Evaluation of Forage Yield and Quality of Low-Lignin Alfalfa in Monoculture and Binary Mixtures in the Dark Brown Soil Zone of Saskatchewan

D. Damiran, B. Biligetu, L. Pearce, and H.A. Lardner*  
*Department of Animal and Poultry Science, University of Saskatchewan, Saskatchewan, SK  
†Department of Plant Science, University of Saskatchewan, Saskatoon, SK  
*(Tel. (306) 966-2147, h.lardner@usask.ca)

Introduction
Lignin increases with advanced maturity in alfalfa. However, lignin is indigestible and reduces fiber digestibility in ruminants. Thus, reducing lignin content should increase fiber digestibility at any maturity stage.

Objective
To compare low-lignin Hi-Gest® 360 alfalfa (Photo 1) to a conventional legume in both monoculture and binary mixtures.

Materials and Methods
Varieties
Alfalfa: Medicago sativa L. cvs. AC Grazeland (Grazeland) and Hi-Gest 360 (Hi-Gest)  
Hybrid bromegrass (HB): cv. AC Success

Growth Condition
In monoculture: Grazeland and Hi-Gest  
In mixture (binary): Graze+HB and HiGest+HB

Soil zone: Dark Brown Soil in Saskatchewan

Irrigation: July 26, 27, and 29 July 2017, for 12, 24, and 24 mm, respectively

Experimental Setup
Plot: 1.2 m × 6.2 m (7.44 m²) with 4 rows and 48 plots (Photo 2)  
Design: plots in a randomized complete block design, four replicates with forages as treatments

Agronomic Information
Seeding date: July 24, 2017
Seeding rate: 400m² for alfalfa monoculture; 2000m² for alfalfa binary mixture; 167m² for AC Success HB binary mixture

Harvest
At 3 maturity stages (stage) of alfalfa over 2 years: 1 = 10% bloom; 2 = 40% bloom; and 3 = 100% bloom

Harvest dates: June 21, 25, and 29, 2018; July 8, 12, and 16, 2019

Results and Discussion

Fig. 1. Dry matter yield of the experimental site (Means ± SE, kg/ha).

Fig. 2. Lignin content of forages (Means ± SE, % DM).

Fig. 3. Regression relationship between forage lignin (Y; %, DM) and DMY (X; kg/ha) in monoculture (A) and binary mixture (B).

Fig. 4. Crude protein (A) and total digestible nutrients (B) of forages.

Fig. 5. Digestibility of NDF of forages.

Fig. 6. Regression relationship between forage NDFD (Y; % NDFD and lignin content X; % DM).

• Hi-Gest alfalfa had greater crude protein (CP, 19.1 vs. 17.9%) (Fig. 4A), total digestible nutrients (TDN, 68.7 vs. 66.5%) (Fig. 4B), relative feed value (186 vs. 164) and sugar (5.4 vs. 4.8%).

Conclusions and Implications
Hi-Gest 360 alfalfa in monoculture yielded 25% lower than AC Grazeland, however, Hi-Gest monoculture had greater nutritive value than AC Grazeland, and similar yield and quality in binary mixture, suggesting Hi-Gest 360 alfalfa is a viable alternative legume for the Dark Brown soil zone of Saskatchewan. Hi-Gest alfalfa harvested at the stage 3 was very similar with AC Grazeland harvested at the stage 2 (commercial cut) suggesting that it may be possible to delay harvest to get higher CP with the same yield as from standard alfalfa varieties cut earlier.

Acknowledgements
Byambatseren Dashnyam (Department of Plant Science, UsfS) assisted in the field work.