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Dear Professor **Luisa Antonella Volpelli**,
here are the details of your abstract as they were saved on Mar 20, 2013.

Nutrition and feeding
USE OF MULTIVARIATE IMAGE ANALYSIS FOR THE EVALUATION OF TOTAL MIXED RATIONS IN DAIRY COW FEEDING

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Multivariate Image Analysis (MIA) techniques are becoming very successful in food analysis, thanks to the wide diffusion of instrumentation for acquisition of digital images (e.g., photo cameras, scanners, webcams) available at low costs. In this context, colourgrams [1] are signals that codify the colour-related information content of a digital image, and which can be elaborated by means of proper multivariate analysis techniques to extract those features that are useful to solve a specific problem. Colourgrams can be considered as an inexpensive way to obtain useful information about colour-related properties of inhomogeneous samples, such as the total mixed rations (TMR) used in dairy cow feeding, since all different colours of the image can be reproduced by one or more pixel (picture element).
In this work, images of TMR samples both with- and without-silage (65 for dairy cows; 4, as a comparison, for steers) were acquired using a common flatbed scanner. Replicate images of the TMR samples were acquired to estimate the reproducibility of the method. Each one of the 168 images was converted into the corresponding colourgram, and the resulting dataset was used to calculate both classification models using Partial Least Squares-Discriminant Analysis (PLS-DA) and regression models using Partial Least Squares (PLS). Both the classification and the regression models were properly validated by cross-validation and using an external test set. Classification models showed excellent capability to discriminate between dairy and meat TMR and good capability to discriminate between with- and without-silage TMR. Regression models were calculated to predict 15 nutritional traits: crude protein, crude fat, crude fiber, ash, starch, NDF, ADF, ADL, dry matter, physical effectiveness factor (pef), physically effective NDF (peNDF), hemicellulose, non-fibrous extracts, non-NDF carbohydrates, and UFL. The best results were obtained using the images of without-silage TMR. In particular, for 9 nutritional traits we obtained satisfactory regression models, i.e. with R2 values for the prediction of the external test set falling in the range between 0.70 and 0.88.

[1] Ulrici, A., Foca, G., Ielo, M.C., Volpelli, L.A., Lo Fiego, D.P., 2012. Innov. Food Sci. Emerg. Technol. 16:417-426.

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