

PROGRESS REPORT ON GRASS SEED PRODUCTION RESEARCH

prepared by
N. Ehlke, D. Vellekson, and D.Grafstrom
Department of Agronomy and Plant Genetics
University of Minnesota
St. Paul, Minnesota 55108

Grass-Legume Seed Institute Presentation Roseau, MN - February 27, 2013

Yearly Data Summaries are on the Web at:
http://www.mnturfseed.org/html/progress_reports.html

Table 1. Precipitation Data 1967-2012

Variety Performance Trials:

- Table 2. Kentucky Bluegrass seeded in 2008.
- Table 3. Kentucky Bluegrass seeded in 2009.
- Table 4. Perennial Ryegrass winter hardiness trial seeded 2011.
- Table 5. Perennial Ryegrass seeded in 2011.
- Table 6. Tall Fescue seeded in 2011.

Perennial Ryegrass Management Trials:

- Table 7. Nitrogen Rates/Timing-4 Yr.Yield Summary
- Table 7A. Nitrogen Rates/Timing-MagPlots
- Table 8. Stabilized Nitrogen Applications-2 Locations
- Table 9. 30 Lbs. Nitrogen Added to Standard Application-2 Locations
- Table 10. Fertilizer Sources- Helmstetter Farm
- Table 11. Liquid Nitrogen Added to Standard Pesticide Apps-MagPlots-Erickson
- Table12. Fungicides/Liquid Nitrogen Applications- Helmstetter-MagPlots
- Table 13. Apogee Split Applications-MagPlots
- Table 14. Apogee Rates-MagPlots
- Table 15. Late Rescue Herbicide Applications-Magnusson Farm
- Table16. Assure II/Fusilade Fall/Spring Applications-MagPlots
- Table 17. Date of Swath-MagPlots

Other Trials:

- Table 18. Herbicides Applied to Underseeded Grasses in Wheat- MagPlots
- Table 19. Tall Fescue Establishment-Management- MagPlots
- Table 20. Junegrass Seeding Date x Rate-MagPlots
- Table 21. Junegrass Variety x Growth Regulator x Fertilizer-MagPlots.
- Table 22. In Furrow Fertility- Wheat Summary 2010-2012-MagPlots
- Table 22a&b. In Furrow Wheat Fertility 2011 &2012-MagPlots
- Table 23. 50/50 ESN-Urea Blends in Spring Wheat-2 Locations
- Table 24. ESN Blends in Water Logged Soil on Spring Wheat-MagPlots
- Table 25. In Furrow-Liquid Applications to Spring Wheat-Magnusson Farm

**Table 1. Monthly and Year End Precipitation Totals*
Roseau ,Mn 1967-2012.**

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	-2.61	
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	8.16	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	2.54	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	3.51	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	-3.45	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	-2.67	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	-0.35	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	4.70	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	-3.72	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	-5.94	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	-2.33	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	-1.15	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	-4.31	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	-2.62	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	1.83	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	-1.56	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	0.18	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	-4.34	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	3.28	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	-2.39	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	-3.85	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	-4.84	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	-0.06	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	-10.09	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	8.52	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	-1.15	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	0.02	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	-3.17	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	0.18	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	4.22	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	-1.10	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	3.17	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	1.12	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	6.46	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	-2.98	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	4.05	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	2.70	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	12.36	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	9.52	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	-5.28	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	3.53	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	4.75	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	4.79	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	6.14	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	-4.05	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	-2.67	275
46 year average annual precipitation													21.77		

*Precipitation amounts used are from the Roseau research site April-September and the National Weather Service the remainder of the year.

Table 2.

**2008 Kentucky Bluegrass Variety Trial
Magnusson Research Farm**

Variety	Seed lot	Seed Yield				Harvest-2012			% Heading-2012			
		2010-12 %of Mean	#/acre			Ht.(In.)	Lodging*	Date	5/22	6/1	6/6	6/10
			2012	2011	2010							
Dragon	3671	152	192	760	633	15	1	6/29	1	33	68	95
Abbey	3608	138	91	758	591	14	1	7/6	0	2	15	50
A99-2679	3774	101	109	607	337	14	1	7/6	0	3	20	50
A99-3124	3872	101	123	607	326	16	1	7/7	0	3	20	55
A99-2626	3792	96	100	600	299	13	1	7/7	0	1	15	50
Unique	3794	96	136	560	303	15	1	7/3	0	4	23	63
A99-2950	3771	88	58	535	321	16	1	7/6	0	13	35	83
Park	3888	80	60	408	368	24	1	7/3	9	79	100	100
A97-1436	3764	76	42	433	314	13	1	7/7	0	4	30	65
Midnight	3539	71	67	390	281	16	1	7/4	0	0	1	18
LSD @ 5%Level		11	24	49	81	2	0	5	2	5	9	11

Mean seed yield 2010-12= 347#/ac.

Experimental Design: RCB w/4 reps

*Lodging-1=no lodging; 9=flat

Management:

All plots burned 7/30/2011

110+30+40+8s applied 10/20/11

.75pt. 2,4-D+.75pt Banvel applied 9/20/11

3 oz. Tilt applied 6/1/12

XX

Table 3.

**2009 Kentucky Bluegrass Variety Trial
Magnusson Farm-**

Variety	Seed lot	Seed Yield				Fall	Harvest-2012			% Heading-2012			
		2011-12 %of Mean	#/acre		Regrowth ¹ 22-Aug	Ht.(In.)	Lodging*	Date	5/22	6/1	6/6	6/10	
			2012	2011									
Dragon	3671	145	339	615	5.8	16.0	1	7/1	0	43	80	97	
Abbey	3608	126	263	562	6.5	16.0	1	7/1	0	10	33	80	
A99-2679	3774	113	279	462	2.5	16.0	1	7/8	0	10	28	68	
A99-3124	3897	113	283	457	2.3	16.0	1	7/8	0	6	23	60	
A99-2626	3899	96	230	401	2.3	15.0	1	7/8	0	6	23	60	
A99-2950	3898	84	158	390	3.5	16.0	1	7/8	0	18	35	85	
Midnight	3539	74	149	332	5.0	18.0	1	7/8	0	1	13	43	
Park	3888	50	161	169	7.5	28.0	1	6/27	14	90	100	100	
LSD @5%Level		21	72	92	0.9	1.5	0	0.8	1	7	8	9	

Experimental Design: RCB w/4 reps

Mean seed yield 2011-12=328 #/ac.

*Lodging-1=no lodging; 9=flat

¹Fall regrowth-1=none;9=best

Management:

All plots burned 7/30/2011

110+30+40+8s applied 10/20/11

.75pt. 2,4-D+.75pt Banvel applied 9/20/11

3 oz. Tilt applied 6/1/12

Table 4.

**2011 Seeding Perennial Ryegrass Winter Hardiness Variety Trial
St.Paul Campus and Magnusson Research Farm Roseau,Mn**

Variety	Source	Seed Lot	St.Paul		Roseau	Mean
			Winter Injury ¹ 3/27/12	Vigor ² 3/27/12	Winter Injury ¹ 4/26/12	WI Roseau- St.Paul
Brightstar SLT	check	3661	NA	NA	5.8	NA
Affinity	check	3500	NA	NA	4.8	NA
Arctic Green	U of M	3953	1.1	5.8	3.0	2.1
FTM WH C4-10	pickseed	3963	1.9	3.8	4.3	3.1
FTM WH C2-09	pickseed	3962	1.8	3.5	6.0	3.9
FTM BL C2-09	pickseed	3960	1.5	4.3	4.3	2.9
NK-200	check	3917	1.3	6.3	3.0	2.1
08 FTMSESL	pickseed	3961	1.8	3.8	5.0	3.4
Quebec	check	3964	1.6	3.5	5.0	3.3
Forageur	U of M	3942	1.1	6.8	3.3	2.2
WH select	U of M	3931	1.0	6.5	3.3	2.1
Ribeye(annual)	check	3689	4.8	5.0	9.0	6.9
3934	U of M	3934	1.4	6.0	4.3	2.8
Survivor	U of M	3848	1.3	6.3	3.3	2.3
922-tetraploid	check	3926	3.0	2.2	7.8	5.4
MSP	U of M	3955	1.4	4.5	5.0	3.2
LSD @5% level			0.5	1.0	0.7	0.5

Planted 9/8/2011 and 8/25/2011 at St.Paul with no cover crop.

Experimental Design:RCB with 4 Reps

¹Winter injury--1=no injury; 9=dead

²Plant vigor-- 1=least; 9=most

NA=Poor stand

XX

Table 5.

**2011 Perennial Ryegrass Seed Production Variety Trial
Magnusson Research Farm- Roseau,Mn**

Variety	seed lot	Seed Yield	Winter	Harvest			RCI Rating ³		% Heading			
		(#/ac.)	Injury ¹	Lodging ²	Ht.(in.)	Date	2-Jul	10-Jul	5-Jun	8-Jun	13-Jun	17-Jun
Arctic Green	3953	1773	2.3	3.3	21	23-Jul	507	379	10	27	50	77
3934	3934	1803	2.3	2	22	22-Jul	558	437	13	27	53	83
Brightstar SLT	3661	1176	2.7	1.7	20	23-Jul	527	409	10	30	58	77
Affinity	3500	1328	3	2.3	24	22-Jul	468	386	13	47	77	92
NK-200	3917	1277	2.3	3.3	28	28-Jul	553	423	2	7	20	47
MSP	3955	1619	3	2	19	22-Jul	549	435	10	28	47	72
LSD @5% level		325	0.8	1.5	1.3	0.4	76	48	7.8	13.7	18.8	12.4
CV(%)		11.9	16.6	34.8	3.2	1	7.9	6.4	44	27	20	9

Planting date--8/25/2011

Experimental Design:RCB with 3 Reps

¹Winter injury-1=No injury; 9=Dead

²Lodging-1=Upright;9=flat

³RCI(relative chlorophyll index)-higher number means more chlorophyll.

Management:

60-30-30-7s 10/15/2011

3/4pt 2,4-D+3/4pt.Banvel and 10 oz. Quilt applied as separate applications

Table 6.

2011 Tall Fescue Seed Production Variety Trial
F7NE- Magnusson Research Farm-Roseau,Mn

	Variety	msp#	Seed Yield #/acre	% Heading			Harvest
				6/4/2012	6/9/2012	6/14/2012	Ht.(in.)
1	PSG 85 P1	3952	840	33	63	91	35
2	Speedway	3950	1022	18	45	76	34
3	Brockton	3944	967	20	50	85	36
4	Kentucky 31	3947	771	43	75	99	44
5	Crossfire 3	3948	851	18	38	65	32
6	Mustang 4	3949	936	23	55	88	34
7	D3- WH*	3943	1005	18	40	78	34
8	Greystone	3946	913	20	48	88	36
9	Durana	3945	1098	10	38	73	36
10	SR 8650	3951	1002	13	40	81	32
LSD @5% level			144	6	9	12	2

Experimental Design: RCB with 4 reps.

Tall fescue underseeded with spring wheat 5/22/2011.

Plot size= 5' x 20'

Tall fescue seeding rate= 6#/acre

Table 7.

2009-12 Perennial Ryegrass Fertility Overall Yield Summaries
Magnusson Research Farm

trt#	Total # Nitrogen	Application Rate ²	Application timing	Seed Yield as % of Yearly Means ⁴					
				2010-2012 ³	2009-2012	2012	2011	2010	2009
1	0	0	0	29	35	21	36	31	51
2	60	60+0+0	Fall	76	58		69	82	82
3	100	60ESN+40	Fall	91	91	80	93	101	
4	100	100+0+0	Fall	98	99	83	110	100	101
5	100	100+0+0+22s	Fall	104	77		105	103	100
6	140	140+0+0	Fall	114	84		119	109	107
7	100	30ESN+70	Split ¹	103	103	104	108	96	
8	100	100+0+0	Split ¹	107	108	112	108	100	111
9	100	100+0+0+22s	Split ¹	107	106	111	110	101	102
10	140	140+0+0	Split ¹	117	112	118	118	114	99
11	60	60+0+0	spring	96	96		93	98	96
12	100	20ESN+80	spring	110	110	102	121	106	
13	100	100+0+0	spring	104	108	96	108	108	119
14	100	100+0+0+22s	spring	105	106	92	115	107	110
15	140	140+0+0	spring	118	120	119	115	121	126
LSD @5% level				9	10	11	12	13	16
Mean Yield #/acre						1499	1313	1136	1274

Plot size= 10' x 12'

7+31+40 Fall applied to all plots.

Variety- Arctic Green(Ragnar II in 2009) planted in spring under wheat.

¹Split applications had 30# N urea in fall and remainder of application in spring except 2009 was 50% of total applied fall and 50% in spring.

AMS applications made in fall.

²ESN and urea splits may vary slightly from year to year but total nitrogen rates are as stated.

³ 2010-2012 may be best data. 2009 had high carryover soil nitrogen.

⁴ Missing data did not have treatments applied in those years.

Observations/Conclusions:

1)140# N rate generally produced the highest seed yields.

2)Split application(2/3 or more applied in spring) or spring only applications generally produced higher yields than fall applications.

3)Spring nitrogen applications with 20%ESN sometimes produced higher yields than 100% urea.

Table 7A.

2011-12 Perennial Ryegrass Fertility Trial
Magnusson Research Farm

trt#	Application	Application	Seed Yield		Harvest			RCI ³		Color	%Hding
	Rate	timing	#/acre	% of mean ¹	Date	Lodging ²	Ht.(in.)	6/22	7/17	6/12	6/12
1	0	0	311	21	19-Jul	1.0	16	289	124	2.0	18
2	30urea+70coated	Fall	1194	80	21-Jul	2.8	22	669	160	4.8	28
3	100+0+0	Fall	1251	83	20-Jul	2.5	22	736	165	5.3	30
4	100+0+0	clip*/split ¹	1827	122	21-Jul	4.5	22	832	160	8.0	35
5	140+0+0	clip*/split ¹	1804	120	22-Jul	7.0	23	946	164	8.8	45
6	30coated/70urea	Split ¹	1555	104	21-Jul	4.5	22	725	172	5.8	35
7	100+0+0	Split ¹	1682	112	21-Jul	4.8	23	791	182	6.8	38
8	100+0+0+22s	Split ¹	1668	111	21-Jul	5.3	23	816	166	6.5	28
9	140+0+0	Split ¹	1764	118	21-Jul	7.3	23	910	170	8.3	33
10	80urea+20coated	spring	1534	102	21-Jul	4.8	23	813	170	6.5	40
11	100+0+0	spring	1440	96	21-Jul	4.3	21	743	150	6.8	35
12	100+0+0+22s	spring	1386	92	22-Jul	4.5	22	818	164	6.8	33
13	140+0+0	spring	1786	119	22-Jul	6.5	23	904	181	8.0	40
14	100+0+0	Split ¹ +SuperU	1470	98	21-Jul	5.0	23	791	158	7.0	40
15	100+0+0	Split ¹ +Agrotain	1640	109	21-Jul	5.3	23	797	164	6.3	28
16	100+0+0	Split ¹ +40#Liquid	1675	112	22-Jul	5.3	22	781	177	6.0	35
LSD @5% level			163	11	2	1.8	1.6	76	24	1.3	12

*Trts 4&5 had straw removed 9/2011(not a recommended management practice) to test amount of nitrogen bound up with residue.

¹Split applications had 30# N urea in fall and remainder of application in spring.

Trt #8 had sulfur+N (AMS) fall applied.

¹Test Mean Yield=1499#/ac.

² Lodging-1=none;9=flat

³RCI-Relative Chlorophyll Index; higher number = more chlorophyll

Variety- Arctic Green planted under wheat 5/11/2011.

7+31+40 applied to all plots and all fall treatments 10/22/2012.

Spring applications 4/16/2012

Plot size= 10' x 12'

Observations/Conclusions:

- 1)Removal of straw in the fall(clip/split) increased yield indicating significant nitrogen tied up breaking down the residue. Increasing applied nitrogen to compensate may be needed to reduce deficiencies.
- 2)Fall only nitrogen applications produced lower yields than split or spring only applications.
- 3)Higher rates (140#N) produced higher yields than lower rates(100#N).
- 4)Split application(30#N fall) vs spring only (trt#7 vs. trt#11) produced a higher seed yield at 100# rate. Split applications vs. spring only at the 140# rate(trt#9 vs. trt#13) did not have significantly different seed yield.

Table 8.

**2012 Perennial Ryegrass Fertility Trial using Stabilized Nitrogen Sources
Magnusson Research Farm and Magnusson Farms Locations**

Trt ¹	Nitrogen Source	Seed Yield -#/Ac. ²				Lodging MagPlots	Ht(in.) MagFarm	RCI ⁴	
		Magnusson Farm		Mag Plots	2 Location Mean ³			18-Jul	23-Jun
		Grower	U of M					MagFarm	MagPlots
1	Urea	1188	1092	1133	1113	1.7	22.7	191	522
2	Super U	1133	1110	1343	1227	3.3	23.7	223	596
3	50%ESN+50%Urea	1101	990	1114	1052	1.3	22.3	174	510
4	Urea+Agrotain	1239	1050	1341	1196	2.3	22.7	182	588
	LSD @ 10% level	125	113	NS	NS(186)	2.0	0.9	31	67
	CV(%)	7	7	15	7	58.0	2.5	10	8

All treatments spread at 80#/ac. N on 4/5/2012.

October fertility=30-30-30 on Magnusson Farm and 50-30-30-6s on MagPlot location

¹All treatments applied with 12' Gandy drop spreader.

²U of M harvested samples from both location. In addition, grower harvested entire plot area(25' x 500').

³Mean of U of M harvest at both locations.

⁴RCI(Relative Chlorophyll index)-higher number=higher relative level of chlorophyll.

Magnusson Farm -on farm location 3 miles northwest of Roseau,Mn.

MagPlots- University of Minnesota Research farm - 6 miles northwest of Roseau,Mn .

Observations/Conclusions:

ESN/urea blend had lower seed yield than Urea+Agrotain or SuperU treatments at the Magnusson Farm location.

No significant seed yield differences overall among any of the treatments.

XX

Table 9.

**2012 Perennial Ryegrass +30 Added Nitrogen Trial
At 2 Locations in Northern Minnesota.**

Fertility Level-Urea source N	Seed Yield ²		RCI ³		Lodging ⁴		Ht.(in.) Harvest	
	Carlson ⁵	Mag ⁵	18-Jul Mag	16-Jul Carlson	12-Jul Carlson	16-Jul Carlson	Mag	Carlson
110#-Nitrogen ¹	924	1175	182	203	1.7	1.3	22	20
110#+30# -Nitrogen ¹	1170	1271	233	240	3.7	3.7	23	22
LSD @ 5% Level	92	87	27	24	NS	1.4	NS	NS
CV	6.7	2.1	3.8	3.2	46	16.3	8	4

Additional +30#N urea spring applied

Treatments all grower applied and harvested.

Harvested plot area 48' x 500'

¹Location 1= Dean Carlson 14 miles southeast of Roseau 50# N in October+60# +Agrotain 4/12/2012-Variety-Arctic Green

Location 2= Magnusson Farms 3 miles northwest of Roseau 30# N in October + 80#N 4/6/2012- Variety-Provocative.

²= Clean seed determined by subsample each plot- corrected to 11%moisture.

³RCI= Relative chlorophyll index- higher number=more chlorophyll present.

⁴Lodging;1=none;9=flat

⁵The +30 rate plots were swathed 3 days later at Magnusson location but all cut at the same time at Carlson location.

Observations/Conclusions:

The addition of 30#N/acre increased seed yields at both locations.

Carlson location +30#N treatment plots had higher seed yields than the standard rate but may have been higher with a delay of swathing date.

Table 10.

**2011-12 Spring Wheat/Perennial Ryegrass Fertility Source Trial
Helmstetter Farm-Roosevelt,Mn.**

Trt#	Treatment ¹	Ryegrass - 2012		Wheat-2011		
		Seed Yield		Yield	Test	
		#/Ac.	% Clean ²	Bu/Ac. ³	Wt./Bu.	%Protein
1	MES10+Liquid	903	82.0	66.4	63.2	13.8
2	MAP+Liquid	905	80.5	68.6	62.7	13.8
3	MES10+ESN	866	81.4	64.5	64.0	13.7
LSD @10% level		NS	0.01	NS	1.1	NS
CV(%)		3.8	0.9	4.0	1.0	2.1

Spring wheat underseeded with perennial ryegrass planted 4/28/2011.

Wheat variety-Barlow ; perennial ryegrass variety-Arctic Green

Experimental Design: RCB w/3 reps.

Plot size= 79' x 500' grower harvest.

Ryegrass fertility treatments applied by U of M. Grower applied wheat fertility treatments.

All other field operations performed by the grower using best management practices.

¹All treatments have equal amounts of N,P,K and Sulfur. P and S sources and N application timing are treatments.

Year1 Spring wheat=60-0-0 applied preplant and 60-0-0 applied post emergent to entire area.

MES10 or MAP applied to all plots in furrow.

Treatment #3=30#N/ac. ESN applied in furrow;other plots 30#N liquid applied.

Year2 Ryegrass= Oct.16,2011 --MAP,MES10,and MES10+30# N(ESN) applied by U of M;

30# N urea applied to remaining plots by grower. 120# N urea split applied by grower in spring 2012.

²% clean seed at harvest. Yields reported as clean seed.

³Yields corrected to 12% moisture.

Fertilizer applied/acre

MAP=12-30-20-8s(added AMS for sulfur)-grower standard

MES10=9-30-20-8s

ESN=30-0-0

Observations/Conclusions:

There were no significant differences in either wheat or ryegrass yields with applications of MAP vs. MES10 or ESN vs. split liquid / urea applications.

Table 11.

**Liquid Nitrogen added to Standard Pesticide Applications*
of Perennial Ryegrass at 2 Locations-2012.
Douglas Erickson Farm-NW of Roseau variety 'Cutter II'
Magnusson Research Farm-variety'Arctic Green'**

Trt#	Broadleaf App 5/15	Grass App ¹ 5/24	Growth Reg 5/29	Fungicide 6/15	Seed Yield-% of Mean			Seed Yield-#/acre		
					Erickson	MagPlots	Average	Erickson	MagPlots	Average
1	2,4-D+Clarity	Grass control	Apogee	Quilt+N	100	93	96	973	1261	1117
2	2,4-D+Clarity+N	Grass control	Apogee	Quilt+N	100	100	100	967	1359	1163
3	2,4-D+Clarity	Grass control	Apogee+N	Quilt+N	110	115	113	1065	1568	1316
4	2,4-D+Clarity	Grass+N	Apogee	Quilt+N	104	106	105	1007	1446	1226
5	2,4-D+Clarity+N	Grass control	Apogee+N	Quilt+N	103	101	102	998	1370	1184
6	2,4-D+Clarity+N	Grass+N	Apogee+N	Quilt+N	99	104	102	962	1414	1188
7	MCPE+Clarity+N	Grass control	Apogee	Quilt+N	99	103	101	965	1401	1183
8	MCPE+Clarity+N	Grass control	Apogee	Quilt	104	100	102	1018	1352	1185
9	2,4-D+Clarity	Grass control	Apogee	Quilt	94	91	92	916	1232	1074
10	Huskie complete	NONE	Apogee	Quilt+N	43	37	39	421	497	459
11	2,4-D+Clarity	Permit	Apogee	Quilt+N	98	101	100	953	1370	1162
12	No treatment				87	86	87	851	1169	1010
LSD @ 5% Level					17.0	13.4	10.0	165	182	117
CV(%)					12.4	9.8	7.3	12.4	9.8	7.3
Mean seed yield by location					970	1358	1164			

Other Data.

Trt#	Broadleaf App 5/15/12	Grass App ¹ 5/24/12	Growth Reg 5/29/12	Fungicide 6/15/12	Erickson			Magnusson Plots			
					Harvest Ht.(in.)	Lodging ²	RCI ³ 7/17	Harvest Ht.(in.)	Date	RCI ³ 6/22	RCI ³ 7/17
1	2,4-D+Clarity	Grass control	Apogee	Quilt+N	21	1.5	247	21	7/20	193	618
2	2,4-D+Clarity+N	Grass control	Apogee	Quilt+N	21	2.0	259	21	7/20	187	614
3	2,4-D+Clarity	Grass control	Apogee+N	Quilt+N	21	1.8	285	21	7/21	203	684
4	2,4-D+Clarity	Grass+N	Apogee	Quilt+N	20	1.3	253	21	7/21	211	687
5	2,4-D+Clarity+N	Grass control	Apogee+N	Quilt+N	20	2.0	262	21	7/21	201	667
6	2,4-D+Clarity+N	Grass+N	Apogee+N	Quilt+N	20	1.3	303	21	7/21	225	730
7	MCPE+Clarity+N	Grass control	Apogee	Quilt+N	20	1.0	224	21	7/21	219	706
8	MCPE+Clarity+N	Grass control	Apogee	Quilt	20	1.0	234	21	7/20	208	679
9	2,4-D+Clarity	Grass control	Apogee	Quilt	21	1.3	276	21	7/20	181	621
10	Huskie complete	NONE	Apogee	Quilt+N	20	1.0	273	18	7/21	290	570
11	2,4-D+Clarity	Permit	Apogee	Quilt+N	20	1.5	273	21	7/20	216	702
12	No treatment				23	6.3	263	21	7/19	174	651
LSD @ 5% Level					2	1.1	64	1	11	21	92
CV(%)					4	44	17	6	4	7	10

Harvest Date - Erickson 7/22/2012, MagPlots 7/20/2012

* Add 3 gallons NPAK 28%N (10#N) per acre in addition to normal pesticide application to +N treatments

3/4pt. Clarity+3/4pt. 2,4-D 9/24/2012 at Magnusson Plot location

Fertility Level- MagPlots- 60-30-30-7.5s on 10/16/2011 + 80-0-0 on 4/6/2012

Erickson-60-30-30 Oct.2011 + 60-0-0 April 2012.

¹Magnusson Location=AssureII; Erickson Location=Tecoma(Puma)²Lodging-1=Upright;9=flat³RCI(Relative Chlorophyll Index)-Higher number means more chlorophyll.

2,4-D amine 4

.75pt.

4#2,4-DA

Clarity

.75pt.

4#dicamba

Assure II

10oz.+ .25%NIS

.88#quialofop

Apogee

6oz.+ .25%NIS+2.5% UAN

27.5%DFprohexadione

Quilt Excel

8oz.

1.02#propiconazole+1.18#azoxystrobin

MCPE 4

.75pt.

3.7#MCPA

Huskie Complete

13.7oz.

.042#thiencarbazone+1.46# bromoxynil+.46#pyrosulfatole

Permit

1 oz.(dry)+.25%NIS

halosulfuron-methyl 75%

Observations/Conclusions:

3 gallons 28%N added to the growth regulator and fungicide produced the highest seed yield at both locations.

Huskie Complete- was injurious to perennial ryegrass(presumably the thiencarbazone component of the product).

Table 12.

**Liquid Nitrogen added to Fungicides Applications-Perennial Ryegrass-2012
Magnusson Research Farm and Helmstetter Farm-Lake of the Woods area**

Trt.#	Fungicide treatment	Rate	2 Location		RCI ¹			Lodging ²				
			3 gal. 28%N	Seed Yield % of mean	Seed Yield (#/ac.)		MagPlot	Helm	Mean	MagPlot	Helm	Mean
					MagPlot	Helm						
1	No treatment		NO	96.2	1184	1345	270	201	235	2.3	3.8	3.0
2	Quilt Excel 2.2se	10.5 oz.	NO	102.5	1271	1423	289	215	252	3.0	5.8	4.4
3	Priaxor	6 oz.	NO	108.5	1269	1583	287	208	248	2.5	6.3	4.4
4	Stratego YLD+Folicur	5.4oz.+5.4oz.	NO	103.4	1204	1514	303	213	258	2.5	5.8	4.1
5	Quilt Excel 2.2se	10.5 oz.	YES	104.3	1244	1496	332	227	279	2.3	6.0	4.1
6	Folicur 3.6#	5.4oz.	YES	93.4	1142	1311	299	202	251	2.5	4.5	3.5
7	Stratego YLD+Folicur	5.4oz.+5.4oz.	YES	100.2	1180	1454	315	200	257	2.5	5.5	4.0
8	No treatment		YES	91.6	1131	1278	284	195	240	2.5	3.0	2.8
LSD @ 5% level				11.8	NS	119	53	27	27	NS	1.9	1.2

Experimental design: RCB with 4 reps

Magnusson location - variety= Arctic Green

Helmstetter location - variety= Provocative

.25%NIS applied with all treatments

¹RCI-Relative Chlorophyll Index- higher number =more chlorophyll

²Lodging-1=upright;9=flat

Trade name	common name	#AI/Gal.
Quilt Excel 2.2se	propiconazole+azoxystrobin	1.02+1.18
Priaxor	fluxapyroxad + pyraclostrobin	1.39+2.78
Stratego YLD+Folicur	prothioconazole+trifloxystrobin+tebuconazole	1.05+3.15
Folicur	tebuconazole	3.6
Quilt	propiconazole+azoxystrobin	1.04+.62

Observations/Conclusions:

Fungicides tended to increase seed yields over untreated checks

The addition of liquid nitrogen to fungicide mixes did not effect seed yield

The addition of liquid nitrogen to fungicide mixes tended to increase chlorophyll at the Magnusson location

Table 13.

**Rates and Split Applications of Apogee to 'Arctic Green' Perennial Ryegrass
Magnusson Research Farm**

Trt.#	Apogee Rate	Application Date	Seed Yield (#/ac.)	Harvest-7/19/12	
				Ht. (in.)	Lodging**
1	No Treatment		1112	25	6.8
2	4oz.	6/1	1123	22	2.5
3	6oz.	6/1	1094	22	1.5
4	8oz.	6/1	1120	20	1.5
5	10oz.	6/1	1047	20	1
6	3+3=6	5/22+6/12	1152	20	1.3
7	4+4=8	5/22+6/12	996	19	1
8	5+5=10	5/22+6/12	949	17	1
9	6+2=8	5/22+6/12	993	20	1
10*	3+2+3*	5/16+5/22+6/26	1094	22	3.5
LSD @ 5% level			117	2	1.2

*Trt.#10 had Apogee split applications applied with pesticide applications
3oz.W/ 2,4-D+Clarity-2oz. W/Assure II,3oz.W/Quilt

** Lodging- 1=upright;9=flat

Pesticide Treatments:

5/16--2,4-D+Clarity applied to all plots. Dry soil-wind N 5mph . GS= vegetative tillering/ 1node
5/22/12--10oz. Assure II +.25%NIS+2.5% -28%N applied to all plots. Split Apogee trts. Applied to trts. 6-10.

6/1/12 Apogee applied to trts.2-5.

6/12/12 Apogee applied to trts.6-9.

6/26/12 Quilt Excel applied to all plots.

Fertility=60-30-30 fall + 70-0-0 spring.

All Apogee treatments include .25% NIS+ 2.5% - 28%NPAK

2- 1ft.2 samples for dry wt. taken from untreated checks

Dry Matter 6/4/2012 = 1.15 tons/a G.Stage- Boot 8"-10"

Dry Matter 6/13/2012= 1.68 tons/a G. Stage11"-15" ht.--30% heading

Observations/Conclusions:

Some split applications treatments of Apogee reduced seed yield.

No single application rate of Apogee significantly affected seed yield.

Apogee applications reduced plant height and lodging.

Table 14.

**2012 Apogee Rates Applied to 'Arctic Green' Per. Ryegrass
Magnusson Research Farm**

Trt#	Apogee Rates	Seed Yield (#/ac.)	Harvest		Test Wt. ⁴	Dry matter Harvest		RCI ³	
			Lodging ¹	Ht.(In.)		Tons/acre	Index ²	6/23	7/17
1	0	1550	7.5	25.5	28.5	2.74	27.8	323	157
2	5oz.	1501	2.0	22.5	28.5	2.40	31.1	363	173
3	8oz.	1463	1.0	21.0	28.4	2.19	34.7	375	212
LSD @5%Level		NS	1.8	3.5	NS	0.35	NS	NS	62
CV(%)		5.1	11.6	3.5	NA	3.4	12.5	9.4	8

Ryegrass seeded into wheat stubble 9/3/2011.

Swath date- 7/18/2012 averaging 33.5% moisture.

Apogee applications 6/6/2012- Growth stage- early heading. Canopy height- 8" ht.

Dry soil conditions- sunny 65F wind 0-4 NNE.

Apogee applied with .25%NIS(Preference)+2.5%NPAK-28

¹Lodging-1=Upright;9=flat

²Harvest index= seed as % of total dry matter.

³RCI(Relative Chlorophyll Index)-Higher number means more chlorophyll.

⁴Test Wt.= Pounds per bushel corrected to 11% moisture.

Observations/Conclusions:

Apogee applications did not affect seed yield but reduced lodging and dry matter production.

XX

Table 15.

**2012 Late Weed Control Applied to 'Arctic Green' Per. Ryegrass
Magnusson Farms- West of Roseau,Mn**

Treatment	Rate/acre	Seed Yield	
	Adjuvant	(#/Ac.)	% of Check
1 MCPE	1pt	1433	107.8
2 2,4-Da	1pt	1439	108.3
3 2,4-DE	3/4pt	1299	97.7
4 2,4-Da+Clarity	1pt+1pt	1320	99.3
5 Stinger	6oz.	1296	97.5
6 Clarity	1pt.	1252	94.2
7 Aim	1oz.+ .25%NIS	1350	101.6
8 Basagran	1.5pt+1%MISO	1302	98.0
9 No Treatment		1329	100.0
10 Avenge	3pt.+ .25%NIS	1311	98.6
11 Assure II	10oz.+ .25%NIS	1213	91.3
12 Fusilade	12oz+.5%HCCOC	1320	99.3
LSD @ 5% level		137	10.3
LSD @ 10% level		114	8.6

Herbicides applications made 6/21/2012 at 60% heading stage.

Wind WSW at 4-8mph

Harvested 7/21/2012

Observations/Conclusions:

Late applications of Assure II may have reduced seed yields(at 10%level).

MCPE and 2,4-D amine applications tended to yield higher than checks(at LSD 20%level).

Table 16.

**Fall/Spring Applications of Assure II/Fusilade to Arctic Green Perennial Ryegrass
Magnusson Research Farm-2012**

Fall Treatment	Spring Treatment	Grass Herbicide	Rate	Seed yield #/ac	Harvest	
					Ht.(in.)	Lodging*
Sept. 26	none	Assurell	10oz.	1314	22	3.3
Sept. 26	none	Assurell	20oz.	1406	22	3.3
Sept. 26	24-May	Assurell	10+10	1293	21	2
Sept. 26	24-May	Assurell	20+10	1234	22	3
None	24-May	Assurell	10oz.	1151	22	1.7
Sept. 26	24-May	Fusilade	12+12	1377	22	3
None	None	None	0	1308	22	2.3
LSD @ 5% Level				222	NS	1.4

Harvest date- 7/19/2012

*Lodging- 1=Upright; 9=flat

Assure II treatments= .25%NIS

Fusilade treatments= 1.0%COG

2pt. Curtail+1pt. Clarity applied 9/19/11

3/4pt. 2,4-D + 3/4pt. Clarity 5/10/12

Observations/Conclusions:

Spring applications of Assure II tended to reduce seed yields while Fusilade did not.

Fall applications of either grass herbicide did not reduce yields.

Table 17.

**Date of Swath 'Arctic Green' Perennial Ryegrass
Magnusson Research Farm**

Trt.#	Cut Date ¹	Seed yield (#/acre)
1	7/17	1426
2	7/19	1450
3	7/21	1218
4	7/23	1118
5	7/17 and leave	1363
6	7/19 and leave	1390
7	7/21 and leave	1169
8	7/23 and leave	1067
LSD @5% Level		94

Experimental Design: RCB with 4 Reps.

¹ Cut Date- Treatments 1-4 yield samples were cut and bagged on the cut date.

Treatments 5-8 samples were cut on same date, left in field, and bagged 6 days later.

All samples taken to St. Paul for threshing and cleaning.

Swath/cut date 7/17- seed =35% moisture

Swath/cut date 7/19- seed =33% moisture

Last 2 cut dates no moisture samples taken but seed shattering had occurred prior to cutting and shattered readily when swathed.

Observations/Conclusions:

Seed yields on first 2 cutting dates did not differ but yield dropped significantly on date 3 and 4. 50-60#/acre (about 4%) was lost when ryegrass was left in the field (typical swath/combine) than harvested and bagged immediately. Seed loss may have been less with an earlier harvest date?

Seed harvest was scheduled to be started at 45% moisture but sampling initiated too late.

Trial is scheduled to be repeated in 2013 with an earlier start to harvest dates.

Table 18.

**2011 Seeding Year Weed Control in Spring Wheat with Underseeded Grasses
Magnusson Research farm**

Trt.#	Treatment	Herbicide tolerance ¹			Stand ² 6/21/2012		
		Ky.bluegrass	per.ryegrass	tall fescue	Ky.bluegrass	per.ryegrass	tall fescue
1	Achieve L	G	G	F	77	73	63
2	Affinity+2,4-D	G	F	F	60	73	65
3	Assert	F	G	G	70	63	53
4	Avenge ³	G	G	G	NA	NA	NA
5	Axial	G	P	P	77	55	0
6	Callisto-3 oz.	G	G	G	80	70	70
7	Callisto -5 oz.	G	G	G	70	75	55
8	Everest 70WG ³	G	F	F	NA	NA	NA
9	Everest 2.0 ³	G	F	F	NA	NA	NA
10	Express+2,4-D	G	F	G	65	67	60
11	Nortron	G	G	G	40	70	60
12	Tecoma(Puma)	P	G	G	10	70	43
13	Wolverine	P	G	F	15	60	50
14	No treatment	G	G	G	70	75	60

¹Tolerance based on stand 10/21/2011;G=good ,F=fair ,P=poor tolerance.

²Stand 6/21/2012- 0= worst stand; 90= best stands.

³Treatments added to these treatments in 2012 so stand notes not available.

Experimental design- Split-plot with 4 reps

All treatments applied 6/24/11 9:00AM 70F west wind 0-3mph

Application growth stages- 6/24:

spring wheat- 6-8" tall 3 leaf tillering

perennial ryegrass 1.5"-2" 2-3 leaf

tall fescue 2" 2-3 leaf

ky.bluegrass 1" 1-2 leaf

1pt. Buctril applied to all 6/24/11 5:00pm wind west 0-5mph

Spring wheat-Samson

Kentucky bluegrass - Park

Tall fescue- Durana

Perennial ryegrass-Arctic Green

Trt.#	Treatment	Rate/Adjuvunct	active ingredient/ac.
1	Achieve Liquid	.5pt+.25%NIS+2.5% -28%N	.208# tralkoxydim
2	Affinity+2,4-D	.6oz.+1/2pt.LV6+.25%NIS	.0094#thifensulfuron+.0094#tribenuron+.375#2,4-DE
3	Assert	1.2pt+.25%NIS	.375# imazamethabenz
4	Avenge	3pt+.25%NIS	2# difenoquat
5	Axial	1pt.	.42# pinoxedin
6	Callisto	3oz.+1%COG+2.5%- 28%N	.094# mesotrione
7	Callisto	5oz.+COG +2.5% - 28%N	.157# mesotrione
8	Everest 70WG	.6oz+.25%NIS	.026# flucarbazone
9	Everest 2.0	.9oz+.25%NIS	.025# flucarbazone+safener
10	Express+2,4-D	.3oz.+1/2pt. 2,4-D LV6+.25%NIS	.0094# tribenuron+.375# 2,4-DE
11	Nortron	2 pt	1# ethofumesate
12	Tecoma	10oz.	.078# fenoxaprop
13	Wolverine	1.7pt. +2.5%-28%N	.08# fenoxaprop+.036# pryrasulfotole+.087# bromoxynil
14	No treatment		

Observations/Conclusions:

Axial gave better control of ryegrass seedlings than Everest formulations

Table 19.

**2011-2 Tall fescue Establishment/Management Trial
Magnusson Research Farm-Roseau**

Variety	Planting		Fungicide ¹	Seed Yield
	Date	Cover		#/ac.
KY-31	7/20/2011	None	Quilt	980
KY-31	7/20/2011	None	no Quilt	925
KY-31	7/20/2011	Wheat	Quilt	329
KY-31	7/20/2011	Wheat	no Quilt	300
KY-31	7/20/2011	wheat-chop off	Quilt	685
KY-31	7/20/2011	wheat-chop off	no Quilt	mice damage-lost
Durant	7/20/2011	None	Quilt	1424
Durant	7/20/2011	None	no Quilt	1610
Durant	7/20/2011	Wheat	Quilt	846
Durant	7/20/2011	Wheat	no Quilt	694
Durant	7/20/2011	wheat-chop off	Quilt	1424
Durant	7/20/2011	wheat-chop off	no Quilt	1593
Durant	8/12/2012	Wheat	Quilt	596
Durant	8/12/2012	Wheat	no Quilt	645

Fertilizer application

120+60+60+15s -- 10/16/11

Observations/Conclusions:

Insufficient replication(2) to analyze results.

Seeding on preventive plant ground is a viable option.

Planting probably needs to be done before Aug.1.

If wheat cover has headed, flail chopping/removal may be beneficial.

Table 20.

Prairie Junegrass(*Koeleria macrantha*) planted at 2 Location in 2010
Seeding Date X Density

Roseau³					Becker³				
Planting		Seed Yield #/acre		% stand	Planting		Seed yield		
Date	Density ²	2011	2012	5/26/2011	Date	Density ²	2012	5/17/2011	
6/8/2010	6"-3#	263	307	65	6/3/2010	6"-3#	14	50	
6/8/2010	6"-1.5#	156	403	86	6/3/2010	6"-1.5#	23	58	
6/8/2010	12"-1.5#	205	274	65	6/3/2010	12"-1.5#	11	45	
Mean 6/8 planting		208	328	72	Ave. 6/8 planting		16	51	
7/20/2010	6"-3#	NH ¹	314	60	7/15/2010	6"-3#	28	30	
7/20/2010	6"-1.5#	NH	276	73	7/15/2010	6"-1.5#	31	40	
7/20/2010	12"-1.5#	NH	301	80	7/15/2010	12"-1.5#	22	30	
Mean 7/20 planting		0	297	71	Ave. 7/20 planting		27	33	
8/28/2010	6"-3#	NH	258	43	9/1/2010	6"-3#	151	83	
8/28/2010	6"-1.5#	NH	283	55	9/1/2010	6"-1.5#	147	90	
8/28/2010	12"-1.5#	NH	236	53	9/1/2010	12"-1.5#	134	88	
Mean 8/28 planting		0	259	50	Ave. 8/28 planting		144	87	
LSD @ 5% level			126	24	LSD @ 5% level			57	23

Variety-'KC' germplasm--Colorado collection

¹NH- not sufficient seed to harvest

²-Density- row spacing and #/ac. Seeding rate

³-Location-Roseau= Magnusson Research farm, Becker= Sand Plain Research farm-Becker, Mn.

⁴-Seed Yield- No seed to harvest at Becker in 2011

Management-

60+30+30 applied 10/2011

3/4pt. 2,4-D+3/4pt. Clarity applied Sept.2011

2x weekly irrigation at Becker when needed

Observations/Conclusions:

Early planting at Roseau established adequately for year 1(2011) seed production.

Late planting at Becker established adequately but earlier plantings did not.

Density(seeding rate/row spacings) did not differ significantly.

Table 21.

Prairie Junegrass(Koeleria macrantha) planted at 2 Location in 2010**Variety x Growth Regulator x Fertility Trials**

Roseau¹					Becker¹				
Variety ²	Growth ⁵ regulator	Fertilizer ⁴	2012		Variety ²	Growth ⁵ regulator	Fertilizer ⁴	2012	
			Seed yield #/acre	Harvest Ht.(In.)				Seed yield #/acre	Harvest Ht.(In.)
KC	0	F1	336	18	KC	0	F1	107	20
KC	0	F2	470	19	KC	0	F2	96	21
KC	0	F3	307	19	KC	0	F3	167	20
KC	Mean 0 growth reg.		371	19	KC	Mean 0 growth reg.		123	20
KC	1	F1	390	18	KC	1	F1	96	19
KC	1	F2	NH ³	18	KC	1	F2	98	19
KC	1	F3	390	17	KC	1	F3	94	18
KC	Mean 4oz. Apogee		390	18	KC	Mean 4oz. Apogee		96	19
KC	2	F1	343	16	KC	2	F1	91	18
KC	2	F2	386	16	KC	2	F2	136	18
KC	2	F3	334	16	KC	2	F3	140	18
KC	Mean 8oz. Apogee		354	16	KC	Mean 8oz. Apogee		122	18
	LSD @ 5% level		74	1		LSD @ 5% level		75	2
KN	0	F1	365	19	KN	0	F1	136	22
KN	0	F2	354	20	KN	0	F2	82	22
KN	0	F3	198	19	KN	0	F3	111	22
KN	Mean 0 growth reg.		306	19	KN	Mean 0 growth reg.		110	22
KN	1	F1	312	18	KN	1	F1	116	21
KN	1	F2	339	18	KN	1	F2	100	21
KN	1	F3	319	18	KN	1	F3	145	21
KN	Mean 4oz. Apogee		323	18	KN	Mean 4oz. Apogee		120	21
KN	2	F1	310	16	KN	2	F1	149	21
KN	2	F2	361	16	KN	2	F2	154	20
KN	2	F3	274	17	KN	2	F3	125	20
KN	Mean 8oz. Apogee		315	16	KN	Mean 8oz. Apogee		143	20
	LSD @ 5% level		74	1		LSD @ 5% level		75	2
WD	0	F1	265	22	WD	0	F1	136	25
WD	0	F2	278	23	WD	0	F2	187	26
WD	0	F3	218	23	WD	0	F3	200	25
WD	Mean 0 growth reg.		254	23	WD	Mean 0 growth reg.		174	25
WD	1	F1	265	21	WD	1	F1	123	24
WD	1	F2	225	22	WD	1	F2	178	24
WD	1	F3	265	22	WD	1	F3	227	24
WD	Mean 4oz. Apogee		252	22	WD	Mean 4oz. Apogee		176	24
WD	2	F1	292	22	WD	2	F1	131	22
WD	2	F2	290	21	WD	2	F2	223	24
WD	2	F3	290	22	WD	2	F3	254	23
WD	Mean 8oz. Apogee		291	22	WD	Mean 8oz. Apogee		203	23
	LSD @ 5% level		74	1		LSD @ 5% level		75	2

¹Location-Roseau= Magnusson Research farm, Becker= Sand Plain Research farm-Becker, Mn.²Variety- WD- Weaver Dunes- SE Minnesota

KC- Colorado

KN- Nebraska

³NH- Not harvested -drowned out⁴Fertilizer- October 2011 and April 2012

F1) 30+30+30 fall

F2)30+30+30 fall+30-0-0 spring

F3)60+30+30 fall

⁵Growth regulator=

0)No growth regulator

1)Apogee 4 oz.+ .25%NIS+2.5%-28%N

2)Apogee 8 oz.+ .25%NIS+2.5%-28%N

Roseau Apogee treatments applied 5/16/2012 1pm 70F 20%RH wind wsw5

growth stage - jointed- no heads showing Harvested 7/6/2012

Becker Apogee treatments applied 5/14/2012 gs= WD 15% headed, ND & KC 30% headed- harvested 7/1/2012

Observations/Conclusions:

KC and KN populations produced highest seed yields at Roseau.

WD population was highest yielding line at Becker.

Growth regulator applications reduced crop height.

No significant seed yield differences among growth regulator or fertility treatments.

Table 22.

**3 Year Summary of In Furrow Fertilizer Applications to Spring Wheat With Underseeded Ryegrass.
Magnusson Research farm- Roseau,Mn.**

Spring Wheat Data Summary

Treatment	Surface ¹	In Furrow ²	Yield as % of mean			Yield Bu./Acre			% Protein			
	Applied Fertilizer	Applied Fertilizer	2010-12 ³	2012	2011	2010	2012	2011	2010	2012	2011	2010
Check- No P or K	110-0-0	0	86.3	69.9	94.0	95.0	44.3	81.8	68.9	16.8	13.5	11.6
MES10	100-0-0	9-30-30-7s	104.2	109.6	99.7	103.4	69.4	86.7	75.0	14.9	13.6	11.8
MES10 (2x)+K20(2x)	90-0-0	18-60-60-14s	106.3	119.7	102.5	96.7	75.8	89.2	70.1	14.9	13.7	11.8
MES10 (2x)						105.1			76.2			
MAP	100-0-0	9-30-30	104.9	109.9	101.8	103.0	69.6	88.6	74.7	15.5	13.8	11.1
MES10 Surface apply	110-30-30-7s	0	98.5	103.4	99.0	93.0	65.5	86.1	67.4	15.6	13.6	11.3
MES10+15#ESN	85-0-0	25-30-30-7s		113.0			71.6			15.2		
MES10+30#ESN	70-0-0	40-30-30-7s	101.8	100.7	102.9		63.8	89.5		15.8	13.9	
MES10+45#ESN	55-0-0	55-30-30-7s		99.1			62.8			15.8		
MES10+60#ESN	40-0-0	70-30-30-7s	96.7	90.8	102.6		57.5	89.3		16.1	13.9	
30# ESN only- no P or K	80-0-0	30-0-0	87.3	77.5	97.1		49.1	84.5		16.8	13.9	
MES10+30# foliarN ⁴	70-0-0	9-30-30-7s	101.9	106.6	97.1		67.5	84.5		17.1	14.0	
MES15	100-0-0	9-30-30-14s	102.6		101.3	103.9		88.1	75.3		13.4	11.6
MESZ	100-0-0	9-30-30-7s-1z	101.3		102.3	100.3		89.0	72.7		13.3	11.2
	LSD @5% Level		5.3	6.3	5.2	8.7	4.0	4.5	6.3	0.4	0.4	0.5
	CV(%)		4.0	5.3	5.4	6.0	5.3	5.4	6.0	2.2	2.4	3
							Mean yield-Bu./acre	63.35	87	72.5		

Plot Design= RCB with 4 Replications

Perennial ryegrass underseeded with spring wheat

¹ Fertilizer applied before final tillage/seed bed prep.

² Fertilizer applied in furrow with seed at planting.

³ Minimum 2 years data.

⁴ 30# Foliar N applied as 28%N at anthesis

Wheat variety-Samson ; perennial ryegrass variety- Arctic Green

Observations/Conclusions:

P and K in furrow applications are more effective than broadcast treatments.

Higher(2x) P and K levels may increase yields if soil tests low.

ESN applied in furrow up to 30# may have benefit; higher rates could be detrimental.

Foliar N(28%N) at anthesis may increase protein.

Table 25.

**2012 Spring Wheat On Farm Fertility Trial
Magnusson Farms NW of Roseau, Mn.**

Trt#	Treatment ¹	In Furrow treatment	Bu./ac ²	%Protein	Test Wt.
1*	MAP+30#Liquid UAN @ Heading	7-30-30	66.1	16.4	61.9
2*	MES10+30#Liquid UAN @ Heading	9-30-30-8 s	71.3	16.6	61.9
3	MES10+30#ESN in furrow	39-30-30-8s	68.5	16.5	61.7
LSD @ 20% level			5.1	NS	NS
CV(%)			6.3	1.7	0.5

Experimental Design= RCB with 3 Replications

Plot size=85' x 500'

* 30# -28%N applied to these plots 6/15/2012

¹ N,P and K rates essentially the same on all 3 treatments.

² corrected to 12% Moisture.

Spring wheat variety= YB Soren.

120#N urea applied to field prior to planting.

All planting,harvesting and treatments were performed by the grower.

University of Minnesota personel assisted in plot layout,recording notes and harvest information and processing samples.

Soil Test Results Prior to Planting-

P2O5- 12#/acre

K2O-126#/acre

PH=7.9

Observations/Conclusions:

Higher yield with MES10 vs. MAP treatment.