

Estimation of lipid degradation of frozen *Pollachius virens* and *Macrurus novaezelandiae* muscle by colour analysis

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Introduction

Colour and general appearance is an important quality attribute of white fish products which highly affects consumer's acceptance since consumers mostly associate colour with freshness, better flavour and high product quality. Colour changes that occur during storage can be used as an indicator of quality deterioration. Moreover, colour measurements can be fast, non-invasive and require little or no sample preparation. In the present study, evaluation of colour changes as an indirect tool to follow lipid deterioration of lean fish muscle during frozen storage was studied.

Methods

Analysis of lightness (L^*), redness (a^*) and yellowness (b^*) changes was evaluated as tool to follow lipid degradation during frozen storage of two lean fish species, saithe and hoki NZ.

Prediction models were developed to quantify:

- Peroxide value (PV)
- Thiobarbituric acid reactive substances (TBARS)
- Fluorescent compounds (OFR)
- Free fatty acids (FFA)
- Phospholipids (PL)
- Sensory attributes

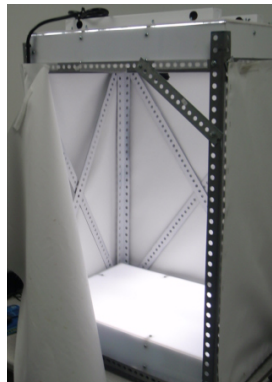


Figure 1. Colour machine vision system (CMVS) was used to analyse the surface colour of the fish muscles.

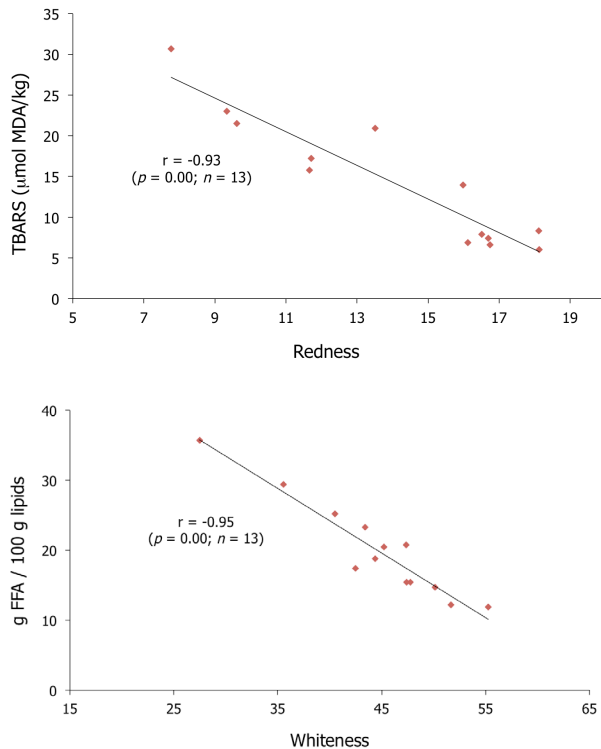


Figure 2. Example of relationship between lipid deterioration and colour parameters of saithe (upper) and hoki NZ (lower) muscles.

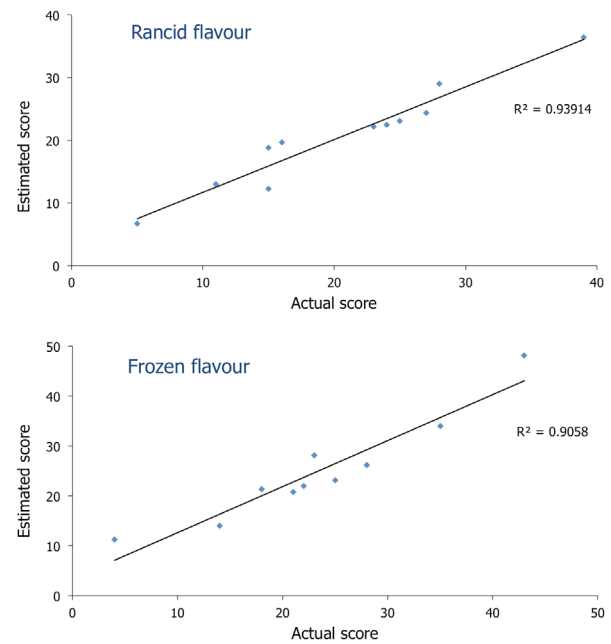


Figure 3. Scatter plot for estimated values vs. reference values of rancid flavour (upper) and frozen storage flavour (lower) of hoki NZ muscles.

Results and Discussion

Colour measurements have the potential to be a fast and simple tool to follow changes of physicochemical properties of fish products during frozen storage. Lipid deterioration can be estimated by colour analysis with good accuracy.

- Decrease in redness of the saithe dark muscle showed strong correlation with lipid oxidation (Figure 2).
- Whiteness, $100 - \sqrt{(100 - L)^2 + a^2 + b^2}$, has the potential of being quality indicator of frozen saithe and hoki muscles (Figure 2).
- Colour measurements can be used to estimate rancid flavour and frozen storage flavour, which highly affect quality and acceptance of frozen fish products (Figure 3).
- Traditional chemical and sensory methods to follow quality degradation are generally costly and time-consuming. It is therefore of great importance for the seafood industry to have a rapid and simple method to follow these factors.
- In order to obtain higher accuracy, more samples should be evaluated to improve the performance of the prediction models.

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