Universiti Malaysia Sabah

Final Report
IRPA project 01-02-10-0005

Control of protein denaturation for enhancing keeping quality and shelf-life of 'beche-de-mer'

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A. **Project Number : 01-02-10-0005**
Project Title : Control of protein denaturation for enhancing Keeping quality and shelf-life of 'beche-de-mer'.

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B. **Summary for the MPKSN Report** (For publication in the Annual MPKSN Report, please summarise the project objectives, significant results achieved, research approach and team structure)

Sea cucumbers are exclusively marine animals which form a conspicuous part of the benthic fauna in Malaysia. They are regarded for nutritional and medicinal value of the processed form of their body wall known as 'beche-de-mer'. Although processing is done by a variety of methods, the technique essentially involves longitudinally incising the body to remove water, gutting, boiling and drying. The product is also smoked or pickled in certain regions. There is no application of new technology to post-harvest processing of sea cucumbers. This project was undertaken to examine the effect of different crypreservation conditions on qualitative nature of protein in beche-de-mer and to determine the treatment which could improve the shelf-life and keeping quality of the product from the common sandfish. *Holothuria scabra*. Body wall of the sandfish was treated at 4° C, 0° C and – 10° C for durations of 12, 24, 48 and 72 hours. At the end of each treatment period the samples were homogenized in chilled 5% neutral (pH=7) salt solution (NaCl) and centrifuged. Protein was measured in the supernatant. Alteration in this salt-soluble fraction of protein was used as an index of denaturation. Protein denaturation in beche-de-mer increased steadily with the duration of storage. Denaturation rate depended on the storage temperature. Lower temperature slowed the denaturation. Thus, in a 12- hour storage at –10°C the protein extractability was 98% - a decline of mere 2%. The decline was more abrupt initially, and with a sustained superchilling, the rate reduced drastically.

Denaturation of protein as observed in beche-de-mer was the result of changes in polypeptide chain structure. During denaturation, peptide bonds are known to be unaffected but polypeptide chains uncoil and develop cross-linkages with adjacent molecular chains,

destroying the higher order structure of the molecule. Temperature above 0°C denatures the protein faster by acting on non-covalent bonds which are considered important in stabilizing the secondary and tertiary structure.

It appears from the results of this study that the molecular mechanisms associated with the folding of polypeptide chains and cross-linking among them are complex processes and their response to temperature gradients different. There might be a temporal pattern in polypeptides in developing a chemically stable form at a particular storage temperature. The data leaves no doubt that initial superchilling can protect the native structure of protein and contribute a great deal to improving its keeping quality and shelf-life.