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O.I. trial: Sensory qualities of farmed amberjack

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By Leonard G. Obaldo, Ph.D. , A. Reza Kamarei, Ph.D. and Alvin S. Huang, Ph.D.

Sensory rating conducted on a nine-point hedonic scale

Amberjack sashimi shows the natural fillet color of the fish.

Amberjack, known as kahala in Hawaii, USA, is a popular food fish found worldwide. Like other predatory fish that inhabit reef areas, amberjacks can accumulate naturally occurring ciguatera toxin by eating certain types of reef fish. This toxin does not affect the fish but can be detrimental to the health of humans who consume it. Fortunately, amberjack farming has shown promising results and could serve as an effective method of controlling this sea-food safety problem in some wild-caught amberjacks.

Amberjacks are becoming an important seafood product because of their high growth rates, ease of domestication, and market appeal. Aquacultured amberjacks are sold fresh, frozen, or whole-dressed, and as fillets and steaks. The meat, often compared to yellowtail jack, is highly desired in Japan for sushi and sashimi. In fact, yellowtail jack farming in Japan has recently shifted to amberjack farming because of its higher consumer acceptance and market price.

Amberjack aquaculture can provide consumers with consistently high-quality, nutritious food, and open up the market for fillets, sushi, and sashimi. Although aquacultured amberjack is gaining popularity, though, little research has been done on the effects of feed on its flavor and textural qualities.

Amberjack analysis

In recent research, the authors, scientists from the Oceanic Institute (O.I.) and the University of Hawaii at Manoa in Hawaii, USA, carried out a sensory evaluation of the texture and flavor properties of market-sized amberjack fed two types of feeds. Using descriptive analysis, the researchers identified, described, and quantified the taste attributes using human subjects specifically trained for this purpose. The project was funded by a grant from the U.S. Department of Agriculture Agricultural Research Service.

Sensory trial

The culture and primary processing of the amberjacks was done at Oceanic Institute. Product preparation and sensory evaluations were conducted at the University of Hawaii Food Science and Human Nutrition Laboratory.

Fish and feed

Aquacultured amberjacks for the sensory trial were obtained from the O.I. Finfish Program grow-out facility under a separate project funded by the NOAA-NMFS Hawaii Sustainable Fisheries Development Program. The fish were reared on two diets, a commercial feed with 50 percent protein and 14 percent fat, and an experimental feed prepared at Oceanic Institute with similar composition that used Alaska fishery byproducts as the principal ingredient.

The commercial feed developed by O.I. for the grow-out of mahi mahi dolphinfish (*Coryphaena hippurus*) served as a control. The popular feed is also used by farmers for feeding other tropical fish species.

At harvest, amberjacks weighing 4 to 6 kg were immediately bled, gutted, headed, filleted, skinned, and stored in ice before cooking and sensory evaluation.

Cooking methods

The fish samples were prepared using two common cooking methods, pan searing and oven baking. In pan searing, each side of the 1.5 cm x 1.5 cm x 18 cm fillet blocks was cooked at 127 degrees-C for about 20 seconds and then cut into 1.5-cm cubes. In oven baking, 1.5-cm cubes cooked in a preheated convection oven at 204 degrees-C for 4 minutes. Cooked samples were equilibrated at room temperature for 15 minutes after preparation to ensure a constant temperature among samples during the sensory evaluation.

Sensory evaluation

A panel of 8 to 10 sensory evaluators was assembled on the basis of familiarity with fish products and food sensory evaluation, and ability to accurately communicate perceptions. The panelists were provided fish fillet cubes in three training sessions prior to the actual sensory evaluation.

The prepared fish fillet cubes were presented to the panelists in an air-conditioned conference room under white lighting. Visual appearance, texture, and flavor attributes were determined by asking panelists for their selections from a preliminary list during the training sessions.

Fish cubes of 3 to 4 grams each were presented on clear plastic plates with assigned codes. Commercial samples of butterfish and tuna were used as references to define each attribute. For example, seared butterfish represented the “soft, moist, and flaky texture” and “rich/buttery flavor”attributes.

In the training sessions, the panelists discussed their perceptions of the samples to minimize personal bias. The sensory rating was conducted on a nine-point hedonic scale, a standard sensory evaluation test method, with 1 and 9 each corresponding to a reference descriptor such as “soft” or “firm.” The sensory ratings for each attribute were subjected to analysis of variance procedures using computer software.

Overall sensory attributes

A summary of the final sensory evaluation results is listed in Table 1. The results are averages of two sensory sessions with a total of 16 observations for each attribute.

The results clearly indicated that the aquacultured amberjack fillet was light in color after either pan searing or oven baking. The texture was of medium firmness, more flaky than grainy, and of moist mouth feel. The flavor profile indicated the fish taste is moderately mild, medium in fattiness, low in earthiness, and practically free of other tastes.

The overall sensory evaluation of the fish fillets clarified the sensory attributes and profile of this popular fish in the marketplace. With either preparation, the fillets had attractive appearance and were moderate in every textural and flavor attribute, according to the trained sensory panel. In addition, a number of the panelists – including those from Japan – who tasted raw samples during the sensory sessions suggested the fish had excellent sashimi quality.

Huang, Sensory evaluation of fillet samples from amberjack, Table 1

Sensory Attributes	Pan Searing Control	Pan Searing Treatment	Oven Baking Control	Oven Baking Treatment
Visual (1 = light, 9 = dark)	1.88	2.31	2.35	1.58
Texture				
Firmness (1 = soft, 9 = firm)	4.24	4.68	4.74	3.84
Graininess (1 = flaky, 9 = grainy)	3.26	3.84	2.30	1.95
Moistness (1 = dry, 9 = moist)	5.72	5.06	3.33*	5.36
Flavor				
Intensity (1 = delicate, 9 = robust)	4.38	5.23	3.13	2.68
Fattiness (1 = lean, 9 = rich/buttery)	4.78	5.25	4.59	5.58
Earthiness (1 = plain, 9 = earthy)	1.50	1.42	1.87	2.14
Off-taste (1 = none, 9 = strong)	1	1	1	1

Table 1. Sensory evaluation of fillet samples from amberjack fed commercial (Control) and experimental (Treatment) feed subjected to two cooking methods.

* Statistically significant at p = 0.1, but not p = 0.05.

Effects of cooking methods

The intensity of the fish flavor was somewhat affected by the cooking methods. The pan-seared samples had a more robust fish taste than the oven-baked ones. This kind of difference between cooking methods is common knowledge among culinary professionals, who recognize that pan searing tends to bring out more of the intrinsic flavors in food than oven baking. Removal of the dark lateral line in the fish tissue before cooking usually resulted in a mild flavor.

Effects of feed

The effects of feed on fish flavor and texture were minimal. None of the differences were significant at a 95 percent confidence level in all test categories. Preliminary nutrient analysis of the fish fillets indicated a probable difference in the total fat content. This difference seemed to reflect the different sensory scores in the moistness of the baked samples (Table 1). The difference was significant at a 90 percent confidence level.

Conclusion

The flavor and texture attributes established in this report serve as baseline information for a better understanding of the positive and negative aspects of aquacultured amberjack fish products. Overall, the amberjack fillets had an attractive appearance and were moderate in all textural and flavor attributes.

At a 95 percent confidence level, there were no significant differences in fish texture and flavor resulting from the difference in tested feeds. These results can serve as a basis for designing further appropriate and cost-effective feeds for aquacultured amberjack that can deliver consumer-approved desirable product quality.

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Authors

LEONARD G. OBALDO, PH.D.

Oceanic Institute
Nutrition Department
41-202 Kalanianaole Highway Waimanalo, Hawaii 96795 USA

lobaldo@oceanicinstitute.org (mailto:lobaldo@oceanicinstitute.org)

A. REZA KAMAREI, PH.D.

Oceanic Institute
Nutrition Department
41-202 Kalanianaole Highway Waimanalo, Hawaii 96795 USA

ALVIN S. HUANG, PH.D.

Department of Human Nutrition
Food and Animal Sciences
College of Tropical Agriculture and Human Resources
University of Hawaii
Honolulu, Hawaii, USA