Title Effects of sodium bicarbonate containing traces of citric acid in combination with sodium chloride on yield and some properties of white shrimp (*Penaeus vannamei*) frozen by shelf freezing, air-blast and cryogenic freezing

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Abstract

Effects of sodium bicarbonate with traces of citric acid in combination with sodium chloride on yield, freezing time, freezing rate, freezing loss and cutting force of white shrimp frozen by shelf, air-blast and cryogenic freezing with/without precooking were investigated. Shelf freezing was done at −40 °C ± 2 °C while air-blast freezing was carried out at −35 °C ± 2 °C, and cryogenic freezing was done at −35 °C, −40 °C and −60 °C. The freezing loss in the non-treated samples was 8.25, 4.6–5.84 and 1.92–3.48 g/100 g fresh shrimp for peeled samples frozen without precooking and increased to 21.85, 17.54–26.97, 17.92–20.31 g/100 g fresh shrimp in the precooked samples frozen by shelf, air-blast and cryogenic freezing, respectively. The treatment of sodium bicarbonate containing traces of citric acid at 4 g/100 ml with sodium chloride at 3 g/100 ml lead to the increase of yield thus reduced the freezing loss by about 6.83–10.28 and 6.41–12.4 g/100 g fresh shrimp for the frozen–thawed samples frozen as uncooked and cooked products, respectively. The toughening of shrimp was observed while sodium bicarbonate containing traces of citric acid treatment with sodium chloride could reduce the texture change occurred during the freezing.