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ECO-RESPONSIVE FEEDING AND NUTRITION

LINKING LIVESTOCK AND LIVELIHOOD

ABSTRACT PAPERS

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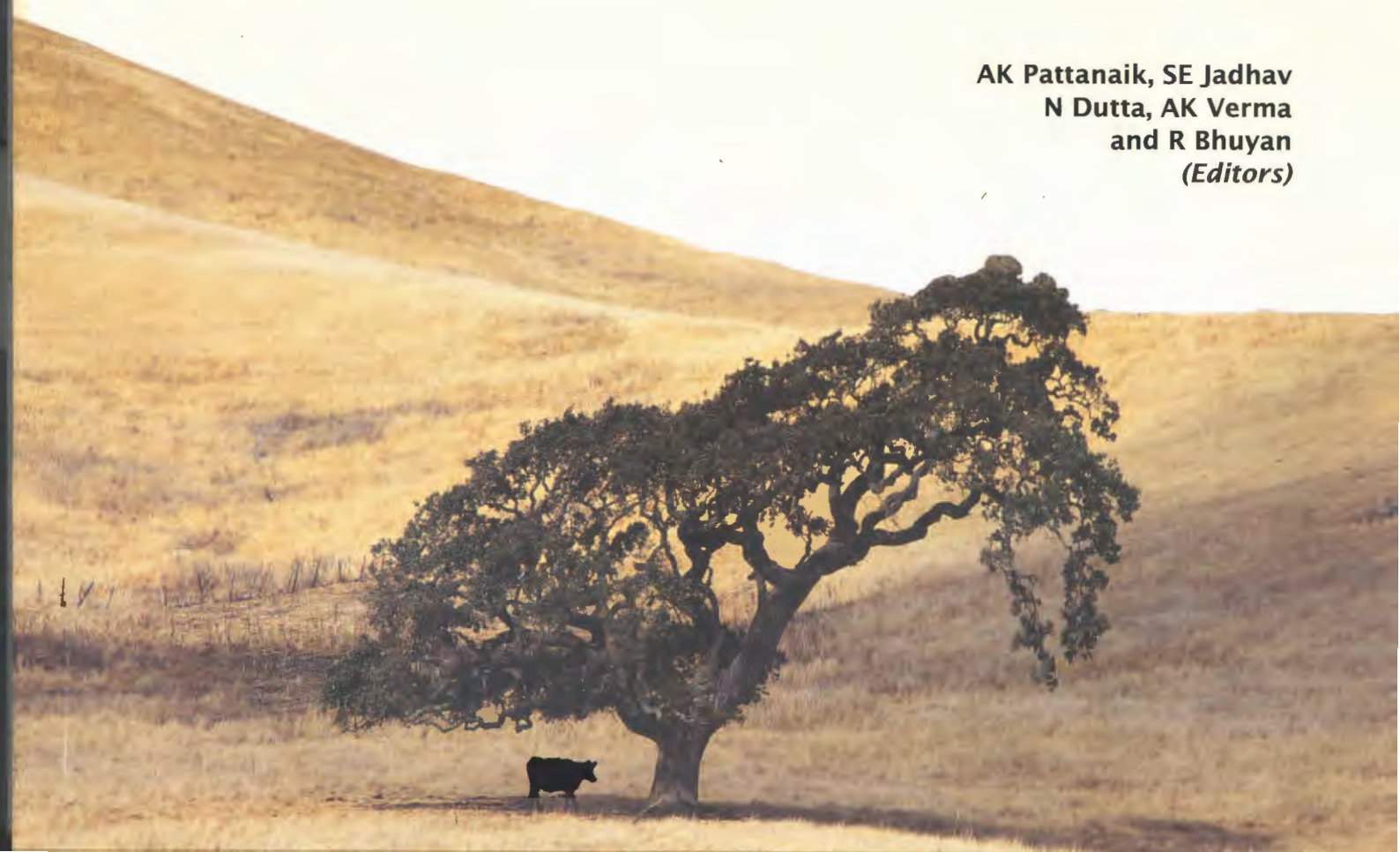

FFS 35

Handheld Mobile Near Infrared Spectroscopy- A Rapid Tool for Quality Evaluation of Feeds

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SUMMARY: A Thermo Micro PHAZIR GP handheld mobile near infrared spectroscopy (NIRS) instrument was tested in predicting protein and fat content of 107 aquaculture feed ingredients. Five NIR spectra (1600-2400nm) were collected from each sample as stored in a polyethylene bag. The sample set was split into a calibration (N= 54) and a validation (N= 53) set. For the NIRS calibration equation development R^2 and SEC were 0.99 and 1.5 for protein and 0.83 and 2.4 for fat, respectively.In the validation set where protein and fat content were blind predicted, R^2 and SEP for comparisons of protein analyzed conventionally and as NIRS predicted were 0.97 and 3.0, respectively. R^2 and SEP for comparisons of fat analyzed conventionally and as NIRS predicted were 0.93 and 2.6, respectively.

Keywords: Aquaculture feeds, Fat, Handheld NIRS, Mobile NIRS, Protein

BACKGROUND

Conventional chemical and *in vitro* analyses are time consuming, laborious and expensive, and therefore Near Infrared Reflectance Spectroscopy (NIRS) has been widely used for predicting feed quality (Shenk and Westershouse, 1993). However, most NIRS instruments to date are stationary and samples need to be send to a central laboratory for analysis. Recently handheld mobile version of NIR instruments have been developed. Most reports on the usage of mobile NIRS come from pharmaceutical industry. The present study explored the use of a handheld mobile NIRS to test key nutrients in feed and feed ingredients used in producing commercial aqua feed in Bangladesh.

METHODOLOGY

Plant and animal based feed ingredients (n=157) were collected randomly from different location of Bangladesh for testing the Thermo Micro PHAZIRGP mobile NIRS for protein and fat estimation. The samples were ground to pass through a 1mm mesh. Conventional protein and fat analysis were carried out by standard AOAC procedures. For NIRS predictions, 5 repositioned scans of the samples were taken through the polyethylene bags and a mean spectrum was calculated as inverse of the reflectance (log 1/R) by the Thermo MICRO Phazir GP chemometrics software. Fifty four samples were used for calibration of the handheld mobile NIRS. The spectra collected were used for developing the best partial least square (PLS) calibration model. Second derivatives were computed by 10 data point gaps used for smoothing by running averages. No samples were eliminated from the dataset by spectral mismatch algorithms. NIRS equations were developed and validated by blind predictions for 53 samples using R^2 and standard error of calibration (SEC) and prediction (SEP) as goodness-of-fit indicators.

RESULTS

For both, NIRS calibration equation development and validation procedures, the goodness-of-fit R^2 and standard error (SE) were very acceptable. Thus R^2 and SEC were 0.99 and 1.5 for protein and 0.83 and 2.4 for fat in NIRS calibration equation developments, respectively. More importantly NIRS blind predicted values- based on these calibration equations-of protein and fat content agreed well with protein and actually measured by conventional laboratory analysis. However, at very low measured fat contents, NIRS predicted values seem to be spurious.

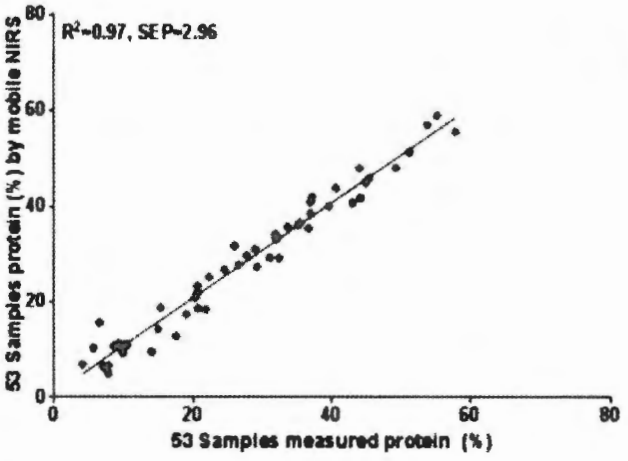

Fig. 1a: Agreement between conventionally measured and NIRS predicted protein content in 53 aquaculture feed ingredients

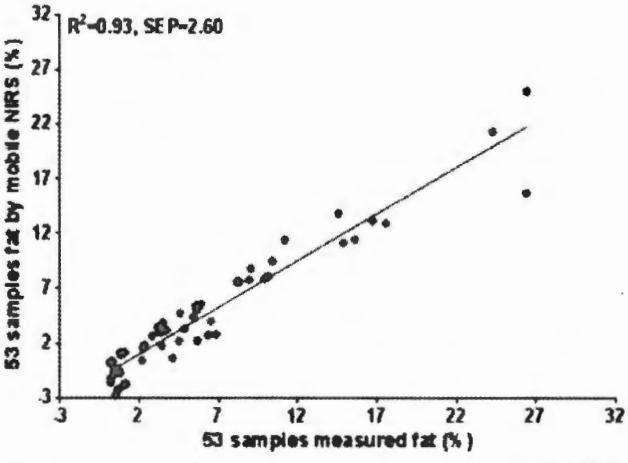

Fig. 1b: Agreement between conventionally measured and *NIRS* predicted fat content in 53 aquaculture feed ingredients

CONCLUSION

Conventionally analyzed and mobile NIRS blind predicted protein and fat contents of aqua feed samples agreed well, suggesting that handheld mobile NIRS technologies can be developed for application at plant, market and field level for rapid, inexpensive feed quality assessments.

REFERENCE

Shenk, J.S. and Westerhaus, M.O. 1993. Crop Science, 33: 582-584.