

Crop Investigations

Verner Site



New Liskeard Agricultural Research Station
Report 15-1
April 2015

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Verner Site

Crop Investigations near Verner for 2015

This project was initiated in 1988 to address expressed needs for research data obtained from the Verner area. This project has been a cooperative venture between the West Nipissing Soil and Crop Improvement Association and the New Liskeard Agricultural Research Station, University of Guelph.

The site

Due to wetness and other factors we have moved from our old site. Our new test site for 2015 was located at 466 Leclair Road Caldwell Township, Nipissing District south of Verner. The soil type is Wolf silt loam. The land is systematically tilled of which the spacing pattern of the current drainage system are not known. Some dairy manure was applied last fall. We expect have good test research conditions generating quality data from this site.

The Weather

For most of Northern Ontario moisture was not a limiting factor for achieving maximum crop production for the 2015 growing season. Overall, the season was dryer than 2014, however in the early spring we did have an abundance of moisture which delayed our planting in Verner to June. The summer growing season was followed with close to average temperature and slightly above average precipitation. All in all, the cereal crops performed well under those good growing conditions.

Local weather data was collected courtesy of Gerald Beaudry. Once again, many thanks to Gerald for recording the weather data.

A detailed representation of the weather data is available in the Verner report.

Seeding Notes

All seeding was achieved on **2nd of June** of 2015.

Based on a soil test, the Verner site indicated we would have a medium response in terms P & K for additional fertilizer. (P=13, K=107, ph=7.1) Although a small benefit would have been apparent, no additional fertilizer was placed with the seed during seeding. After seeding ammonium nitrate (34-0-0) was applied at a rate of 205 kg/ha (185 lbs/ac) top dress. *(Note: The recommended rate for N on spring cereals is 70 N actual)*

The small soybeans performance did not receive any chemical fertilizers.

There was no canola performance seeded in New Liskeard nor Verner last year due to the moratorium on growing canola crop in the North with regards to high Swede Midge pressure levels.



Report # 516798

NEW LISKEARD AG.RES.STN. - John Kobler - Verner Field

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Sample ID	Lab #	pH	BpH	Total Salts (mmhos/cm)	Organic Matter (%)	Nitrogen NO3-N (ppm)	Phosphorus - P (ppm) Sodium Bicarb.		Potassium K (ppm)	Magnesium Mg (ppm)	Calcium Ca (ppm)							
1 - Verner Field	30645118	7.1					13		107	485 LR								
Sample ID	Zinc Zn (ppm)	Zn Index	Manganese Mn (ppm)	Mn Index	Copper Cu (ppm)	Iron Fe (ppm)	Boron B (ppm)	Texture	Cation Exchange MEQ/100g	Base Saturation								
1								M		K%	Mg%	Ca%	H%					
Sample ID	Sodium Na (ppm)	Sulphate Sulphur SO4-S (ppm)	Chloride Cl (ppm)	Aluminum Al (ppm)	K/Mg Ratio	Exchangeable Acidity												
1					0.2													
OMAFRA Nutrient Guidelines																		
Sample ID	Crop to be Grown	Yield Goal	N Rec	P2O5 Rec	K2O Rec	Magnesium	Calcium	(kg/ha)			Sulphur	Zinc	Manganese	Copper	Iron	Boron	Lime (te/ha)	
1	Cereal																	

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These results pertain solely to the sample(s) received by the laboratory.*

Authorized By: Jack Legg - Certified Crop Advisor, CCA-ON

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Date Oct-09-2015

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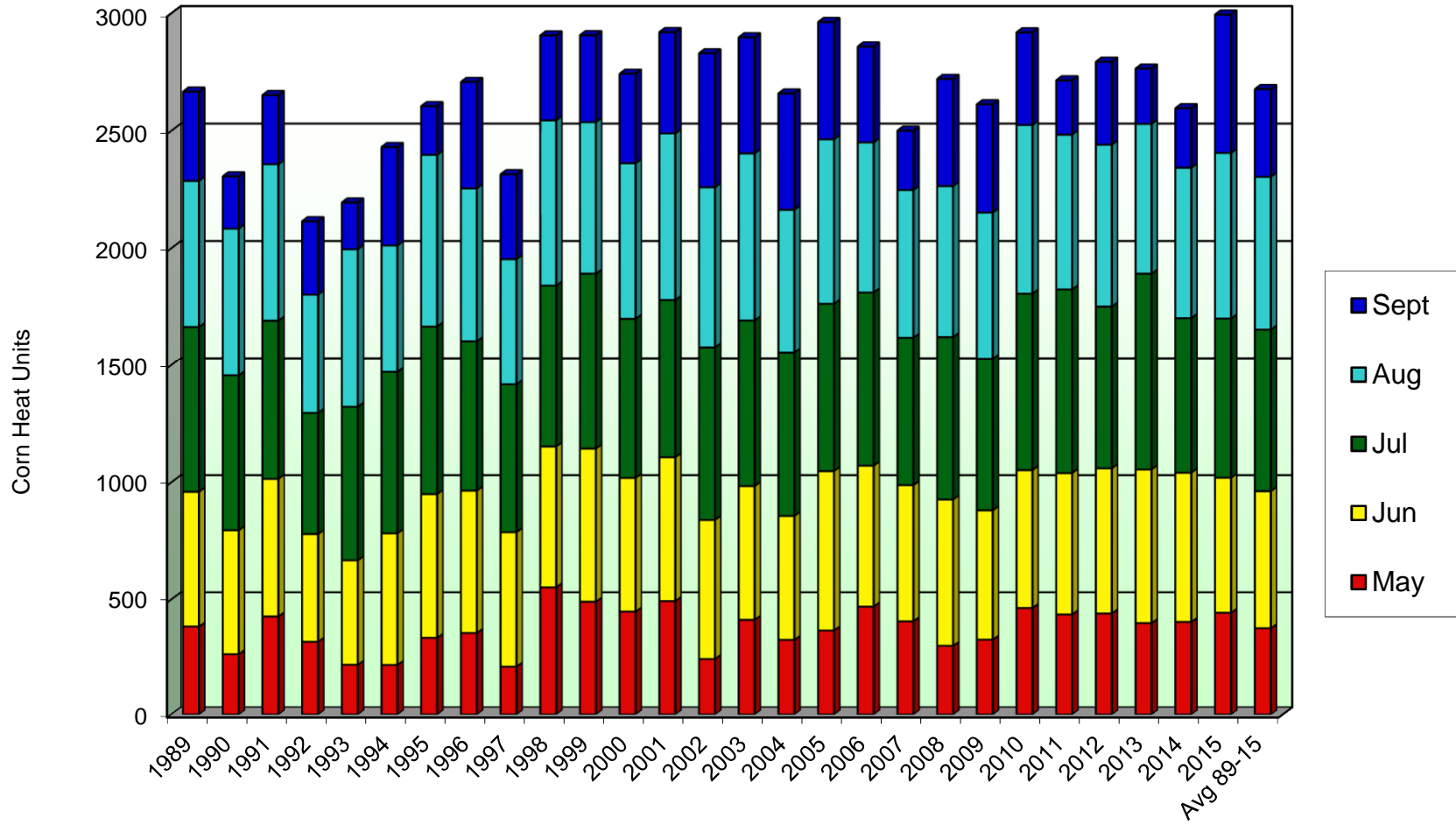
Summary 2015

Month	Air Temperature			Precip (mm)	Growing Degree Days (5C)	Corn Heat Units (CHU)
	Avg °C	Min °C	Max °C			
May	13	-4	28	144	258	442
June	17	3	28	52	348	578
July	19	5	34	42	441	681
August	19	6	29	129	434	705
September	17	3	29	43	356	589
Total				410	1836	2996

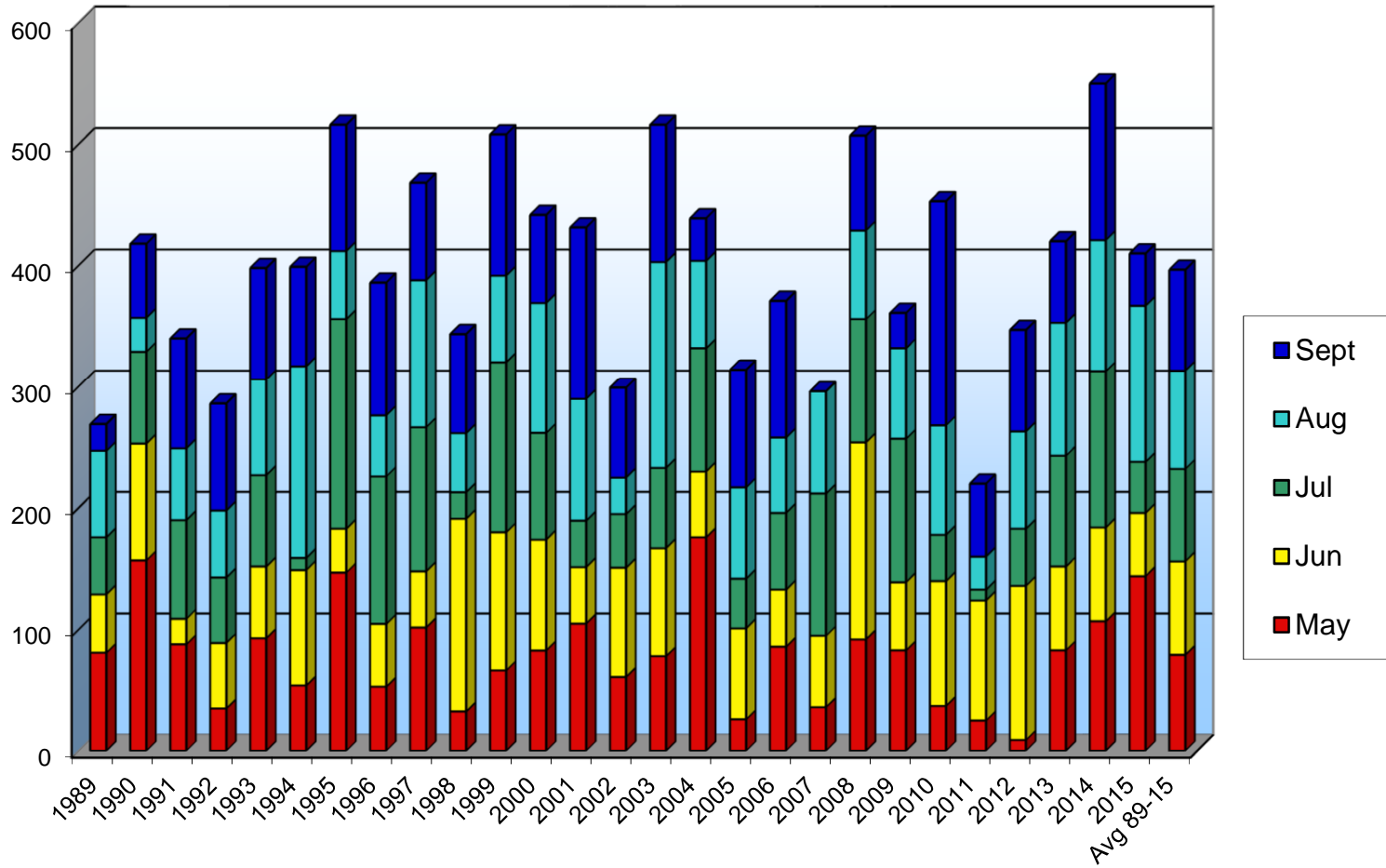
Comparison with Farmzone.com

Month	Air Temperature			Precip (mm)	Growing Degree	Corn Heat Units
	Avg °C	Min °C	Max °C			
May				126	233	363
June				51	292	478
July				47	430	662
August				76	404	657
September				52	345	553
Total				352	1704	2713

Corn Heat Unit Accumulation At the Verner Test Site

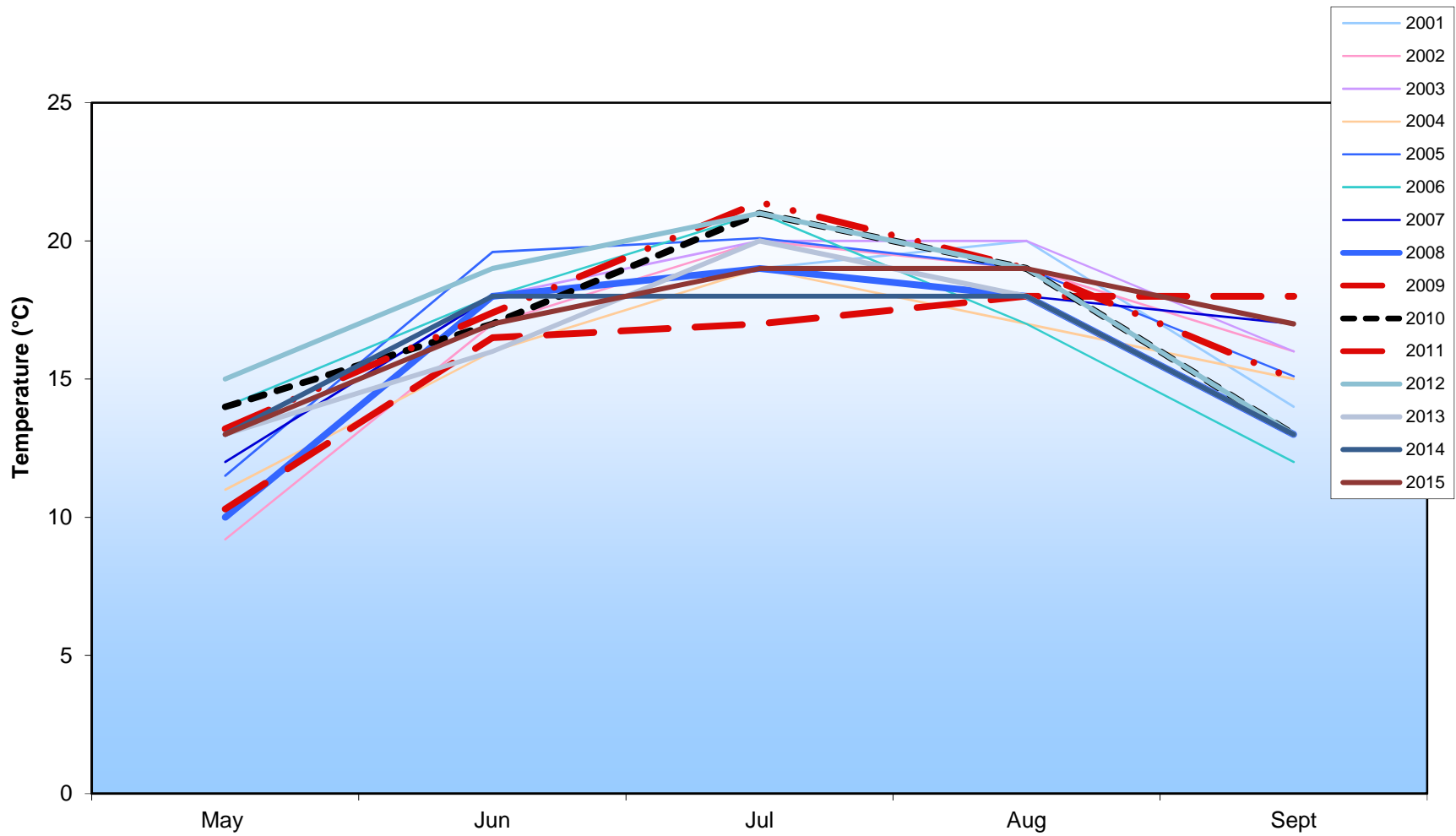


Precipitation At the Verner Test Site



Average Air Temperatures

At the Verner Test Site



Historical Weather Records Verner Site

New Liskeard Agricultural Research Station

Accumulated Monthly Corn Heat Units (CHU)

CHU	May	Jun	Jul	Aug	Sept	Total
1989	382	578	705	622	380	2667
1990	262	534	660	628	222	2306
1991	426	589	677	666	294	2652
1992	316	464	516	507	312	2115
1993	216	452	654	674	199	2195
1994	215	568	688	541	419	2431
1995	333	617	717	731	207	2605
1996	354	611	639	651	453	2708
1997	208	580	630	536	361	2315
1998	553	600	688	704	361	2906
1999	490	654	748	645	370	2907
2000	447	572	681	662	381	2743
2001	493	614	673	709	431	2920
2002	241	599	738	682	570	2830
2003	411	573	709	711	494	2898
2004	324	533	699	608	495	2659
2005	365	683	716	700	499	2963
2006	469	602	741	639	408	2859
2007	405	583	631	629	253	2501
2008	298	629	695	643	456	2721
2009	325	556	648	623	461	2613
2010	463	589	755	718	394	2919
2011	435	605	785	659	231	2715
2012	439	621	692	689	353	2794
2013	397	658	837	638	235	2765
2014	402	639	662	640	253	2596
2015	442	578	681	705	589	2995
Avg 89-15	374	588	691	650	373	2678
Min	208	452	516	507	199	2115
Max	553	683	837	731	589	2995

Notes: CHU are for May 1 to first <-2°C

Historical Weather Records Verner Site

New Liskeard Agricultural Research Station

Accumulated Monthly Precipitation (mm)

Precip	May	Jun	Jul	Aug	Sept	Total
1989	81	48	47	71	22	269
1990	157	96	76	28	61	418
1991	88	21	81	59	91	340
1992	35	54	54	55	88	286
1993	93	59	75	79	92	398
1994	54	95	10	158	82	399
1995	147	36	173	56	104	516
1996	53	52	121	50	110	386
1997	102	46	118	122	80	468
1998	33	159	22	49	82	344
1999	66	114	140	72	116	508
2000	83	91	88	107	73	442
2001	105	46	38	100	142	431
2002	61	90	44	30	74	299
2003	78	89	66	170	113	516
2004	176	54	102	72	35	439
2005	26	75	41	75	97	314
2006	86	47	63	62	113	371
2007	36	59	117	84	0	296
2008	92	162	102	73	78	507
2009	83	56	118	75	29	361
2010	37	103	38	90	185	453
2011	25	99	9	27	60	220
2012	9	127	47	80	84	347
2013	83	69	91	110	67	420
2014	107	77	129	108	129	550
2015	144	52	42	129	43	410
Avg 89-15	79	77	76	81	83	397
Min	9	21	9	27	0	220
Max	176	162	173	170	185	550

Historical Weather Records Verner Site

New Liskeard Agricultural Research Station

Average Monthly Air Temperature (°C)

AirT	May	Jun	Jul	Aug	Sept
1989	12	17	20	17	14
1990	10	16	19	18	13
1991	13	18	19	18	14
1992	11	15	15	15	13
1993	9	14	18	19	10
1994	12	17	18	16	13
1995	11	18	19	19	11
1996	10	18	18	18	14
1997	7	17	18	15	13
1998	16	17	19	19	14
1999	15	19	20	18	15
2000	13	17	19	18	12
2001	14	18	19	20	14
2002	9	17	20	19	16
2003	13	18	20	20	16
2004	11	16	19	17	15
2005	12	20	20	19	15
2006	14	18	21	17	12
2007	12	18	18	18	17
2008	10	18	19	18	13
2009	10	17	17	18	18
2010	14	17	21	19	13
2011	13	17	21	19	15
2012	15	19	21	19	13
2013	13	16	20	18	13
2014	13	18	18	18	13
2015	13	17	19	19	17
Avg 89-15	12	17	19	18	14
Min	7	14	15	15	10
Max	16	20	21	20	18

Verner OCCC Barley Performance 2015
 New Liskeard Agricultural Research Station
 (VBPT15)

Seeded: 2-Jun-15
 Fertilization: 70N kg/ha
 Herbicide: None
 Fungicide: 0.5L/ha Twinline

Entry	Code	Variety	Grain	1000 Seed	Test Wt.	Lodging	Height	Days to Head	Days to Mature	Index	Harv
			kg/ha	weight (g)	kg/hl	(0-9)	(cm)			Grain	Grain
19	1049	OCEANIK	6062.5	51.4	61.0	0.5	92	51	88	116	115
15	1108	Chambly	5854.1	53.5	62.1	0.5	87	51	90	112	111
11	1115	HYEXPT-6R	5782.2	53.5	57.7	0.0	91	51	87	111	110
17	1056	Harmony	5740.3	53.6	62.4	1.3	98	51	89	110	109
18	1104	Masky	5738.4	49.4	63.8	1.0	89	51	90	110	109
8	1009	Bornholm	5704.9	55.8	68.3	0.8	81	51	85	109	108
14	1118	HS 5626-39	5618.4	53.0	60.7	0.5	94	51	88	108	107
6	1101	Boroe	5550.8	52.0	61.4	0.0	92	51	89	106	106
20	1043	SYNABELLE	5548.0	51.0	63.3	1.0	89	51	86	106	106
9	1038	HY 481-6R	5487.2	50.0	62.3	3.8	86	51	87	105	105
10	1080	HY 621-6R	5458.0	53.6	63.0	2.8	86	51	87	105	104
3	1069	Alliance	5396.8	50.5	61.3	0.0	87	51	90	103	103
7	1117	UL188	5101.1	50.7	59.7	1.8	91	51	87	98	98
4	1113	AAC Purpose	4953.9	62.0	63.8	3.8	93	51	89	95	96
21	1057	Synasolis	4916.8	47.2	60.4	2.3	83	51	86	94	95
1	1110	HS5455-1	4895.6	49.3	60.7	2.0	93	51	88	94	95
13	1093	AAC Mirabel	4848.9	48.7	59.5	1.0	91	51	85	93	94
2	1111	HS5606-11	4679.2	52.1	60.4	1.3	90	51	89	90	91
5	1082	Alyssa	4646.0	49.0	59.6	5.8	89	51	88	89	90
16	1116	Bastile	4226.0	47.9	73.2	1.8	89	51	87	81	83
12	1059	Amberly	3330.2	45.3	56.0	5.3	90	51	87	64	68

Average 5216.2 51.4 61.9 1.8 90 51 88
 LSD (0.05) 595.459
 C.V. 8.07%

	Grain
SE	420.9438
SD	645.7035
H	0.89

Verner OCCC Spring Wheat Performance 2015

New Liskeard Agricultural Research Station

(VSWPT15)

Seeded: 2-Jun-15

Fertilization: 70N kg/ha

Herbicide: none

Fungicide: 0.5L/ha Twinline

Entry	Code	Variety	Grain	1000 Seed	Test Wt.	Lodging	Height	Days to Head	Days to Mature	Index	Harv
			kg/ha	weight (g)	kg/hl	(0-9)	(cm)			Grain	Grain
7	5010	Sable	5396.3	45.8	79.0	0.0	86	60	94	122	118
14	5072	HYEXPT-SW	5046.5	49.2	77.2	0.0	92	60	91	114	112
11	5026	Touran	5024.6	50.3	79.4	0.0	99	60	91	113	111
19	5073	Moka	4932.9	49.0	78.7	0.0	103	60	93	111	109
18	5054	MAGOG	4731.7	49.9	77.8	0.0	106	60	91	107	106
3	5067	AW725	4651.9	48.4	78.6	0.0	103	60	91	105	104
9	5059	Hoffman	4649.8	50.1	77.2	0.0	103	60	91	105	104
8	5041	Wilkin	4615.5	43.0	76.0	0.0	89	60	91	104	104
1	5077	AW774	4600.1	45.4	78.5	0.0	97	60	93	104	103
21	5014	Orleans	4581.7	47.3	77.8	0.0	105	60	90	103	103
25	5031	MAJOR	4563.9	47.7	79.2	0.0	103	60	96	103	103
6	5009	Norwell	4503.4	44.8	78.8	0.0	96	60	91	102	101
20	5053	Carberry	4466.9	43.7	78.3	0.0	87	60	91	101	101
13	5024	HY 124-HRS	4449.7	48.4	77.2	0.0	86	60	91	101	100
24	5060	KLEOS	4406.4	49.7	77.6	0.0	104	60	90	100	100
17	5043	KINGSEY	4387.0	51.9	79.7	0.0	103	60	93	99	99
2	5078	QB(2)-126-15	4341.0	46.4	78.4	0.0	98	60	91	98	98
5	5030	Furano	4268.4	45.4	79.2	0.0	100	60	93	96	97
22	5079	Pasteur	4254.3	43.2	77.8	0.0	91	60	94	96	97
23	5037	Fuzion	4210.7	47.6	77.8	0.0	103	60	91	95	96
4	5066	CM9004	4173.1	43.3	77.8	0.0	86	60	94	94	95
16	5074	Bangor	4126.5	47.2	76.2	0.0	101	60	93	93	94
15	5042	AAC Scotia	4022.4	45.7	75.1	0.0	103	60	91	91	92
10	5070	SS Blomidon	3804.1	46.3	75.5	0.0	94	60	91	86	88
26	5019	Megantic	3739.3	47.9	78.9	0.0	105	60	91	84	87
12	5076	Vikki	3167.7	39.5	55.3	0.0	96	60	102	72	76

Average	4427.5	46.8	77.0	0.0	98	60	92
LSD (0.05)	524.487						
C.V.	8.41%						

	Grain
SE	372.3556
SD	452.6382
H	0.83

Verner OCCC Oat Performance 2015
 New Liskeard Agricultural Research Station
 (VOPT15)

Seeded: 2-Jun-15
 Fertilization: 55N kg/ha
 Herbicide: none
 Fungicide: 0.5L/ha Twinline

Entry	Code	Variety	Grain	1000 Seed	Test Wt.	Lodging	Height	Days to Head	Days to Mature	Index	Harv
			kg/ha	weight (g)	kg/hl	(0-9)	(cm)			Grain	Grain
7	3056	Bolina	5770.6	45.8	45.3	3.5	90	58	98	122	116
12	3025	RC Amaze	5624.9	40.4	44.5	2.8	97	58	87	119	114
19	3063	AAC Nicolas	5267.8	42.9	42.5	0.8	97	58	91	111	108
8	3061	Kara	5265.6	55.3	44.6	2.8	93	58	90	111	108
6	3062	Akina	5172.3	55.0	41.1	0.5	96	58	88	109	107
10	3034	HY 174-OA	5156.2	45.6	43.3	1.3	100	58	88	109	106
5	3054	Riley	5069.7	55.4	46.6	3.0	101	58	91	107	105
2	3066	OA1357-2	5013.1	56.3	41.8	1.3	99	58	94	106	104
18	3046	AAC Bullet	4908.6	45.3	44.5	1.8	95	58	90	104	103
22	3067	OA 1347-2	4888.5	44.9	42.3	0.0	99	58	93	103	102
15	3019	Canmore	4826.5	46.8	45.0	1.3	105	58	91	102	101
3	3033	Oscar	4788.3	52.3	45.1	1.8	91	58	88	101	101
1	3065	OA1342-1	4787.2	53.9	43.3	0.8	106	58	90	101	101
25	3026	Synextra	4748.6	43.4	47.0	4.0	108	58	93	100	100
20	3043	Bradley	4660.4	44.3	43.7	0.8	98	58	92	99	99
24	3038	Hidalgo	4656.9	41.1	43.4	2.3	91	58	91	98	99
14	3058	AAC Richmond	4561.6	44.4	44.1	2.8	110	58	98	96	97
11	3005	OAC Markdale	4558.1	41.6	43.4	1.3	103	58	87	96	97
26	3039	Vitality	4557.0	47.5	41.2	2.3	97	58	93	96	97
9	3051	Nice	4526.5	47.5	44.6	4.3	99	58	95	96	97
23	3064	PGR-N10-31	4523.2	43.9	42.7	5.0	101	58	87	96	97
4	3059	AAC Oaklin	4445.1	52.8	43.9	1.5	95	58	88	94	96
13	3060	AAC Pontiac	3990.8	42.8	43.5	1.8	88	58	91	84	89
17	3055	AAC Almonte	3812.8	41.6	44.9	2.0	104	58	90	81	86
21	3031	Dieter	3748.1	46.2	45.1	4.0	106	58	91	79	85
16	3044	CANTAL	3686.1	44.5	46.7	3.3	109	58	91	78	84

Average 4731.3 47.0 44.0 2.2 99 58 91
 LSD (0.05) 782.317
 C.V. 11.74%

	Grain
SE	555.4583
SD	521.9510
H	0.72

Verner Soybean Performance RR 2015
 New Liskeard Agricultural Research Station
 (VSPRR15)

Seeded: 2-Jun-15
 Fertilization: None
 Herbicide: 2L/ha Roundup Transorb

Entry	Code	Variety	Grain		100 Seed	Test Wt.	Protein	Oil	Lodging	Height	Index	Harv
			kg/ha	bu/ac	weight (g)	kg/hl	%	%	(0-9)	(cm)	Grain	Grain
1		23-10 RY	2882.1	42.9	19.2	71.8	35.4	17.5	0.0	80	87	90
2		24-61 RY	3462.2	51.5	17.8	72.6	35.2	18.1	0.0	89	105	104
3		24-10 RY	3709.9	55.2	17.3	72.7	35.8	16.0	0.0	85	112	110
4		26-10 RY	3159.7	47.0	16.1	72.8	35.5	16.9	0.0	96	96	96
5		25-10 RY	3546.6	52.7	18.5	73.7	35.4	16.9	0.0	94	107	106
6		23-11 RY	3173.9	47.2	17.0	72.5	35.3	17.4	0.0	85	96	97
7		24-11 RY	3219.0	47.9	17.1	72.8	35.7	17.1	0.0	87	97	98
8		22-60 RY	2861.2	42.5	15.7	71.9	34.4	17.8	0.0	75	87	89
9		23-60 RY	3595.4	53.5	18.3	72.3	35.2	17.3	0.0	89	109	107
10		S007-Y4	3767.1	56.0	19.1	73.5	37.1	17.5	0.0	93	114	111
11		S00-B7	2982.0	44.3	18.0	73.0	35.6	17.0	0.0	92	90	92

Average 3305.4 49.1 17.6 72.7 35.5 17.2 0.0 87.7
 LSD (0.05) 416.749
 C.V. **8.7%**

Grain	
288.5598	SE
327.2216	SD
0.81	H

New Liskeard OSACC Soybean Performance 2015

New Liskeard Agricultural Research Station

(NLOSP15)

Seeded: 14-May-15

Fertilization: None

Herbicide: 2.0L/ha Roundup Transorb

Entry	Code	Variety	Grain		1000 Seed	Test Wt.	Lodging	Protein	Oil	Height	Days to Flower	Days to Mature	Index
			kg/ha	bu/ac	weight (g)	kg/hl	(0-9)	%	%	(cm)			Grain
1	CFDQ	NSC Jaden RR2Y	3546.1	52.7	171.3	73.1	0.0	29	20	77	56	131	111
2	CFDQ	Pekko R2	3170.8	47.1	181.1	72.7	0.0	30	20	70	60	127	99
3	CFDQ	Sampsa R2	3540.7	52.6	189.3	73.3	0.0	34	17	62	56	131	111
4	SPIQ	Vito R2	3025.3	45.0	171.9	73.9	0.0	31	20	79	56	127	95
5	PROS	PRO 2525R2	3583.3	53.3	204.7	72.7	0.0	32	19	75	56	131	112
6	SPIQ	Astro R2	3900.1	58.0	185.0	72.7	0.0	33	18	77	58	138	122
7	CFDQ	Akras R2	3936.2	58.5	198.2	74.5	0.0	31	18	70	58	131	123
8	CFDQ	CFS12.5.01 R2	3327.5	49.5	206.4	73.5	0.0	33	19	76	56	130	104
9	SYNS	S007-Y4	3649.5	54.3	178.2	72.6	0.0	30	19	68	56	131	114
10	CFDQ	CFS13.2.01 R2	3529.7	52.5	172.2	75.0	0.0	30	19	71	58	134	111
11	CFDQ	CFS13.3.01 R2	3426.4	50.9	182.3	72.7	0.0	30	20	80	56	131	107
12	PRID	PS 0035 NR2	3326.9	49.5	220.1	72.3	0.0	34	18	77	57	120	104
13	NGEN	NSC Libau RR2Y	3341.5	49.7	186.6	71.3	0.0	33	19	66	56	120	105
14	SPIQ	Kendo R2	3131.7	46.6	193.4	73.5	0.0	33	19	76	56	127	98
15	NGEN	NSC Moosamin	2841.1	42.2	183.8	72.4	0.0	33	18	56	56	117	89
16	DEKB	22-60RY	3407.5	50.7	173.7	73.0	0.0	31	19	59	58	125	107
17	PRID	PS 0055 R2	3454.6	51.4	158.5	72.6	0.0	31	20	70	56	129	108
18	CFDQ	Notus R2	3076.6	45.7	218.4	71.8	0.0	32	19	60	57	125	96
19	SYNS	S0009-M2	2861.0	42.5	175.3	71.3	0.0	31	20	69	56	113	90
20	SYNS	X2R00451	2701.5	40.2	192.0	71.8	0.0	28	21	61	56	112	85
21	SECN	Currie R2	3178.3	47.3	210.1	73.1	0.0	29	20	70	56	135	100
22	SECN	Mahony R2	3507.4	52.2	191.7	72.3	0.0	32	19	72	56	120	110
23	SECN	Mcleod R2	3469.0	51.6	200.5	72.8	0.0	32	19	71	56	123	109
24	NGEN	NSC Sanford RR2	3293.1	49.0	168.7	73.8	0.0	29	20	70	56	128	103
25	NGEN	NSC Watson RR2Y	2556.1	38.0	174.3	71.8	0.0	32	19	66	57	111	80
26	PION	P001T34R	2128.9	31.7	156.9	73.1	0.0	30	21	46	56	113	67
27	PION	P002T04R	2475.0	36.8	153.1	72.3	0.0	30	20	60	56	112	78
28	PION	PH14002	2923.4	43.5	189.3	72.7	0.0	30	20	61	56	126	92
29		Montcalm	2709.7	40.3	164.2	72.5	0.0	30	21	74	56	118	85
30		Montcalm	2741.1	40.8	173.0	72.7	0.0	33	20	75	56	120	86

Average	3192.0	47.5	184.1	72.8	0.0	31.2	19.4	69	56	124
LSD (0.05)	427.650									
C.V.	9.5%									

SE

New Liskeard Corn Performance 2015
 New Liskeard Agricultural Research Station
 (NLCP15)

Seeded: 6-May-15
 Fertilization: 150 N Preplant 200kg/ha (8-32-16) banded with seed
 Herbicide: Converge PRO 220ml/ha + Converge 480 2.22 L/ha (Applied with Samco) + 2 L/ha Roundup Transorb

Entry	Company	CHU	Variety	Grain Yield		Harvest	Protein	Oil	Test Wt.	Lodging	Height	Days to Tassle	Days to Silk	Index	Harv
				kg/ha	bu/acre	Moisture %	%	%	kg/hl	(0-9)	(cm)			Grain	Grain
1	Elite	2225	E47A12R	10134.1	161.5	23.6	9.8	4.5	67.6	0.0	208	82	83	104	103
2	Elite	2150	E46J77R	8984.2	143.1	24.1	10.8	4.7	73.1	0.0	206	80	83	92	94
3	Pickseed	2200	PS-2263VT2P RIB	9429.5	150.2	25.8	10.0	5.0	69.0	0.0	215	79	85	97	98
4	Pickseed	2350	PS-SilExVT3P RIB	9870.0	157.2	25.8	10.4	5.2	68.6	0.0	225	80	87	101	101
5	Pioneer	2050	P7211 HR	9652.8	153.8	22.9	10.7	4.3	69.3	0.0	213	78	80	99	99
6	Pioneer	2300	P7958 AM	10094.4	160.8	24.1	10.1	4.5	68.5	0.0	227	82	85	104	103
7	Pioneer	2225	P7632 AM	9927.2	158.2	27.6	9.0	4.5	64.0	0.0	211	83	86	102	101
8	Pioneer	2500	P8387 AM	10160.9	161.9	25.6	10.1	5.1	65.3	0.0	221	83	85	104	103
9	Pioneer	2000	P7332 R	10097.5	160.9	24.5	9.5	4.6	67.7	0.0	213	81	86	104	103
10	Dekalb	2075	DKC23-22RIB	8392.6	133.7	24.0	10.5	4.4	72.2	0.0	201	80	81	86	90
11	Pride	2250	A4025G3 RIB	9617.7	153.2	22.2	10.6	4.9	70.0	0.0	193	78	80	99	99
12	Pride	2175	A4199G2 RIB	9470.3	150.9	25.2	9.7	4.3	68.9	0.0	213	79	82	97	98
13	Pride	2300	A4415G2 RIB	9077.0	144.6	25.2	10.5	4.1	72.2	0.0	224	78	80	93	95
14	DAS	2300	X13002S2	10650.7	169.7	24.5	9.2	4.6	64.8	0.0	217	84	83	109	107
15	DAS	2275	3085	9287.3	148.0	26.5	10.7	4.8	69.0	0.0	206	83	36	95	97
16	DAS	2300	3093	9486.9	151.1	25.1	10.0	5.0	70.0	0.0	219	83	83	97	98
17	DAS	2300	4093	9839.4	156.8	24.7	10.0	4.9	69.9	0.0	218	83	82	101	101
18	DAS	2525	8166 RA	11051.6	176.1	26.9	9.6	4.7	67.0	0.0	214	84	83	114	110

Average 9734.7
 LSD (0.05) 902.375
 C.V. 6.53%

	Grain
SE	635.6735
SD	617.5782
H	0.74

Intensive Oat Management

John Kobler

New Liskeard Agricultural Research Station, University of Guelph

In 2014 we had many fields where oats had become flat, the technical wording would be, “severely lodged.” The growing season was wet right throughout the summer and this in turn provided adequate amounts of moisture to all of our Northern Ontario crops. Abundance of moisture, coupled with good soil fertility can be a contributing factor for creating a lodging problem, particularly to an oat crop. A discussion initiated at the local OSCIA meeting, and the general comment was that we needed to have some sort of Intensive Oat Management trial at the New Liskeard Agricultural Research Station. Clearly as farmers we also need to better understand how fertility effects our crops, particularly oats, and what could we do to help mitigate any of those lodging concerns.

In our experimental design we settled on three varieties of oats, Dieter - a traditional oat grown in our area, Morrison - a Quaker preferred variety, and Camden - a known high yielding oat originating from Western Canada. We had the opportunity to include two growth regulators, a product call Palisade from Syngenta and a product called Manipulator from EngageAgro. And we also had the opportunity to include one fungicide treatment a product called Twinline from BASF.

Past research has shown that excessive nitrogen (N) in our soils available to the plant during the growing season could be a factor for causing excessive lodging. To help simulate a lodging condition, via that fertility vector, we needed to look at applying various rates of additional nitrogen (N) in our experiment. The experimental design was rather large and we had to limit the number of nitrogen treatments to four distinct rates namely; 0N, 60N, 60N + 30N at flag leaf and 90N. The OMAFRA recommendation in the Agronomy Guide (Publication 811) calls for an application rate of 55N kg/ha of actual Nitrogen for an oat crop

The Intensive Oat Management trial was seeded May 14, 2015, two weeks later than we had hoped for. Unfortunately, later seeding dates inherently tend to have less lodging issues. This proved to be true for us in the fall of 2015 as we didn’t see the severe lodging issues of previous year on any of the plots in our experiment.



Photo 1: Temiskaming Crop Tour July 23rd

Figure 1 shows the average overall yield that we attained for each variety individually, when we combine all the various treatments for each variety.

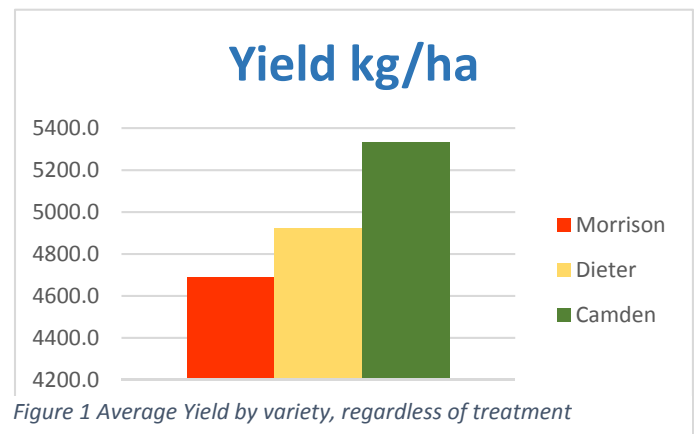


Figure 1 Average Yield by variety, regardless of treatment

Camden clearly turned out to be the highest yielding variety and Morrison was the lowest yielding variety in our experiment. Dieter was measured to be tallest variety with an average height of 106 cm. Both Camden and Morrison measured simpler at 90cm in height. Dieter had the highest lodging score as compared to the other two varieties. Farmers tend to shy away from taller varieties because they tend to be related to having potential lodging issues.

Interestingly, despite our late seeding date, we saw a response from each of the individual treatments. Those 4 nitrogen rates that we applied created a characteristic nitrogen response graph for each of the three varieties. Figure 2 shows the treatment response for Dieter oats and we can clearly see that Twinline fungicide was beneficial on the mid to higher rates of nitrogen. Out in the field, when we physically viewed the plots, at 0N the plant density or “canopy” was much thinner, resulting in a lower opportunity for disease pressure to have an effect.

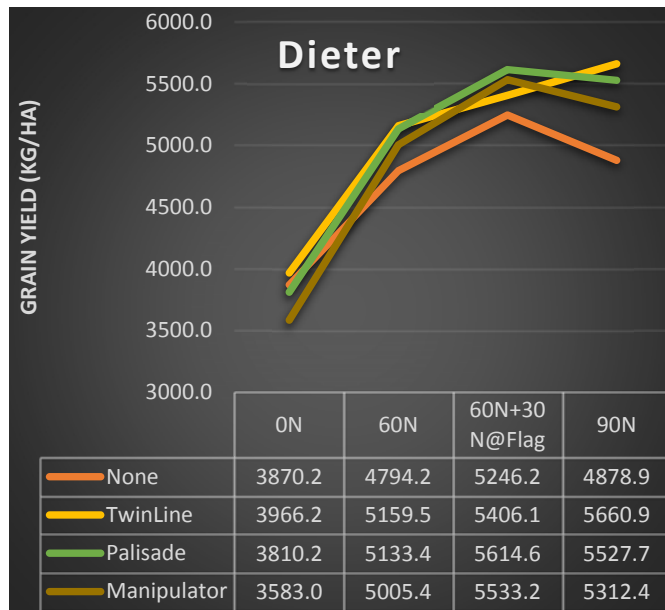


Figure 2: Treatment Response for Dieter Oat

In the Camden response graph, Figure 3, we see a lower benefit of using Twinline fungicide. Out in

the field when we looked for actual physical disease pressure in the plots, Camden appeared to

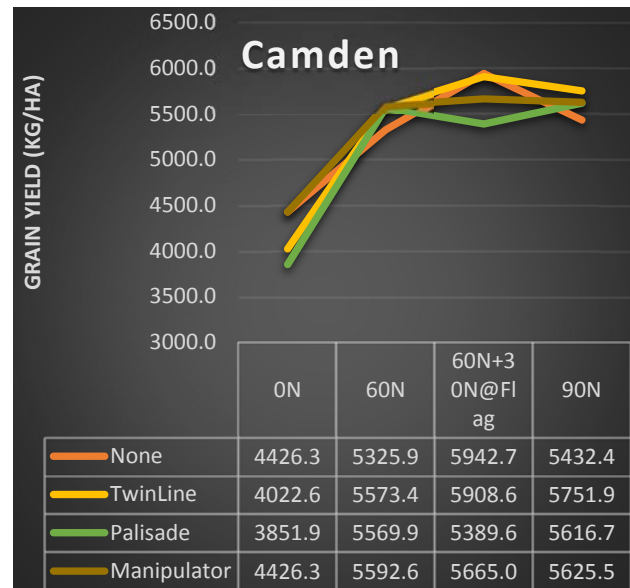


Figure 3: Treatment Response of Camden Oat

less susceptible than we would have thought, for a western variety in our area. Interestingly Camden had a visually thicker stem, and accordingly, Camden had the lowest lodging scores of those three varieties.

Figure 4 shows some benefit occurring from that single application of Twinline fungicide a crossed all rates of N for Morrison oat. This could be a varietal trait. (more susceptible to disease) Also, based on those lower yield numbers, there seems to be very little benefit from using a growth regulator on this variety.

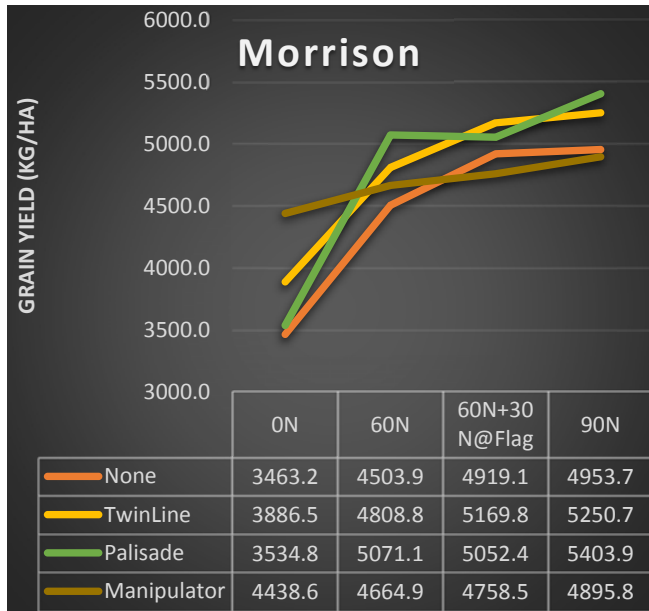


Figure 4: Treatment response for Morrison

Statistically if we look at all the interactions between treatments the amount of data that gets generated becomes rather large to be explained in a single article. At the risk of creating a complex graph, I created a graph showing each individual treatment response for all variety(s) lumped together. We can start to see some general trends as shown in Figure 5. Twinline fungicide clearly showed a benefit for all N rates levels, across the board for all plot data. (Remember regardless of Variety) However, the general trend for using a growth regulator appears to be that they are N rate sensitive.

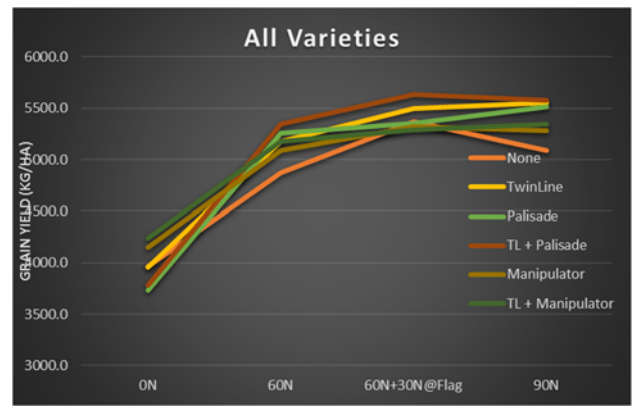


Figure 5 Treatment response across all varieties

We achieved the highest yield in this experiment from a combination of treatments. It was the treatment that included Camden Oat, at an N rate of 60N + 30N applied at flag leaf, and it included Twinline fungicide and Palisade as the growth regulator, where we achieved that highest yield of 6,294 kg/ha. Having said all this, in research we shouldn't draw too many conclusions with only one year of data. Therefore, we really need to be planning to execute this experiment again next year.

Funding for this work was provided by Northern Ontario Farm Innovation Alliance, Pepsico Quaker, BASF, Grain Farmers of Ontario, EngageAgro, Syngenta, Canterra Seeds, SeCan and OMAFRA/U of G Partnership Agreement.

New Liskeard Intensive Oat Management 2015
 New Liskeard Agricultural Research Station
 (NL10M15)

Physical Field Plan Layout

Rep 1		Rep 2		Rep 3	
Camden 60N Twinline	5861.9	Morrison 0N GR 1 Twinline	3761.0	Dieter 90N GR2 Twinline	4857.6
Camden 60N	5342.7	Morrison 0N GR 1	3636.3	Dieter 60N+30N @ flag leaf GR 2	5972.0
Camden 0N	4680.8	Morrison 90N GR1 Twinline	5891.9	Dieter 0N Twinline	4540.1
Camden 60N GR2 Twinline	5535.0	Morrison 60N+30N @ flag leaf	5565.7	Dieter 60N+30N @ flag leaf Twinline	5850.6
Camden 60N GR2	5513.4	Morrison 60N+30N @ flag leaf GR 1	5323.9	Dieter 90N	4877.6
Camden 60N+30N @ flag leaf Twinline	6041.6	Morrison 90N	5591.3	Dieter 60N	4737.9
Camden 0N GR 2 Twinline	3779.1	Morrison 60N GR1 Twinline	5630.7	Dieter 0N GR 1 Twinline	3767.0
Camden 60N+30N @ flag leaf	5663.0	Morrison 0N GR 2	4424.5	Dieter 60N+30N @ flag leaf	5329.1
Camden 60N+30N @ flag leaf GR 2	5642.8	Morrison 60N GR2 Twinline	5747.9	Dieter 90N Twinline	5464.2
Camden 60N GR1 Twinline	5181.1	Morrison 60N GR2	5323.5	Dieter 0N GR 2 Twinline	3808.9
Camden 60N GR1	5107.1	Morrison 90N GR2 Twinline	5891.5	Dieter 60N+30N @ flag leaf GR 1	5583.6
Camden 90N GR1	5510.0	Morrison 60N GR1	5418.3	Dieter 90N GR1 Twinline	5564.9
Camden 0N GR 2	3432.1	Morrison 0N GR 2 Twinline	4124.5	Dieter 60N+30N @ flag leaf GR 2 Twinline	4913.7
Camden 90N GR2 Twinline	5608.0	Morrison 60N+30N @ flag leaf GR 2 Twinline	5788.1	Dieter 0N GR 2	3136.1
Camden 90N GR1 Twinline	5353.5	Morrison 60N+30N @ flag leaf GR 1 Twinline	5795.4	Dieter 60N+30N @ flag leaf GR 1 Twinline	5369.5
Camden 60N+30N @ flag leaf GR 2 Twinline	5099.0	Morrison 90N GR2	5649.5	Dieter 60N GR1 Twinline	4861.8
Camden 60N+30N @ flag leaf GR 1	5138.4	Morrison 60N	5333.9	Dieter 60N Twinline	5025.4
Camden 0N Twinline	3542.1	Morrison 0N	4120.7	Dieter 60N GR2 Twinline	4875.5
Camden 60N+30N @ flag leaf GR 1 Twinline	5474.0	Morrison 60N Twinline	5699.7	Dieter 90N GR2	5211.5
Camden 90N Twinline	5378.9	Morrison 60N+30N @ flag leaf Twinline	6171.8	Dieter 0N	3282.8
Camden 90N GR2	5342.4	Morrison 60N+30N @ flag leaf GR 2	5132.5	Dieter 60N GR2	4947.7
Camden 0N GR 1	3375.6	Morrison 90N GR1	5904.8	Dieter 0N GR 1	3386.6
Camden 90N	5353.3	Morrison 90N Twinline	6034.5	Dieter 60N GR1	4950.8
Camden 0N GR 1 Twinline	3787.4	Morrison 0N Twinline	4769.4	Dieter 90N GR1	5861.3
Morrison 90N GR1	5203.0	Dieter 60N GR2 Twinline	6191.7	Camden 60N GR2	5695.6
Morrison 90N GR2 Twinline	5056.9	Dieter 60N GR2	5639.3	Camden 60N+30N @ flag leaf GR 1 Twinline	6410.1
Morrison 0N GR 2 Twinline	4323.4	Dieter 60N+30N @ flag leaf Twinline	5406.8	Camden 60N GR1 Twinline	6174.6
Morrison 0N GR 2	4984.1	Dieter 60N GR1	6199.2	Camden 0N GR 2 Twinline	5536.1
Morrison 60N GR1	5178.6	Dieter 90N	5177.2	Camden 0N GR 2	5925.5
Morrison 60N+30N @ flag leaf GR 1	4734.0	Dieter 0N GR 2 Twinline	5084.0	Camden 60N GR1	5314.9
Morrison 60N+30N @ flag leaf Twinline	4572.5	Dieter 60N+30N @ flag leaf	5772.3	Camden 0N Twinline	3948.0
Morrison 60N GR1 Twinline	4365.9	Dieter 0N GR 2	4438.6	Camden 60N GR2 Twinline	5166.5
Morrison 60N+30N @ flag leaf	4619.8	Dieter 90N Twinline	6447.8	Camden 0N GR 1 Twinline	3936.1
Morrison 0N GR 1	2982.9	Dieter 0N GR 1	4642.3	Camden 0N GR 1	3567.5
Morrison 60N GR2 Twinline	4073.6	Dieter 60N+30N @ flag leaf GR 1 Twinline	5852.7	Camden 60N+30N @ flag leaf GR 1	5319.1
Morrison 0N GR 1 Twinline	2717.7	Dieter 60N Twinline	5865.8	Camden 60N Twinline	4999.1
Morrison 90N	4209.8	Dieter 90N GR2	5800.8	Camden 90N	5155.1
Morrison 60N GR2	3946.1	Dieter 60N+30N @ flag leaf GR 1	6059.7	Camden 90N GR2 Twinline	5261.1
Morrison 60N+30N @ flag leaf GR 2	4048.6	Dieter 90N GR1	5957.4	Camden 90N Twinline	5587.6
Morrison 60N+30N @ flag leaf GR 2 Twinline	4078.2	Dieter 0N Twinline	4014.4	Camden 90N GR1 Twinline	5477.7
Morrison 90N GR2	4328.6	Dieter 90N GR1 Twinline	6112.4	Camden 90N GR1	5531.3
Morrison 60N	3829.3	Dieter 60N+30N @ flag leaf GR 2 Twinline	6468.9	Camden 60N+30N @ flag leaf GR 2	4947.0
Morrison 90N Twinline	4460.5	Dieter 0N	4457.0	Camden 60N	4789.4
Morrison 0N	2442.4	Dieter 0N GR 1 Twinline	4413.8	Camden 60N+30N @ flag leaf Twinline	5560.3
Morrison 60N Twinline	3857.7	Dieter 60N+30N @ flag leaf GR 2	5946.7	Camden 60N+30N @ flag leaf GR 2 Twinline	5234.0
Morrison 90N GR1 Twinline	4630.4	Dieter 90N GR2 Twinline	6088.5	Camden 90N GR2	5330.6
Morrison 0N Twinline	3115.2	Dieter 60N	5421.2	Camden 60N+30N @ flag leaf	5474.6
Morrison 60N+30N @ flag leaf GR 1 Twinline	5017.3	Dieter 60N GR1 Twinline	5716.0	Camden 0N	3908.8
Dieter 90N Twinline	5070.8	Camden 0N	5100.6	Morrison 60N+30N @ flag leaf Twinline	4765.1
Dieter 0N GR 2 Twinline	3347.0	Camden 60N GR2 Twinline	6356.5	Morrison 60N+30N @ flag leaf GR 2 Twinline	5055.8
Dieter 0N GR 1	3401.8	Camden 60N+30N @ flag leaf GR 1 Twinline	6999.0	Morrison 60N GR1 Twinline	5003.7
Dieter 90N GR2 Twinline	4848.8	Camden 60N GR1	6287.7	Morrison 60N GR2	4725.2
Dieter 60N Twinline	4587.3	Camden 60N GR1 Twinline	6686.5	Morrison 60N GR2 Twinline	4151.2
Dieter 60N	4223.5	Camden 60N+30N @ flag leaf GR 2	6405.3	Morrison 0N GR 1	3985.1
Dieter 90N GR1	4764.2	Camden 90N GR2	6203.5	Morrison 60N+30N @ flag leaf GR 2	5094.4
Dieter 60N+30N @ flag leaf GR 1 Twinline	5002.9	Camden 0N Twinline	4577.7	Morrison 0N GR 2	3907.1
Dieter 0N	3870.8	Camden 60N+30N @ flag leaf	6690.5	Morrison 60N+30N @ flag leaf	4571.8
Dieter 60N+30N @ flag leaf GR 2	4680.8	Camden 0N GR 1 Twinline	4516.0	Morrison 90N GR2 Twinline	4476.1
Dieter 60N+30N @ flag leaf GR 1	5200.5	Camden 60N Twinline	5859.2	Morrison 0N GR 1 Twinline	3877.3
Dieter 90N GR2	4924.9	Camden 90N Twinline	6289.2	Morrison 90N	5060.0
Dieter 0N Twinline	3344.1	Camden 90N GR2 Twinline	6045.7	Morrison 0N GR 2 Twinline	3808.7
Dieter 60N GR1	4250.2	Camden 60N+30N @ flag leaf Twinline	6123.7	Morrison 60N GR1	4616.6
Dieter 0N GR 1 Twinline	3246.3	Camden 90N GR1 Twinline	6779.9	Morrison 90N GR1 Twinline	5315.3
Dieter 90N	4581.8	Camden 0N GR 1	4612.5	Morrison 90N GR1	5103.8
Dieter 60N+30N @ flag leaf GR 2 Twinline	4573.5	Camden 60N	5845.6	Morrison 60N Twinline	4868.9
Dieter 60N GR2	4429.2	Camden 60N+30N @ flag leaf GR 2 Twinline	6420.7	Morrison 90N Twinline	5257.0
Dieter 60N GR2 Twinline	4506.2	Camden 60N GR2	5568.6	Morrison 60N+30N @ flag leaf GR 1	5099.2
Dieter 60N GR1 Twinline	4478.4	Camden 0N GR 2 Twinline	4328.6	Morrison 60N+30N @ flag leaf GR 1 Twinline	4810.1
Dieter 0N GR 2	3174.4	Camden 90N	5788.7	Morrison 60N	4348.6
Dieter 60N+30N @ flag leaf Twinline	4961.0	Camden 90N GR1	5808.9	Morrison 90N GR2	4709.2
Dieter 90N GR1 Twinline	5079.8	Camden 60N+30N @ flag leaf GR 1	5711.4	Morrison 0N Twinline	3775.1
Dieter 60N+30N @ flag leaf	4637.1	Camden 0N GR 2	3921.1	Morrison 0N	3826.4

New Liskeard Intensive Oat Management 2015

New Liskeard Agricultural Research Station

(NLIOM15)

Seeded: 14-May-15

Fertilization: 0,60,60+30,90 N (select plots)

Herbicide: 1.25 L/ha Logic M (all plots)

Fungicide: none, 0.5L/ha Twinline

Growth Regulator: none, Palisade EC 0.83L/ha, Manipulator 1.8L /ha

Treatment	Yield	Kernel Wt	Test Wt.	Protein	Height	Lodging	Stem Break	Heading	Maturity
	kg/ha	g/1000	kg/hl	%	cm	0-9	0-9	Days	Days
Reps									
1	4537.6	36.1	46.4	11.1	91	2.9	0.9	65	94
2	5539.3	35.5	46.1	11.2	100	4.7	4.3	65	94
3	4870.0	35.4	46.1	11.2	97	3.4	2.6	65	94
Variety									
1 Dieter	4924.1	36.5	46.7	10.9	106	5.5	2.9	65	96
2 Morrison	4690.6	33.0	46.7	11.6	90	3.0	2.6	65	89
3 Camden	5332.2	37.5	45.1	11.0	91	2.4	2.4	65	96
Probability <= 0.05	0.0055	0.0003	0.0987	0.0111					
N-Rate									
1 0N	3970.6	36.1	46.9	10.2	87	1.1	0.3	66	93
2 60N	5153.9	35.0	46.2	11.1	99	4.6	3.3	65	94
3 60N+30N at flag leaf	5410.7	36.3	46.1	11.9	98	3.6	2.5	65	94
4 90N	5393.9	35.3	45.6	11.5	100	5.3	4.4	65	94
Probability <= 0.05	0.0000	0.0000	0.0000	0.0000					
Variety x N-Rate									
1 Dieter x 0N	3853.1	36.8	47.4	9.9	92	2.1	0.0	66	96
2 Dieter x 60N	5050.4	36.1	46.8	10.6	109	6.7	3.9	65	96
3 Dieter x 60N+30N	5421.2	36.5	46.5	11.6	110	6.5	3.6	65	96
4 Dieter x 90N	5371.7	36.5	46.3	11.4	113	6.8	3.9	65	96
1 Morrison x 0N	3810.1	33.7	47.5	10.5	84	0.2	0.0	66	88
2 Morrison x 60N	4784.4	32.5	46.8	11.5	92	3.8	2.8	65	89
3 Morrison x 60N+30N	5013.6	33.3	46.4	12.6	91	2.9	2.5	65	89
4 Morrison x 90N	5154.1	32.7	46.2	12.0	93	5.0	5.1	65	89
1 Camden x 0N	4248.7	37.7	45.6	10.0	85	0.9	0.8	66	96
2 Camden x 60N	5627.0	36.6	44.9	11.0	95	3.2	3.3	65	96
3 Camden x 60N+30N	5797.5	39.0	45.4	11.6	93	1.5	1.3	65	96
4 Camden x 90N	5655.8	36.7	44.3	11.3	93	4.2	4.2	65	96
Fungicide									
0 None	4915.9	35.4	46.0	11.2	96	4.5	3.6	65	94
1 Twinline	5048.7	35.9	46.3	11.1	96	2.8	1.6	65	94

Treatment	Yield	Kernel Wt	Test Wt.	Protein	Height	Lodging	Stem Break	Heading	Maturity
	kg/ha	g/1000	kg/hl	%	cm	0-9	0-9	Days	Days

Probability <= 0.05 0.0195 0.0000 0.0004 0.1666

Variety x Fungicide

1 Dieter x none	4859.1	36.4	46.6	10.9	106	5.6	2.7	65	96
2 Dieter x Twinline	4989.1	36.6	46.9	10.9	106	5.5	3.1	65	96
3 Morrison x none	4638.3	32.9	46.5	11.7	90	4.0	3.9	65	89
4 Morrison x Twinline	4742.8	33.2	46.9	11.6	90	1.9	1.3	65	89
1 Camden x none	5250.2	37.0	45.0	11.0	92	3.8	4.2	65	96
2 Camden x Twinline	5414.3	38.0	45.2	11.0	91	1.1	0.6	65	96

N-Rate x Fungicide

1 0N x none	3949.1	36.0	46.8	10.2	86	1.2	0.6	66	93
1 0N x Twinline	3992.2	36.1	46.9	10.1	87	1.0	0.0	66	93
2 60N x none	5073.5	34.7	45.9	11.2	98	5.6	4.5	65	94
2 60N x Twinline	5234.4	35.4	46.4	11.0	99	3.6	2.2	65	93
3 60N+30N x none	5346.8	35.9	45.9	11.9	99	4.9	3.7	65	94
3 60N+30N x Twinline	5474.7	36.6	46.3	12.0	98	2.3	1.2	65	94
4 90N x none	5294.1	35.0	45.4	11.6	100	6.2	5.6	65	93
4 90N x Twinline	5493.7	35.6	45.8	11.5	99	4.4	3.2	65	94

Variety x N-Rate x Fungicide

1 Dieter x 0N x none	3754.5	37.0	47.5	9.9	90	1.7	0.0	66	96
2 Dieter x 0N x Twinline	3951.7	36.7	47.3	10.0	94	2.6	0.0	66	96
3 Dieter x 60N x none	4977.7	35.8	46.4	10.8	111	7.0	3.6	65	96
4 Dieter x 60N x Twinline	5123.1	36.3	47.2	10.5	108	6.4	4.3	65	96
1 Dieter x 60N+30N x none	5464.6	36.1	46.2	11.5	110	6.8	3.6	65	96
2 Dieter x 60N+30N x Twinline	5377.7	36.8	46.7	11.6	111	6.2	3.6	65	96
3 Dieter x 90N x none	5239.6	36.5	46.1	11.5	114	7.0	3.6	65	96
4 Dieter x 90N x Twinline	5503.9	36.5	46.5	11.3	112	6.7	4.3	65	96
1 Morrison x 0N x none	3812.2	33.5	47.4	10.6	84	0.3	0.0	66	88
2 Morrison x 0N x Twinline	3808.0	33.8	47.6	10.3	83	0.1	0.0	66	88
3 Morrison x 60N x none	4746.7	32.4	46.5	11.7	91	5.0	4.7	65	89
4 Morrison x 60N x Twinline	4822.1	32.6	47.0	11.4	93	2.6	0.9	65	88
1 Morrison x 60N+30N x none	4910.0	33.3	46.2	12.6	93	5.2	5.0	65	89
2 Morrison x 60N+30N x Twinline	5117.2	33.4	46.7	12.6	90	0.6	0.0	65	90
3 Morrison x 90N x none	5084.5	32.4	45.9	12.0	93	5.4	6.0	65	88
4 Morrison x 90N x Twinline	5223.8	33.0	46.4	11.9	93	4.6	4.2	65	89
1 Camden x 0N x none	4280.5	37.6	45.5	10.1	85	1.6	1.7	66	96
2 Camden x 0N x Twinline	4216.8	37.9	45.8	10.0	84	0.2	0.0	66	96
3 Camden x 60N x none	5496.1	35.9	44.8	11.0	94	4.7	5.2	65	96
4 Camden x 60N x Twinline	5757.8	37.3	45.0	11.0	96	1.8	1.3	65	96
1 Camden x 60N+30N x none	5665.8	38.4	45.4	11.6	93	2.8	2.7	65	96
2 Camden x 60N+30N x Twinline	5929.2	39.6	45.4	11.7	92	0.2	0.0	65	96

Treatment	Yield	Kernel Wt	Test Wt.	Protein	Height	Lodging	Stem Break	Heading	Maturity
	kg/ha	g/1000	kg/hl	%	cm	0-9	0-9	Days	Days
3 Camden x 90N x none	5558.2	36.1	44.1	11.3	94	6.2	7.3	65	96
4 Camden x 90N x Twinline	5753.5	37.3	44.5	11.2	92	2.1	1.1	65	96

Growth Regulator

None	4935.8	35.7	46.4	11.2	99	3.8	2.2	65	93
GR1 - Palisade	5024.8	35.9	46.1	11.1	93	3.5	2.6	65	94
GR2 - Manipulator	4986.3	35.4	46.0	11.2	95	3.7	3.1	65	94

Probability <= 0.05 nil 0.0000 nil nil

Variety x Growth Regulator

1 Dieter x none	4872.8	36.6	46.7	11.1	110	5.7	1.6	65	96
2 Dieter x Palisade	4988.5	36.6	46.9	10.7	104	5.3	3.0	65	96
3 Dieter x Manipulator	4911.1	36.2	46.6	10.8	104	5.7	4.0	65	96
1 Morrison x none	4619.5	33.4	47.1	11.6	92	2.9	2.3	65	88
2 Morrison x Palisade	4750.1	33.2	46.4	11.7	88	3.0	2.7	65	89
3 Morrison x Manipulator	4702.1	32.5	46.7	11.6	90	3.0	2.8	65	89
1 Camden x none	5315.1	37.1	45.5	10.9	96	3.0	2.7	65	96
2 Camden x Palisade	5335.8	38.0	45.0	10.9	89	2.1	2.2	65	96
3 Camden x Manipulator	5345.8	37.4	44.6	11.1	90	2.2	2.4	65	96

N-Rate x Growth Regulator

1 0N x none	3962.0	36.3	47.1	10.1	90	1.6	0.4	66	93
2 0N x Palisade	3756.3	36.4	47.1	9.8	84	0.5	0.0	66	93
3 0N x Manipulator	4193.6	35.6	46.4	10.5	87	1.1	0.4	66	94
1 60N x none	5027.6	35.1	46.4	11.0	101	4.7	3.3	65	93
2 60N x Palisade	5301.2	35.3	45.9	11.3	97	4.7	3.4	65	94
3 60N x Manipulator	5132.9	34.7	46.1	10.9	98	4.3	3.3	65	93
1 60+30N x none	5432.1	36.0	46.3	12.0	102	3.8	1.8	65	94
2 60+30N x Palisade	5494.5	36.6	46.0	12.0	96	3.5	2.5	65	94
3 60+30N x Manipulator	5305.7	36.2	46.0	11.9	97	3.6	3.1	65	94
1 90N x none	5321.4	35.4	45.9	11.7	104	5.3	3.3	65	93
2 90N x Palisade	5547.2	35.5	45.5	11.4	98	5.1	4.6	65	94
3 90N x Manipulator	5313.1	35.0	45.4	11.5	98	5.6	5.4	65	94

Probability <= 0.05 0.0084 0.3352 0.0025 0.0003

Variety x N-Rate x Growth Regulator

1 Dieter x 0N x none	3918.2	37.2	47.5	10.2	96	3.0	0.0	66	96
2 Dieter x 0N x Palisade	3809.6	36.9	47.6	9.7	89	1.5	0.0	67	96
3 Dieter x 0N x Manipulator	3831.5	36.4	47.1	9.9	91	1.8	0.0	67	96
1 Dieter x 60N x none	4976.8	36.4	46.8	10.8	111	6.7	3.8	65	96
2 Dieter x 60N x Palisade	5076.1	36.4	46.9	10.6	108	6.5	2.7	65	96
3 Dieter x 60N x Manipulator	5098.3	35.4	46.7	10.5	108	7.0	5.3	65	96

Treatment	Yield	Kernel Wt	Test Wt.	Protein	Height	Lodging	Stem Break	Heading	Maturity
	kg/ha	g/1000	kg/hl	%	cm	0-9	0-9	Days	Days
1 Dieter x 60+30N x none	5326.1	36.2	46.4	11.8	114	6.5	1.3	65	96
2 Dieter x 60+30N x Palisade	5511.5	36.6	46.7	11.5	108	6.0	4.0	65	96
3 Dieter x 60+30N x Manipulator	5425.9	36.6	46.4	11.5	109	7.0	5.3	65	96
1 Dieter x 90N x none	5269.9	36.6	46.2	11.8	119	6.5	1.2	65	96
2 Dieter x 90N x Palisade	5556.7	36.6	46.4	11.1	110	7.0	5.3	65	96
3 Dieter x 90N x Manipulator	5288.7	36.4	46.3	11.3	109	7.0	5.3	65	96
1 Morrison x 0N x none	3674.9	34.2	47.7	10.3	86	0.3	0.0	66	88
2 Morrison x 0N x Palisade	3493.4	33.7	47.7	10.2	80	0.0	0.0	66	88
3 Morrison x 0N x Manipulator	4262.1	33.1	47.2	11.0	86	0.3	0.0	65	89
1 Morrison x 60N x none	4656.4	33.0	47.1	11.4	92	3.7	2.7	65	88
2 Morrison x 60N x Palisade	5035.6	32.4	46.4	12.0	90	3.8	3.7	65	89
3 Morrison x 60N x Manipulator	4661.3	32.1	46.9	11.3	93	3.8	2.0	65	88
1 Morrison x 60+30N x none	5044.5	33.7	47.0	12.6	95	3.0	2.7	65	89
2 Morrison x 60+30N x Palisade	5130.0	33.5	45.8	12.7	89	3.3	2.2	65	90
3 Morrison x 60+30N x Manipulator	4866.2	32.8	46.6	12.4	91	2.3	2.7	65	89
1 Morrison x 90N x none	5102.2	32.9	46.5	12.1	95	4.5	3.8	65	88
2 Morrison x 90N x Palisade	5341.5	33.1	45.9	12.0	93	4.8	5.0	65	89
3 Morrison x 90N x Manipulator	5018.6	32.1	46.2	11.9	93	5.7	6.5	65	89
1 Camden x 0N x none	4293.0	37.6	46.2	10.0	88	1.5	1.2	66	96
2 Camden x 0N x Palisade	3965.9	38.4	46.0	9.6	81	0.0	0.0	67	96
3 Camden x 0N x Manipulator	4487.1	37.2	44.8	10.6	84	1.2	1.3	66	96
1 Camden x 60N x none	5449.6	36.0	45.4	10.9	100	3.7	3.3	65	96
2 Camden x 60N x Palisade	5792.0	37.2	44.4	11.3	91	3.8	4.0	65	96
3 Camden x 60N x Manipulator	5639.3	36.6	44.8	10.9	93	2.2	2.5	65	96
1 Camden x 60+30N x none	5925.6	38.2	45.6	11.5	98	1.8	1.3	65	96
2 Camden x 60+30N x Palisade	5842.0	39.6	45.5	11.7	91	1.2	1.3	65	96
3 Camden x 60+30N x Manipulator	5624.8	39.3	45.1	11.7	91	1.5	1.3	65	96
1 Camden x 90N x none	5592.1	36.7	44.9	11.3	98	5.0	4.8	65	96
2 Camden x 90N x Palisade	5743.5	36.9	44.3	11.1	91	3.5	3.5	65	96
3 Camden x 90N x Manipulator	5631.9	36.6	43.7	11.3	91	4.0	4.3	65	96

Fungicide x Growth Regulator

None x None	4824.5	35.3	46.2	11.3	99	4.5	3.0	65	93
None x GR1 - Palisade	4964.7	35.7	46.0	11.2	94	4.6	3.9	65	94
None x GR2 - Manipulator	4958.4	35.2	45.8	11.2	95	4.3	3.9	65	94
Twinline x None	5047.1	36.1	46.6	11.2	100	3.2	1.4	65	94
Twinline x GR1 - Palisade	5084.9	36.1	46.2	11.1	93	2.3	1.4	65	94
Twinline x GR2 - Manipulator	5014.2	35.5	46.2	11.2	95	3.0	2.2	65	94

Variety x Fungicide x Growth Regulator

Dieter x None x None	4697.4	36.5	46.5	11.2	110	5.8	0.7	65	96
Dieter x None x GR1 - Palisade	5021.5	36.5	46.8	10.8	104	5.6	3.3	65	96
Dieter x None x GR2 - Manipulator	4858.5	36.1	46.4	10.8	104	5.5	4.0	65	96

Treatment	Yield	Kernel Wt	Test Wt.	Protein	Height	Lodging	Stem Break	Heading	Maturity
	kg/ha	g/1000	kg/hl	%	cm	0-9	0-9	Days	Days
Dieter x Twinline x None	5048.2	36.7	47.0	11.0	110	5.6	2.5	65	96
Dieter x Twinline x GR1 - Palisade	4955.5	36.7	47.0	10.6	103	4.9	2.7	65	96
Dieter x Twinline x GR2 - Manipulator	4963.7	36.3	46.8	10.9	105	5.9	4.0	65	96
Morrison x None x None	4460.0	33.0	46.9	11.6	91	3.7	3.9	65	88
Morrison x None x GR1 - Palisade	4765.5	33.0	46.2	11.9	89	4.8	4.5	65	89
Morrison x None x GR2 - Manipulator	4689.4	32.7	46.4	11.8	91	3.6	3.3	65	89
Morrison x Twinline x None	4779.0	33.9	47.2	11.6	92	2.1	0.7	65	89
Morrison x Twinline x GR1 - Palisade	4734.7	33.3	46.6	11.6	87	1.3	0.9	65	89
Morrison x Twinline x GR2 - Manipulator	4714.7	32.3	47.0	11.5	90	2.5	2.3	65	89
Camden x None x None	5316.1	36.5	45.3	11.0	96	4.2	4.4	65	96
Camden x None x GR1 - Palisade	5107.0	37.7	45.0	10.8	89	3.4	3.8	65	96
Camden x None x GR2 - Manipulator	5327.3	36.8	44.5	11.2	90	3.8	4.5	65	96
Camden x Twinline x None	5314.1	37.7	45.7	10.9	96	1.8	0.9	65	96
Camden x Twinline x GR1 - Palisade	5564.7	38.4	45.0	11.0	88	0.8	0.7	65	96
Camden x Twinline x GR2 - Manipulator	5364.2	38.0	44.7	11.1	89	0.6	0.3	65	96

0.0766 0.0776 nil nil

N-Rate x Fungicide x Growth Regulator

0N x None x None	3965.6	36.3	47.0	10.2	89	1.9	0.8	66	93
0N x None x GR1 - Palisade	3732.3	36.3	47.2	9.8	84	0.3	0.0	66	93
0N x None x GR2 - Manipulator	4149.3	35.5	46.2	10.7	86	1.3	0.9	66	94
0N x Twinline x None	3958.4	36.3	47.2	10.1	91	1.3	0.0	66	93
0N x Twinline x GR1 - Palisade	3780.3	36.4	47.0	9.8	84	0.7	0.0	66	93
0N x Twinline x GR2 - Manipulator	4237.8	35.6	46.5	10.4	87	0.9	0.0	66	94
60N x None x None	4874.7	34.7	46.3	11.0	100	5.3	4.4	65	93
60N x None x GR1 - Palisade	5258.1	34.9	45.6	11.5	97	6.2	4.7	65	94
60N x None x GR2 - Manipulator	5087.6	34.5	45.9	11.0	98	5.1	4.3	65	93
60N x Twinline x None	5180.6	35.4	46.6	11.0	103	4.0	2.1	65	93
60N x Twinline x GR1 - Palisade	5344.3	35.8	46.2	11.1	96	3.2	2.2	65	94
60N x Twinline x GR2 - Manipulator	5178.2	35.0	46.3	10.7	98	3.6	2.2	65	93
60+30N x None x None	5369.3	35.3	46.1	11.9	101	4.8	2.7	65	94
60+30N x None x GR1 - Palisade	5352.2	36.4	45.8	12.0	97	5.2	4.1	65	94
60+30N x None x GR2 - Manipulator	5318.9	36.1	45.8	11.8	98	4.8	4.4	65	94
60+30N x Twinline x None	5494.8	36.8	46.5	12.0	102	2.8	0.9	65	94
60+30N x Twinline x GR1 - Palisade	5636.8	36.8	46.1	11.9	95	1.8	0.9	65	94
60+30N x Twinline x GR2 - Manipulator	5292.4	36.3	46.2	11.9	96	2.4	1.8	65	94
90N x None x None	5088.3	34.9	45.6	11.9	105	6.1	4.1	65	93
90N x None x GR1 - Palisade	5516.1	35.4	45.5	11.4	99	6.6	6.7	65	94
90N x None x GR2 - Manipulator	5277.9	34.7	45.2	11.5	97	6.0	6.1	65	93
90N x Twinline x None	5554.5	35.9	46.2	11.5	103	4.6	2.4	65	93
90N x Twinline x GR1 - Palisade	5578.4	35.6	45.6	11.4	97	3.7	2.6	65	94
90N x Twinline x GR2 - Manipulator	5348.2	35.3	45.6	11.5	98	5.1	4.7	65	94

Treatment	Yield	Kernel Wt	Test Wt.	Protein	Height	Lodging	Stem Break	Heading	Maturity
	kg/ha	g/1000	kg/hl	%	cm	0-9	0-9	Days	Days
Variety x N-Rate x Fungicide x Growth Regulator									
Dieter x 0N x None x None	3870.2	37.5	47.6	10.2	95	3.0	0.0	66	96
Dieter x 0N x None x GR1 - Palisade	3810.2	37.1	47.8	9.6	87	1.0	0.0	67	96
Dieter x 0N x None x GR2 - Manipulator	3583.0	36.5	47.1	9.8	89	1.0	0.0	67	96
Dieter x 0N x Twinline x None	3966.2	36.8	47.4	10.1	97	3.0	0.0	66	96
Dieter x 0N x Twinline x GR1 - Palisade	3809.0	36.8	47.4	9.7	92	2.0	0.0	66	96
Dieter x 0N x Twinline x GR2 - Manipulator	4080.0	36.3	47.1	10.1	94	2.7	0.0	67	96
Dieter x 60N x None x None	4794.2	36.4	46.5	10.8	111	6.7	2.7	65	96
Dieter x 60N x None x GR1 - Palisade	5133.4	36.1	46.5	10.9	113	7.3	2.7	65	96
Dieter x 60N x None x GR2 - Manipulator	5005.4	34.9	46.3	10.7	108	7.0	5.3	65	96
Dieter x 60N x Twinline x None	5159.5	36.3	47.1	10.8	112	6.7	5.0	65	96
Dieter x 60N x Twinline x GR1 - Palisade	5018.7	36.6	47.3	10.3	104	5.7	2.7	65	96
Dieter x 60N x Twinline x GR2 - Manipulator	5191.2	36.0	47.1	10.4	109	7.0	5.3	65	96
Dieter x 60+30N x None x None	5246.2	35.7	46.1	11.8	111	6.3	0.0	65	96
Dieter x 60+30N x None x GR1 - Palisade	5614.6	35.9	46.3	11.5	109	7.0	5.3	65	96
Dieter x 60+30N x None x GR2 - Manipulator	5533.2	36.7	46.1	11.3	109	7.0	5.3	65	96
Dieter x 60+30N x Twinline x None	5406.1	36.7	46.6	11.8	116	6.7	2.7	65	96
Dieter x 60+30N x Twinline x GR1 - Palisade	5408.4	37.4	47.0	11.4	106	5.0	2.7	65	96
Dieter x 60+30N x Twinline x GR2 - Manipulator	5318.7	36.4	46.6	11.7	109	7.0	5.3	65	96
Dieter x 90N x None x None	4878.9	36.3	45.7	12.1	122	7.0	0.0	65	96
Dieter x 90N x None x GR1 - Palisade	5527.7	37.0	46.5	11.1	109	7.0	5.3	65	96
Dieter x 90N x None x GR2 - Manipulator	5312.4	36.3	46.2	11.3	109	7.0	5.3	65	96
Dieter x 90N x Twinline x None	5660.9	36.9	46.7	11.4	116	6.0	2.3	65	96
Dieter x 90N x Twinline x GR1 - Palisade	5585.7	36.1	46.3	11.2	110	7.0	5.3	65	96
Dieter x 90N x Twinline x GR2 - Manipulator	5265.0	36.5	46.5	11.4	108	7.0	5.3	65	96
Morrison x 0N x None x None	3463.2	33.8	47.7	10.2	82	0.3	0.0	66	88
Morrison x 0N x None x GR1 - Palisade	3534.8	33.5	47.9	10.1	82	0.0	0.0	65	88
Morrison x 0N x None x GR2 - Manipulator	4438.6	33.2	46.7	11.5	88	0.7	0.0	65	89
Morrison x 0N x Twinline x None	3886.5	34.5	47.6	10.4	89	0.3	0.0	66	88
Morrison x 0N x Twinline x GR1 - Palisade	3452.0	33.9	47.4	10.2	78	0.0	0.0	66	88
Morrison x 0N x Twinline x GR2 - Manipulator	4085.5	33.0	47.7	10.5	83	0.0	0.0	65	89
Morrison x 60N x None x None	4503.9	32.5	47.1	11.4	92	4.7	5.3	65	88
Morrison x 60N x None x GR1 - Palisade	5071.1	32.3	46.0	12.5	88	6.0	6.0	65	89
Morrison x 60N x None x GR2 - Manipulator	4664.9	32.4	46.6	11.3	93	4.3	2.7	65	88
Morrison x 60N x Twinline x None	4808.8	33.4	47.0	11.3	92	2.7	0.0	65	88
Morrison x 60N x Twinline x GR1 - Palisade	5000.1	32.5	46.8	11.6	92	1.7	1.3	65	89
Morrison x 60N x Twinline x GR2 - Manipulator	4657.6	31.8	47.2	11.2	94	3.3	1.3	65	88
Morrison x 60+30N x None x None	4919.1	33.3	46.7	12.6	96	4.7	5.3	65	89
Morrison x 60+30N x None x GR1 - Palisade	5052.4	33.3	45.4	12.7	90	6.3	4.3	65	90
Morrison x 60+30N x None x GR2 - Manipulator	4758.5	33.1	46.4	12.5	92	4.7	5.3	65	89
Morrison x 60+30N x Twinline x None	5169.8	34.1	47.3	12.6	93	1.3	0.0	65	90
Morrison x 60+30N x Twinline x GR1 - Palisade	5207.6	33.7	46.2	12.7	88	0.3	0.0	65	89
Morrison x 60+30N x Twinline x GR2 - Manipulator	4974.0	32.4	46.7	12.4	89	0.0	0.0	65	90
Morrison x 90N x None x None	4953.7	32.2	46.1	12.2	94	5.0	5.0	65	88

Treatment	Yield	Kernel Wt	Test Wt.	Protein	Height	Lodging	Stem Break	Heading	Maturity
	kg/ha	g/1000	kg/hl	%	cm	0-9	0-9	Days	Days
Morrison x 90N x None x GR1 - Palisade	5403.9	33.0	45.7	12.1	95	6.7	7.7	65	89
Morrison x 90N x None x GR2 - Manipulator	4895.8	32.1	46.0	11.8	90	4.7	5.3	65	88
Morrison x 90N x Twinline x None	5250.7	33.6	46.9	11.9	95	4.0	2.7	65	88
Morrison x 90N x Twinline x GR1 - Palisade	5279.2	33.2	46.0	11.9	90	3.0	2.3	65	89
Morrison x 90N x Twinline x GR2 - Manipulator	5141.5	32.1	46.3	12.0	95	6.7	7.7	65	89
Camden x 0N x None x None	4426.3	36.8	44.8	10.7	83	2.3	2.7	66	96
Camden x 0N x None x GR1 - Palisade	3851.9	38.4	45.9	9.6	82	0.0	0.0	66	96
Camden x 0N x None x GR2 - Manipulator	4426.3	36.8	44.8	10.7	83	2.3	2.7	66	96
Camden x 0N x Twinline x None	4022.6	37.6	46.5	9.8	86	0.7	0.0	66	96
Camden x 0N x Twinline x GR1 - Palisade	4079.8	38.5	46.1	9.6	81	0.0	0.0	67	96
Camden x 0N x Twinline x GR2 - Manipulator	4547.9	37.5	44.8	10.6	85	0.0	0.0	66	96
Camden x 60N x None x None	5325.9	35.3	45.2	10.8	97	4.7	5.3	65	96
Camden x 60N x None x GR1 - Palisade	5569.9	36.3	44.2	11.1	91	5.3	5.3	65	96
Camden x 60N x None x GR2 - Manipulator	5592.6	36.1	44.9	11.2	93	4.0	5.0	65	96
Camden x 60N x Twinline x None	5573.4	36.6	45.6	11.0	104	2.7	1.3	65	96
Camden x 60N x Twinline x GR1 - Palisade	6014.1	38.2	44.6	11.5	92	2.3	2.7	65	96
Camden x 60N x Twinline x GR2 - Manipulator	5686.0	37.1	44.8	10.6	92	0.3	0.0	65	96
Camden x 60+30N x None x None	5942.7	36.9	45.6	11.4	97	3.3	2.7	65	96
Camden x 60+30N x None x GR1 - Palisade	5389.6	40.0	45.8	11.7	91	2.3	2.7	65	96
Camden x 60+30N x None x GR2 - Manipulator	5665.0	38.4	44.9	11.6	92	2.7	2.7	65	96
Camden x 60+30N x Twinline x None	5908.6	39.5	45.6	11.6	98	0.3	0.0	65	96
Camden x 60+30N x Twinline x GR1 - Palisade	6294.4	39.2	45.2	11.8	90	0.0	0.0	65	96
Camden x 60+30N x Twinline x GR2 - Manipulator	5584.5	40.1	45.3	11.7	89	0.3	0.0	65	96
Camden x 90N x None x None	5432.4	36.3	44.8	11.5	98	6.3	7.3	65	96
Camden x 90N x None x GR1 - Palisade	5616.7	36.1	44.2	11.1	92	6.0	7.0	65	96
Camden x 90N x None x GR2 - Manipulator	5625.5	35.8	43.4	11.4	93	6.3	7.7	65	96
Camden x 90N x Twinline x None	5751.9	37.0	45.0	11.1	97	3.7	2.3	65	96
Camden x 90N x Twinline x GR1 - Palisade	5870.4	37.6	44.3	11.1	90	1.0	0.0	65	96
Camden x 90N x Twinline x GR2 - Manipulator	5638.2	37.3	44.0	11.3	90	1.7	1.0	65	96
Grand Means	4880.9	34.8	45.4	11.0	95.8	3.7	2.6	65.3	93.6
Coefficient of Variation (%)	8.3%	2.1%	1.5%	4.4%	5.6%	53.0%	101.1%		

