The Relationship Between Collagen and Raw Muscle Texture of Rockfish During Ice Storage

By

Ya-Luan Erin Chou
B.S (Fu Jen Catholic University) 1981

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ABSTRACT

The shear force of muscle from 5 different species of rockfish was determined using the Kramer shear device of Instron Model 1122. The results indicated the shear force is different among the following species: Yelloweye rockfish (*S. ruberrimus*)> Canary rockfish (*S. pinniger*)> Bocaccio rockfish (*S. paucispinis*)> Widow rockfish (*S. entomelas*)> Yellowtail rockfish (*S. flavidus*). Shear force is also directly proportional to the length of rockfish. For example, as the length of Bocaccio increased from 43 cm to 63 cm, the shear force of the raw muscle increased from 20.8 kg to 33.3 kg per 20 g coarsely ground muscle. The firmness of rockfish muscle also decreased during postharvest storage on ice. The rate of muscle softening varied with the kind of rockfish. In the species studied, softening was most pronounced with Yellowtail rockfish, and least for Bocaccio. The shear force of bled and nonbled rockfish muscle was also determined. The results showed that raw texture, 24 hours postharvest, was consistently firmer for muscle from live-bled fish than for muscle from non-bled fish.

The total collagen content of muscle from 5 different species of rockfish was determined on dry weight basis. In the Brown rockfish (*S. auriculatus*) and Chilipepper (*S. goodei*), the collagen content was proportional to the length of the fish. As the body length of Chilipepper increased from 31 cm to 50 cm, the collagen content increased from 17.0 mg/g to 22.4 mg/g. In Yelloweye rock-

fish, Bocaccio rockfish, and Yellowtail rockfish, the collagen content was independent of length.

The collagen from muscle of Yellowtail and Bocaccio rockfish was studied during postharvest ice storage. An increase in heat soluble collagen was concomitant with texture softening of muscle from Yellowtail rockfish. However, Bocaccio muscle showed very little change in both texture softening and soluble collagen.

Vacuum-packed Chilipepper fillets were cold sterilized with 2 Mrad ionizing radiation to prevent the growth and metabolism of bacteria, and these fillets were incubated at 0°C, 20°C, and 30°C for up to 13 days. SDS-polyacrylamide gel electrophoresis showed no significant change in α, β, or γ collagen chains of soluble collagen from fillets incubated at 0°C or 20°C for 13 days. However, after incubation at 30°C for 6 days, the α, β and γ collagen chains completely disappeared concomitant with a complete breakdown of muscle texture. These results suggest that at 30°C, endogenous collagenase is activated to cleave muscle collagen or that thermal changes in collagen structure make the molecule more susceptible to catabolism by endogenous enzymes.

The results of this study indicate that muscle texture softening

and collagen degradation differ with species of rockfish and that endogenous enzymes can act *in situ* to contribute to changes in raw muscle texture and collagen degradation. The finding that collagenolytic activity was potentiated by near ambient temperature may explain why short term temperature abuse after harvest can result in drastic quality deterioration. More work needs to be done in this field to more completely understand the fish softening problem.

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