

Barley Silage Project Update; January 2014



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Research Silage Samples, 2012 and 2013

- **2012 growing season, 80 Sask barley and 9 Alberta samples of known variety and farm.**
- **2013 growing season, the same number of samples are expected. Summary by variety.**
- **Cumberland Valley Analytical Service Analysis on all samples via DairySmart Nutrition and Dept of Animal and Poultry Science.**
- **NDF rate of fermentarion (30 hr) and volatile fatty acid analysis, J. K. Nair PhD project.**

Main Barley Variety Characteristics

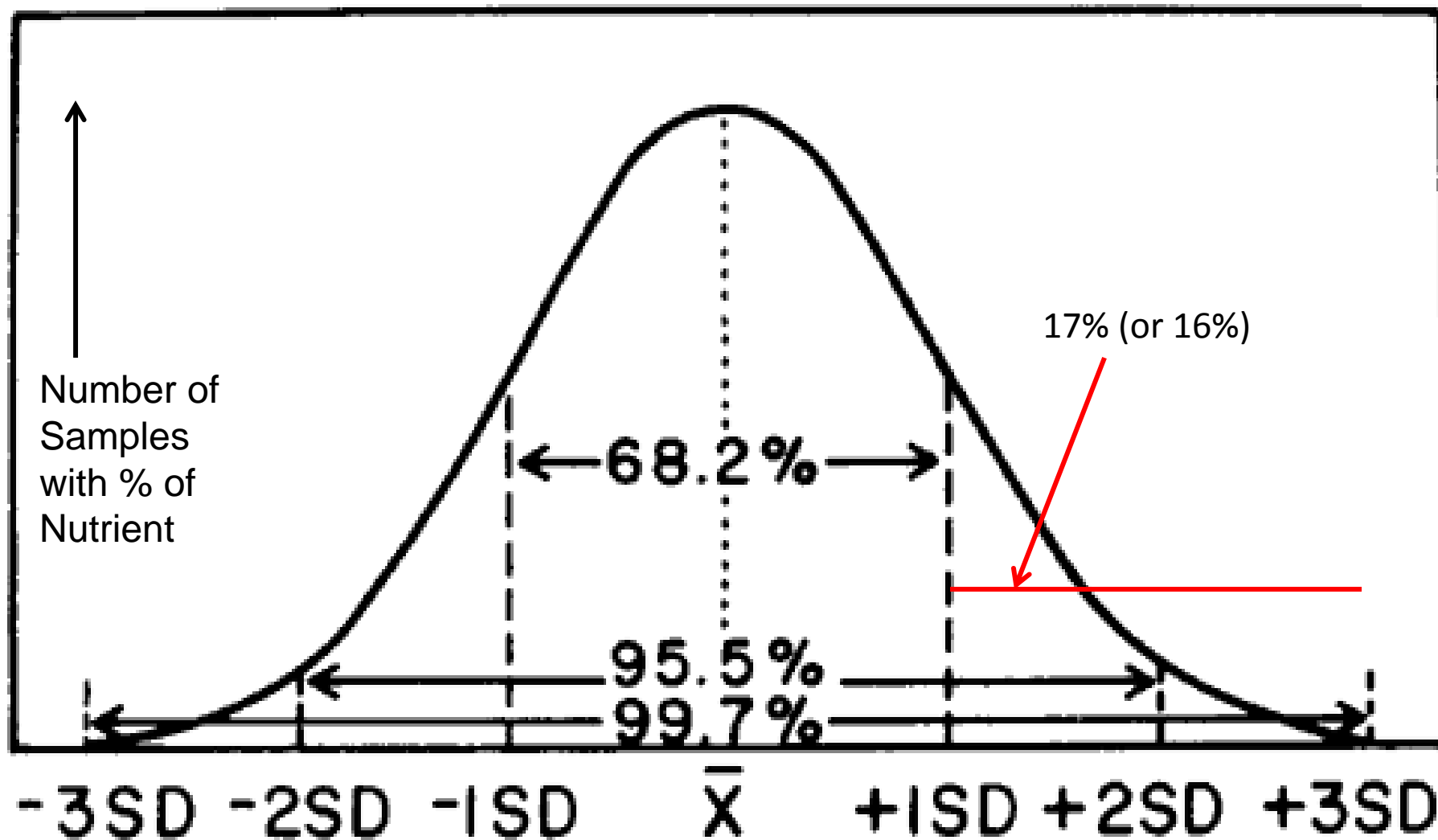
	Type	Row	Awn
Conlon	General	2	Smooth
Copeland	Malt	2	Rough
Cowboy	Feed	2	Rough
Falcon	Hulless	6	Smooth
Legacy	Malt	6	Smooth
Metcalfe	Malt	2	Rough
Ranger	General	6	Smooth
Sundre	Feed	6	Smooth
Xena	General	2	Rough

Cumberland Valley laboratory Barley Silage Composition 2013 Crop Year

Item	Conlon	Copeland	Cowboy	Falcon	Legacy	Corn, Sk	Corn, Mn
Number of samples	10	5	6	5	13	20	12
Dry matter, %	36.0	38.3	36.3	34.3	37.2	38.5	43.8
Crude protein, %	9.7	9.8	10.4	12.1	10.1	8.3	7.97
Soluble CP, % CP	67.0	65.6	56.4	65.0	58.5	43.4	42.1
ADF, %	24.7	26.7	28.5	26.4	26.2	27.7	25.5
NDF, %	39.3	43.5	47.4	40.9	41.5	44.5	42.6
Lignin, %	3.52	3.62	3.91	3.77	3.84	3.10	3.21
Crude fat, %	3.57	3.31	3.06	3.12	2.90	3.01	2.96
Sugar, %	3.96	6.24	3.6	1.8	3.58	1.11	1.16
Starch, %	25.1	20.2	21	24.10	25.1	28.0	31.8
TDN, %	68.7	67.7	64.9	67.0	66.8	70.2	71.3
pH	3.93	3.94	4.15	4	4.11	4.03	4.12
Ash, %	7.46	6.71	7.21	7.74	7.20	4.28	4.19

The Normal Distribution Curve

How much variation is there in silage composition



Western Canadian Barley Silage, 2013

Item	Average	Lowest	Highest
Barley Silage	93 Samples	17%	17%
Dry matter, %	37.4	33.1	41.7
Crude protein, %	10.3	8.73	11.9
Soluble CP, % CP	62.9	53.8	71.9
ADF, %	27.4	23.9	31.0
NDF, %	44.0	39.0	49.0
Sugar, %	3.52	1.33	5.71
Starch, %	21.9	15.9	27.9
TDN, %	66.4	63.3	69.5
pH	4.12	3.77	4.47
Ash	7.06	6.02	8.10

Saskatchewan Legacy Silage, 2013

Barley Silage	13 Samples	17%	17%
Dry matter, %	37.2	32.4	42.0
Crude protein, %	10.1	8.46	11.80
Soluble CP, % CP	58.5	48.9	68.1
ADF, %	26.2	24.3	28.0
NDF, %	41.5	38.9	44.1
Sugar, %	3.58	1.20	5.96
Starch, %	25.1	20.7	29.5
TDN, %	66.8	65.3	68.4
pH	4.11	4.02	4.20
Ash	7.20	6.78	7.62

Saskatchewan Conlon Silage, 2013

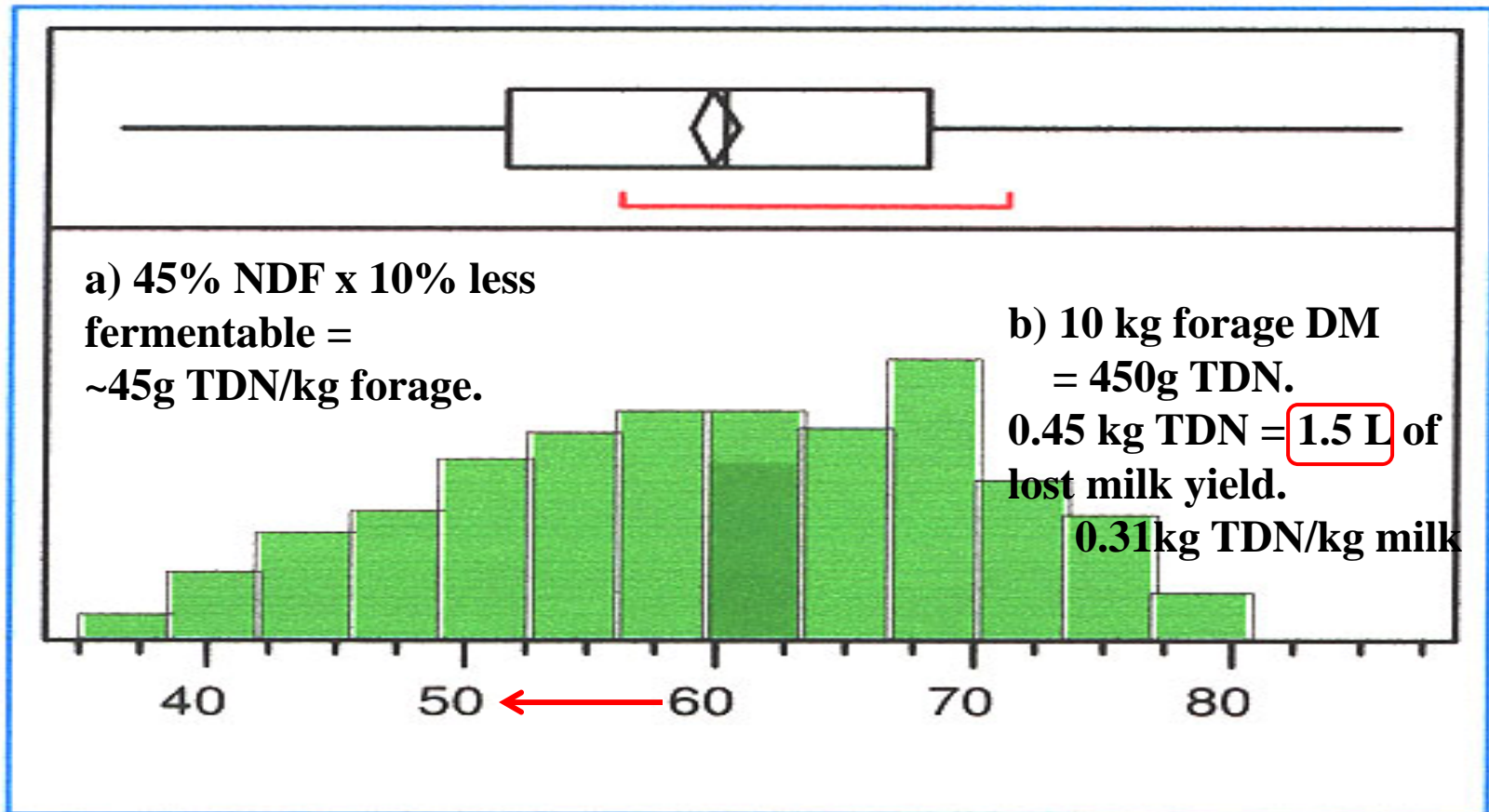
Barley Silage	10 Samples	17%	17%
Dry matter, %	36.0	33.1	38.9
Crude protein, %	9.7	8.8	10.60
Soluble CP, % CP	67.0	61.7	72.2
ADF, %	24.7	22.0	27.4
NDF, %	39.3	35.7	43.0
Sugar, %	3.96	1.84	6.08
Starch, %	25.1	22.5	27.8
TDN, %	68.7	66.3	71.2
pH	3.93	3.81	4.05
Ash	7.46	6.33	8.59

Variation in NDF Fermentation in 40 Hours

95% of Samples are Between 40 and 80% Fermented

F. Small Grain Forage

Mean = 59.9% Std Dev = 10.4 N = 569



Summary

- **The 93 Barley silage samples (2013) averaged 44% NDF, 21.9% starch and 66.4% TDN.**
- **There was variation within as well as among Varieties. Yield information was not available.**
- **The variation in percent of NDF fermented in 30 hours could account for differences of 1.5L milk per day.**

AAFC/Laval Barley and Corn silage Compared to Saskatchewan					
Item	Barley Silage		Corn Silage		
	Sask	AAFC		Sask	AAFC
Samples	93, 2013	1		20, 2013	1
Dry matter, %	37.4	31.8		38.5	31.3
Crude protein, %	10.3	9.04		8.3	7.95
Soluble CP, % CP	62.9	NA		43.4	NA
ADF, %	27.4	34.9		26.7	23.4
NDF, %	44.0	52.3		44.5	36.7
Sugar, %	3.52	NA		1.11	NA
Starch, %	21.9	13.9		28.0	32.2
TDN, %	66.4	NA		70.2	NA
pH	4.12	4.31		4.03	4.08
Ash	7.06	6.10		4.28	3.10
AAFC/Laval; Journal of Dairy Science 97(2):961. 2014					
Conclusions on corn silage					
Less methane production					
Improved milk production					
Higher Dry matter Intake					
Less urinary nitrogen loss					

Image courtesy: google images



Nutritional Evaluation of Forage Barley Varieties for Silage and Swath Grazing

Dairy Day Presentation

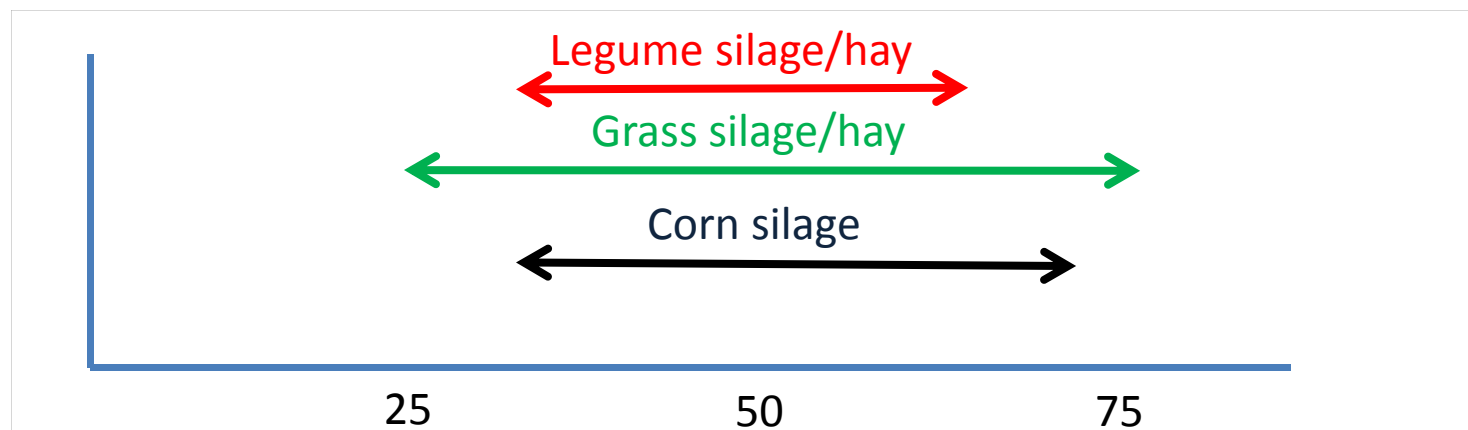
By

Jayakrishnan Nair

30th January 2014

Neutral Detergent Fiber (NDF) digestibility

- Forages 40 - 50% NDF
- Forages are the major source of dietary NDF for dairy cattle
- Rumen digestibility of NDF varies widely among various forage types



NDF digestibility (% of NDF)

Hoffman et al. (2001)

Increased NDF digestibility of forages increases dry matter intake and milk yield ...

Item	Dietary NDF digestibility (% of NDF)		
	45%	50%	55%
DMI (lbs/d)	45.1	48.6	51.3
NDF intake (lbs/d)	18.7	19	21.6
Milk yield (lbs/d)	70.3	73.2	73.6

Hoffman and Bauman 2003

- In general,
 - Dry matter intake increases 0.37 lbs/d for every % increase in NDF digestibility (Oba and Allen 1999)
 - Milk production increases 0.55 lbs for every % increase in NDF digestibility (Oba and Allen 1999)
 - Increase average daily gain of feedlot cattle
 - Reduced manure output

Factors affecting NDF digestibility

- Plant species
- Variety within species
- Stage of maturity at harvest
- Climatic condition
- Interaction

Objectives

- To determine and evaluate the NDF digestibility of barley varieties ensiled typically in Western Canada
- Select 3 varieties which vary in NDF digestibility, grow and ensile.
- Feedlot, metabolism and dairy trials to evaluate the nutritive value

In vitro Daisy^{II} incubation

- Advantages of using Daisy^{II} incubator
 - Accurate results
 - Can use > 100 samples at a time
 - Reduced labor costs



Image courtesy: Ankom technologies

Year 1 (2012)

- 80 samples
 - (9 from Alberta)
- 16 varieties

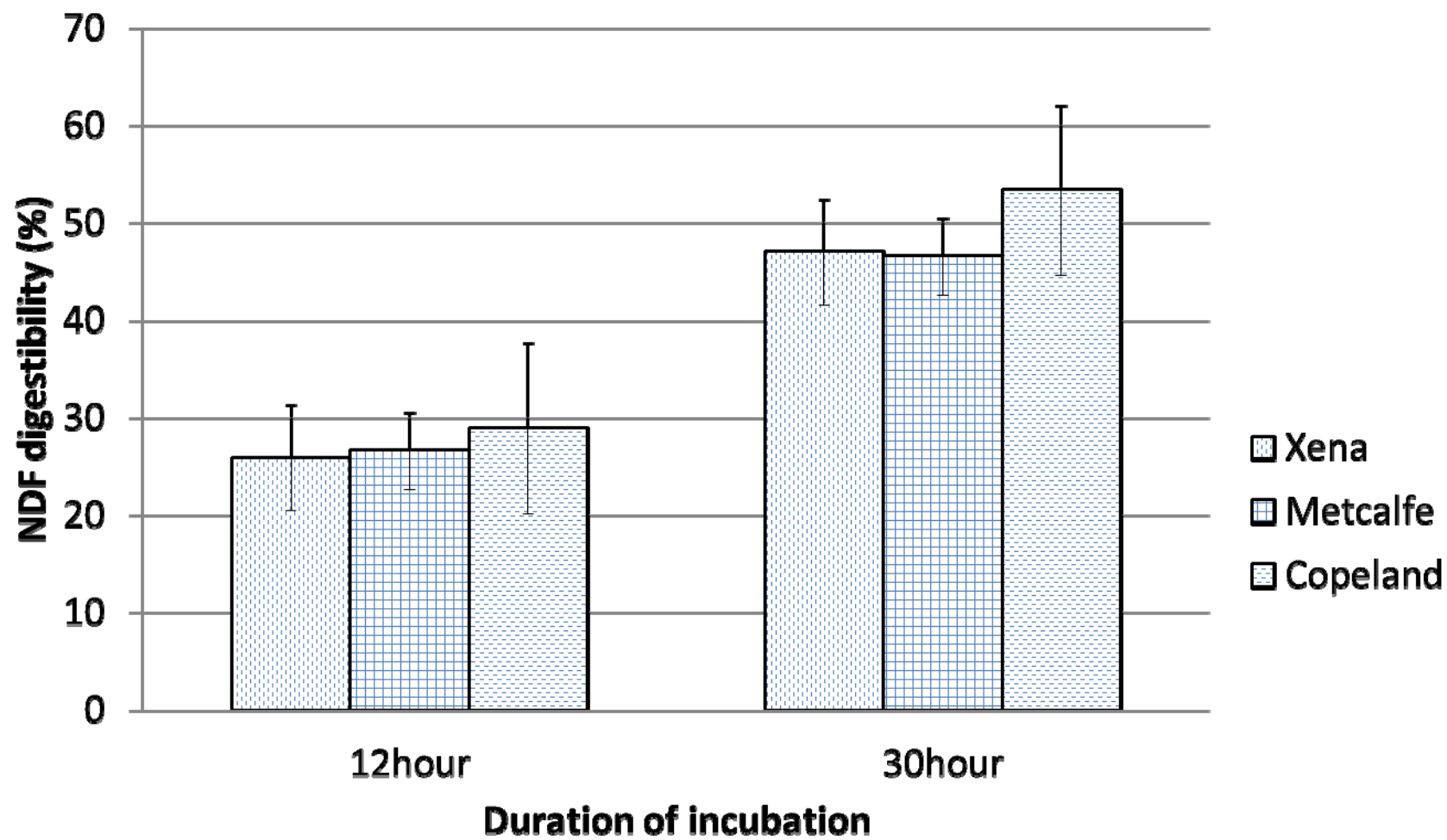
Variety	No. of samples
Champion	4
Chigwell	1
Coalition	1
Conlon	5
Copeland	8
Cowboy	5
Falcon	3
Harper	2
Legacy	3
Metcalfe	14
Newdale	5
Ranger	3
Rosser	5
Sundre	5
Virden	3
Xena	12



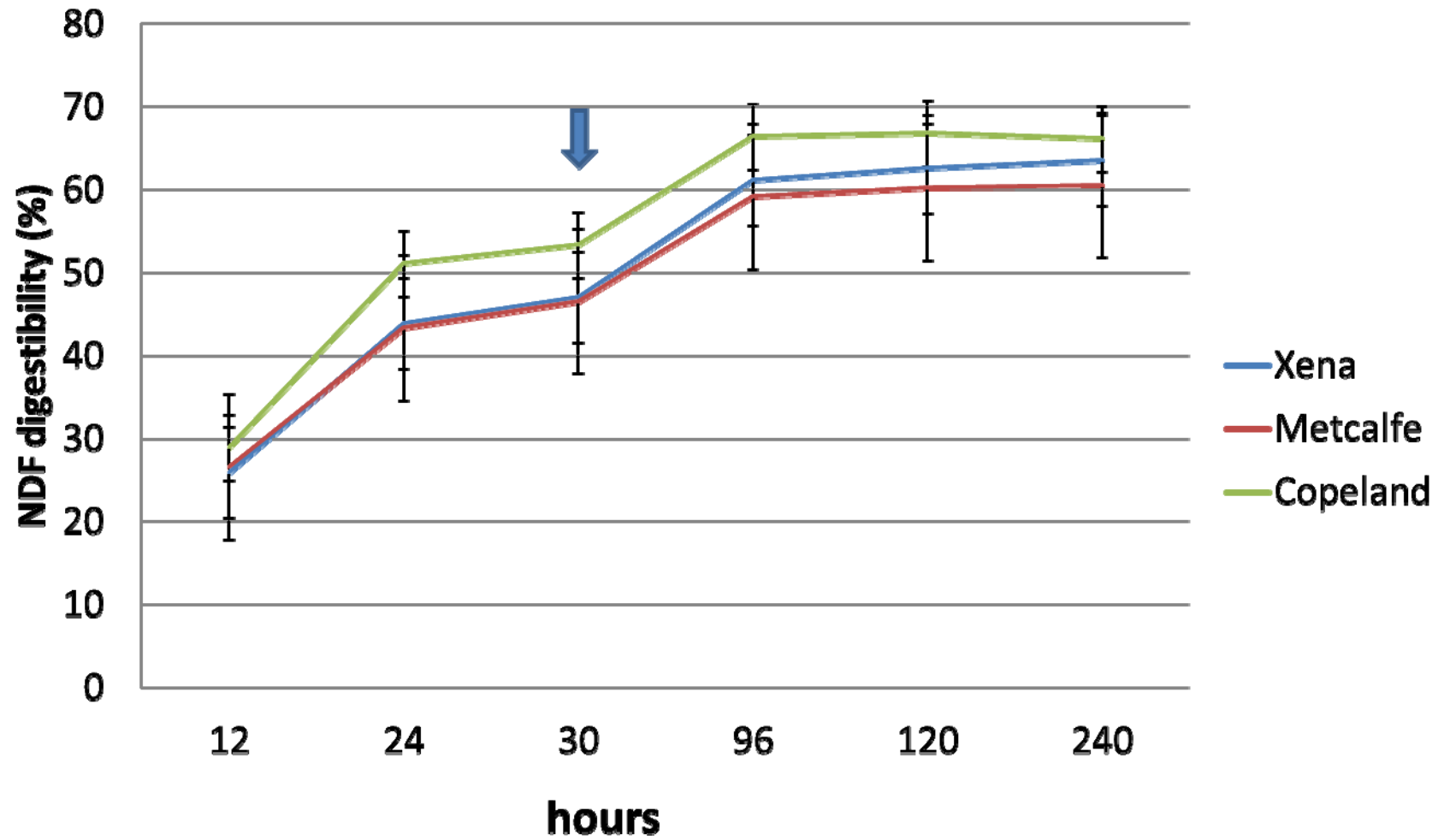
Image courtesy: Google images,
Ankom technologies

Cumberland Valley Analytical Services results

	Variety (n = 2)	CP	NDF	ADF	Lignin	Starch
1	Xena	11 ± 1.5	44.5 ± 3.1	27.2 ± 2.6	3.6 ± 0.48	21.8 ± 4.1
2	Metcalf	12 ± 2.3	43.4 ± 0.85	27.4 ± 2.6	4.2 ± 0.38	23.8 ± 4.0
3	Copeland	12 ± 0.14	43.9 ± 0.42	27.5 ± 0.78	3.5 ± 0.55	21.4 ± 1.8



NDF digestibility of barley silage samples incubated *in vitro*



In vitro NDF digestibility of barley silage varieties

- Year 1 (2012) samples analyzed for NDFD
- More samples to come from Year 2 (2013)
- Growing of selected varieties in summer 2014
- Feedlot performance trials, metabolism trial and dairy trial in next couple of years.

Acknowledgements

- Saskatchewan Agriculture Development Fund
- Canadian Cattleman's Association
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- University of Saskatchewan
- Dairy Smart Nutrition
- Cumberland Valley Analytical Services
- Dairy Producers

