The impact of different grinders and grinding size on NIR predicted pepsin cellulase DOMD

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Many laboratories use NIRS to predict *in vivo* digestibility of samples, and achieve this by applying calibration equations that are either purchased or developed from a set of samples which have had detailed wet chemistry performed or for which *in vivo* data is available. These samples may have all been processed through the same laboratory mill using the same screen, or may have come from other laboratories using different equipment or screen sizes. The purpose of the study was to determine if there is an effect of grinder used to process samples on NIR predicted pepsin cellulase DOMD (PC-DOMD). The grinders of interest were the FOSS Cyclotec with 1mm vs the Perten Labmill 3100 with 0.8mm to match the visual grind size as close as possible.

The 19 tropical grass samples used in the study were provided by CSIRO, Floreat and covered a range of *in vivo* digestibility and a range of species including kikuyu, Rhodes and Buffel grass, Panicum and Pangola.

Coarsely ground samples were sub-sampled into two groups. One sub-set chosen at random was processed through the Cyclotec™ 1mm grinder while the second group was processed through the LABMILL 3100 fitted with a 0.8mm screen prior to analysis. Samples were then allocated to three separate NIR vials per treatment and oven dried for 2 hrs @ 80°C, and allowed to equilibrate to room temperature. Vials were analysed by scanning three times using a BRUKER™ Multi-Purpose NIR Analyser and a generic equation to predict sample PC-DOMD. Predicted mean PC-DOMD estimates for each sample were obtained using the Restricted Maximum Likelihood Estimation (REML) directive and compared using a linear regression within Genstat® ver 19.

There was a visible particle size difference between the two grinders used in the study (figure 1), with the CSIRO-Cyclotec having a visibly coarser grind than the LABMILL 3100. Analysis of the results confirming a significant difference (P=0.001) in predicted PC-DOMD between the Cyclotec-1mm and Labmill 3100- 0.8mm grind.

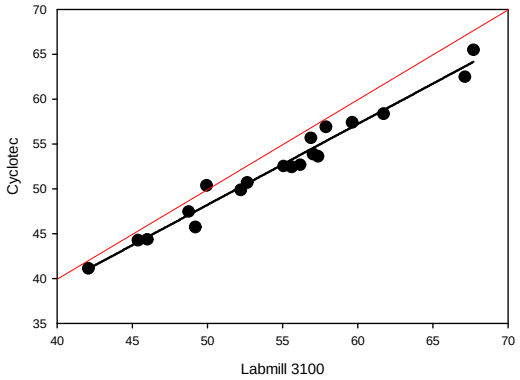

Figure 1. Predicted pepsin cellulase DOMD in samples ground through the Labmill 3100 vs Cyclotec laboratory mills Y=0.90x-3.29 r^2=0.97; se=1.08

The results from this study confirm that using samples prepared through different grinders may result in significant predictive error for PC-DOMD, even when screens of an essentially similar grinding size are used. There is evidence however, that the error could be reduced to an acceptable level with bias adjustments or slope adjustment. It is unclear if a calibration created with both types of grinders could eliminate the effect of grinder. Unless more work is done showing the effect could be eliminated it is not recommended that different grinding preparations be used in development of a particular calibration. This study supports findings of other research (Osborne, 1983).

References

Genstat version 19. VSN International, Hemel Hempstead, UK.
Osborne BG and Fearn T (1983) *Journal of Food Science and Agriculture*. **34 (1)**, 1441-1443.