

Corn silage: yield, quality and harvest window

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Introduction The whole plant corn silage is a forage resource that has been increasingly important in Argentina for beef and milk production. The stage of maturity at harvesting and choice of the hybrid influence the physical and chemical characteristics of cell wall and nonstructural carbohydrates in the silage of corn crops (Johnson *et al.*, 2003). In addition, harvest time is variable because farmers do not have their own machinery, so harvest process relay on contractors. As the crop develops, starch is accumulated in the grain, dry matter digestibility decreases in the stover fraction and indigestible NDF fraction increases. Therefore, from the practical point of view, it is important to have hybrids with low drying rates when they have between 30 - 40% dry matter, in order to extend the harvest window (Rodriguez *et al.*, 2009). Consistent with those aspects, the objective of this study was to evaluate, in four corn hybrids, the yield, quality and harvest window of whole plant corn silage.

Materials and Methods Corn hybrids were sown (September 28th, 2011) in Pergamino, Buenos Aires, Argentina, in rows 5 m in long and 0.7 m apart. Treatments were three stages of maturity: early dent (R5), 1/2 milklane (R5.5) and black layer (R6) in four hybrids: NK 900 (H1), DK 747 (H2), PAN 5e 202 (H3) and SU 9939 (H4). Treatments were arranged in a split-plot design with hybrid as the main plot and stage of maturity as the sub-plot and three replicates. Sampling for dry matter yield (DMY) was done in an area of 2.1 m² (R5 and R6) and 7 m² (R5.5). For experimental unit, five plants were separated for determination ear/whole plant ratio (E/WP) and another fifteen were chopped and ensiled in containers 20 l capacity. Silage samples were dried (65 °C) for analyses: dry matter (%DM), *in vitro* DM digestibility (IVDMD) and NDF digestibility (NDFD). With DMY and IVDMD was calculated digestible DMY (DDMY). Whole plant drying rate (WPDR) was estimated from different maturity stages as the ratio of % DM/growing degree day (GDD). Data were analyzed with the MIXED procedure of the SAS system (SAS Institute, Inc., 2008). WPDR was determined by fitting regression using analysis of covariance. Means were compared by LSD test (P < 0.05).

Results and Discussion The interaction between maturity stage and hybrid were not significant for all variables analyzed. Significant main effects were detected for most variables except for IVDMD, as there were not different among hybrids. DMY decreases as the maturity stages progresses due to loss of leaves (Table 1). There was also a decrease in IVDMD. As a consequence, there was a sharp decline in DDMY as harvest stage was delayed. This was partially explained by a low NDF digestibility due to an increase in the complexity of the structure of the cell wall as time go through (Di Marco *et al.*, 2002). The larger harvest window (Figure 1) due to lower WPDR, not necessarily was related with a decrease in IVDMD and NDFD (Table 1).

Conclusions Management practices such as harvest stage and hybrids selection are important factors affecting yield and quality of corn silage. These characteristics could be successfully combined to get a wide harvest window.

References

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Table 1 Dry matter yield (DMY), ear/whole-plant ratio (E/WP), *in vitro* dry matter digestibility (IVDMD), NDF digestibility (NDFD), digestible dry matter yield (DDMY) and whole plant drying rate (WPDR) for four hybrids harvested at three stages of maturity.

	DMY, tn/ha ⁻¹	E/WP, % DM	IVDMD, % DM	NDFD, % DM	DDMY, tn/ha ⁻¹	WPDR, % DM/GDD
Hybrid						
H1	14.9 ^b	51.8 ^{ab}	79.4 ^a	48.8 ^b	11.6 ^b	0.025 ^{ab}
H2	12.4 ^c	56.3 ^a	78.1 ^a	54.7 ^a	9.7 ^c	0.037 ^c
H3	14.3 ^b	46.2 ^b	78.0 ^a	53.4 ^a	11.3 ^b	0.032 ^{bc}
H4	17.3 ^a	49.5 ^b	77.7 ^a	51.5 ^{ab}	13.5 ^a	0.020 ^a
Maturity stage						
R5	16.0 ^a	39.8 ^a	81.4 ^a	58.5 ^a	12.7 ^a	
R5.5	15.2 ^a	55.3 ^b	79.4 ^b	52.6 ^b	11.5 ^{ab}	
R6	12.9 ^b	54.6 ^b	74.1 ^c	45.2 ^c	10.4 ^b	

^{a-c} Means within a column with different superscripts differ ($P < 0.05$).

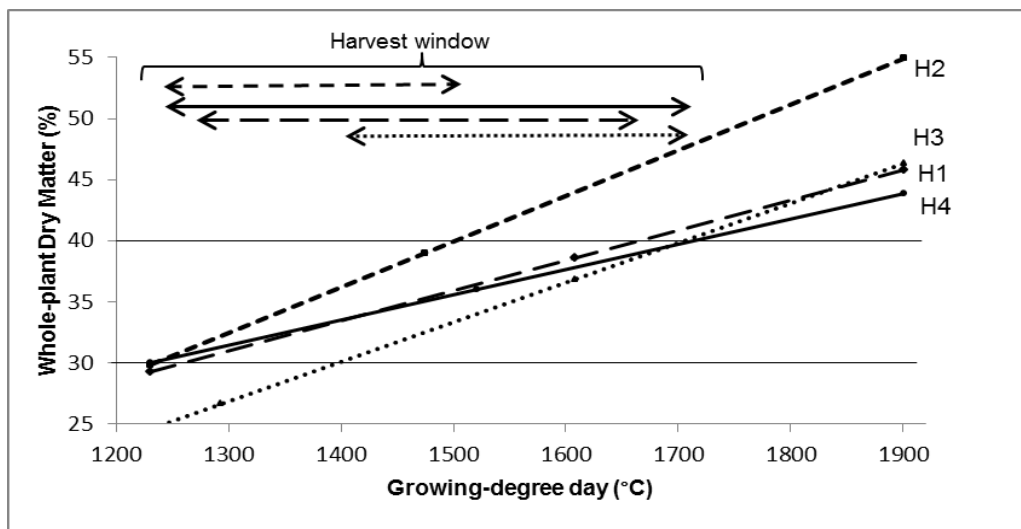


Figure 1 Drying rate effect on the harvest window (30-40% DM) in four hybrids