Barley and Corn Silage Varieties for Dairy Cattle in Saskatchewan in 2013

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Leland Fuhr, Dairysmart Nutrition
AAFC, Outlook and Lethbridge
Seed Companies
Dairy producers
ADOPT and Sask Forage Association

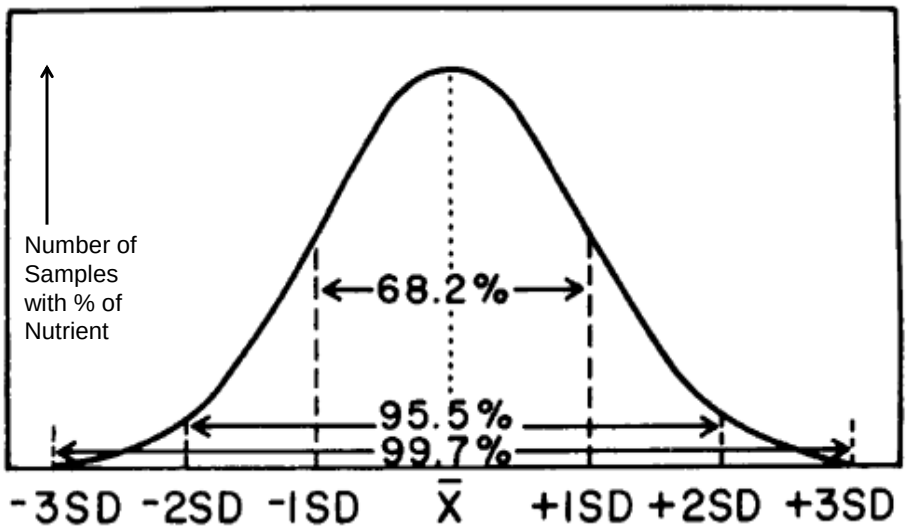
Barley and Corn Silage Evaluation

A priority of dairy and beef producers

- ADF corn variety evaluation, Yu and Christensen
- ADOPT on farm barley variety evaluation, Saskatchewan Forage Council
- Beef Cattle Research Council, barley silage evaluation, John McKinnon, Christensen, others
- Evaluation of protein characteristics of feeds, Peiqiang Yu, D Christensen, ADF.

The Normal Distribution Curve

How much variation is there in silage composition



Average Composition, Plus and Minus One Standard Deviation

Variation in Barley Silage Composition

Item	Average	17% less	17 % more
CVAS, 2012 Crop	79 samples	Than	Than
Dry matter, %	37.4	32.4	42.4
Crude Protein, %	11.4	9.9	12.9
Soluble CP, % of CP	60	52	69
NDF, % of DM	46.2	41.5	50.8
Starch, % of DM	19.6	13.6	25.6
TDN, % of DM	64.8	62.2	67.4
Iron, ppm	183	43	323
Ash, %	7.4	6.1	9.6
DCAD, meq/kg DM	447	306	588

Cultivar Characteristics ADOPT Project, 2012				
Characteristic	Falcon	Legacy	Ranger	Sundre
Row	6	6 Malt	6 GP	6
Awn	smooth	smooth	smooth	smooth
Height, cm	68	84	75	88
Hull	loose	tight	tight	tight
Disease	F to G	P to G	VP to G	P to VG
Maturity	early	medium	+2 days	late
Grain Yield	low	101- 104%	above Ave	116 - 120%

ADOPT Sask Dairy Forage Project				
Falcon barley Silage Variation				
Analysis	Dalmeny 1	Dalmeny2	Osler 1	Average
Dry matter, %	36.2	33.1	30.1	33.1
Crude protein, %	12.7	15.3	14.8	14.3
Soluble CP, % CP	61.6	68.8	65.8	65.4
ADF, %	26.3	26.3	25.0	25.9
NDF,%	40.9	43.6	42.7	42.4
Starch. %	19.6	14.4	17.3	17.1
Potassium, %	1.82	2.12	1.92	1.95
DCAD, meq	206	280	180	222
TDN, %	65.1	64.4	65.1	64.9
pH	4.11	4.06	3.97	4.05
Acetic acid, %	0.93	2.04	1.31	1.43

ADOPT- Saskatchewan Forage Council Project, 2012				
		Variety		
Item	Falcon	Legacy	Ranger	Sundre
Dry matter, %	33.1	33.8	33.8	37
Crude protein, %	14.3	13.0	13.1	10.6
Soluble CP, % CP	65.4	63.4	64.8	61.9
ADF, %	25.9	27.1	29.5	34.6
ND Residue	42.5	45.0	47.2	51.4
Sugar, %	3.8	2.2	2.5	2.6
Starch, %	17.1	19.6	15.6	13 *
TDN, %	**64.9**	**64.6**	**63.9**	**58.3**
pH	4.05	3.97	4.03	4.05
Iron, ppm	131	87	90	221 *

Barley Silage Samples, 2012 Crop year				
SADF, Dairysmart Nutrition, CVAS				
Total samples with analyse, 84				
Identified Cultivars to Dec 24, 2012; 64				
Cultivar	number		Cultivar	number
Metcalfe	13		Ranger	3
Copeland	8		Legacy	3
Xena	8		Sundre	3
Conlon	7		Virden	3
Cowboy	4		Champion	2
Newdale	4		Falcon	2
Rosser	4			

Cumberland Valey Analyses (Dairysmart Nutrition), ADF Project				
Item	Falcon,2	Legacy,3	Ranger,3	Sundre,3
Dry matter, %	34.9	40	39.7	35.6
Crude protein, %	11.3	12.3	10.5	10.9
Soluble CP, % CP	60.9	58.9	50.7	63.2
ADF, %	26.4	25.7	30.6	29.7
ND Residue	41.5	39.2	48.4	46.5
Sugar, %	1.6	2.3	5.1	1.2
Starch, %	23.6	26.3	17.2	20.6 *
TDN, %	66.8	66.8	63.4	63.8
pH	NA	4.13	NA	4.32
Iron, ppm	171	118	139	159

Cultivar Characteristics ADF-Dairysmart Project, 2012					
Characteristic	Copeland	Conlon	Cowboy	Metcalfe	Xena
Row	2 Malt	2 GP	2 feed	2 malt	2 GP
Awn	rough	smooth	rough	rough	rough
Height, cm	83	82	105	82	79
Hull	tight	tight	tight	tight	tight
Disease	P to G	VP to G	P to G	VP to VG	VP to G
Maturity	medium	2 day early	late	medium	1 day late
Grain Yield	107-108%	low	99- 105%	100%	109-166%

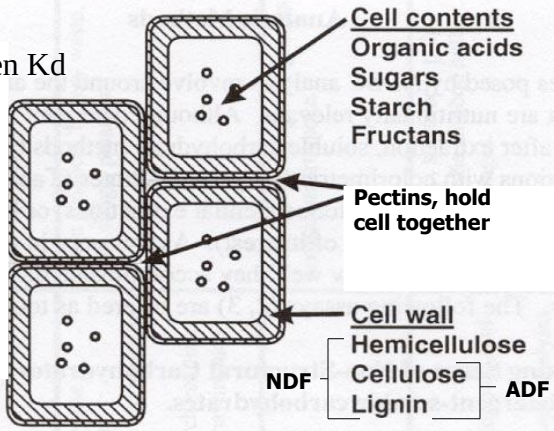
Cumberland Valey Analyses (Dairysmart Nutrition) ADF Project						
Item	Copeland	Conlon	Cowboy	Metcalfe	Xena	Corn, Sk
Number of samples	6	5	8	14	10	10
Dry matter, %	33.9	34.8	36.5	38.1	36.8	39.4
Crude protein, %	11.3	11.1	11.8	12.0	10.9	8.0
Soluble CP, % CP	66.0	65.4	62.9	59.7	57.7	40.9
ADF, %	28.9	28.0	31.6	29.7	28.0	28.0
ND Residue	45.5	43.1	49.0	47.0	45.7	46.2
Sugar, %	2.87	1.98	3.48	2.08	2.39	2.23
Starch, %	18.4	24.5	12.1	19.3	23.5	25.2
TDN, %	66.3	64.8	63.2	64.2	65.2	67.3
pH	4.02	4.02	4.24	4.16	4.05	4.03
Iron, ppm	266	301	134	177	145	157
Ash	6.73	8.4	8.3	7.49	6.67	4.98

Metcalfe Barley Silage (CVAS picture)

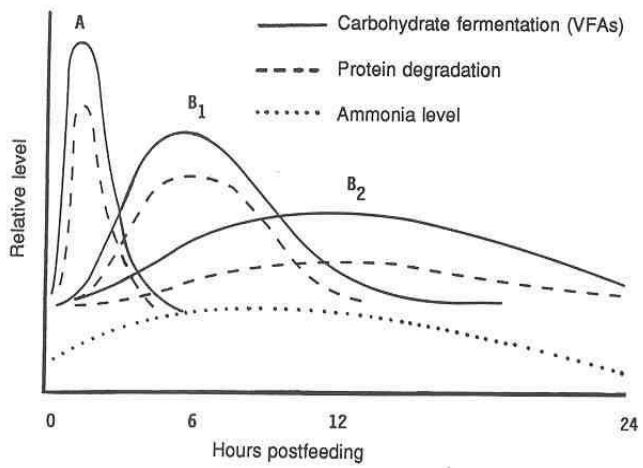
22 % starch, ADF 30%, NDF 36%, 7.5% ASH

Plant Cell Carbohydrates

The basis of CNCPS fractions, and related to rumen Kd

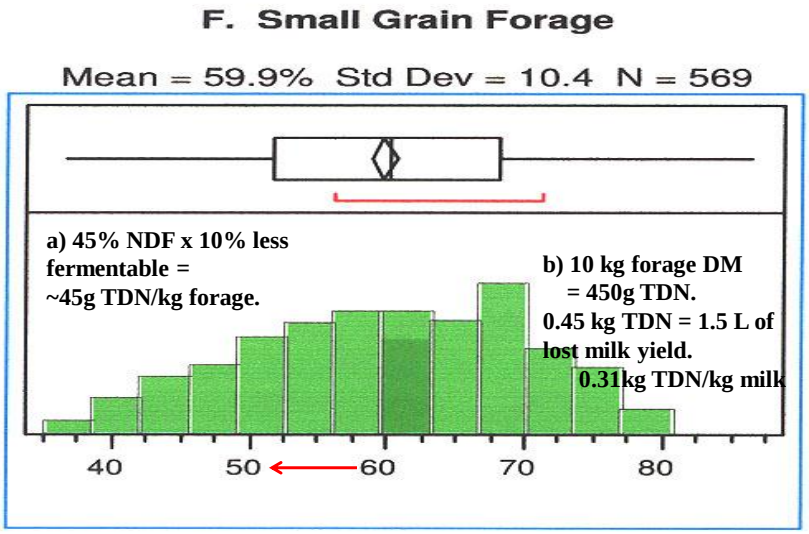


Carbohydrate and Protein Utilization Rates in the Rumen



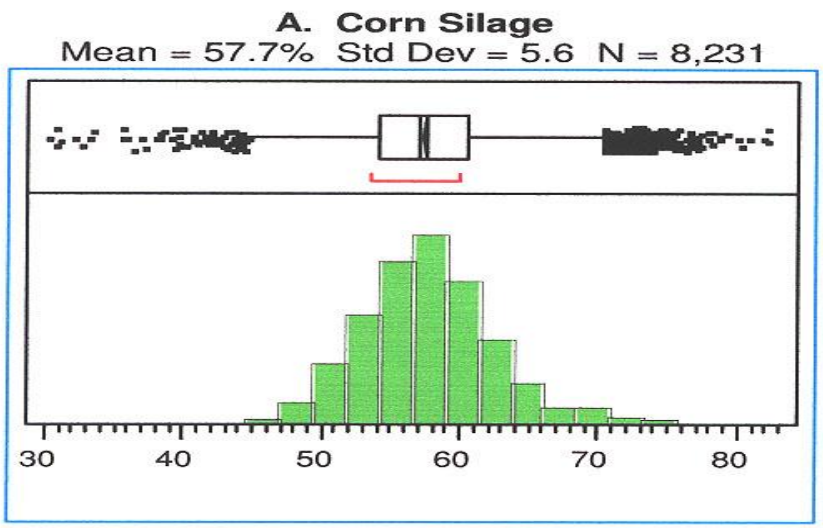
Variation in NDF Fermentation in 40 Hours

95% of Samples are Between 40 and 80% Fermented



Variation in NDF Fermentation in 40 Hours

95% of Samples are Between 46 and 69% Fermented



Corn Silage as an Alternative to Barley

Higher yield potential, benefit of irrigation

Higher Heat Unit requirement

Higher net energy, lower crude protein

Cost of seed, fertilizer and weed control.

Manitoba has a useful cost calculator.

http://www.gov.mb.ca/agriculture/financial/farm/pdf/copcerealsilagecosts2009.pdf

Barley & Corn Silage Cost Summary - March, 2009

	Barley Silage		Corn Silage		
A. Operating Costs	Cost/ Acre	Cost/ Ton Wet	Cost/ Acre	Cost/ Ton Wet	Your Cost
Total Operating Costs	$141.61	$23.60	$266.96	21.36	
B. Fixed Costs					
2. Depreciation					
3. Investment					
C. Labour					
Total Cost of Production	$219.46	$36.58	$353.28	$28.26	
Estimated yield per acre Wet ton		6.0		12.5	

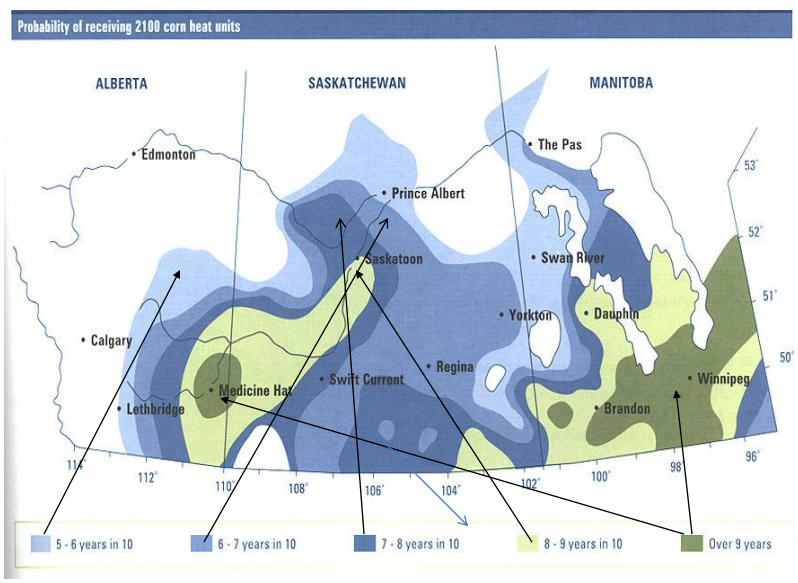
Crop Heat Units (CHU)

- Calculated from day temp over 10C. Night over 4.4C
- 33 CHU areas in Sask. Shows daily and Cumulative CHU

http://www.farmzone.com/index.php?product=farmzone&pagecontent=saskatchewan

- Know corn variety CHU target
  - But, corn development varies with soil moisture and temp.
  - Cloud cover
  - Latitude
- **How to judge corn maturity, white line ???**
- **Is the starch content over 30% ???**

Probability of 2100 Heat Units

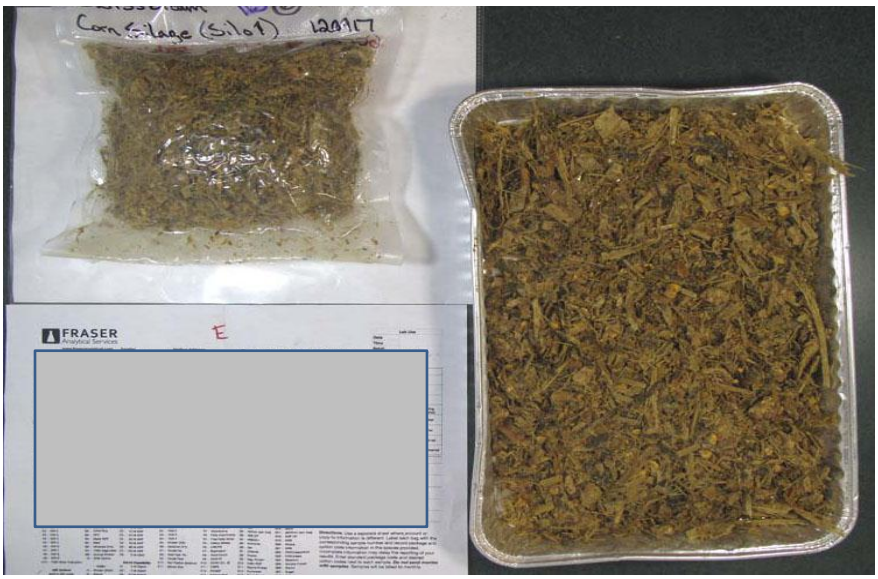


	AAFC Outlook Corn Green Chop Composition, 2011						
Item	Hyland	Hyland	Hyland	Pioneer	Pioneer	Pioneer	
	HL SR06	HL SR 22	BAXXOSRR	P7213R	7443R	7535R	Average
Target Crop Heat Units	2250	2525	2250	2050	2100	2100	
DM Yield Tonnes/acre	5.9	6.7	6.1	6.6	5.9	5.9	6.2
Crude Protein, % DM	8.95	7.07	6.16	6.90	7.25	6.40	7.12
Soluble CP, % CP	42.5	44.4	51.1	45.4	42.5	46.7	45.4
ADF, % DM	26.9	31.2	28.5	26.5	28.9	28.2	28.4
NDF, %DM	46.9	54.0	48.9	47.2	49.8	49.8	49.4
NDF % rumen fermented	53	59.0	52	63	53	49	55
Starch, % DM	25.2	16	22.2	27.5	25.8	24.6	23.6
Ash, % DM	5.4	5.0	5.2	4.6	4.7	4.5	4.9
TDN, % DM (NRC 2001)	68.7	66.1	67.1	69.8	67.9	68.6	68.0
NE L 1x, Mcal/kg DM	1.60	1.53	1.54	1.62	1.58	1.59	1.58

Alberta Corn Committee Corn Green Chop Yields, 2012			
Yield LSD, 1.1	Outlook, Sk	Silking	Yield/acre
Company	Hybrid	Date	Tonnes
Hyland	3093	Aug 9	7.20
Hyland	R219	Aug 8	7.85
Hyland	3085	Aug 9	7.12
Hyland	BaxxosRR	Aug 6	5.91
Hyland	3120	Aug 12	7.08
Pickseed	2262RR	Aug 8	6.39
Pickseed	SilExBtRR	Aug 8	7.24
Pickseed	22248VT2P	Aug 11	7.04
Seeds 2000	2791RR	Aug 9	7.77
Syngenta	NO4F-3000GT	Aug 10	7.20
Syngenta	N12R-3000GT	Aug 12	8.05
Syngenta	N20Y-3000GY	Aug 12	7.97
Syngenta	N08N-GT/CB/LL	13-Aug	7.04

High Quality Manitoba Corn Silage

33% Starch, 22% ADF, 37% NDF, 70.6% TDN, 5.6% ASH



Corn “silage” From near Saskatoon

52% DM, 24% ADF, 43% NDF, 34% Starch, 71.5% TDN, 3.0% Ash

Experimental Silos; 250 silos, 1973 to 1993

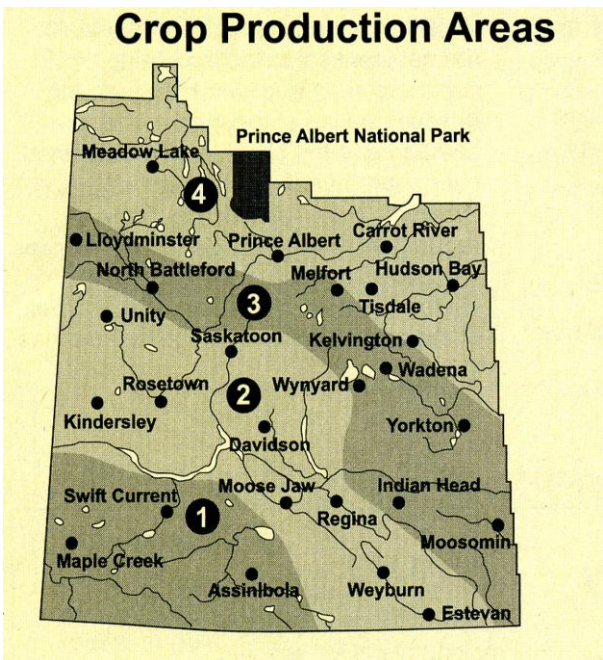
600 kg capacity, Two silos per variety, two steers per silo

Conclusions

- **There is variation in composition of all cultivars from farm to farm and even within farm.**
- **Several barley cultivars appear to be less desirable.**
- **Some of the most popular cultivars are awned.**
- **Ash content is variable and accounts for much of the difference between corn and barley silage TDN.**
- **Soil contamination of samples submitted for analysis must be avoided.**
- **Rumen fermentability of NDF will be measured for further evaluation of cultivars.**

Feeding Value and Stage of Maturity of Annual Cereal Forages

- **Barley harvested as silage. TDN and protein reach peak at mid dough stage.** Yield may increase to late dough. The recommended stage is later than US mid-west due to our longer day length and lower temperatures.
- **Oat. Highest quality at milk stage, digestibility declines as oat matures.**
- **Corn. Harvest anytime after dent stage when the white line is at mid kernel. Starch should be over 20-25% in silage.**
- **Wheat, similar to barley.**
- **Rye and triticale. Highest quality at flower stage. Quality and palatability decline with maturity.**



This Corn had been exposed to its target CHU. Note the milk on the knife blade

How well defined is the white line?