Whole plant, starch and cell wall digestibility of maize silage

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INTRODUCTION

Maize silage is composed of two main energetic fractions, cell wall and starch, which vary in proportion among varieties and maturity stages, and have a different rate and extent of digestion.

A better understanding of whole plant organic matter digestibility (OMd) variation requires to investigate starch and cell wall digestibility.

OBJECTIVE

Analyse whole plant, starch and cell wall digestibility of maize silage in order to improve evaluation of its energetic value.

METHODS

16 maize silages
- 4 genotypes (A, B, C, D)
- 4 stages of maturity from 27% (milk-dough) to 42% of DM (flint)

\textbf{In vivo digestibility measurement}

\begin{itemize}
  \item A Latin square design for each variety
  \item Each period = 12 days (6 days for acclimatisation phase prior to 5 days measurement phase)
\end{itemize}

Sixteen sheep housed in metabolic crates

Maize silage offered in limited quantity (40g DM/kg P\textsuperscript{0.75})

RESULTS

\textbf{Chemical composition}

\begin{itemize}
  \item Starch (% DM)
  \item Cell Wall (NDF) (% DM)
\end{itemize}

\textbf{In vivo Digestibility}

\begin{itemize}
  \item Cell Wall Digestibility (NDF, %)
  \item Starch Digestibility (%)
  \item Organic Matter digestibility (OMd, %)
\end{itemize}

\begin{table}

\begin{tabular}{|c|c|c|c|}
\hline
Chemical composition & Variety & Stage of maturity & Variety\textsuperscript{*} stage of maturity \\
\hline
NDF & <0.0001 & <0.0001 & 0.43 \\
Starch & <0.0001 & <0.0001 & 0.60 \\
\hline
\end{tabular}

\begin{tabular}{|c|c|c|c|}
\hline
In vivo Digestibility (P-value) & Variety & Stage of maturity & Variety\textsuperscript{*} stage of maturity \\
\hline
OM & 0.02 & 0.37 & 0.22 \\
NDF & 0.77 & <0.0001 & 0.05 \\
Starch & <0.0001 & <0.0001 & <0.0001 \\
\hline
\end{tabular}

CONCLUSIONS

With maturity stage, the increase in starch content and the decrease in NDF content of the plant compensate the decrease in NDF digestibility, leading to a rather constant evolution of OMd.

As OMd variations are closely linked with non digestible cell-wall content, predicting the non digestible cell-wall fraction will help to predict whole plant digestibility.