Shrimp processing assessed by low field nuclear magnetic resonance, near infrared spectroscopy, and physicochemical measurements – the effect of polyphosphate content and length of prebrining on shrimp muscle.

Abstract: The effect of using polyphosphates during prebrining and the effect of prebrining time of cold water shrimp (Pandalus borealis) was studied with low field nuclear magnetic resonance (LF-NMR) transverse relaxation time measurements (benchtop and unilateral) and near infrared (NIR) spectroscopy with the aim of improving shrimp processing. Strong calibrations were obtained for moisture content and water-holding capacity (WHC) using the NIR technique. Multivariate analysis indicated significant correlations between benchtop NMR parameters and moisture content and WHC, as measured with physicochemical methods and NIR spectroscopy. Significant correlations were also observed between NMR parameters and muscle pH, protein content, and phosphate content. The study showed that LF-NMR contribute to improved understanding of the shrimp brining process and to improved process control on-line or at-line, especially in combination with NIR measurements. However, optimization of the unilateral device is necessary.

Practical Application: Shrimp processing contains various steps that can lead to denaturation or aggregation of proteins, such as during cooking or freezing. Optimization of shrimp processing is therefore an essential task to ensure minimal moisture loss and to ensure a high quality of the final product. Traditional analytical methods for physicochemical measurements are, however, time-consuming, sample-destructive and expensive, and are, therefore, poorly suited for on-line or at-line process monitoring and optimization. The study showed the potentials of using LF-NMR and NIR spectroscopy for on-line or at-line process control during processing of cold water shrimp. The methods showed strong correlations to various physicochemical properties, such as muscle pH, moisture content, and WHC, which are important quality factors during shrimp processing. Moreover, the techniques are fast, reliable, and nonsample destructive and may therefore suit well for on-line or at-line applications. © 2011 Institute of Food Technologists.

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