Reduced-lignin alfalfa digestibility and effects on performance of growing beef steers

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Introduction

- Lignin negatively affects the digestibility of forages
- Alfalfa varieties have been developed to have less lignin by genetic modification, (HarvXtra, Forage Genetics International) and by conventional breeding, (HiGest 360, Alforex Seeds)

Materials and Methods

- All alfalfa was harvested as baleage at d 29 of second-harvest maturity
- Table 1
  - 3 alfalfa trtmts x 4 pens/trtmt; 5 or 7 crossbred steers per pen
  - Fed solely HarvXtra, HiGest 360, or LegenDairy alfalfa baleage with access to trace mineral salt block
- Table 2
  - Replicated 3x3 Latin square crossover design
  - 6 crossbred steers (310 ± 5 kg) in individual pens, fitted with fecal collection bags
  - 3, 14 d periods; fecal collection d 12-14

Approach

- Characterize novel reduced-lignin alfalfa varieties, assess their effects on growth of beef steers, and determine digestibilities using a total fecal collection trial

Results

Table 1. Growth performance of beef steers, 83 d

	LegenDairy	HiGest 360	Harv Xtra	SEM	P-value
Lignin, % DM	7.56	7.18	6.30	0.76	0.35
Initial, kg steer^{-1}	300	300	300	0.87	0.64
Final, kg steer^{-1}	378	383	389	6.51	0.28
Gain, kg steer^{-1} d^{-1}	0.94	1.00	1.07	0.07	0.25
DMI, kg steer^{-1} d^{-1}	7.23	7.65	7.77	0.47	0.51
Gain/DMI	0.129	0.132	0.139	0.01	0.78
TTNDFD, % of NDF	33.9	35.0	40.3	2.15	0.08

Table 2. Total tract digestibility of three alfalfa cultivars that differed in lignin concentration at d 29 of second-harvest maturity

	LegenDairy	HiGest 360	Harv Xtra	SEM	P-value
Dry Matter Intake, kg steer^{-1} d^{-1}	6.72	6.65	6.65	0.30	0.98
Dry Matter Excreted, kg steer^{-1} d^{-1}	2.51^{a}	2.44^{a}	2.27^{b}	0.05	<0.01
Dry Matter Digestibility, %	62.4	63.1	65.8	2.5	0.38
NDF Intake, kg steer^{-1} d^{-1}	2.99	3.02	3.08	0.24	0.94
NDF Excreted, kg steer^{-1} d^{-1}	1.40^{a}	1.31^{bc}	1.22^{c}	0.04	<0.01
NDF Digestibility, %	52.6	56.2	60.3	3.0	0.09
ADF Intake, kg steer^{-1} d^{-1}	2.49	2.61	2.54	0.25	0.91
ADF Excreted, kg steer^{-1} d^{-1}	1.14	1.11	1.03	0.04	0.08
ADF Digestibility, %	53.6	56.6	59.4	4.6	0.48
Lignin Intake, kg steer^{-1} d^{-1}	0.47	0.48	0.40	0.05	0.35
Lignin Excreted, kg steer^{-1} d^{-1}	0.44^{a}	0.41^{b}	0.35^{b}	0.02	<0.01
Lignin Digestibility, %	1.52	10.9	12.2	10.6	0.57

^{a,b,c} Within a row, means without a common superscript letter differ (P<0.05)

Alfalfa Harvest at Day 29

Fecal Collection Harness

Conclusions

- Alfalfa lignin concentration differences were not detected through acid detergent-lignin analysis of harvested bales
- Ranking of lignin concentrations, digestibilities, and growth rates followed prevailing logic, though alfalfa variety treatment effects were not detected
- Experimental designs with greater sensitivity should be implemented in the future