Evaluation corn varieties in the West Central Alberta area

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Partners

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Summary

In 2018, 8 varieties of corn were evaluated for forage dry matter yield and feed quality value in Wildwood, Alberta. Corn Heat Units (CHU) for these hybrids varieties rage from 1950 to 2700. Four of those eight varieties are conventional "non-genetically modified" the rest are Roundup Ready[™] "genetically modified". (Table 1)

Objective

To evaluate eight corn varieties for quality, yield biomass on dry matter basis and maturity.

Treatments				
Company	Variety CHU			
DLS Pickseed ™	2320 RR	2300		
Northstar Seed Ltd.	LR 9573	2200		
Northstar Seed Ltd.	LR 9473	2150		
Northstar Seed Ltd.	LR 9972*	2150		
Green Bos Farms	GS Leafy silage*	2200 - 2700		
CanaMaize™ Seed Inc.	CM 440 *	1950		
CanaMaize [™] Seed Inc.	CM 16N20*	2100		

Table 1. – 2018 corn varieties and CHU. *Conventional varieties.

Methodology

Demonstration plots were planted at the West-Central Forage Association (WCFA) Forage Research Site (SE 27-53-9- W5th) near Wildwood Alberta, in the gray wooded soil zone. Plots were seeded in a prepared seedbed on May 23 with a John Deere corn planter (20 m long 12 rows at 30 inch spacing), at a rate of 30,000 seeds per acre and 62,000 seeds per acre for CanaMaize CM440 variety.

Glyphosate treatments were administered prior to seeding and to Roundup Ready[™] varieties and when the crop was three leaf stage. For conventional varieties 2,4D Ester 700 treatments were administered.

Due to the environmental conditions (temperatures below average and excess moisture) corn plants where stunted and weed pressure extreme, on August 1st all varieties were treated with Alpine G22 plus AAntrex Liquid 480 at 1.25 L/acre, mix.

Once established, rows where trimmed 20 m for uniformity. At harvest, plant and cob population counts were conducted along 17.5m length of 2 rows per treatment (A & B). Above ground plant matter was harvested, weighed and subsampled to determine moisture content, dry matter and feed quality.

Environmental conditions were collected from (Alberta Agriculture) weather station in Evansburg AB and used to determine Corn Heat Units (CHU) which are calculated using maximum and minimum growing season temperatures, and precipitation levels. See Graphs 6, 7 and 8.

Results

Plant count: Plant counts, cob maturity summaries and moisture percentages for each treatment are shown in Table 2.

- Due to frost, corn was harvested before it was mature
- Assessment of cob maturity:

o(R2 Stage: Blister). R2 kernels are white on the outside and resemble a blister. The endosperm and its now-abundant inner fluid are clear. The embryo is still developing, but it now contains a developing miniature corn plant. Much of the kernel has grown out from the surrounding cob materials. The cob is close to full size. Silks are darkening and beginning to dry out. Kernels are beginning to accumulate dry matter. Seed-fill is beginning.

○(R3 Stage: Milk) The R3 kernel is yellow outside, while the inner fluid is now milky white due to accumulating starch. The embryo is growing rapidly. Most of the R3 kernel has grown out from the surrounding cob. Silks are brown and dry or becoming dry. DuPont Pioneer™, Reproductive Growth Stages. Management Guide.

Variety	# Plants	R2-cobs	R3-cobs	Total cobs	Moisture %
Thunder Seed A	34	30	0	30	76.47
Thunder Seed B	31	26	4	30	76.47
Pickseed 2320 A	26	30	0	30	75.86
Pickseed 2320 B	39	38	0	38	75.86
Northstart LR 9573 A	37	53	2	55	76.52
Northstart LR 9573 B	36	47	2	49	76.52
Northstart LR 9473 A	38	43	0	43	64.22
Northstart LR 9473 B	36	39	0	39	64.22
Northstart LR 9972 A *	35	60	0	60	75.00
Northstart LR 9972 B *	32	29	0	29	75.00
CanaMaize CM 440 A *	46	57	8	65	65.57
CanaMaize CM 440 B *	58	51	21	72	65.57
Green Bos Farms GS Leafy silage A *	33	36	0	36	64.71
Green Bos Farms GS Leafy silage B *	24	29	0	29	64.71
CanaMaize CM 16N20 A *	26	23	0	23	73.85
CanaMaize CM 16N20 B *	32	31	0	31	73.85

Table 2. – Plant counts were conducted along 17.5ft in length (1/10,000 of an acre), 2 samples per treatment (A & B).

Forage dry matter yield:

Two samples were taken from each variety to determine yield biomass on dry matter basis.

The highest yielding treatment was Northstart LR 9573-A with 8.3 tons per acre, followed by Northstart LR 9473-A with 5.9 tons, followed by Northstart LR 9473-B with 5.1 tons. Yield results are illustrated in Graphic 1 below.



Graphic 1. – 2018 Corn Variety Trial, Dry Matter (Tons/ac) for corn grown in Wildwood Alberta. *Conventional varieties

Feed quality:

Starch. - Starch is an important nutrient in animal feed a primary source of energy and to improve production. The most common energy source is from the carbohydrates contained in feeds. These are the sugars, starches, cellulose and hemicellulose that have been stored in plant tissues. Chemical reactions and microbial activity in the digestive system release the energy in the feed (originally trapped from the sun by the plant) which the animal can use, (Nutrients for Cattle, AAF 2003)

Crude Protein.- The beef cow rule of thumb with protein is 7-9-11, which means an average mature beef cow requires a ration with crude protein of 7 per cent in mid pregnancy, 9 per cent in late pregnancy and 11 per cent after calving, (Yurchak, 2004).

Northstart LR 9972 showed the highest crude protein percentage at 10.1%, Northstart LR 9573 and CanaMaize CM 440 showed 9.5% and 9.3% respectively and Pickseed 2320 with the lowest at 7.8%. Northstart LR 9573 and Pickseed 2320 seemed to have the highest starch percentage with 17.9% and 17.4% respectively. Green Bos Farms GS Leafy silage showed the lowest at 12%. Percentages are shown in Graphic 2.



*Graphic 2. - Crude protein and Starch percentages. *Conventional varieties*

Feed quality:

Acid Detergent Fibre (ADF). - ADF is the fibrous, least-digestible portion of roughage. An ADF content of less than 30% on DM basis is an indicator that the forage is high quality (Kopp, 2015). High quality feedstuff should have less than 40% NDF value (Yaremcio, 2012).

Northstart LR 9573 was the variety with the lowest ADF with 28% ADF value followed by Pickseed 2320 and CanaMaize CM 440 with 29 % both, Green Bos Farms GS Leafy silage showed the highest ADF values with 33%.

Total Digestible Nutrients (TDN). - TDN measures available energy of feeds and energy requirements. As a rule of thumb for a mature beef cow to maintain her body condition score through the winter, the ration must have a TDN energy reading of 55 per cent in the mid pregnancy. (Yurchak, 2004).

Northstart LR 9573 was the variety that show higher TDN with 67% TDN value followed by Pickseed 2320 and CanaMaize CM 440 with 66% for both and the lowest was Green Bos Farms GS Leafy silage with 63%.

Neutral Detergent Fibre (NDF). - Commonly called "cell walls." NDF gives a close estimate of fibre constituents of feedstuffs as it measures cellulose, hemi-cellulose, lignin, silica and tannins. NDF has been shown to be negatively correlated with dry matter intake. As the NDF in forages increases, animals will be able to consume less forage. NDF is used in formulas to predict the dry matter intake of cattle.

Northstart LR 9573 was the variety that showed lower NDF value with 49%, followed by Thunder Seed, CanaMaize CM 440, and Pickseed 2320 with 51.7% and the highest was Green Bos Farms GS Leafy silage with 55.1%. (Graph 3).



Graphic 3. - 2018 Corn Variety Trial showing ADF, NDF and TDN comparison, Wildwood AB. *Conventional varieties

Net Energy Maintenance (NEm). - NEm is an estimate of the energy value of a feed used to keep an animal in energy equilibrium, neither gaining weight nor losing weight. A topical Alfalfa silage mid bloom is 1.14 NEm Mcal/kg, Corn Grain is 2.24 NEm Mcal/kg, and Wheat straw is .64 NEm Mcal/kg.

Northstart LR 9573 showed the highest (NEm) with 1.66 followed by Canamaize CM 440, with 1.63 and the lowest was Green Bos Farms GS Leafy silage with 1.4 NEm Mcal/kg value.

Calcium and Phosphorus. - CA and P, are the minerals most often added to ruminant diets. The Ca:P ratio is very important. The ratio should be more than 1.5:1 but less than 7:1. If possible, add the proper amounts of Ca and P to cattle diets, or feed them free choice. The values are seen in Graphic 4.



Graphic 4. – 2018 Corn Variety Trial, Net Energy Maintenance, Calcium, Phosphorus and Crude Fat at Wildwood AB. *Conventional varieties

Relative Feed Value (RFV)

RFV - relative feed value has no units but is a way to compare the potential of two or more like forages for energy intake. Relative feed value is an index of forage quality calculated from ADF% and NDF%. Forages with values greater than 100 are of higher quality, and forages with a value lower than 100 are of lower quality.

Northstart LR 9573 showed the highest RFV with 127 followed by Pickseed 2320 and Canamaize CM 440, with 119 and the lowest was Green Bos Farms GS Leafy silage with 106 value.

Relative Forage Quality (RFQ)

Researchers at the University of Wisconsin have designed the relative forage quality RFQ index that uses fiber digestibility to estimate intake as well as the total digestible nutrients "energy" of the forage. The RFQ index is an improvement over the RFV index for those that buy and sell forages, and it better reflects the performance that can be expected from cattle fed those forages. (Table 2)

Northstart LR 9573 showed the highest RFQ with 156 followed by Pickseed 2320 with 143 and the lowest was Northstart LR 9473 with 125 value.

Relative Forage Quality		
Quality	Suggested Cattle Type	
100-200	Heifer, 18-24 months, Dry cow	
115-130	Heifer, 12-18 months, Beef cow and calf	
125-150	Dairy, last 200 days Heifer, 3-12 months Stocker Cattle	
140-160	Dairy, 1st three months of lactation, Dairy calf	

 Table 2. - Relative Forage Quality, source: Undersander (UW-Extension 2003)

Milk (kg per tonne)

The milk per ton quality index (MILK2000; Schwab et al., 2003) has become a focal point for corn silage hybrid-performance trials and hybrid breeding programs in academia and the seed-corn industry (Lauer et al., 2005). Milk per ton calculations provide relative rankings of forage samples, but should not be considered as predictive of actual milk responses in specific situations for the following reasons:

a) Equation and calculation are simplified to reduce inputs for ease of use.

b) Farm to farm differences exist.

c) Genetic, dietary, and environmental differences affecting feeding utilization are not considered. Source: Milk2016 (ALFALFA-GRASS): Index Combining Yield and Quality by Dan Undersander2, 3, D. Combs1, 2, and J. R. Shaver1,3. Department of Dairy Science1 and Agronomy. University of Wisconsin-Madison. University of Wisconsin-Extension3

Canamaize CM 16N20 showed the highest Milk with 1178 followed by Green Bos Farms GSL 86 silage with 1157 and the lowest was Northstart LR 9473 with 1087 (kg/tonne) value. The values are shown in Graphic 5.



Graphic 5. – 2018 Corn Variety Trial, Net Energy Maintenance, Calcium, Phosphorus and Crude Fat at Wildwood AB. *Conventional varieties

Environmental Records

Corn Heat Units (CHU): CHU is an energy term calculated for each day and accumulated from planting to the harvest date. CHU was calculated from May 1st to October 31st using data from the Evansburg weather station. In 2018 the Total CHU were 1863 below average



Graphic 6. - Historical CHU at the Evansburg, Alberta weather station from 2012 - 2018. The average for this weather station is 1800 CHU.



Precipitation: Growing Season precipitation of the gray wooded soil zone from 1971 to 2000 was 447mm (Agroclimatic Atlas of Alberta, 2003)



Graphic 7. – Growing Season Precipitation in the Evansburg weather station from 2012 to 2018



Graphic 8. – Monthly Precipitation. Source: Evansburg weather station from May to October