

PROGRESS REPORT ON GRASS SEED PRODUCTION RESEARCH

prepared by

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This summary and previous annual summaries are on the Web at:

http://www.mnturfseed.org/html/progress_reports.html

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Standard Management Practices for Perennial Ryegrass Seed Production Research Plots in Minnesota

General management regime of perennial ryegrass plots on the Magnusson Research Farm:

Spring seeded ryegrass with wheat

Ryegrass seeded at 5#/acre with spring wheat
Banvel+ 2,4-D amine (0.75 + 0.75 pint) applied in mid-September
Fertilize 30-30-30 mid-October
Fertilize 100-0-0 applied early to mid-May, 300 - 600 GDD
Banvel+ 2,4-D amine (0.75+0.75 pint) applied late May, 700 - 900 GDD
Tecoma or Assure (8-10 oz) applied early June, 800 - 1,000 GDD
Apogee (6-8 oz) applied early heading, 1,100 - 1,300 GDD
Quilt Excel (10 oz) applied full heading, 1,700 - 1,900 GDD

Fall seeded ryegrass in wheat stubble

Ryegrass seeded at 5#/acre after wheat harvest into existing stubble
Pre-harvest glyphosate application to wheat , or
glyphosate applied to wheat stubble prior to seeding ryegrass.
No broadleaf application in fall but other management for fall seeded ryegrass the same as spring seeded.

On-farm small plot research trials

All crop planting and general management are done by the grower/cooperator.
Application of treatment variables, agronomic notes and harvest by University of Minnesota personnel.
Cooperators will avoid applications of treatments involved in the study to the research plot area.

General ryegrass seed harvest procedure for small research plot

Measured areas are hand cut and bagged for each individual plot.
These samples are then brought to the U of M St.Paul campus where they are dried, threshed, cleaned and weighed.
Seed yields and other data are statistically analyzed and results summarized.

On-farm large plot trial research protocol

These experiments are conducted in grower/cooperator fields with ALL field operations performed by the grower.
University personnel design experiments with the goal of having a limited number (2 or 3) of treatment variables.
University and local agronomists work closely with the grower to initiate field trials and monitor applications.
Plant samples, crop development observations and other applicable notes
, are recorded as needed throughout the growing season.
At harvest, University or local agronomists will assist the growers in collecting quality samples and recording data.

**Table 1. Monthly and Year End Precipitation Totals*
Roseau ,Mn 1967-2013.**

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Yearly Total(in.)	DEVIATION	Park' blg.
														FROM MEAN	mean yield lbs/A
1967	1.13	0.39	0.59	2.89	0.89	2.23	4.95	1.69	0.83	1.11	0.70	1.76	19.16	-2.66	
1968	0.62	T	1.25	0.63	1.46	6.47	6.13	8.49	2.35	1.26	1.06	0.21	29.93	8.11	650
1969	3.07	0.11	0.05	1.27	3.31	2.29	3.70	4.28	3.29	1.91	0.30	0.73	24.31	2.49	488
1970	0.71	0.41	1.38	2.56	5.93	4.07	3.55	0.83	2.77	1.49	1.21	0.37	25.28	3.46	673
1971	0.54	0.13	0.26	1.50	2.24	2.29	3.58	0.69	3.33	2.97	0.29	0.50	18.32	-3.50	492
1972	0.68	0.76	0.50	0.70	1.66	5.03	1.92	1.53	4.22	1.40	0.38	0.32	19.10	-2.72	405
1973	0.09	0.17	1.18	0.90	2.46	2.21	4.04	2.09	5.67	1.19	0.67	0.75	21.42	-0.40	422
1974	0.88	0.87	0.16	2.72	4.12	1.56	2.56	11.00	0.42	0.66	0.15	1.40	26.47	4.65	642
1975	1.10	0.29	0.64	1.40	1.52	4.96	2.26	1.75	1.79	1.49	0.20	0.65	18.05	-3.77	504
1976	1.13	0.50	1.05	0.77	0.54	5.82	1.52	3.72	0.34	0.07	T	0.37	15.83	-5.99	146
1977	0.14	0.62	1.02	0.27	2.43	3.71	2.28	1.74	3.83	0.87	2.27	0.26	19.44	-2.38	140
1978	0.36	0.26	0.17	1.00	1.97	1.92	6.25	3.25	3.44	0.23	0.98	0.79	20.62	-1.20	507
1979	0.50	1.01	1.06	2.77	1.89	1.91	3.70	1.59	0.45	1.40	1.02	0.16	17.46	-4.36	415
1980	0.55	0.82	0.35	0.00	0.24	1.75	3.35	5.19	4.12	1.66	0.94	0.18	19.15	-2.67	62
1981	0.27	0.16	0.66	0.56	2.79	6.85	2.63	2.41	3.63	1.75	0.90	0.99	23.60	1.78	625
1982	1.30	0.45	0.74	0.24	1.38	2.00	5.53	2.71	1.92	2.91	0.46	0.57	20.21	-1.61	595
1983	1.31	1.26	1.17	0.53	2.76	4.03	1.62	3.34	2.91	2.26	0.66	0.10	21.95	0.13	605
1984	T	0.95	T	0.72	0.72	4.46	3.78	0.99	0.37	4.32	0.10	1.02	17.43	-4.39	613
1985	0.12	0.33	0.06	1.07	4.35	4.62	1.08	8.72	1.60	1.04	1.68	0.38	25.05	3.23	525
1986	0.30	0.90	0.26	2.96	1.40	2.43	3.59	2.04	2.52	0.65	1.97	0.36	19.38	-2.44	488
1987	0.47	0.30	0.10	0.59	4.37	2.25	4.80	2.22	0.82	0.92	0.73	0.35	17.92	-3.90	288
1988	0.60	0.09	1.75	0.00	1.74	1.34	5.53	1.70	2.24	0.12	0.77	1.05	16.93	-4.89	152
1989	3.27	0.32	2.86	0.10	2.82	5.46	1.60	2.56	1.24	0.41	0.62	0.45	21.71	-0.11	320
1990	0.55	0.20	1.12	1.09	0.46	3.19	2.48	0.62	0.91	0.16	0.18	0.72	11.68	-10.14	160
1991	0.56	0.64	0.58	2.87	3.19	5.94	3.40	1.99	7.42	1.64	1.36	0.70	30.29	8.47	210
1992	0.61	0.68	0.45	2.27	1.99	2.36	2.72	4.51	2.76	0.12	1.27	0.88	20.62	-1.20	630
1993	0.68	0.05	0.27	1.01	1.63	5.06	5.87	4.69	0.72	0.71	0.45	0.65	21.79	-0.03	490
1994	0.21	0.33	0.47	0.02	0.16	2.54	3.03	3.48	3.94	1.38	2.72	0.32	18.60	-3.22	230
1995	0.57	0.59	1.23	0.61	2.50	2.13	4.59	3.59	1.81	1.33	1.54	1.46	21.95	0.13	300
1996	0.94	0.48	0.22	1.65	4.62	1.64	7.34	1.78	1.77	1.75	2.73	1.07	25.99	4.17	250
1997	1.06	0.14	1.02	0.84	2.02	3.36	4.02	1.31	4.01	2.45	0.19	0.25	20.67	-1.15	350
1998	0.69	1.05	0.21	0.77	4.55	5.39	3.01	2.20	0.31	4.42	1.39	0.95	24.94	3.12	275
1999	0.15	0.77	0.23	1.31	4.09	6.97	3.46	1.38	3.16	0.43	0.38	0.56	22.89	1.07	400
2000	0.45	0.14	0.79	0.38	1.83	7.38	1.63	6.45	2.14	2.89	3.41	0.74	28.23	6.41	550
2001	0.21	0.52	0.46	1.89	3.27	1.76	4.74	1.40	0.72	1.76	1.50	0.56	18.79	-3.03	575
2002	0.19	0.10	0.45	1.44	2.79	9.94	2.96	4.47	1.62	1.02	0.30	0.54	25.82	4.00	300
2003	0.80	0.77	1.60	1.75	2.95	3.56	1.92	1.78	4.55	1.32	1.52	1.95	24.47	2.65	550
2004	2.85	0.70	2.14	2.61	8.19	2.98	2.42	5.50	2.97	2.36	0.08	1.33	34.13	12.31	650
2005	2.33	0.67	0.82	0.73	3.62	7.55	3.37	3.24	1.77	3.48	2.06	1.65	31.29	9.47	400
2006	2.52	0.95	1.01	1.23	1.97	1.00	0.94	2.18	2.42	1.54	0.17	0.56	16.49	-5.33	300
2007	0.44	0.56	1.25	0.95	2.75	7.75	2.92	1.37	0.92	5.14	0.39	0.86	25.30	3.48	200
2008	0.25	1.29	0.46	2.17	1.56	3.93	4.33	3.63	3.06	2.37	2.00	1.47	26.52	4.70	275
2009	1.25	1.75	4.45	1.37	3.59	3.72	1.28	3.92	2.67	1.06	0.28	1.22	26.56	4.74	375
2010	0.80	0.43	0.55	1.23	6.47	2.88	3.79	1.50	6.09	2.42	1.14	0.61	27.91	6.09	350
2011	1.15	0.20	0.23	3.14	2.63	3.87	2.38	1.63	0.89	1.34	0.19	0.07	17.72	-4.10	375
2012	0.59	1.06	2.06	1.39	1.48	3.32	2.74	1.42	0.18	3.64	1.22	0.24	19.10	-2.72	275
2013	1.34	1.21	1.05	1.40	4.69	1.70	2.14	3.77	2.65	0.84	1.43	1.85	24.07	2.25	375
47 year average annual precipitation													21.82		

*Precipitation amounts used are from the Roseau research site April-September and Minnesota Climatology Working Group the remainder of the year.

Table 4.

2012 Fine Fescue Variety Trial
Magnusson Research Farm- Roseau,Mn

Cultivar	Species	Company	Lot	Festuca spp.	2013		% of			% Heading		
					Seed Yield LBS/Acre	Harvest Date	Ht.(in.)	Heads ¹	plants headed ²	6/3	6/7	6/15
1 Bridgeport II	Chewings fescue	Barenbrug	M20-11-DF229	<i>rubra commutata</i>	194	8-Jul	30	4	5	2	14	49
2 Culumbra II	Chewings fescue	ProSeeds Marke	Z2-10-10		198	8-Jul	28	4	6	1	9	49
3 Enchantment	Chewings fescue	Pure Seed	M65-9-4CH6-F-1		105	8-Jul	29	4	4	3	13	41
4 J-5	Chewings fescue	Jacklin Seed by	B09-10		220	8-Jul	27	5	6	4	20	58
5 Longfellow III	Chewings fescue	DLF International			85	10-Jul	25	3	3	0	0	19
6 PSG 50C3	Chewings fescue	Seed Research	(BLK-L5-08N-09		180	8-Jul	26	4	6	0	4	40
7 PSG SPRS	Chewings fescue	Seed Research	(BLK-26-14-09EABC-09		227	8-Jul	30	5	7	2	15	53
8 Radar	Chewings fescue	Peak Plant Genetics			247	8-Jul	26	5	6	0	2	44
9 Windward	Chewings fescue	Seed Research of Oregon			154	8-Jul	27	4	6	1	10	51
10 Wrigley 2	Chewings fescue	DLF International			138	8-Jul	25	4	5	0	5	38
11 Azay Blue	Blue hard fescue	Seed Research	(BLK-1-06E-08		56	8-Jul	20	3	6	10	23	48
12 Barok	Sheep's fescue	Barenbrug	H4-11-00812	<i>ovina</i>	4	8-Jul	14	1	1	0	0	1
13 Barpreza	Sheep's fescue	Barenbrug	6911	<i>ovina duriuscula</i>	5	9-Jul	17	1	1	0	0	2
14 Bighorn GT	Hard fescue	Pure Seed	M65-11-4BU3-R		26	8-Jul	21	2	2	2	5	13
15 Blueray	Hard fescue	Peak Plant Genetics			16	8-Jul	17	1	2	0	0	6
16 Hardtop	Hard fescue	Barenbrug	H4-11-00911-A	<i>trachyphylla</i>	24	8-Jul	25	2	2	2	4	17
17 MNHD	Hard fescue	University of Minnesota			69	8-Jul	20	3	5	3	6	21
18 PSG 3TH3	Hard fescue	Seed Research of Oregon			49	8-Jul	22	3	5	3	9	30
19 Soil Guard	Hard fescue	Pure Seed	M65-10-4CU3-R		38	8-Jul	18	3	4	0	1	11
20 SR 3210	Blue hard fescue	Seed Research of Oregon			111	8-Jul	23	4	7	14	35	63
21 07-1 FF	Creeping red fescue	Seed Research	(BLK-SO-08E-10		256	11-Jul	30	5	7	0	4	43
22 BRJDT	Strong creeping red fescue	Seed Research	(BLK-54-11E-11-CTBT		360	10-Jul	30	7	9	0	7	50
23 Cindy Lou	Strong creeping red fescue	DLF International			196	9-Jul	25	5	7	0	8	43
24 Contender	Strong creeping red fescue	Barenbrug	L187-9-1CRF	<i>rubra rubra</i>	234	9-Jul	26	6	7	2	14	46
25 Epic	Strong creeping red fescue	ProSeeds Marke	M85-11-15		127	10-Jul	26	4	6	0	1	23
26 OR C126	Strong creeping red fescue	Seed Research	(2011-CTBT		425	10-Jul	28	7	8	0	11	48
27 PPG-FRR 103	Strong creeping red fescue	Peak Plant Genetics			156	11-Jul	23	4	6	0	3	35
28 PSG 5J5115 L	Strong creeping red fescue	Seed Research of Oregon			174	10-Jul	24	5	6	0	1	30
29 PSG 5J5115E	Strong creeping red fescue	Seed Research of Oregon			176	10-Jul	23	5	5	0	3	28
30 Shademaster III	Strong creeping red fescue	Pure Seed	M65-10-48Y7-F		80	11-Jul	20	3	5	0	0	20
	LSD @5% level				70	1	3	1	2	3	9	19
	CV(%)				34	9	9	22	24	159	89	40

Seeding date- 5/1/2012

Seeding rate- 5#/acre

¹-Heads-heading expression-0=no heading;9=best heading²- % of plants headed(x10) 7/6/13- higher number =higher potential seed yield

Weed control:

Bronate +.5pt LV6 7/8/2012

2pt Curtail M+.5pt Clarity 9/29/2012

Fertilizer applied 10/23/2012:

70-35-35-8s

Table 5.

**2011&12 Tall Fescue Seed Production Variety Trials
Roseau and Crookston,Mn. 2012-13 data**

Variety	Lot#	Seed Yield		Seed Yield-- Lbs./Ac.				Roseau-% Heading			Roseau Harvest			Crookston Harvest	
		% of Mean ¹	Location Average ¹	Crookston ²		Roseau		6/15	6/18	6/23	Ht.(in.)	Lodging	Date	Lodging	Ht.(in.)
				2013	2012-13	2013	2012								
1 PSG 85 P1	3952	95	1110	1350	871	902	840	1	40	79	35	1.0	7/16	1.0	33
2 Speedway	3950	106	1247	1437	1058	1094	1022	0	25	65	35	1.5	7/22	1.0	33
3 Brockton	3944	94	1102	1261	943	920	967	0	23	70	37	1.0	7/22	1.0	35
4 Kentucky 31	3947	94	1095	1198	991	1212	771	9	58	90	47	3.5	7/16	2.5	41
5 Crossfire 3	3948	96	1124	1386	863	876	851	0	15	58	35	1.0	7/22	1.0	33
6 Mustang 4	3949	94	1098	1341	854	773	936	1	33	75	36	1.0	7/22	1.0	32
7 D3- WH*	3943	NA	NA	NA	1006	1007	1005	0	18	60	33	1.0	7/22	NA	NA
8 Greystone	3946	96	1129	1352	907	900	913	0	18	58	38	1.8	7/22	2.8	38
9 Durana	3945	116	1353	1553	1154	1210	1098	0	18	60	37	1.0	7/22	1.3	37
10 SR 8650	3951	110	1288	1606	969	936	1002	2	28	69	36	1.0	7/22	1.3	35
11 Hidden Valley*		NA	NA	570	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.0	38
LSD @5% level		15	177	326	139	166	144	1	7	9	3	0.4	0	1.9	4
CV(%)		10	10	17	10	12	11	99	17	9	6	22	0	61	9

Experimental Design: RCB w/4 reps

Underseeded tall fescue at 6#/ac. Under spring wheat

Roseau - 5/22/2011 ; Crookston 4/20/2012

Crookston all harvest 7/18/2013 1171.77778

Plot size= 5' x 20'

Management- residue burned after harvest

Fertility-

2013 harvest--30-30-30 in September + 100-0-0 in late April

2012 harvest-- 10/22/2011 -110-34-40-8s

3/4pt. 2,4-D + 3/4pt. Banvel in late September

*Hidden Valley Crookston location only;D3-WH (U of M experimental) Roseau location only

¹-Roseau/Crookston- Mean of 2012-2013 seed yield at Roseau + 2013 seed yields from Crookston=1172#/ac

²-Crookston had a visually estimated 20% seed shatter prior to harvest

Locations=

Crookston- NWROC University of Minnesota

Roseau- Magnusson Research farm-North west of Roseau,Mn

Table 6.

**2012 Seeding Perennial Ryegrass Winter Hardiness Variety Trial
St.Paul Campus and Magnusson Research Farm Roseau,Mn**

Source	Variety	Seed lot	St.Paul	Roseau	Mean
			Winter Injury ¹ 6/11/13	Winter Injury ¹ 5/28/13	WI Roseau- St.Paul
U of M	Survivor	3848	2.3	2.3	2.3
check	NK-200	3917	3.3	3.0	3.1
U of M	Forageur	3942	3.0	3.3	3.1
U of M	Royal Green	3934	3.0	3.5	3.3
U of M	MSPxA.Green/Ragnar	3973	3.8	3.0	3.4
U of M	Green Emperor	3976	4.3	2.8	3.5
pickseed	FTMBL-C4-10	3978	3.5	3.5	3.5
U of M	Spreader III	3791	3.8	3.5	3.6
U of M	Spreader III x P201	3982	4.3	3.3	3.8
pickseed	WH-PR-11-3	3980	3.5	4.0	3.8
check	Quebec	3981	4.5	3.8	4.1
U of M	Ragnar	3909	5.0	3.6	4.3
check	Brightstar SLT	3977	5.0	3.5	4.3
U of M	Arctic Green	3953	5.4	3.5	4.4
pickseed	Ps-Lp-10-4	3979	4.5	4.8	4.6
check	Gulf(annual)	3983	7.3	8.5	7.9
LSD @5% level			2.5	1.3	1.5
CV(%)			44	25	28

Experimental Design:RCB with 4 Reps

Planted 8/22/2012 at Roseau and 9/7/2012 at St.Paul .

¹-Winter injury--1=no injury; 9=dead

Table 7.

2013 Grower Managed Perennial Ryegrass Growth Regulator Trial at 2 On Farm Locations*-Roseau and Lake of the Woods

Apogee Rate ¹	Seed Yield ²		test wt.		harvest Ht.(in.)		% cleanout ³		Lodging ⁴
	Magnusson*	Estling*	Magnusson*	Estling*	Magnusson*	Estling*	Magnusson*	Estling*	Estling*
7 oz.(standard)	1101	1182	28.5	27.7	21	26	14.2	14.1	6
11 oz.(+4 oz.)	1111	1160	28.7	27.7	21	25	12.7	15.1	5
LSD @ 20% level	NS	NS	0.1	NS	NS	NS	1.5	NS	NS

Experimental plot design= RCB with 3 reps

*-Roseau location= Magnusson Farms- west of Roseau

*-Lake of the Woods area= Estling Farms- north of Roosevelt--Applied 6/15/2013

Variety at both locations=Arctic Green

Harvest area= .55 acres at Magnusson Farms; 1.75 acres at Estling farms

¹-Apogee Rate-Standard rate= Magnusson Farm-8oz. , Estling Farm-6oz.

Adjuvants used with Apogee applications= .25% NIS + 2.5%-28%N (Estling Farm) +3gal.-28%N (Magnusson Farm)

Separate spray batches for each rate were mixed and applied by grower. The only variable was the Apogee rate.

²-Seed Yield= Clean seed corrected to 11.5% moisture

³-% cleanout= % of material cleaned out of combined samples

⁴-Lodging at harvest= 1=none;9=flat

Apogee 27.5%DFprohexadione --Applied at early heading

Observations/Conclusions:

Determine the effect of growers applying an additional 4oz. Of Apogee growth regulator to their standard application. No yield effect but slightly shorter height and cleaner seed with +4oz. rate

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Table 8.

**2013 Grower Managed Perennial Ryegrass Fertility Trial
Byron Tveit Farm- North of Roosevelt
Standard Fertility+Agrotain and +30#N**

Fertilizer Treatment	Seed Yield ²	Test Wt.	Harvest Lodging ³
120#N (Standard)	1200	27.8	3.6
120#N+Agrotain Ultra	1266	28.1	4.3
150#N(+30#N)	1225	27.5	4.3
LSD @ 20% level	NS	0.5	0.7

Experimental plot design= RCB with 3 reps

Variety= Accent II

Fertilizer Application date=5/28/2013

Harvest area= .55acres

NO3/ac. prior to fertilizing

Soil test results-	0-6"	6-24"	Total 0-24"
5/9/2013	24#	42#	66#

Observations/Conclusions:

Determine if additional 30#N or Agrotain Ultra to standard grower practice, impacts ryegrass growth and seed yield. The addition of Agrotain showed similar lodging results as +30#N but yields were not significantly different.

Table 9.

2011-13 Perennial Ryegrass Nitrogen Fertility Trial
Magnusson Research Farm-Spring Plant var. Arctic Green

Trt#	Application Rate	Application timing	2013 #/acre	Seed Yield % of mean			Vigor ⁵	Harvest			RCI ⁶			
				2013	2012	2011		7/1	Date	Ht.	7/1	7/15	8/2	8/2 cut ⁷
1	0	0	294	28	21	36	1.8	28-Jul	15	163	148	123	117	
2	100+0+0	Fall	998	93	83	110	6.3	29-Jul	19	376	265	147	132	
3	140+0+0	Fall	1067	100		119	7.0	30-Jul	20	432	281	167	150	
4	70coated/70urea	Fall	1065	100		114	6.8	29-Jul	21	391	283	175	161	
5	100+0+0	Split ¹	1022	96	112	108	5.8	29-Jul	19	347	269	167	148	
6	140+0+0	Split ¹	1112	104	118	118	6.8	30-Jul	21	462	295	234	177	
7	180+0+0	Split ¹	1183	111			7.8	30-Jul	21	470	345	244	280	
8	80urea+20coated	Spring	1074	101	102	121	6.0	30-Jul	20	342	289	186	178	
9	100urea+40coated	Spring	1216	114			6.3	30-Jul	21	431	330	241	276	
10	100+0+0	Spring	998	93	96	108	5.8	30-Jul	19	368	257	166	158	
11	140+0+0	Spring	1109	104	119	115	7.3	31-Jul	21	428	299	221	246	
12	140+0+0+20s	Spring	1058	99			6.8	31-Jul	21	390	301	215	203	
13- ²	100+0+0	Clip/split ¹	1054	99	122		5.0	29-Jul	19	384	287	151	187	
14- ²	140+0+0	Clip/split ¹	1247	117	120		6.8	31-Jul	20	448	343	200	238	
15- ³	140+0+0	Rake off/split ¹	1156	108			7.3	31-Jul	20	391	328	169	205	
16	100+0+0	Split ¹ +Agrotain	1009	95	109		6.8	30-Jul	19	350	281	170	156	
17	100+0+0	Split ¹ +SuperU	1105	104	98		6.3	30-Jul	20	377	276	174	155	
18- ⁴	140+0+0	Split ¹ +Liquid	1165	109			6.5	31-Jul	21	423	284	220	186	
19	140+0+0	Split ¹ +Agrotain	1176	110			7.0	30-Jul	21	415	347	242	216	
20	140+0+0	Split ¹ +SuperU	1254	117			6.8	30-Jul	21	488	360	236	262	
LSD @5% level			176	16	11	12	1	2	2	81	45	55	61	
CV(%)			12	12			15	4	5	15	11	20	23	

Experimental design=RCB with 4 reps

7+31+40 applied to all plots and all fall treatments 10/17/2012.

Variety=Arctic Green under seeded in spring wheat 5/1/2012

2013 Trial mean=1068#/ac.

¹-Split application= 30# N urea in fall and remainder of rate application in spring.

²-trts. #13-14= all straw clipped and removed in fall

³-trt#15= straw baled off after harvest-no clip

⁴-trts.#18= 30#N in fall,90#N in spring +20#N- 28%N applied 6/27 at full heading

⁵- Vigor-1=poor plant vigor;9=best vigor

⁶-RCI-Relative Chlorophyll Index; higher number = more chlorophyll

⁷-All readings are from crop canopy except the 'cut area' on 8/2 which has readings on vegetative regrowth(possibly a better indicator of residual N at harvest?)

Variety- Arctic Green planted under wheat 5/1/2012.

Fall applications 10/17/2012

Spring applications 5/22/2013

Plot size= 11' x 11'

Observations/Conclusions:

Fall only nitrogen applications are less efficient than split or spring only applications

Baling off straw from wheat fields in the fall may reduce need for nitrogen fertilizer

Using a small amount of coated urea(ESN) in the spring may increase N efficiency

Table 10.

**2012-13 Phosphorus and Potassium Fertility Trial-Arctic Green Per.Ryegrass
Magnusson Research farm-F5 south**

Trt#	2012 In Furrow ¹ Treatment	2012- ¹ In furrow Rate	Fertilizer ²		Ryegrass				Harvest		
			Broadcast 10/17/2012	2013 Ryegrass Yield % of mean	% Stand	Vigor ³	RCI ⁴		Ht.(in.)	Date	
1	No P or K added	0	0	43.1	412	83	3.3	327	253	16	24-Jul
2	MES10 (2x)+K20(2x)	18-60-60-14s	0	96.3	920	88	6.5	414	272	21	27-Jul
3	MES10	9-30-30-7s	9-30-30-7s	110.8	1058	85	7.5	490	293	22	27-Jul
4	MAP	9-30-30	9-30-30	110.4	1054	85	6.8	491	298	21	26-Jul
5	MES10 (Surface apply)	9-30-30-7s	9-30-30-7s	109.4	1045	88	7.3	465	265	22	24-Jul
6	MES10+15#ESN	25-30-30-7s	9-30-30-7s	108.9	1040	83	6.8	460	297	21	29-Jul
7	MES10+30#N applied foliar at anthesis	9-30-30-7s	9-30-30-7s	121.3	1158	88	8.5	545	302	22	27-Jul
		LSD @5% Level		14.1	135	1	1	62	33	2	4
		CV(%)		10	10	10	10	9	8	6	11

Experimental Design= RCB with 4 Replications

Mean Yield of all plots=955#/ac.

120-0-0 broadcast in bulk to all plots 5/22/2013.

¹-All applied in furrow(down the tube) to wheat/ryegrass at planting except for treatment #5 which was surface applied.²-Rate surface applied for ryegrass crop-2013. MAP applied to trt.4 and MES10 to other trts if needed same as spring 2012³-Vigor-9=best plant vigor;1=least vigor.⁴-RCI=Relative Chlorophyll Index -larger number=more chlorophyll.

Soil test 4/20/2012

4#/ac. P2O5(Olsen) 138#/ac. K2O PH=8.0

Observations/Conclusions:

Adding phosphorus and potassium fertilizer is important to maximizing ryegrass seed production if soils test low

Adding high rates of in furrow P and K to wheat may not be sufficient for maximum ryegrass seed production

Higher than 30# in furrow ESN applications may reduce stands and yield of wheat and ryegrass in dry years

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Table 11.

**2012-13 Urea vs. ESN Fertilizer Applied at Different Dates to Arctic Green Per.Ryegrass
Magnusson Research farm-F5 north**

Trt#	Fertilizer Treatment ¹	2013 Seed Yield		Vigor ² 7/1/13	RCI ³		Harvest		
		% of mean	#/ac.		7/1	7/15	Ht.(in.)	Date	
1	100% urea -Spring	97.8	1100	8.5	403	309	22	28-Jul	
2	75% urea+25% ESN -Spring	111.1	1250	8.5	456	300	21	28-Jul	
3	50% ESN-Fall + 50% urea-Spring	106.8	1201	8.5	416	280	21	24-Jul	
4	100% ESN-Fall	91.1	1025	7.8	376	255	20	24-Jul	
5	100% urea-Fall	93.4	1051	8.3	355	243	19	24-Jul	
		LSD @5% Level	10.4	117	0.7	46	27	1	0
		CV(%)	7	7	6	7	6	4	0

Experimental Design= RCB with 4 Replications

Mean Yield of all plots=1125#/ac.

9-30-30-7s applied to all plots 10/18/2012

120# N rate applied to all plots at timing and source as described above.

¹-Fertility treatment- 120# nitrogen applied to all plots at specified time and source in table above.²-Vigor-9=best plant vigor;1=least vigor.³-RCI- Relative Chlorophyll Index- higher numbers = higher relative amount of chlorophyll.

Soil test 4/20/2012

16#/ac. P2O5(Olsen) 158#/ac. K2O PH=7.9

Observations/Conclusions:

Fall only nitrogen applications are less efficient than spring applications

Additions of ESN produced the highest yields

Table 12.

**2013 Nitrogen Fertilizer Rates x Growth Regulator applications to Per.Ryegrass
Tveit Farm-Lake of the Woods and Dahlgren Farm-Roseau**

Trt	N -Rate*	Apogee ¹ Application	Seed Yield						Dahlgren		
			% of Mean			#/ac.			NO3 soil residual ²		
			Tveit	Dahlgren	Mean	Tveit	Dahlgren	Mean	0-6"	6-24"	0-24"
1	0	6 oz.	92.8	45.2	70.7	1174	494	834			
2	0	6 oz.+3oz.	87.2	42.2	66.3	1103	461	782			
3	90	6 oz.	95.4	92.3	94.0	1207	1009	1108	2	4	6
4	90	6 oz.+3oz.	109.0	94.6	102.3	1379	1034	1206			
5	120	6 oz.	103.4	110.2	106.5	1308	1205	1256	27	16	43
6	120	6 oz.+3oz.	107.0	103.6	105.4	1354	1132	1243			
7	150	6 oz.	95.7	101.1	98.1	1210	1105	1157	7	16	23
8	150	6 oz.+3oz.	108.9	114.1	111.3	1377	1247	1312			
9	150split ⁵	6 oz.	94.7	112.7	103.1	1198	1232	1215	47	16	63
10	150split ⁵	6 oz.+3oz.	103.9	101.9	103.0	1314	1114	1214			
11	180	6 oz.	95.4	117.8	105.8	1207	1288	1247	m	m	m
12	180	6 oz.+3oz.	100.9	109.9	105.0	1276	1201	1238			
13	210	6 oz.	100.9	110.2	105.3	1276	1205	1241	105	52	157
14	210	6 oz.+3oz.	105.3	113.1	108.9	1332	1236	1284			
15	240	6 oz.	99.8	109.6	104.4	1263	1198	1231	70	12	82
16	240	6 oz.+3oz.	100.0	121.5	109.9	1265	1328	1296			
LSD @5% Level			10.9	12.4	8.6	138	136	101			
CV(%)			8	9	6	8	9	6			

Trt	N -Rate*	Apogee ¹ Application	Ht.(in.) at harvest		Lodging ³	Color ⁴		RCI ⁵	RCI ^{5a}	RCI ^{5b}
			Tveit	Dahlgren	Tveit	Tveit	Dahlgren	Dahlgren	Dahlgren	Dahlgren
			Tveit	Dahlgren	Tveit	Dahlgren	Dahlgren	Dahlgren	Dahlgren	
1	0	6 oz.	21	16	2.5	2.5	2.3	111	162	m
2	0	6 oz.+3oz.	21	16	2.0	2.3	2.5	111		
3	90	6 oz.	24	20	3.3	3.0	4.3	165	286	341
4	90	6 oz.+3oz.	23	19	2.0	4.3	4.8	204		
5	120	6 oz.	25	20	4.3	3.8	5.8	216	302	425
6	120	6 oz.+3oz.	23	20	2.8	4.5	5.8	249		
7	150	6 oz.	24	21	4.0	5.3	7.0	225	324	394
8	150	6 oz.+3oz.	24	20	4.0	5.5	7.0	235		
9	150split ⁵	6 oz.	23	21	4.0	7.8	7.5	304	337	422
10	150split ⁵	6 oz.+3oz.	22	19	3.0	7.3	8.0	307		
11	180	6 oz.	23	21	4.0	6.8	6.5	272	311	441
12	180	6 oz.+3oz.	22	20	2.3	5.8	6.5	244		
13	210	6 oz.	25	20	5.3	6.0	7.8	261	326	438
14	210	6 oz.+3oz.	22	22	3.0	6.0	8.0	246		
15	240	6 oz.	24	21	6.5	7.3	8.0	305	328	465
16	240	6 oz.+3oz.	23	21	3.8	6.8	8.0	248		
LSD @5% Level			2	2	1.4	1.4	0.6	46	50	41
CV(%)			7	6	29	19	7	14	12	7

Experimental Design-Split block with 4 replications

Mean yields-Tveit= 1265 ;Dahlgren=1093

Ryegrass varieties-Tveit Farm=Accent II and Dahlgren Farm=Sun

*-N-Rate- urea application Tveit-5/7 , Dahlgren-4/29

¹-Apogee application-Grower applied-Tveit=5oz. ; Dahlgren=7oz.

3oz. Apogee (applied 7 days prior to main grower application)-Dahlgren-applied 6/13/2013-4node-trace heading

3oz. Apogee (applied 7 days prior to main grower application)Tveit-Applied 6/14/2013 trace heading

²-NO3 soil residual- NO3- #/acre. Soil sampled after harvest- 8/4/2013 .

³-Lodging- 1=no lodging;9=flat

⁴-Color-1=light green/brown;9=dark green

⁵-RCI-Relative chlorophyll index -higher number =more chlorophyll

^{5a}-^{5b}=at harvest; ^{5a}=7/3/13; ^{5b}=7/16/13

⁶-100#N early+50#N late(Tveit 5/27-Dahlgren 5/22)

Soil test results-	# NO3/ac. prior to fertilizing		
	0-6"	6-24"	Total 0-24"
Tveit	24#	42#	66#
Dahlgren	10#	15#	25#

Observations/Conclusions:

Addition of split application (+3oz.) of Apogee were 6% higher overall at Tveit location but not different at Dahlgren

Optimum yields at Tveit location were obtained with 90#N and 120#N at Dahlgren

Higher nitrogen rates did not consistently impact seed yield but tended to increase RCI,lodging and height

Split 150#N applications were not efficient at either location with surplus nitrogen available at harvest

Table 13.

2013 Summary of Fungicide Applications to Perennial Ryegrass Dahlgren and Pieper Farms

Trt.#	Fungicide Treatment	Rate/Ac.	3 gal. 28%N ²	Seed Yield % of mean	
				Dahlgren	Pieper
1	Priaxor ¹	6 oz.	NO	111	107
2	Priaxor ¹	6 oz.	YES	109	
3	Quilt Excel 2.2se	10.5 oz.	NO	105	102
4	Quilt Excel 2.2se	10.5 oz.	YES	102	
5	Stratego YLD ¹ +Folicur	5.4oz.+5.4oz.	NO	101	109
6	Stratego YLD ¹ +Folicur	5.4oz.+5.4oz.	YES	98	
7	Folicur	5.4oz.	NO	99	103
8	Folicur	5.4oz.	YES	99	
9	No treatment		YES	91	
10	No treatment		NO	86	79
LSD @5% level				10	13

Experimental Design-Randomized complete block with 4 replications

Apply .25%NIS with all treatments

Pieper mean yield= 1601#/ac.

Dahlgren mean yield of no added N= 1245#/ac.

Dahlgren mean yield of +3 gal. N to fungicide= 1240#/ac.

Application timing:

Dahlgren-7/10/2013 fully headed/early bloom

Pieper-7/11/2013 mid bloom

Applications made with CO2 backpack sprayer@27psi 12GPA

¹-Priaxor and Stratego YLD are not labeled treatments on ryegrass

²- Yes= add 3 gal. N-PAK 28 to fungicide mix

Product Trade name	Rate	common name	#AI/Gal.
Quilt Excel 2.2se	10.5oz.	propiconazole+azoxystrobin	1.02+1.18
Priaxor	6 oz.	fluxapyroxad + pyraclostrobin	1.39+2.78
Stratego YLD	5.4oz.	prothioconazole+trifloxystrobin	1.05+3.15
Folicur	5.4oz.	tebuconazole	3.6
N-PAK 28	3 gal.	UAN	3.3#N

Observations/Conclusions:

Applications of a fungicide increased seed yield at both locations.

Addition of liquid nitrogen to the fungicide mix did not effect yield

at the Dahlgren location. There were no added N treatments at Tveit location.

Table 13a.

**2013 Fungicides + Liquid Nitrogen Combinations Applied to Ryegrass
Dahlgren Farm- South of Roseau -Variety 'Sun' Spring Planted**

Trt.#	Fungicide treatment	Rate/Ac.	3 gal. Seed Yield		Harvest		
			28%N ³	% of mean	#/ac.	Lodging ¹	Ht.(in.)
1	Priaxor ²	6 oz.	NO	111	1377	1.0	22
2	Priaxor ²	6 oz.	YES	109	1354	1.8	22
3	Quilt Excel 2.2se	10.5 oz.	NO	105	1299	1.5	23
4	Quilt Excel 2.2se	10.5 oz.	YES	102	1267	2.0	23
5	Stratego YLD ² +Folicur	5.4oz.+5.4oz.	NO	101	1256	1.3	22
6	Stratego YLD ² +Folicur	5.4oz.+5.4oz.	YES	98	1221	1.5	22
7	Folicur	5.4oz.	NO	99	1230	1.3	22
8	Folicur	5.4oz.	YES	99	1227	1.8	21
9	No treatment		YES	91	1129	1.8	22
10	No treatment		NO	86	1063	2.0	22
LSD @5% level				10	122	NS	1.6
CV(%)				7	7	44	5

Harvest date=7/30/2013

Apply .25%NIS with all treatments

Mean yield of no added N= 1245#/ac.

Mean yield of +3 gal. N to fungicide= 1240#/ac.

All applications made 7/10/13- Ryegrass fully headed some pollen shedding-75F wind WNW 5-10

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Table 13b.

**2013 Fungicides Applied to Arctic Green Per.Ryegrass
Dan Pieper Farm-Lake of the Woods area- Fall Planted**

Trt#	Fungicide	Rate	2013 Seed Yield		Harvest	
			% of mean	#/ac.	Color ⁴	Lodging
1	Stratego YLD ² +Folicur	5.4oz.+5.4oz.	109.1	1746	4	4
2	Priaxor ²	6 oz.	106.7	1708	6	4
3	Folicur	5.4oz.	103.5	1657	5	5
4	Quilt Excel	10.5 oz.	102.1	1634	5	5
5	No treatment		78.8	1262	3	2
LSD @5% Level			24	387	2	NS
CV(%)			13	13	27	45

.25%NIS applied with all treatments

Harvest Date= 8/6/2013

Mean yield=1601#/ac.

All applications made 7/11/2013 5:30pm. Wind SW 5-10mph

Growth Stage= Mid-Bloom stage, starting to fill.

Lodging¹,1=upright;9=severe;

²Priaxor and Stratego YLD are not labeled treatments on ryegrass

³- Yes= add 3 gal. N-PAK 28 to fungicide mix

Color⁴-9=dark green;1=light green/brown

Trade name	Common name	#AI/Gal.
Quilt Excel 2.2se	propiconazole+azoxystrobin	1.02+1.18
Stratego YLD+Folicur	prothioconazole+trifloxystrobin	1.05+3.15
Folicur	tebuconazole	3.6
Priaxor-	fluzapyroxad	1.39
N-PAK 28	UAN	3.3#N

Table 14.

2013 Wild Oat Herbicide Screen on Spring Wheat Underseeded With Arctic Green* Per.Ryegrass-Magnusson Research farm-F1W

Treatment	Rate	Wild oat control ¹ 8/22/2013
Affinity+MCPE	.6oz.+ .5pt.+ .25%NIS	2.5
Everest	.9oz.+ .25%nis	8.5
Assert	1.5pt.+ .25%NIS	7.3
Avenge	3pt.+ .25% NIS	6.8
Tecoma(Puma)	10oz.	1.5
Huskie+Tecoma	13.5oz+10oz.+2.5%NPAK	2.5
Huskie	13.5oz.+2.5%NPAK	3.0
No treatment		1.0

Data collected was insufficient for analysis

Wild oats and white cockle seeded prior to wheat/ryegrass.

Weed seed used was from local cleaning plants.

*-Same trial established in another location on the Magnusson Research farm with the non-Assure tolerant variety Integra per.ryegrass without weed seed planting

¹-Wild oat control- visual rating 1=no control;9=best control

Sprayed 6/14/2013 9' backpack sprayer @13GPA

Ryegrass just emerging to 2leaf--wheat 3leaf stage. Wild oats stage= not emerged to 2 leaf.

Objectives/Observations:

Test efficacy of commonly used wheat herbicides on wild oat biotypes

cleaned from perennial ryegrass fields in northern Minnesota

Tecoma(Puma), was not effective controlling the wild oats present in this trial.

Treatment	active ingredient/ac.
Affinity+2,4-D	.0094#thifensulfuron+.0094#tribenuron+.375#2,4-DE
Assert	.375# imazamethabenz
Avenge	2# difenoquat
Huskie	.036# pryasulfotole+.087# bromoxynil
Everest 2.0	.025# flucarbazone+safener
Tecoma	.08# fenoxaprop

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Table 15.

2012-13 Nortron Residual Plant Back Trial Magnusson Research farm-F5 by shed

Crop	Herbicide Treatment ¹	Rate	Crop Injury 7/11 ²	Redroot pigweed control 7/11 ³
Wheat	Nortron	2pt.	3.0	3
Wheat	Nortron	4pt.	5.0	5
Wheat	2,4-D+Banvel	1pt.+1pt.	1.3	6
Wheat	No Treatment	none	1.0	1
Soybeans	Nortron	2pt.	2.0	
Soybeans	Nortron	4pt.	5.3	
Soybeans	2,4-D+Banvel	1pt.+1pt.	1.7	
Soybeans	No Treatment	none	1.0	
Canola	Nortron	2pt.	4.0	
Canola	Nortron	4pt.	6.3	
Canola	2,4-D+Banvel	1pt.+1pt.	2.3	
Canola	No Treatment	none	1.0	
LSD @5%level			2.7	

¹-Herbicide treatments applied to existing wheat stubble 9/30/2012.

² Visual Crop Injury/suppression- 1=none;9=severe(readings above 4 are likely to result in some yield loss).

³ Visual overall residual weed control across all crops-1=none;9=complete control

Entire area tilled and seedbed prepared 5/25/2013.

All species planted 5/26/2013.

Trial Objective:

Determine if late fall applications of Nortron ,2,4-D, and Banvel are likely to have sufficient soil carryover to impact the following years crop in the event that the ryegrass winterkills or is taken out in the spring and replaced with another crop.

Table 16.

**2013 Late Herbicide Applications to 'Arctic Green' Per. Ryegrass
Magnusson Farms- West of Roseau,Mn**

Trt#	Treatment	Rate/acre Adjuvant	Seed Yield			
			% of no treatment		(#/Ac.)	
			2012	2013	2012	2013
1	MCPE	1pt	107.8	112.4	1433	1023
2	2,4-Da	1pt	108.3	107.5	1439	978
3	2,4-DE	3/4pt	97.7		1299	
4	2,4-Da+Clarity	1pt+1pt	99.3	112.7	1320	1026
5	Stinger	6oz.	97.5		1296	
6	Clarity	1pt.	94.2		1252	
7	Aim	1oz.+ .25%NIS	101.6		1350	
8	Basagran	1.5pt+1%MSO	98.0		1302	
9	No Treatment		100.0	100.0	1329	910
10	Avenge	3pt.+ .25%NIS	98.6		1311	
11	Assure II	10oz.+ .25%NIS	91.3	122.5	1213	1115
12	Fusilade	12oz.+ .5%HCCOC	99.3	110.8	1320	1008
	LSD @ 5% level		10.3	14.5	137	132
	LSD @ 10% level		9	12	114	108

Herbicides applications made 6/21/2012 at 60% heading stage and 7/10/2013 at late pollen shedding.
Wind WSW at 4-8mph in 2012. Wind NW 5-10 and 75F in 2013.
Harvested 7/21/2012 and 7/26/2013

Observations/Notes:

Applications made in 2013 were at a later growth stage.

Late applications of Assure II reduced seed yields in 2012 but not in 2013.

MCPE and 2,4-D amine applications tended to increase yields.

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Table 17.

**2013 Grass Herbicide Applications to 'Arctic Green' Perennial Ryegrass
Magnusson Farms- West of Roseau,Mn**

Trt#	Treatment	Rate ¹	Seed Yield		Harvest	
			#/ac	Ht	Vigor ³	Lodging ⁴
1	AssureII	10oz.	1020	21	5.5	1.4
2	AssureII	20oz.	976	20	5.5	1.0
3	Fusilade ²	12oz.	948	20	5.4	1.4
4	Fusilade ²	24oz.	957	19	5.3	1.0
5	Assert ²	1.5pt.	723	19	5.8	1.3
6	No Treatment		1155	22	5.3	1.8
	LSD @ 5% level		219	1.5	NS	0.6
	CV(%)		16	5	10	31

All grass control treatments applied 6/10/2013- 70F Wind S12

Growth stage - 2 nodes-about 8" ht.

¹ -Assert and Assure II add .25%NIS

Fusilade add 1% COC+ 2.5 pt. 28%N

² - Fusilade and Assert are not labeled treatments on ryegrass seed production

³ -Vigor-1= Least; 9=best plant vigor

⁴ -Lodging-1=no lodging;9=flat

Observations/Conclusions:

Assert application decreased seed yield in this trial.

Table 18.

**2012-13 Summary of Liquid N additives Applied to Standard Ryegrass Pesticide Applications
4 Roseau Area Locations* Over 2 years**

Trt.#	Broadleaf ²	Grass ³	Apogee ⁴	Fungicide ⁵	2012-13	2013		2012	
					Overall	Magnusson	Dahlgren	Erickson	MagPlots
					----- Seed Yield % of mean-----				
1	Yes	Yes	Yes	Quilt Excel	94	96	95	94	91
2	Yes	Yes	Yes	Quilt+N	98	94	105	100	93
3	Yes	Yes	Apogee+N	Quilt+N	106	95	105	110	115
4	Yes+N	Yes	Apogee+N	Quilt+N	99	97	96	103	101
5	Yes+N	Yes	Yes	Quilt+N	100	98	100	100	100
6	Yes	Yes+N	Yes	Quilt+N	106	112	103	104	106
7	Yes+N	Yes+N	Apogee+N	Quilt+N	98	91	96	99	104
8	Yes	Yes+N	Apogee+N	Quilt+N		95	105		
9	NO	NO	NO	NO	93	106	94	87	86
10	Yes	Yes	Yes	NO		106			
**11	Yes	Yes	Yes	Quilt Excel		117			
LSD @5% level					10.3	19.7	NS	17.0	13.4
#/acre Seed Yield mean of each trial =						950	1121	970	1358

Experimental Design-Randomized complete block with 4 replications

*Locations/variety- 2012 Erickson farm -NW of Roseau- variety- Cutter II

2012 Magnusson research farm NW of Roseau-variety- Arctic Green

2013 Dahlgren farm south of Roseau-variety-Sun

2013 Magnusson farms west of Roseau-variety-Arctic Green and

**11-- Fungicide applied with each pesticide application + 5/14/2013 alone. Treatments below--

Stratego YLD¹ applied 5/14/13-- ryegrass 2" 60F wind sse8-15

Folicur 6/3/13 Priaxor¹ 6/10/13

Quilt Excel 6/17/13 Quilt Excel 7/9/13

¹- Stratego YLD and Priaxor are not labeled treatments on perennial ryegrass.

²-Broadleaf application- 3/4pt. 2,4-D+3/4pt. Clarity with(+3 gal.28% UAN) and without added UAN

³- Assure II or Tecoma (Puma)with(+3 gal.28% UAN) and without added UAN

⁴-Apogee 5-8 oz. + .25%NIS+2.5%UAN with(+3 gal.28% UAN) and without added UAN

⁵-Quilt Excel 10.5 oz. with(+3 gal.28% UAN) and without added UAN

Trade name	Rate + adjuvant	Common name	#AI/Gal.
2,4-D	.75pt.	2,4-D amine	4
Clarity	.75pt.	dicamba	4
Assure II	10oz.+ .25%NIS	quizalofop	0.88
Apogee	8oz.+ .25%NIS+2.5% UAN	prohexadione	27.5%DF
Quilt Excel 2.2se	10.5oz.	propiconazole+azoxystrobin	1.02+1.18
Fusilade DX	12oz.+1%COG	fluazifop	2
Priaxor	6 oz.	fluxapyroxad + pyraclostrobin	1.39+2.78
Stratego YLD	5.4oz.+5.4oz.	prothioconazole+trifloxystrobin	1.05+3.15
Folicur 3.6#	5.4oz.	tebuconazole	3.6
N-PAK 28		UAN	3.3#N

Observations/Conclusions:

Adding 3 gal. nitrogen with grass control, growth regulator and fungicide has shown some seed yield increases. Nitrogen added to broadleaf herbicide applications have shown less consistent seed yield increases.

Table 18a.

**2013 Liquid N applied with Standard Pesticide Applications to 'Sun' Per. Ryegrass
Dave Dahlgren - 3 Miles south west of Roseau**

Trt#	Broadleaf ⁶ 6/3/13	Grass ⁷ 6/11/13	Apogee ⁸ 6/17/13	Quilt Xcel ⁹ 7/8/13	Seed	Harvest				Ht.(in.)			RCI ⁴		
					Yield #/Acre	Lodging ¹	Ht.(in.)	%injury ²	Vigor ³	6/16/13		7/3/13		7/16/13	
1	Yes	Yes	Yes	Yes+N	1173	1	19	5	7.0	13	442	372			
2	Yes+N	Yes	Yes	Yes+N	1119	1	19	1	7.3	13	430	333			
3	Yes	Yes	Yes+N	Yes+N	1170	1	19	3	8.0	13	414	324			
4	Yes	Yes+N	Yes	Yes+N	1148	1	20	5	7.3	13	399	349			
5	Yes+N	Yes	Yes+N	Yes+N	1072	1	20	4	7.3	12	399	353			
6	Yes+N	Yes+N	Yes+N	Yes+N	1072	1	19	5	6.5	13	410	320			
7	Yes	Yes+N	Yes+N	Yes+N	1177	1	19	4	7.8	13	408	355			
8	Yes	Yes	Yes	Yes	1064	1	20	4	7.5	13	399	325			
9	Yes	Assert ⁵	Yes	Yes+N	1159	1	20	0	8.5	13	415	333			
10	No	No	No	No	1054	7	25	0	8.3	15	505	283			
LSD @5% level					NS	0.6	2	NS	0.8	1.1	64	48			
CV(%)					8	28	6	121	7	6	11	10			

Seed Yield mean = 1121 #/acre

Harvest date-7/24/2013

Lodging¹-1=no lodging;9=flat%injury²- Crop supression/injury- as % of normal growthVigor³- 1=poor plant vigor;9=good vigorRCI⁴ -Relative Chlorophyll Index- Higher number= more chlorophyllAssert⁵- Assert is not a labeled treatment on ryegrass**Pesticide application rate and timing:**⁶- .75pt. 2,4-D+.75pt. Clarity 6/3/13--ht.5" 1 node- 59F wind e10-15mph with(+3 gal.28% UAN) and without added UAN⁷- 10oz.Tecoma (Puma)6/11/13-- ht.7-8"-- 2-3 nodes 73F wind wnw 9mph with(+3 gal.28% UAN) and without added UAN⁸-Apogee 6oz. + .25%NIS+2.5%UAN 6/16/13--ht.10" 3-4 nodes 64F wind ene 13mphwith(+3 gal.28% UAN) and without added UAN⁹-Quilt Excel 10.5 oz. 7/8/13-- ht.=19" shedding pollen 81F wind wsw 6mph with(+3 gal.28% UAN) and without added UAN

Trade name	Rate +adjuvunt	Common name	#AI/Gal.
2,4-D	.75pt.	2,4-D amine	4
Clarity	.75pt.	dicamba	4
Tecoma	10oz.	fenoxaprop	0.08
Apogee	8oz.+ .25%NIS+2.5% UAN	prohexadione	27.5%DF
Quilt Excel 2.2se	10.5oz.	propiconazole+azoxystrobin	1.02+1.18
Priaxor	6 oz.	fluxapyroxad + pyraclostrobin	1.39+2.78
Stratego YLD	5.4oz.+5.4oz.	prothioconazole+trifloxystrobin	1.05+3.15
Folicur	5.4oz.	tebuconazole	3.6
Assert	1.2pt.+ .25%NIS	imazamethabenz	0.375
N-PAK 28	2.5% solution or 3 gal.(+N)	UAN	3.3#N

Table 18b.

**2013 Liquid N and Fungicides applied with Standard Pesticide Applications-Arctic Green Per.Ryegrass
Magnusson Farms- 2 miles west of Roseau**

Trt#	Early Fungicide Trt?	Broadleaf ⁶ 6/3/13	Grass ⁷ 6/10/13	Apogee ⁸ 6/17/13	Quilt Xcel ⁹ 7/9/13	Seed	Seed	Harvest			RCI ³ 7/16/13
						Yield % of mean	Yield #/Acre	Lodging ¹	Ht.(in.)	Vigor ²	
1	NO	Yes	Yes	Yes	Yes+N	94	894	1.3	20	5.5	364
2	NO	Yes+N	Yes	Yes	Yes+N	98	930	1.3	19	4	391
3	NO	Yes	Yes	Yes+N	Yes+N	95	901	1.5	19	5.3	369
4	NO	Yes	Yes+N	Yes	Yes+N	112	1061	1.0	20	5.5	381
5	NO	Yes+N	Yes	Yes+N	Yes+N	97	917	1.0	19	4.5	386
6	NO	Yes+N	Yes+N	Yes+N	Yes+N	91	866	1.0	19	4	407
7	NO	Yes	Yes+N	Yes+N	Yes+N	95	899	1.3	20	4.8	514
8	NO	Yes	Yes	Yes	Yes	96	910	1.0	20	4.8	345
9	NO	Yes	Fusilade ⁴	Yes	Yes+N	95	901	1.5	19	5.3	400
10	NO	No	No	No	No	106	1003	5.0	24	5.5	327
11	NO	Yes	Yes	Yes	No	106	1010	1.8	19	5.3	352
12*	5/14	Yes+Folicur	Yes+Priaxor	Yes+Quilt	Yes	117	1113	1.3	20	5.5	383
LSD @5% level						19.7	187	0.7	2	0.9	79
CV(%)						14	14	30	6	13	15

Seed Yield mean=950#/acre

Harvest date-7/24/2013

¹-Lodging-1=no lodging;9=flat²-Vigor- 1=poor plant vigor;9=good vigor³-RCI -Relative Chlorophyl Index- Higher number= more chlorophyl⁴-Fusilade - Fusilade in not a labeled treatment on ryegrass⁵- Stratego YLD and Priaxor are not labeled treatments on perennial ryegrass.

Pesticide application rate and timing:

⁶-Broadleaf-2,4-D .75pt +Clarity .75pt. 6/3/13--ht.= 3-6" 1 node 53F wind e10-15mph⁷-Grass-Assure II(except Fusilade trt#11) 10oz. 6/10/13-- ht.7-8" 2-3 nodes 73F wind wnw 9mph⁸-Growth Regulator-Apogee 8oz. 6/17/13--ht.10" 4 nodes 61F wind ene 12mph⁹-Fungicide-Quilt Excel 10.5 oz. 7/9/13-- ht.=19" shedding pollen 68F wind ns 10-20mph

12*-- Fungicide applied with each pesticide application + 5/14/2013 alone. Treatments below--

Stratego YLD⁵ applied 5/14/13-- ryegrass 2" 60F wind sse8-15

Folicur 6/3/13

Priaxor⁵ 6/10/13

Quilt Excel 6/17/13

Quilt Excel 7/9/13

Trade name	Rate per acre + adjuvunt	common name	#Al/Gal.
2,4-D	.75pt.	2,4-D amine	4
Clarity	.75pt.	dicamba	4
Assure II	10oz.+25%NIS	quizalofop	0.88
Apogee	8oz.+25%NIS+2.5% UAN	prohexadione	27.5%DF
Quilt Excel 2.2se	10.5oz.	propiconazole+azoxystrobin	1.02+1.18
Fusilade DX	12oz.+1%COG	fluazifop	2
Priaxor	6 oz.	fluxapyroxad + pyraclostrobin	1.39+2.78
Stratego YLD	5.4oz.+5.4oz.	prothioconazole+trifloxystrobin	1.05+3.15
Folicur	5.4oz.	tebuconazole	3.6
N-PAK 28	2.5% solution or 3 gal.(+N)	UAN	3.3#N

Table 19.

**2013 Growth Regulator Trial-'Sun' Perennial Ryegrass
Dahlgren farm-3 mi.Southwest of Roseau,Mn**

Trt#	Product	Application		Seed Yield (#/Ac.)	Harvest		7/3 RCI ³	
		Timing ¹	Rate(oz./A)		Lodging ²	Ht.(in.)		Ht.(in.)
1	None	0	0	1255	7.8	24	24	517
2	Apogee	1x	6	1351	1.5	21	20	517
3	Apogee	2x	3+3	1284	1.5	21	19	479
4	Apogee	1x	8	1303	1.3	20	20	515
5	Apogee	1x	8 ⁴	1295	1.0	20	20	495
6	Apogee	2x	3+5	1262	1.5	20	20	459
7	Apogee	1x	10	1288	1.3	20	19	449
8	Apogee	2x	3+7	1406	1.0	20	20	488
9	Apogee	1x	14	1262	1.0	20	18	445
10	Apogee	2x	3+11	1282	1.0	20	20	475
LSD @5% level				143	0.6	1	2	NS
CV(%)				8	23	4	5	11

Experimental Design-Randomized complete block with 4 replications

¹-Timing- 1x= all applied 6/18/2013---30% heading

2x= 1st application 6/13 -- 4th node-trace heading; 2nd application 6/25 early pollination.

²-Lodging- 1=none;9=flat

³-RCI- Relative chlorophyl index-higher number =more chlorophyl

⁴- 3 Gallons additional liquid 28%N added to treatment 5.

.25%NIS+2.5%AMS to all plots(trt4 will have additional 3gal/ac.AMS (10#N)

Target Apogee Timing=1x at early heading- 1100GDD,

2x= 1st timing 800GDD,2nd at 1200GDD

Objective/observations: To evaluate perennial ryegrass yields and growth parameters with varying Apogee rates and split applications.

Lowest yields and most lodging occurred in the untreated check.

Table 20.

**2013 Date of Swath- Arctic Green Per.Ryegrass
Magnusson Farms- west of Roseau,Mn**

Trt#	Cut Date	Seed Moisture ¹	Seed Yield	
			% of Mean	#/ac.
1	7/22/13	44	86.1	802
2	7/24/13	43	93.1	867
3	7/26/13	44	105.8	985
4	7/28/13	38	108.4	1009
5	7/31/13	36	113.2	1054
6	8/7/13	28	93.6	871
LSD @5% Level			14.6	136
CV(%)			10	10

Experimental Design- RCB with 4 reps

¹-Moisture-Seed moisture at swathing.

Mean seed yield=931#/ac.

Objective/observations:

Determine optimum swath timing to maximize seed production.

Maximum yields can be obtained by waiting as long as possible to swath crop

but additional risks of shattering need to be considered if inclement weather is forecast.

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Table 21.

**Fall Seeding into Existing Spring Planted Stands -Arctic Green Perennial Ryegrass
Magnusson Farms - west of Roseau,Mn**

Treatment*	Seed Yield #/acre	Harvest Ht.(in.)
Add seed*	893	20
No added seed	985	21
LSD @5% level	NS	NS

Experimental Design- RCB with 3 reps

*- 3# additional seed planted into existing spring seeded stand, 8/25/2012.

Dry conditions caused poor establishment of supplemental seeding.

Objective:

Determine if fall planting additional ryegrass into a thinner than ideal spring planted stand can increase seed yield in perennial ryegrass

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Table 22.

**2013 Cultipack After Fertilizing- Arctic Green Perennial Ryegrass
Magnusson Farms - west of Roseau,Mn**

Treatment*	Seed Yield #/acre	Harvest Ht.(in.)
Cultipack*	793	20
No cultipack	875	21
LSD @5% level	NS	NS

Experimental Design- RCB with 3 reps

Fertilizer applied by grower-- 5/7/2013

*Cultipack- Brillion cultipacked 2x after fertilizing -- 5/8/2013 (wheat stubble 4")

Objectives:

Determine if rolling after spring fertilizer application can increase ryegrass seed production

a)Determine if flattened grain stubble will increase light penetration and increase photosynthesis and growth.

b)Determine if rolling after spring urea fertilizer application can stabilize nitrogen and increase efficiency.

