WEST-CENTRAL FORAGE ASSOCIATION

WCFA Corn Variety Trial 2019

Final Report

December 18, 2019

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Introduction

West-Central Forage Association (WCFA) is a non-profit, producer directed organization that provides leading edge, applied, innovative and unbiased research and extension to Alberta's West-Central region, which encompasses over 10 million acres within six counties. Our mission is to provide local, applied agricultural research and extension supporting sustainable agriculture. Operating since 1978, we bring together a network of agricultural producers, industry members and researchers to discuss methods of ensuring profitable and sustainable ways to move Alberta's agricultural industries forward.

The purpose of this trial was to evaluate corn varieties for maturity, quality and yield as well as to demonstrate varieties of corn that can be successfully grown in the west-central area. The results of this trial will be used to provide valuable local information to cattle producers intending to grow corn for winter grazing or silage. The 2019 WCFA Corn Variety Triall was conducted at the WCFA Brazeau County Research Site. This trial was completed in partnership with Northstar Seed Ltd., Nutrien Ag Solutions, Performance Seed, Brazeau County, Bart Guyon and Bouius Custom Work. The 2019 trial included four silage corn varieties, one conventional and three Roundup-Ready.

Methods

The 2019 WFCA Corn Variety trial was conducted at the Brazeau Country research site (NW-14-49-09-W5). Four varieties with various Corn Heat Unit (CHU) requirements were seeded (Figure 1). Seedbed was prepared with a glyphosate pre-burn, disked, and tilled. Plots were seeded on June 14, using a John Deere corn planter at a rate of 30,000 seeds/acre. Plots were 10x20 meters consisting of 12 rows spaced at 30". Granular 46-0-0 was broadcast applied at a rate of 102lbs/acre one week after seeding. One combination glyphosate (1L/acre) and fertilizer (7-14-5 at 1L/acre) spray was applied at the four leaf stage to all varieties. Weeds were also mechanically controlled after plants matured beyond the four leaf stage.

Unfortunately, due to a miscommunication within WCFA the conventional variety, De Dell's Defrost, suffered an approximate 60% mortality rate following the glyphosate spray. As a result, no samples were collected from this variety.

Sampling for yield and quality was intended, however, due to the late planting date and cool, wet growing season plants did not mature beyond the leaf stage, and no tasseling or cob formation occurred (Figure 2). Additionally, an early frost and initial snowfall followed by warm weather caused significant damage to plants (Figure 3). Plants were highly saturated with snowmelt and, as a result, attempts to estimate yield were unreliable and will not be included in this report. On October 2nd composite feed quality samples were collected from each plot, consisting of five plants selected on a diagonal transect across each plot. At the time of collection samples were saturated with snow melt. Due to the excess

moisture, samples were air dried prior to shipping to avoid degradation in transit. Samples were submitted to A&L Canada Laboratories Inc. (A&L) for feed quality testing the following week.

Results and Discussion

Environmental Records

All weather data was retrieved from the Violet Grove Alberta Climate Information Service (ACIS) weather station, which is nearest to the Brazeau County Site, and will referred to as "Brazeau" throughout this report.

Temperature

The average temperature of the growing season (May 1st to October 2nd) in Brazeau was 12°C (54°F) with a low of -2°C on May 4th and a high of 19.5°C on August 21st. First frost occurred on September 28th (Figure 4).

Corn Heat Units

Corn heat units (CHU) are a measurement of cumulative heat over the growing season. CHU are calculated daily and accumulates as the growing season progresses. CHU are calculated using the equation below:

$$CHU = [1.8(\text{daily min temp} - 4.4) + 3.3(\text{daily max temp} - 10) - 0.084(\text{daily max temp}) - 10)2]/2$$

The long-term normal CHU for the growing season in Brazeau is 1818.2, while the CHU for 2019 was 1916.3 (ACIS, 2019). From seeding to harvest (June 13-Oct 2) Violet Grove reached 1,521.1 CHU. Varieties in the trial ranged from 2000-2130 in CHU requirements (Figure 1).

Precipitation

The 2019 growing season is the second wettest in the last ten years (Figure 8), with an accumulated precipitation of 413mm (16.3") (Figure 6). June received the most rainfall, 180mm, most of which occurred in the latter half of the month, following seeding (Figure 6 & Figure 7). Though 2019 was not the wettest year on record, the significant rainfall in June significantly affected the plant development (Figure 8). When excessively wet soil conditions occur during stage 1 of plant development, the maximum-reduction in corn yields occur (Kanwar, Baker, & Mukhtar, 1988).

Feed Quality

Composite samples consisting of five plants per plot were collected on October 2nd. At the time of collection the majority of plants had soaked up excess water from the recent snowmelt and were lying flat. Due to the external source of moisture, attempts to determine yield would have resulted in

inflated tons/acre and therefore false values. Additionally, plants only reached the R10 maturity stage, and no cob formation occurred (Figure 2). Samples were submitted to A&L after air drying for one week, to prevent sample degradation during shipping. Upon receiving the feed quality analysis reports, WCFA staff consulted with industry professionals regarding the results. It was determined that the values reported after analysis were not sufficient to confidently make any feeding recommendations. Please see Appendix 1 for full copies of the feed analysis reports.

Summary

Regional variety trials provide invaluable information for local producers. The 2019 WCFA Corn Variety Trial at the Brazeau Research Site was an excellent demonstration of how, regardless of variety selection, crop management is crucial to success. The combination of the late seeding date, low CHU and excessive soil moisture during early development, resulted in low quality and poor yield across all varieties within the trial. Although the 2019 trial was less successful than previous years, it demonstrates why local applied research data is invaluable to local producers, due to the variation of localized climate and weather in the West-Central Region.

Figures

Supplier	Variety	Corn Heat Units (CHU)	Days to Relative Maturity (DRM)
Northstar Seed Ltd.	LR 99S77 RR	2310	77
Northstar Seed Ltd.	LR 9073 RR	2200	73
Nutrien Ag Solutions	PV 60075	2125	75
Performance Seed	De Dell Defrost	2000	67

Figure 1- Summary table of variety names, suppliers, CHU, and DRM.

Figure 2- A representative LR 9073 plant on September 12, 2019 at the R10 stage, which was the maximum maturity reached in 2019.

Figure 3- The LR 9073 plot on October 2 following snowfall and melt.

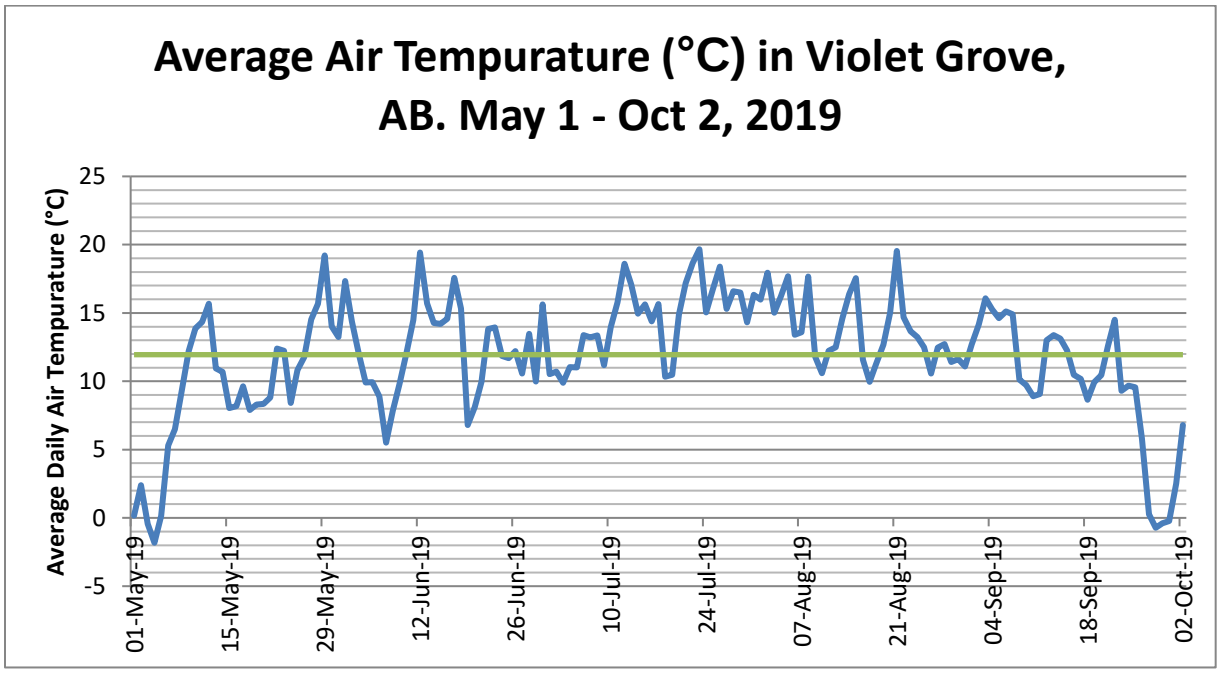

Figure 4- Daily temperature chart for the ACIS Violet Grove, AB weather station from May 1st to Oct 2nd, 2019. The horizontal green line represents the season average temperature of 12°C.

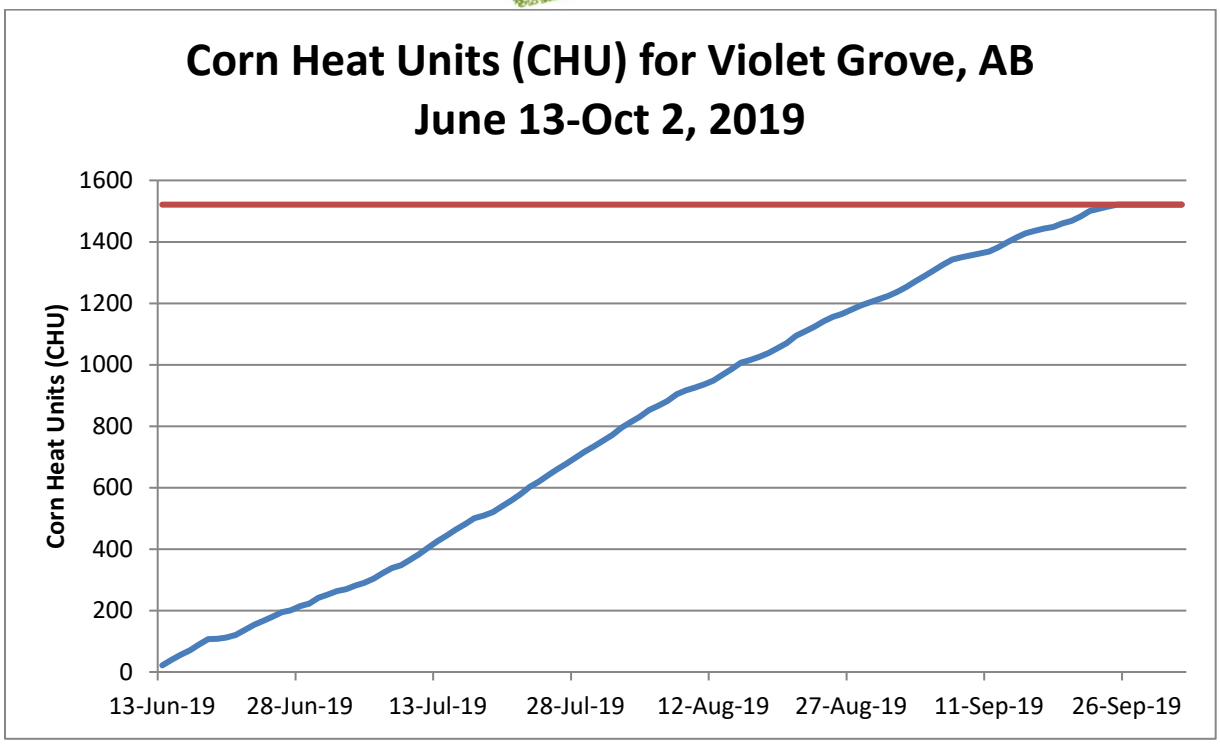

Figure 5- Corn Heat Units (CHU) for Violet Grove, AB from June 13-Oct 2, 2019. The red line represents the total CHU of 1,521.14.

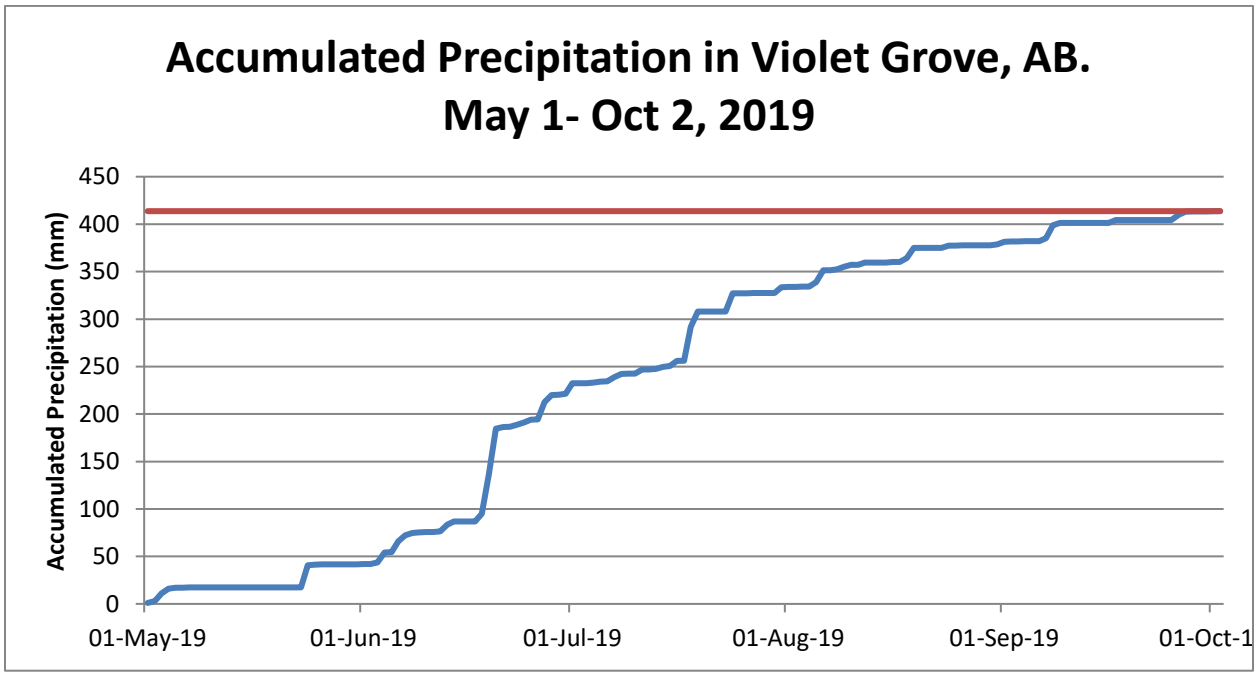

Figure 6- Accumulated Precipitation in Violet Grove, AB for the 2019 growing season. The red line represents the total precipitation accumulated, 413mm (16.3").

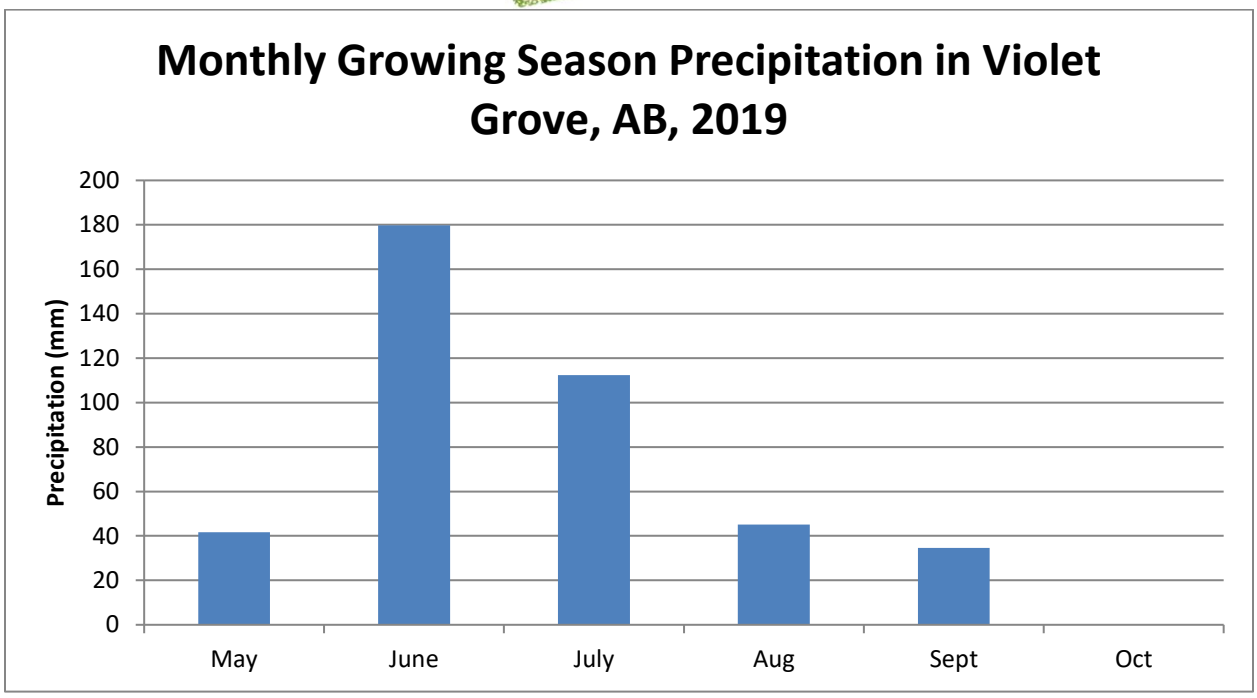

Figure 7- Monthly Growing Season Precipitation For Violet Grove, AB, 2019.

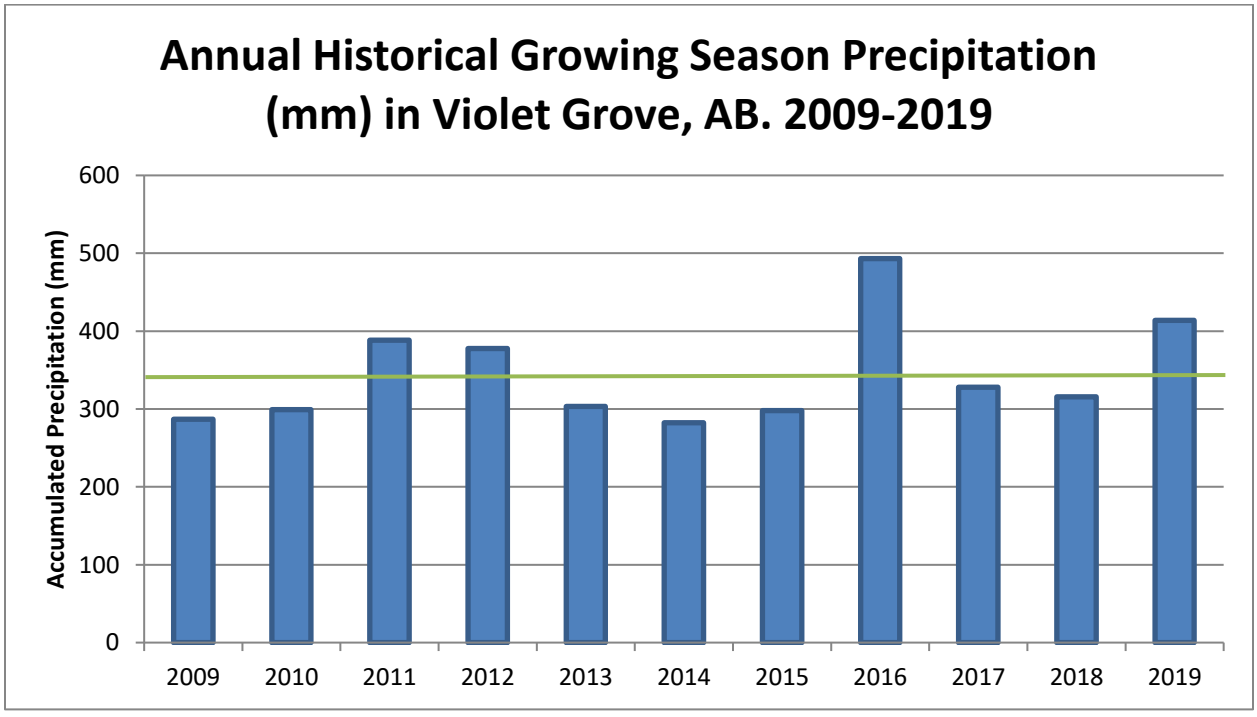

Figure 8- Annual growing season precipitation in Violet Grove, AB. from 2009 to 2019. The horizontal green line represents the ten-year average of 344mm (13.5").

References

ACIS. (2019). *Alberta Climate Information Service (ACIS)*. Retrieved December 2, 2019, from Alberta Agriculture and Forestry: https://agriculture.alberta.ca/acis/

Kanwar, R. S., Baker, J. L., & Mukhtar, S. (1988). Excessive Soil Water Effects at Various Stages of Development on the Growth and Yield of Corn. *Transactions of the ASAE*, 133-141.

Appendices

Apendix 1: A&L Canada Laboratories Feed Analysis Reports

REPORT NO.
C19295-35074

ACCOUNT NUMBER
03086

A&L CANADA LABORATORIES INC.

2136 Jetstream Rd, London, ON, N5V 3P5 Tel (519) 457-2575 Fax: (519) 457-2664

TO: WEST CENTRAL FORAGE ASSOC.
BOX 360
#1 5013 50 AVE
EVANSBURG, AB T0E 0T0
Phone: 780-727-4447
Fax: 780-727-4334

FOR: WCFA CORN VARIETY TRIAL 2019

CERTIFICATE OF ANALYSIS

LAB NUMBER: 2956184
SAMPLE ID: LR 6073RR CORN
SAMPLE MATRIX: Corn Grain
SAMPLE CUT:
TEST CODE: FN1WM

DATE SAMPLED: 2019-10-21
DATE RECEIVED: 2019-10-22
DATE REPORTED:
DATE PRINTED: 2019-10-24

PARAMETER	RESULTS AS FED	RESULTS DRY	UNIT	METHOD
DRY MATTER				
Moisture	6.28	0.00	%	AOAC 930.15
Dry Matter	93.72	100.00	%	Calculation
PROTEIN				
Crude Protein	11.68	12.46	%	NIR
Soluble Crude Protein	47.27	47.27	% of CP	NIR
ADF-CP	0.68	0.73	%	NIR
NDF-CP	1.81	1.93	%	NIR
UIP (Bypass Protein)	28.24	30.13	Est % CP	NIR
FIBRES				
Acid Detergent Fibre	31.11	33.19	%	NIR
Neutral Detergent Fibre	49.52	52.84	%	NIR
Lignin	2.76	2.94	%	NIR
ENERGY				
Total Digestible Nutrients (Weiss)	62.82	67.03	%	Calculation
NE Lactation	1.34	1.43	MCal/Kg	Calculation
Net Energy Lactation (Weiss)	1.42	1.52	MCal/Kg	Calculation
NE Gain	0.77	0.82	MCal/Kg	Calculation
Net Energy Gain (Weiss)	0.78	0.83	MCal/Kg	Calculation
NE Maintenance	1.44	1.54	MCal/Kg	Calculation
Net Energy Maintenance (Weiss)	1.32	1.41	MCal/Kg	Calculation
MINERALS				
Calcium	0.36	0.38	%	Wet Chemistry *
Chloride	0.35	0.37	%	NIR
Copper	5.47	5.84	ug/g	Wet Chemistry
Phosphorus	0.47	0.50	%	Wet Chemistry *
Potassium	3.37	3.60	%	Wet Chemistry
Sulphur	0.11	0.12	%	Wet Chemistry *
Magnesium	0.15	0.16	%	Wet Chemistry
Zinc	28.72	30.64	ug/g	Wet Chemistry *
Iron	81.30	86.75	ug/g	Wet Chemistry *
Manganese	22.01	23.48	ug/g	Wet Chemistry *
Sodium	0.02	0.02	%	Wet Chemistry
OTHER				
Starch	8.80	9.39	%	NIR
Total Ash	3.66	3.90	%	NIR
Crude Fat	0.98	1.05	%	NIR

* - accredited test

BDL - Not Detected

C19295-35074

The results of this report relate to the sample submitted and analyzed

Results Authorized By:
Ron Piett, Feed & Forages Specialist

REPORT NO.
C19295-35074

ACCOUNT NUMBER
03086

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EVANSBURG, AB T0E 0T0
Phone:780-727-4447
Fax:780-727-4334

FOR:WCFA CORN VARIETY TRIAL 2019

CERTIFICATE OF ANALYSIS

LAB NUMBER:2956184
SAMPLE ID:LR 6073RR CORN
SAMPLE MATRIX: Corn Grain
SAMPLE CUT:
TEST CODE:FN1WM

DATE SAMPLED:2019-10-21
DATE RECEIVED:2019-10-22
DATE REPORTED:
DATE PRINTED:2019-10-24

PARAMETER	RESULTS AS FED	RESULTS DRY	UNIT	METHOD
NFC	27.88	29.75	%	Calculation
Relative Feed Value	110.98	110.98		Calculation

* - accredited test
BDL - Not Detected

C19295-35074

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FOR:WCFA CORN VARIETY TRIAL 2019

CERTIFICATE OF ANALYSIS

LAB NUMBER:2956185
SAMPLE ID:NQ2507HTTT2 (PV 60075)
SAMPLE MATRIX: Corn Grain
SAMPLE CUT:
TEST CODE:FN1WM

DATE SAMPLED:2019-10-21
DATE RECEIVED:2019-10-22
DATE REPORTED:
DATE PRINTED:2019-10-24

	RESULTS			
PARAMETER	AS FED	DRY	UNIT	METHOD
DRY MATTER				
Moisture	9.98	0.00	%	AOAC 930.15
Dry Matter	90.02	100.00	%	Calculation
PROTEIN				
Crude Protein	10.96	12.18	%	NIR
Soluble Crude Protein	44.70	44.70	% of CP	NIR
ADF-CP	0.67	0.74	%	NIR
NDF-CP	1.67	1.86	%	NIR
UIP (Bypass Protein)	28.45	31.60	Est % CP	NIR
FIBRES				
Acid Detergent Fibre	31.26	34.73	%	NIR
Neutral Detergent Fibre	48.75	54.16	%	NIR
Lignin	2.57	2.86	%	NIR
ENERGY				
Total Digestible Nutrients (Weiss)	59.22	65.78	%	Calculation
NE Lactation	1.26	1.40	MCal/Kg	Calculation
Net Energy Lactation (Weiss)	1.34	1.49	MCal/Kg	Calculation
NE Gain	0.71	0.79	MCal/Kg	Calculation
Net Energy Gain (Weiss)	0.71	0.79	MCal/Kg	Calculation
NE Maintenance	1.36	1.51	MCal/Kg	Calculation
Net Energy Maintenance (Weiss)	1.23	1.37	MCal/Kg	Calculation
MINERALS				
Calcium	0.31	0.34	%	Wet Chemistry *
Chloride	0.32	0.35	%	NIR
Copper	5.31	5.90	ug/g	Wet Chemistry
Phosphorus	0.48	0.53	%	Wet Chemistry *
Potassium	2.93	3.26	%	Wet Chemistry
Sulphur	0.10	0.11	%	Wet Chemistry *
Magnesium	0.14	0.15	%	Wet Chemistry
Zinc	34.07	37.85	ug/g	Wet Chemistry *
Iron	68.60	76.20	ug/g	Wet Chemistry *
Manganese	22.77	25.29	ug/g	Wet Chemistry *
Sodium	0.02	0.02	%	Wet Chemistry
OTHER				
Starch	7.01	7.79	%	NIR
Total Ash	3.34	3.71	%	NIR
Crude Fat	0.74	0.82	%	NIR

* - accredited test

BDL - Not Detected


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CERTIFICATE OF ANALYSIS

LAB NUMBER: 2956185
SAMPLE ID: NQ2507HTTT2 (PV 60075)
SAMPLE MATRIX: Corn Grain
SAMPLE CUT:
TEST CODE: FN1WM

DATE SAMPLED: 2019-10-21
DATE RECEIVED: 2019-10-22
DATE REPORTED:
DATE PRINTED: 2019-10-24

PARAMETER	RESULTS AS FED	RESULTS DRY	UNIT	METHOD
NFC	26.22	29.13	%	Calculation
Relative Feed Value	106.23	106.23		Calculation

* - accredited test
BDL - Not Detected

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FOR:WCFA CORN VARIETY TRIAL 2019

CERTIFICATE OF ANALYSIS

LAB NUMBER:2956186
SAMPLE ID:LR 99577
SAMPLE MATRIX: Corn Grain
SAMPLE CUT:
TEST CODE:FN1WM

DATE SAMPLED:2019-10-21
DATE RECEIVED:2019-10-22
DATE REPORTED:
DATE PRINTED:2019-10-24

	RESULTS			
PARAMETER	**AS FED**	**DRY**	**UNIT**	**METHOD**
DRY MATTER				
Moisture	1.21	0.00	%	AOAC 930.15
Dry Matter	98.79	100.00	%	Calculation
PROTEIN				
Crude Protein	12.92	13.08	%	NIR
Soluble Crude Protein	38.11	38.11	% of CP	NIR
ADF-CP	0.72	0.73	%	NIR
NDF-CP	1.38	1.40	%	NIR
UIP (Bypass Protein)	34.94	35.37	Est % CP	NIR
FIBRES				
Acid Detergent Fibre	33.60	34.01	%	NIR
Neutral Detergent Fibre	53.11	53.76	%	NIR
Lignin	2.88	2.92	%	NIR
ENERGY				
Total Digestible Nutrients (Weiss)	64.72	65.51	%	Calculation
NE Lactation	1.39	1.41	MCal/Kg	Calculation
Net Energy Lactation (Weiss)	1.46	1.48	MCal/Kg	Calculation
NE Gain	0.79	0.80	MCal/Kg	Calculation
Net Energy Gain (Weiss)	0.80	0.81	MCal/Kg	Calculation
NE Maintenance	1.50	1.52	MCal/Kg	Calculation
Net Energy Maintenance (Weiss)	1.37	1.39	MCal/Kg	Calculation
MINERALS				
Calcium	0.37	0.37	%	Wet Chemistry *
Chloride	0.38	0.38	%	NIR
Copper	5.18	5.24	ug/g	Wet Chemistry
Phosphorus	0.40	0.40	%	Wet Chemistry *
Potassium	2.40	2.43	%	Wet Chemistry
Sulphur	0.13	0.13	%	Wet Chemistry *
Magnesium	0.17	0.17	%	Wet Chemistry
Zinc	34.67	35.09	ug/g	Wet Chemistry *
Iron	98.20	99.40	ug/g	Wet Chemistry *
Manganese	25.00	25.31	ug/g	Wet Chemistry *
Sodium	0.02	0.02	%	Wet Chemistry
OTHER				
Starch	9.10	9.21	%	NIR
Total Ash	3.12	3.16	%	NIR
Crude Fat	0.77	0.78	%	NIR

* - accredited test

BDL - Not Detected

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SAMPLE CUT:
TEST CODE:FN1WM

DATE SAMPLED:2019-10-21
DATE RECEIVED:2019-10-22
DATE REPORTED:
DATE PRINTED:2019-10-24

	RESULTS			
PARAMETER	AS FED	DRY	UNIT	METHOD
NFC	28.87	29.22	%	Calculation
Relative Feed Value	107.99	107.99		Calculation

* - accredited test
BDL - Not Detected


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Ron Piett, Feed & Forages Specialist