Strategies to maximize kernel processing in Brazilian vitreous endosperm hybrid

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Introduction

Whole-plant corn silage (WPCS) is the predominat source of forage for lactating dairy cattle in Brazil (Bernardes and Rêgo, 2014). WPCS is a high-energy forage composed by stover and grain fractions which are rich in NDF and starch contents, respectively (Dias Junior et al., 2016). For the highest availability of starch in WPCS the kernel processing is crucial (Ferraretto and Shaver, 2012). Despite the increase in custom contractors offering self-propelled forage harvester (SPFH) services (Daniel et al., 2019), the most part of Brazilian dairy farmers harvest the corn crop with a pull-type forage harvester (PTFH) without a kernel processor (KP; Bernardes and Rego, 2014). This is a concern because the most cultivated hybrids in Brazil have vitreous kernels with higher vitreous endosperm proportion (Correa et al., 2002. Futhermore, higher vitreous endosperm is related to kernel hardness (Correa et al., 2002) which makes kernels more difficult to be broken by the harvester's processors (Ferraretto et al. 2018) and this could be worse for a PTFH without KP. Strategies for optimization of kernel processing Brazilian scenario are necessary. The hypothesis of our study was that in order to achieve adequate kernel processing in vitreous endosperm hybrid, a lower TLOC and a longer ensiling time would be required. The objective of this study was to evaluate the impact of two different kinds of forage harvesters, TLOC and ensling time on the kernel processing score of WPCS.

Materials and Methods

Two experiments were conducted to evaluate the effects of theoretical length of cut (TLOC) and ensiling time on WPCS particle size and kernel processing with two different types of forage harvesters. The same vitreous corn hybrid DKB 177 VT PRO 2 was used in both experiments. The average of whole-corn plant DM was 34.2%. In the first experiment, the whole-plant corn was harvested by a pull-type forage harvester (PTFH) at TLOC of 3, 6 and 9-mm. In the second experiment, the harvesting was performed by a self-propelled forage harvester (SPFH) at the following TLOC settings: 6, 12 and 18-mm with a roll gap of 3-mm. The WPCS were stored for 0, 35 and 140 d. Vitreousness, measured by dissection in unfermented kernels, averaged 65.6%. The corn silage processing score (CSPS) or kernel processing score (KPS) was performed as described by Ferreira and Mertens (2005). The data from both trials was analyzed as a split-plot design using the procedure MIXED of SAS. The model included the fixed effects of TLOC, ensiling time and the interaction TLOC × ensiling time. A mini-silo was used as the experimental unit. Means were determined using the LSMEANS statement and were compared using the Tukey test at 5 % of significance.

Results and Discussion

The strategy of reducing TLOC in SPFH improved the KPS. Furthermore, The TLOC of 6-mm led to the best kernel processing for SPFH. The corn silage processing score improved 9.9 % units with 140 d of ensiling for SPFH samples. Ferraretto et al. (2015b) reported a rise of 7 to 10 % units for KPS in WPCS ensiled for at least 30 d and up to 240 d.

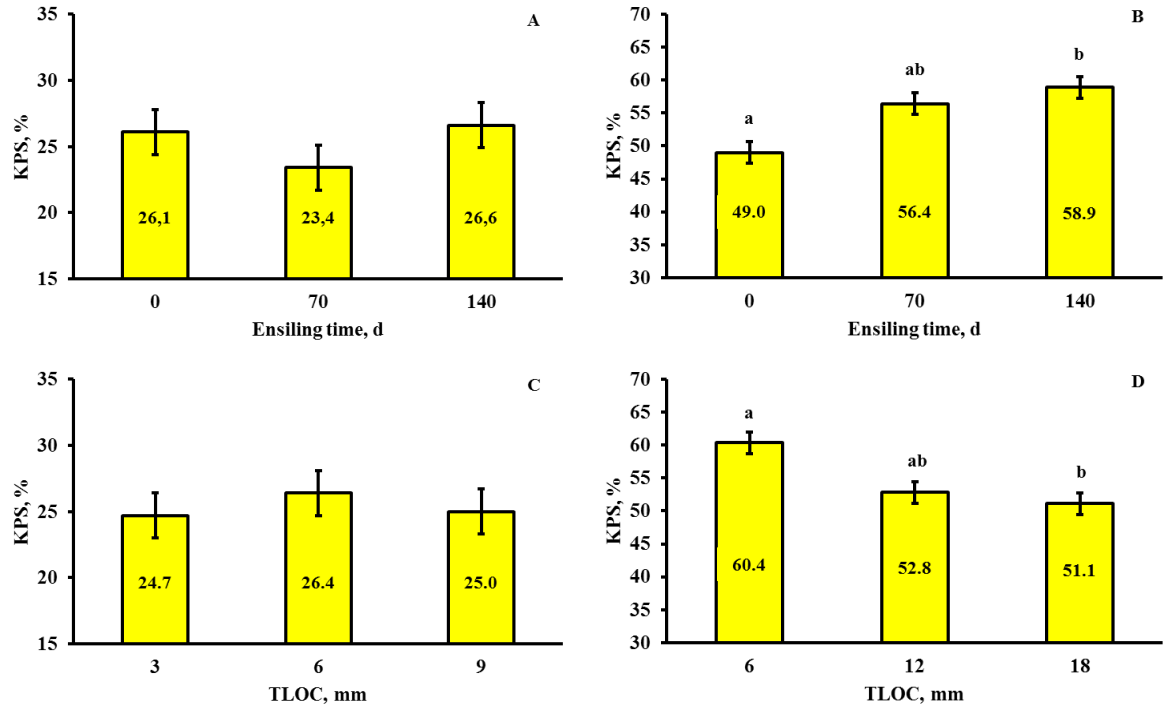

Figure 1. Effect of theoretical length of cut (TLOC) and ensiling time on kernel processing score (KPS) of corn silage samples harvested by a pull-type forage harvester (panel A and C) or by self-propelled forage harvester (panels B and D).

Conclusion

The strategy of reducing TLOC and 140 d of ensiling time was efficient to improve kernel processing only in SPFH.

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