Effect of silage corn hybrid on fermentation losses

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Introduction In North-Western Europe, silage corn hybrids can be distinguished either into types with different maturation characteristics (stay green and dry down) or into types with a different source of digestible energy (starch and cell walls) (Van Schooten et al.,2002). At a similar whole crop dry matter content (WCDM), stay green type silage corn hybrids (SG) have higher grain dry matter (DM) content and lower leaf plus stem DM content than dry down type silage corn hybrids (DD). This suggests a more mature cob and a less mature leaf plus stem fraction. Among silage corn hybrids with similar organic matter digestibility (OMD), there are hybrids characterized by a relatively high starch content and low fiber digestibility, the so-called starch type silage corn (ST), and hybrids characterized by a relatively low starch content and high digestible cell walls, the so-called cell wall type silage corn (CW). The objective of this study was to evaluate the effects of silage corn hybrid type on fermentation losses.

Materials and Methods In 2003 and 2004, four trials were carried out at two different locations (Van Dijk et al.,2006). Within the variety trial, hybrids SG and DD were most contrasting in maturation characteristics and ST and CW were most contrasting in the source of digestible energy. In each trial four varieties per hybrid type were planted in two replicates. The corn silage was harvested at five different stages of maturity defined by WCDM. The WCDM ranged from 240 to 400 g kg^{-1}. The corn silages were chopped to lengths of 6-8 mm and ensiled in 15-L mini silos. Fermentation products and fermentation losses including effluent losses were quantified.

Results and Discussion Dry matter losses, energy losses and pH value depended on WCDM, but at similar WCDM no differences were found between the contrasting types. Lactic acid, acetic acid and butyric acid content (g kg^{-1}) were neither influenced by WCDM nor the contrasting types. There was a little difference in ethanol content between the contrasting hybrids (Figure 1). The ethanol content of DD was 0.8 g kg^{-1} higher than of SG ($P<0.05$) and the ethanol content of CW was 1.2 g kg^{-1} higher than of ST ($P<0.05$). There was a difference ($P<0.05$) in effluent losses between DD and SG (Figure 2), but not between ST and CW. The minimum DM content to avoid effluent losses was 32,5% for SG and 31% for DD. Effluent losses of SG were higher than those of DD. At equal effluent losses WCDM of SG was 1.5% higher than of DD.

Conclusions

The results of this study indicate that there are hardly any differences in fermentation losses of silage corn hybrids differing in maturation characteristics (stay green and dry down) and source of digestible energy (starch and cell walls). At a given whole crop dry matter content, effluent losses of stay green hybrids are higher than those of dry down hybrids.

References

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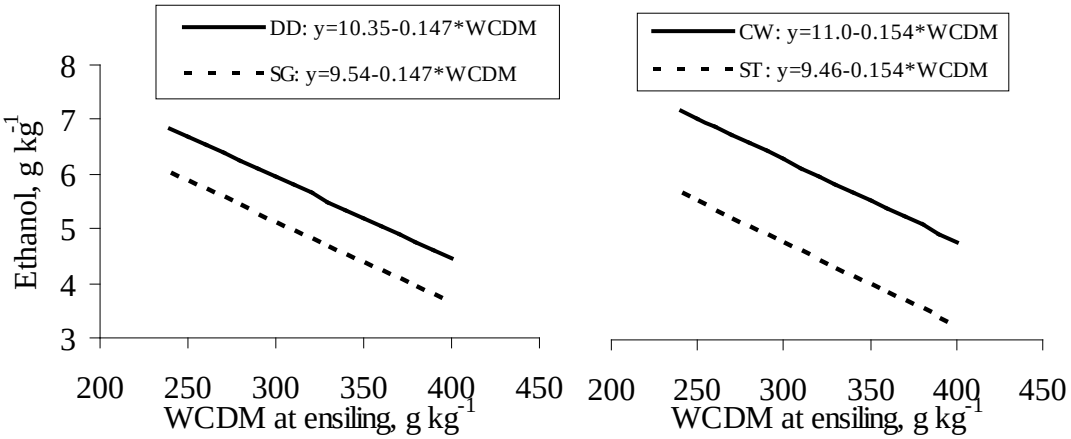

Figure 1 Calculated relationship between WCDM at ensiling and ethanol content for two contrasting maturation types (DD vs. SG) and two contrasting energy types (CW vs. ST)

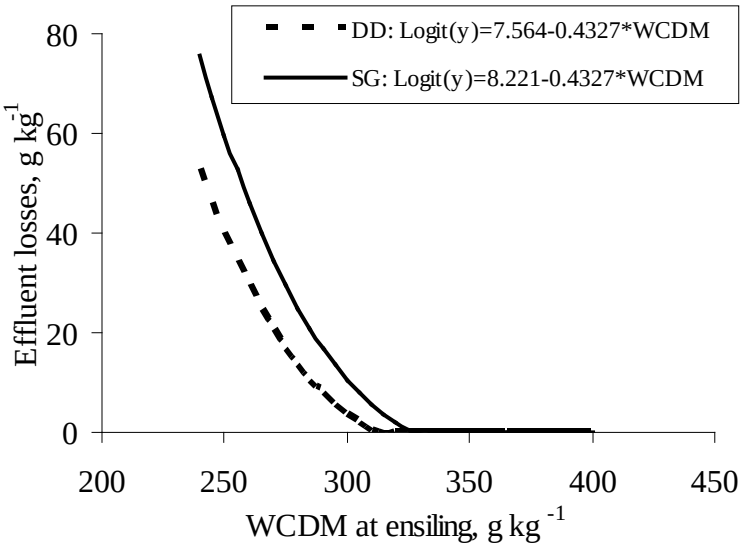

Figure 2 Calculated relationship between WCDM at ensiling and effluent losses during ensiling of two corn silages with contrasting maturation types. Effluent losses as a fraction (p) of the total amount of silage at ensiling was analyzed with the model: $\text{Logit}(p)=\ln(p/(1-p))= \beta_{oi} + \beta_1 * X_{ij}$ where β_{0i} is the intercept (on logit-scale) of maturation type *i*, β_1 is the linear slope parameter (on logit-scale) and X_{ij} is the value of WCDM in silo *j* of maturation type *i*. The model assumes that the variance of the observed effluent losses, Y can be described by the variance (Y I p) = φ*n*p(1-p). Where *n* is the total amount of silage in the silo.