

## CHAPTER 7

### FUTURE WORK

In this study, it was hypothesized that alteration of hemoglobin upon facing to pH of post mortem fish decreased hemoglobin extractability. Although, results from the model system of cod minced proved this assumption, it was found that decrease in extractability of herring heme proteins could occur even at pH equal to 7.0. Further investigation is, therefore, needed to verify the factors causing the decrease in extractability of heme proteins. Some suggestions are:

- Future studies should be conducted to evaluate a relationship between deoxygenation and autoxidation of myoglobin on its extractability. Since myoglobin situates with filament proteins in myocytes, conversion of chemical energy to mechanical energy by muscle proteins can therefore trigger the release of oxygen molecule from oxymyoglobin. Thus, most of oxymyoglobin content of post-mortem fish should be decreased abruptly. It may be of importance to test the hypothesis that deoxygenation of myoglobin results in the decrease in extractability of heme proteins, especially that of dark muscle.
- It would be of interest to investigate in more detail whether amount of lipid oxidized products spontaneously formed in post mortem herring influences changes of heme proteins especially myoglobin, resulting in loss of heme proteins extractability.

Although preparation of a functional fish protein isolate with high protein recovery by the alkaline solubilization process has been established recently. The results of this

study suggested that exposure of hemoglobin to high pH of the process might favor the alteration of the protein, resulting in loss of its extractability. Therefore, further investigation is needed to look into its consequence. Some suggestions are:

- Future studies should be conducted to test the hypothesis that hemoglobin becomes less stable at low pH after the protein is exposed for some time at high pH.
- It may be of importance to identify what alkaline pH value is a safety limit to avoid such effect before application of the process for making fish protein isolate from any fish species. Effect of exposure of fish homogenate to such pH on functional properties or recovery of the protein isolate should be also taken into account.
- It is recommended that further work should be performed on the influence of the fish muscle components especially components with pro-oxidative property or oxidized products of aged fish on a change of heme protein at high pH.
- It would be of interest to investigate in more detail whether pH adjustment of the process enhances pro-oxidative capability of the hemoglobin and myoglobin of herring or other target species and how this phenomenon affects storage stability of the corresponding protein isolate.
- The study of pre-extraction of red muscle containing high portion of endogenous non extractable heme proteins should be considered in order to improve color values and storage stability of the protein isolate.
- Amount of heme protein removed by the process is not satisfactory for evaluation the effectiveness of the process used. Color values depended on amount of either non extractable and extractable pigments existing initially and after the process. The

evaluation of those pigments is also recommended to indicate the efficiency of pigment removal.