

Thesis Title: Non-destructive Estimation of Broiler Egg Yolk Content and Its Relationship with Hatching Time

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Abstract 1: The feasibility of using Vis-NIR spectroscopy to quantify the yolk ratio in light brown shell eggs was investigated. Spectral transmission (600 to 900 nm) data of eggs was used to develop several multivariate regression models to noninvasively predict yolk ratio of eggs. Developed models were then used for prediction of the unknown sample. The best model was found to be Least square support vector machine (LS-SVM) with an accuracy of 88% and a RMSEP of 0.0408. These results show the potential of Vis-NIR spectroscopy for noninvasive determination yolk ratio in eggs.

Keywords: chicken egg; yolk ratio; regression; Vis-NIR spectroscopy; multivariate analysis;

Abstract 2: The present study aimed to classify double yolk and single yolk eggs using UV-Vis-NIR spectroscopy and multivariate classification in light brown shell eggs. Initially, Principal Component Analysis was performed on the spectroscopic data (200 to 900 nm). The range 601-900 nm was identified as the most relevant for classification of single yolk and double yolk eggs from the correlation loading plot. Later, Genetic Algorithm was used to narrow down the variables to 832-834, 838-840 and 872-875 nm wavelength. Several classification models were developed using Principal Component (PC) scores. The developed models were able to classify double yolk and single yolk eggs of unknown samples with an accuracy of 92.85% to 100%. The position and orientation of yolks influenced the classification accuracy.

Keywords: noninvasive; single yolk; double yolk; Genetic algorithm; multivariate classification; light brown eggs.

Abstract 3: Hatching window and the gender of hatching eggs were investigated in relation to the yolk content and yolk ratio (yolk to egg ratio) of the eggs. To quantify the amount of yolk noninvasively, a regression model from absorbance spectra (600 to 900 nm) was developed using known yolk content. This model was then used to determine the yolk content subsequently the yolk to albumen ratio of the hatching eggs. This yolk information of hatching egg was then correlated with hatching time and the gender of the egg. The results showed a significant correlation between estimated yolk-albumen ratio and hatching time, but no significant correlations were obtained with the gender of the eggs.

Keywords: hatching time; chick gender; regression; yolk; albumen; spectroscopy;