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Transmission Spectroscopy for the Assessment of the Yolk Index for White-Shelled Eggs and Brown-Shelled Eggs

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Extended Abstract

Eggs are a source of protein, fat and micronutrients, they play an important role in basic nutrition [1], and the price is cheap. The freshness of eggs changes with processing, transportation and storage. The main factors that affect the freshness of eggs include: weight loss, increased air cells, egg yolk index, Huff units, protein pH, and egg yolk pH. In the detection of freshness, the methods of Haugh unit and egg yolk index are more commonly used for destructive testing. Non-destructive testing methods include electronic nose [2] and dielectric [3] measurement methods. In the egg yolk index, spectroscopy is rarely used as a detection method.

In this study, the full spectrum was used to detect the yolk index of white-shell eggs and brown-shell eggs. Use 100 eggs each for Roman white shell eggs and brown shell eggs. Eggs are stored in an environment with a temperature of 23 to 26°C and a humidity of 55% RH for 9 days, and recorded once a day. The raw spectral response data of white and brown shell eggs vary between 500-810 nm [4], so 500-810 nm spectra will be used to analyze and record the height and diameter of the yolk. The egg measurement spectrum uses standard normal variation (SNV) to process the signal and multiple linear regression (MLR) and multilayer perceptron (MLP) are used to establish the correlation between the "spectrum and egg yolk index". And randomly take 30 eggs as prediction group for prediction.

The analysis results show that multiple linear regression uses five spectral wavelengths (699 nm, 809 nm, 630 nm, 759 nm, and 794 nm) to establish the correction equation for white-shelled eggs. The correlation coefficient (Rc) of the correction group was 0.857. The correlation coefficient (Rp) of the prediction group was 0.721. Correction equation for MLP analysis of white shell eggs. The correlation coefficient (Rc) of the correction group was 0.975. The correlation coefficient (Rp) of the prediction group was 0.603. The multiple linear regression method was used to establish the correction equations for brown eggs with seven spectral wavelengths (724 nm, 687 nm, 679 nm, 728 nm, 659 nm, 683 nm and 733 nm). The correlation coefficient (Rc) of the correction group was 0.815. The correlation coefficient (Rp) of the prediction group was 0.607. The correction equation of brown shell eggs was established using MLP. The correlation coefficient (Rc) of the correction group was 0.98. The correlation coefficient (Rp) of the prediction group is 0.64, so the results show that the wavelength measured by the spectrum can effectively predict the egg yolk index.

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