

CHANGES IN SARCOPLASMIC AND MYOFIBRILLAR PROTEINS DURING THE PROCESSING OF BUFFALO AND CHICKEN SURIMI

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Summary

Fresh rib cuts of local buffalo meat, spent hen and broiler chicken were processed into surimi-like material called 'beefrimi' and 'ayami' respectively. The processing methods include grinding the meat twice a 3 mm grinder plate, followed by three steps washing with ice cold water, after which the washed meat is mixed with cryoprotectants and stored in polyethylene bags at -18°C . Changes in sarcoplasmic and myofibrillar proteins during the processing stages were monitored using the SDS-PAGE method. Results showed an increase in the intensity of higher molecular weights sarcoplasmic proteins (>60000 Dalton) with lower molecular weights (45000 Daltons) decreasing (as raw meat was washed out). Washing however leads to a decrease in the intensity of myofibrillar proteins as the washing steps processed.

Introduction

In processing of surimi, washing not only removes fat, blood and pigments but also removes water soluble proteins from meat (Grant 1985). This results in an increase of myofibrillar proteins, especially actomyosin, that is responsible for gel formation (Grant 1985; Suzuki, 1981). Washing also results in loss of sarcoplasmic and myofibrillar proteins in the ratio of 1.7:1.0 (Lee 1984). Various authors have investigated the effects of washing on yield, composition and physico-chemical characteristic of surimi-like materials.

Analytical Procedures

Myofibrillar and sarcoplasmic proteins was extracted following the method of Hay *et al.* (1973). Sample of washed meat at various steps of the processing operation was diluted with buffer solution (2.3 ml 10% SDS solution, 5.2 ml distilled water, 1.0 ml glycerol, 0.5 ml 2-mercaptoethanol, 1.0 ml 0.625 M Tris-HCl pH 6.8 solution and a drop of bromophenol Blue) to 1000 $\mu\text{g/ml}$, boiled for 5 min and then cooled to room temperature before placing in the gel for electrophoresis.

Determination of Molecular weights of Protein

The proteins molecular weights were determined by measuring the relative mobility and reading the semi log graph for molecular weights versus relative mobility (Weber and Osborne, 1969).

Results and Discussion

Sarcoplasmic protein

Figure 1 shows the changes in the sarcoplasmic and myofibrillar proteins of buffalo meat as a result of washing to obtain a surimi-like material. An increase in the intensity was observed with sarcoplasmic proteins ranging 21000 to 200000 Daltons (bands 10, 6, 5, 4, 3, 2 and 1). However proteins with molecular weights at 45000 Daltons, 35000 Daltons and 19000 Daltons (bands 13, 8 and 6) decreased in intensity. This study showed not all low molecular weights sarcoplasmic proteins are washed out, which means that one cannot rule out the role of sarcoplasmic proteins of low molecular weights in the gelation process of protein. Babji and Gna (1994) showed the presence of >100000 Daltons sarcoplasmic proteins are clearly present in the last wash (surimi), which means they do have a role in gelation.

Myofibrillar protein

Figure 1 shows the changes in the myofibrillar proteins in buffalo meat and Figure 2 shows the changes in broiler meat and spent hen meat as a result of surimi processing methods. There is a significant decrease in intensity of the myosin fraction at 200000 Daltons and the actin fraction at 40000 Daltons. Although the intensity of myofibrillar proteins decreased with washing, this study showed an increase in the concentration of myofibrillar protein as more sarcoplasmic proteins are washed out. Our results showed multiple washing resulted in myofibrillar protein loss. This study showed that specific proteins (myosin and actin) are purified and retained while other proteins decreased as washing proceeds. With buffalo meat, broiler and spent hen meat used in this study, it was unnecessary to wash as many as three times to obtain surimi-like materials. Since the availability of such raw materials such as buffalo and spent hen are limited, producing surimi for Asian market needs should be done economically with at most two step wash to obtain reasonable quality surimi-like materials with acceptable gelation properties.

Conclusion

The results of this study showed the presence of higher molecular weights sarcoplasmic proteins (100000 Daltons above) which are still present in surimi-like materials such as beefrimi and ayami. Two groups of sarcoplasmic proteins stand out as increasing in intensity after washing i. e. 45000 and 21500 Daltons. Other sarcoplasmic proteins below 100000 Daltons decreased in intensity. The intensity of myofibrillar proteins decreased as washing steps increased. Three steps washing is uneconomical and wasteful as the decrease in intensity resulted in lower yield. It is suggested that a minimum washing of two times is sufficient for surimi-like materials of acceptable quality to be produced in this region.

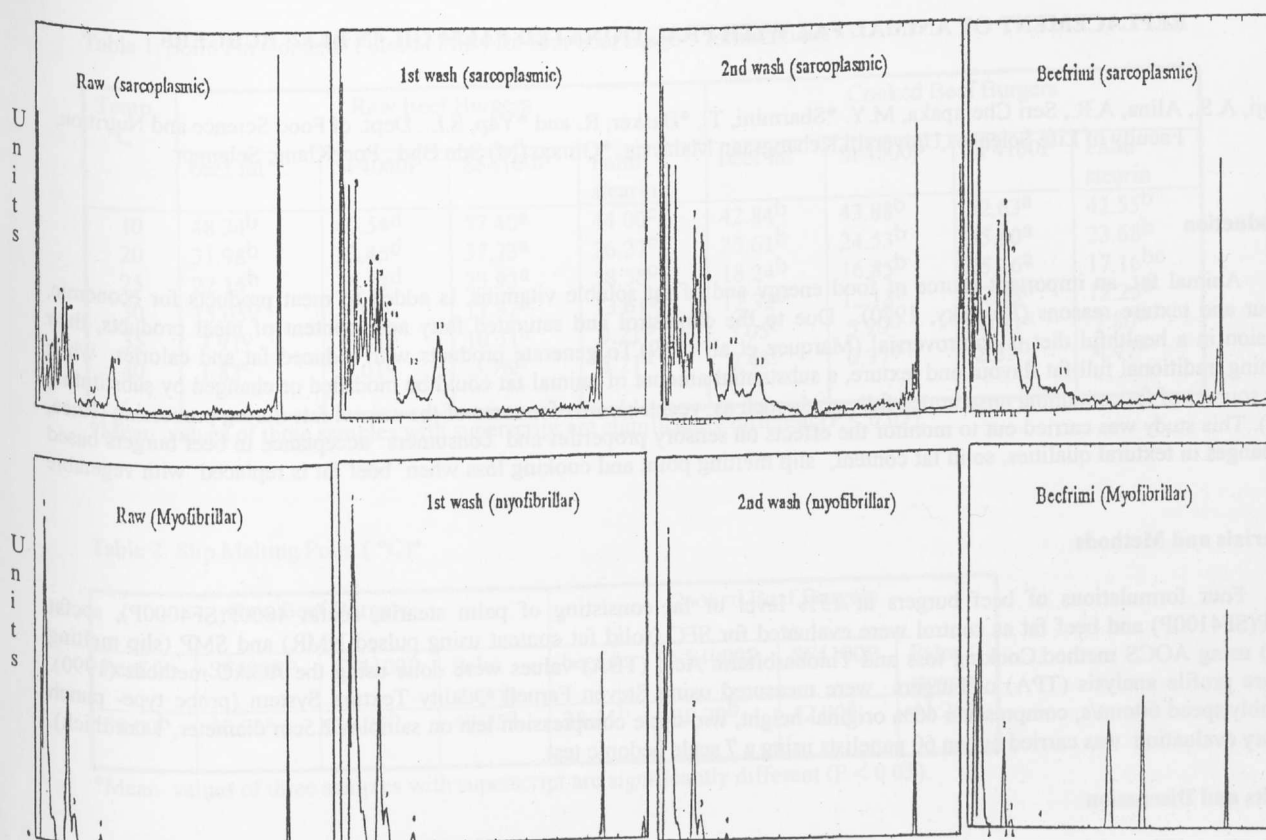


Figure 1: Electrophoretic pattern of sarcoplasmic and myofibrillar proteins of buffalo meat due to various washing procedure.

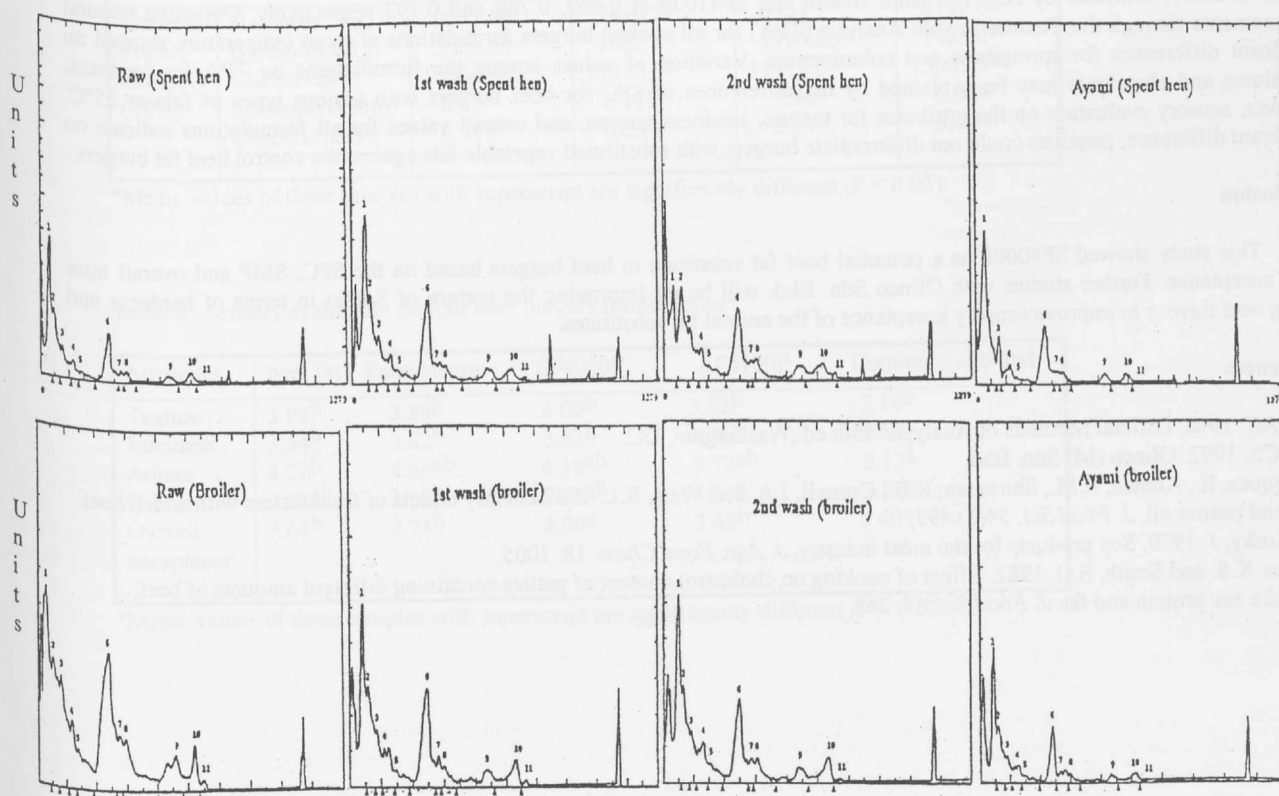


Figure 2: Electrophoretic pattern of myofibrillar protein of broiler and spent hen meat due to various washing procedure.