

# Physiochemical, Nutritional and Molecular Structural Characterization of Silages: Comparison Among CDC Barley Silage Varieties and New Forage Corn Silage for Dairy Cows

Basim Refat<sup>1</sup>, David Christensen<sup>1</sup>, John McKinnon<sup>1</sup>, Aaron Beattie<sup>2</sup>, Wenzhu Yang<sup>3</sup>, and Peiqiang Yu<sup>1\*</sup>

<sup>1</sup>Department of Animal and Poultry Science and <sup>2</sup>Crop Development Center, College of Agricultural and Bioresources, University of Saskatchewan, Saskatoon, SK, Canada

<sup>3</sup>Agriculture and Agri-Food Canada, Lethbridge Research Center, Alberta, Canada.

\*Corresponding author: Email: peiqiang.yu@usask.ca

Whole-crop barley (*Hordeum vulgare* L.) silage is the main forage source for dairy producers in western Canada. There are many varieties are constantly being developed. However, there is limited knowledge on their nutritional quality. The main objectives of this study were to (1) assess the magnitude of difference among CDC developed barley silage varieties in comparison with new corn forage silage in physiochemical features, carbohydrates nutrient fractions and rumen digestive contents in dairy cows and (2) define the interactive association between carbohydrates molecular structure and digestible carbohydrates contents. The experiment was a complete randomized design with four treatments: new forage corn silage (P7213R), CDC Cowboy barley silage, CDC Copeland barley silage and Xena barley silage. Five cannulated lactating dairy cows were used for measuring the rumen degradation kinetics. The carbohydrates related-molecular structure spectral data was collected using Ft/VMS molecular spectroscopy. The results showed that CDC Cowboy barley silage had the lowest rumen degradation of total carbohydrates (TRDC) when compared with other barley silages varieties (32 vs 38 % DM,  $P < 0.05$ ). The new forage corn silage had the highest TRDC compared with all barley silage varieties (42.5 vs 35 % DM,  $P < 0.05$ ). All varieties had a similar total tract NDF digestibility. However, the new forage corn silage and Xena barley silages had higher total tract DM digestibility compared with Cowboy barley silage (568 vs 491 g/kg, DM;  $P < 0.01$ ). The spectral intensities of molecular carbohydrates were significantly correlated ( $-0.88$ ;  $P < 0.05$ ) with silage digestible carbohydrates in dairy cows.

**Implications:** Cowboy barley silage had a lower nutritive value when compared with other barley silage varieties. New forage corn silage has a highly potential to be utilized as a good forage source in western Canada compared with barley silage. The Ft/VMS molecular spectroscopy can be used to rapidly evaluate to the silage quality, particular in the digestible fibre content.