Evaluation of Different Edible Coatings for Egg Quality Preservation using Near Infrared Spectroscopy

Thanh Tung Pham, Lien Le Phuong Nguyen, Adrienn Tóth, Csaba Németh, László Baranyai, László Ferenc Friedrich

Institute of Food Science and Technology, Hungarian University of Agriculture and Life Sciences

Introduction

Eggs are a global staple food with annual production exceeding 80 million tonnes worldwide. However, due to their perishable nature and the rapid deterioration of internal quality, especially at room temperature, hundreds of millions of eggs are wasted each year.

Problem

Refrigeration is effective but costly and not always available, especially in traditional markets.

Solution

Edible coatings offer a sustainable alternative and can be applied to the eggshell surface to act as barriers to moisture and gas exchange.

Challenge

Different coating bases exhibit distinct mechanical and barrier properties, which affect their effectiveness in maintaining egg quality. Egg size may also influence the overall performance of the coating.

Our Study

- Evaluating 3 edible coating bases (polysaccharide-, protein-, lipid-based) for maintaining egg quality (M and XL size) at room temperature.
- Assessing Near-Infrared (NIR) spectroscopy for non-destructive egg quality assessment.

Materials and methods

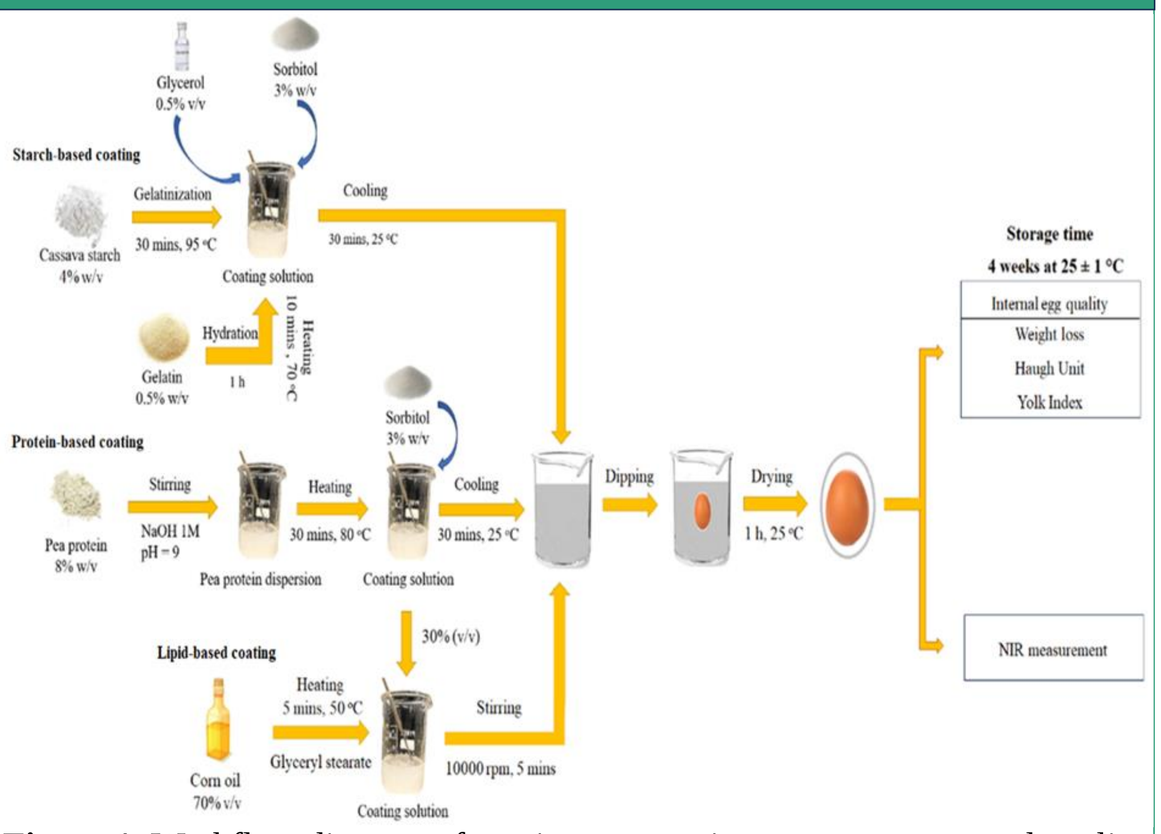
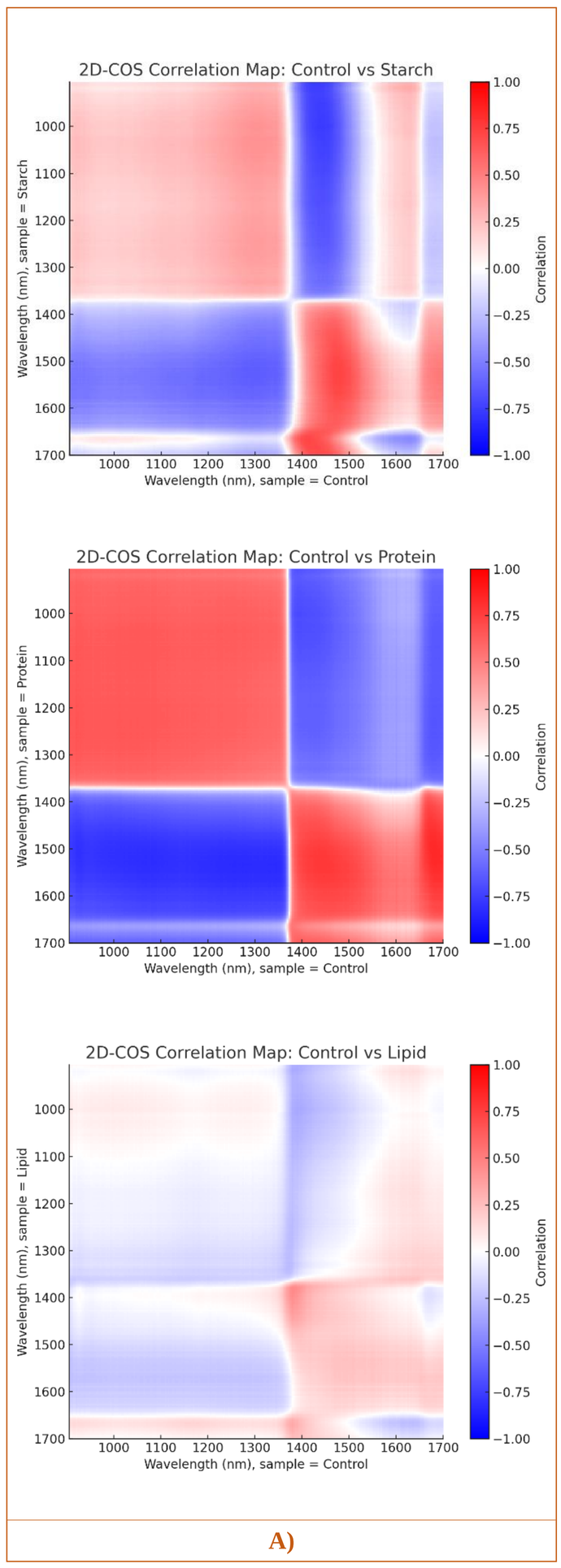


Figure 1. Workflow diagram of coating preparation, egg treatment and quality assessment

Results



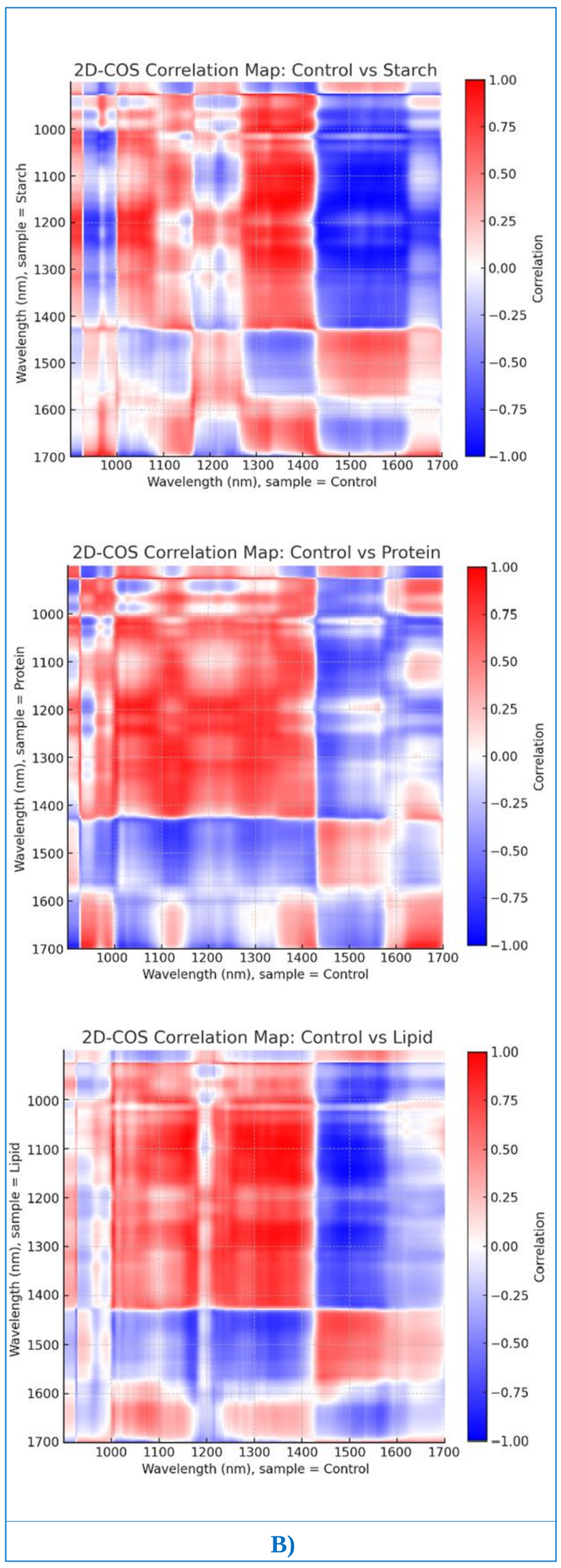


Figure 2. 2D correlation spectroscopy map between treatments based on A) SNV-preprocessed NIR spectra and B) First derivatives-preprocessed NIR spectra

Conclusions

- The lipid-based coating exhibited the highest efficiency in reducing weight loss, while the starch- and protein-based coatings demonstrated better retention of Haugh unit and yolk index during a 4-week storage period.
- Egg size influenced the performance of starch- and protein-based coatings, whereas the lipid-based coating maintained consistent effectiveness across different egg sizes.
- NIR spectroscopy is a promising approach for monitoring egg quality.

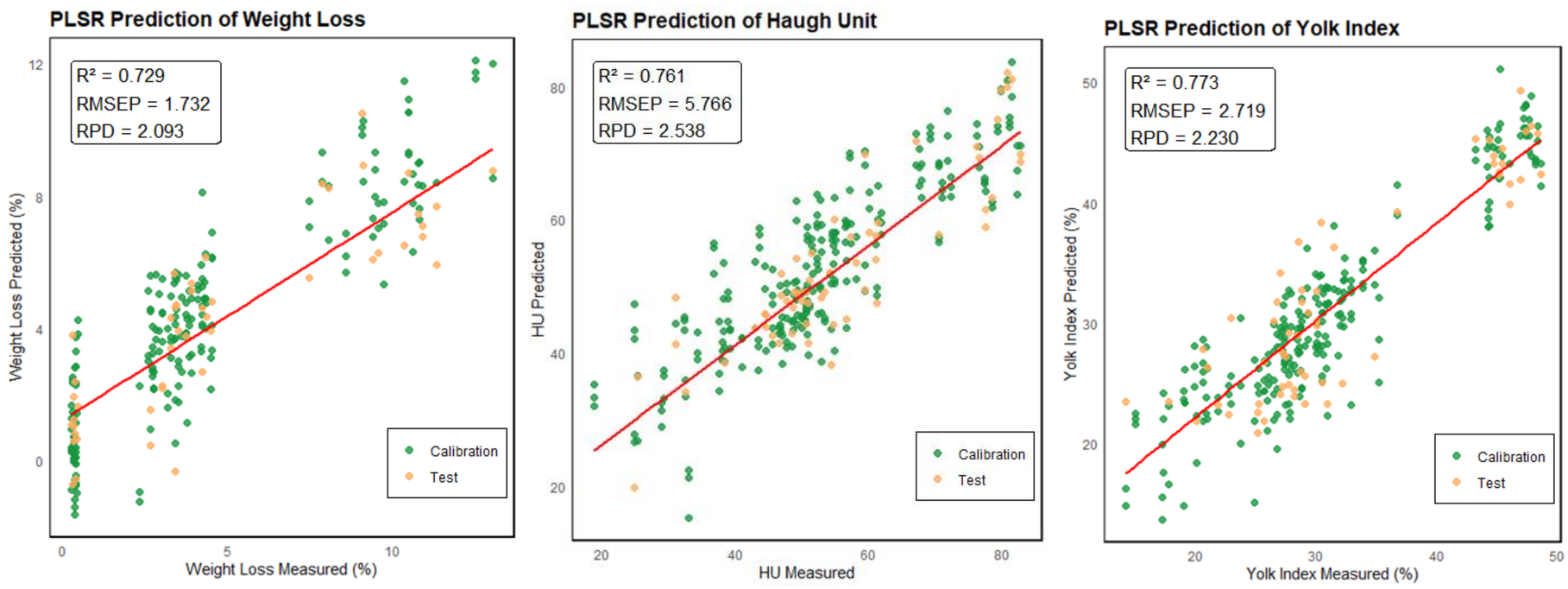


Figure 3. Results of PLSR models for egg quality parameters using SNV-preprocessed NIR spectra

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