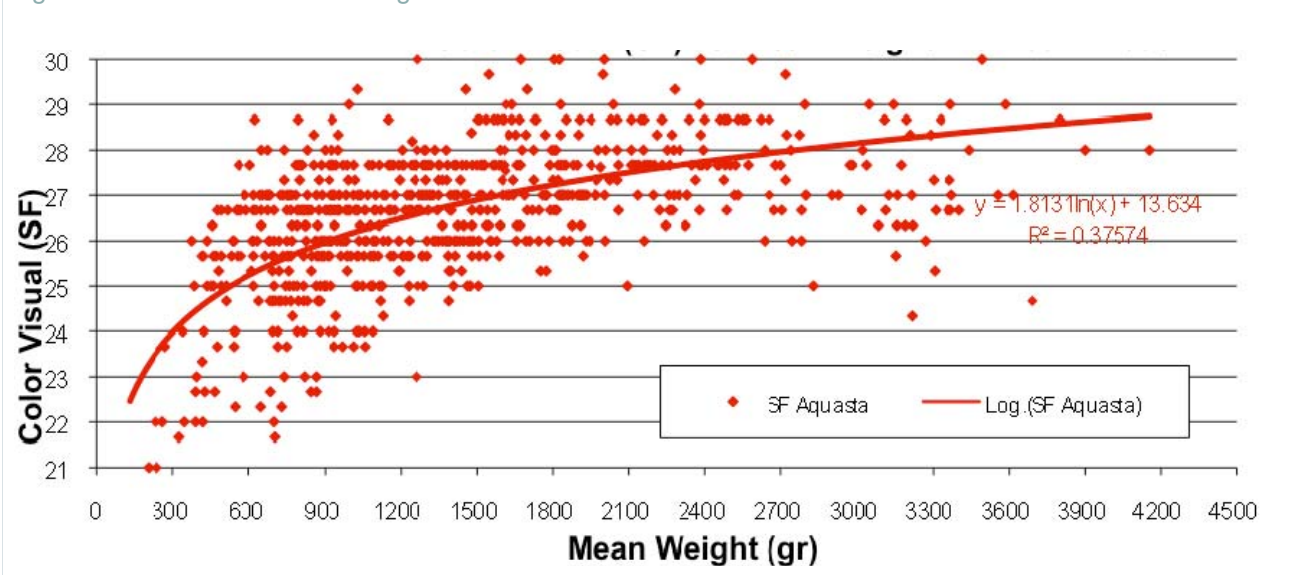
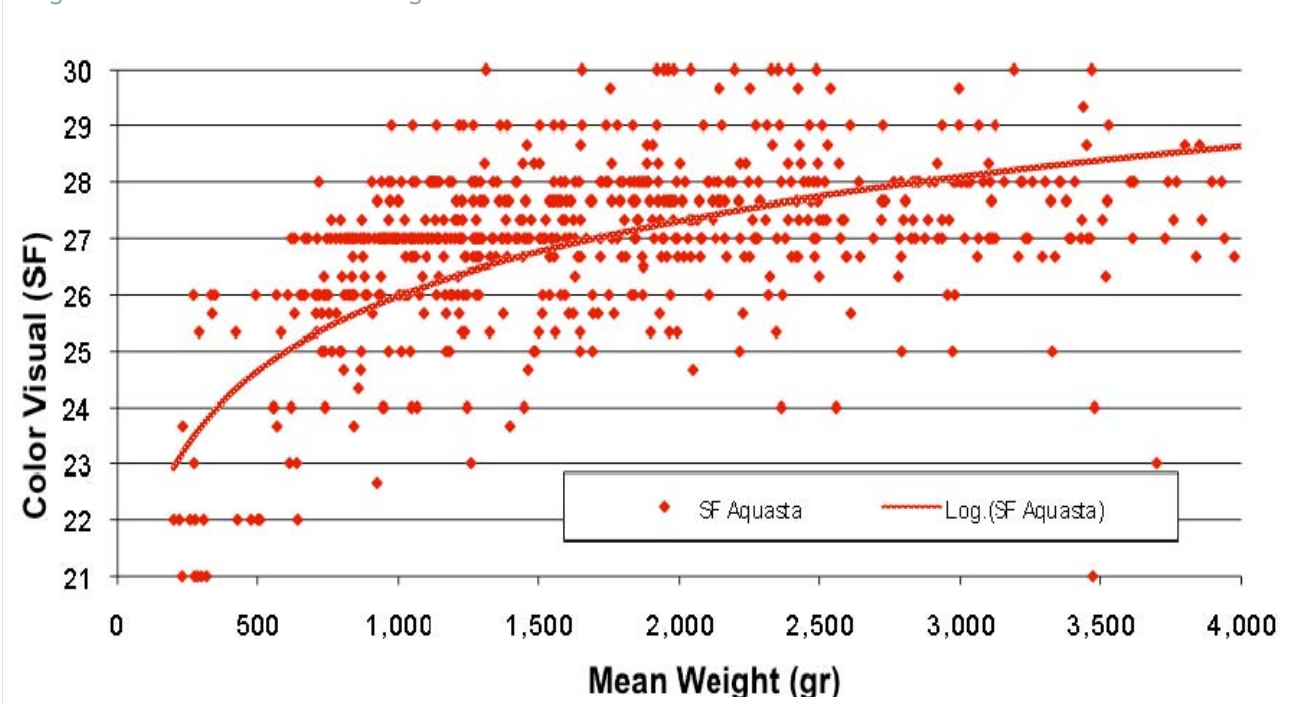



Fig. 6 Visual Color vs. Mean Weight: Coho salmon



All of these studies indicate that naturally sourced Aquasta astaxanthin is a reliable source for feed manufacturers and fish producers to fulfill the pigmentation strategies of organic aquaculture markets around the world and address the rising consumer demand for renewable, natural product sources. 

For more information or to obtain literature references, please contact [Stephen F. Hiu, Ph.D.](#), Chief Technology Officer, Naturxan, LLC. Or visit the Naturxan [website](#).

