Report on the development and employment of low cost NIRS devices for breeding in Colombia

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Determining the nutritional contents of forages in the laboratory using traditional methods of wet chemical analysis is time consuming and expensive. Thus, the number of genotypes that can be evaluated is extremely limited. It is necessary to quickly and precisely measure nutritional quality parameters of many genotypes so that decisions can be made in a timely fashion during each breeding cycle. Near infrared spectroscopy provides a cost-effective solution to perform evaluations of nutritional quality contents on a larger number of forages in minimum time with more than acceptable reliability and precision of the data (error of +/- 0.5% compared against wet chemistry calculations).

Widely used as a quantitative and qualitative analysis method, NIRS technology requires the development of prediction models that involve multivariate analysis and analytical chemistry to extract the most relevant information. It is based on measurements of the near infrared light spectrum between 700 to 2500 nm and provides information about the main structural elements and/or functional groups associated with living organisms: CH, OH, NH, SH and C = O, which respond to radiation in the range of these stated lengths (Valenciaga et al., 2006).
The nutritional quality Lab at CIAT has standardized successfully chemometric curves that apply for graminea in general. During 2018, the respective analyses were done in order to standardize the chemometric equation for Brachiaria humidicola to increment the precision within this specie. The results revealed that chemometric models for nutritional quality in B. humidicola were robust and reliable for all parameters under study (ADF, acid detergent fiber, NDF, neutral detergent fiber, CP, crude protein, IVDMD, in vitro dry matter digestibility). New NIRS models enabled CIAT forage breeders to evaluate more samples for nutritional quality.
NIRS equations guarantee high precision when new samples evaluated display values covered within the range of the samples used for the model design, therefore model performance should be regularly monitored by comparing predictions with reference methods. The outcome of this research will be a significant improvement in efficiency in the lab plus a publication in indexed literature. The paper is already drafted and will be submitted in the first semester of 2019. The drafted document can be privately provided upon request, but not published before acceptance by the indexed journal.