ABSTRACT

ADRIZAL. Prediction of Nutrient Composition of Fishmeal by Artificial Neural Network based on Near Infrared Absorbance. Under the supervisions of HADI KARYA PURWADARIA, SUROSO, I WAYAN BUDIASTRA, AND WIRANDA GENTINI PILIANG.

The objective of this study was to apply artificial neural network (ANN) models to enable an accurate and fast prediction of nutrient composition in fishmeal using near infrared absorbance. Stepwise multiple linear regression (SMLR) and principal components analysis (PCA) were applied to the near infrared absorbance data prior to inputting them into the models. The ANN with three, five, seven and nine nodes at hidden layer was trained to determine the moisture, fat, protein, lysine and methionine contents. The training was carried out using 35 samples (for moisture, fat and protein content), 33 samples (for lysine content) and 30 samples (for methionine content). Validation was conducted using 10 independent samples.

The results indicated that the best prediction on moisture was obtained by the ANN with seven nodes at hidden layer that was trained with 55 000 iterations with the near infrared wavelength of 1915 nm, 1215 nm and 1285 nm. The fat contents could be predicted with the smallest error by the ANN with seven nodes, trained with 16 000 iterations using 915 nm, 1470 nm and 1735 nm wavelengths. Consecutively, the model best prediction was found for protein by performing 25 000 iterations with 8 principal components, for lysine by applying 11 000 iterations with 1020 nm, 1325 nm, 1745 nm, 1025 nm, 1100 nm and 1650 nm wavelengths, for methionine by applying 15 000 iterations with 1415 nm, 1325 nm, 1920 nm, 1645 nm and 1405 nm wavelengths. The standard error of prediction, the coefficient of variation and the ratio of standard deviation over the standard error of prediction were respectively 0.62 %, 4.92% and 6.73 for moisture content; 0.81%, 15.21% and 2.90 for fat content; 2.12 %, 4.56% and 4.72 for protein content; 0.14%, 11.42% and 3.01 for lysine content; and 0.07%, 10.05% and 2.25 for methionine content.

In conclusion, the ANN could be applied to predict the nutrient composition of fishmeal based on near infrared absorbance. It is suggested to increase the number of samples for training and validation to improve the accuracy of the model before its application in quality control for fishmeal and feed industries.

Keywords: Artificial neural network, near infrared, fishmeal.