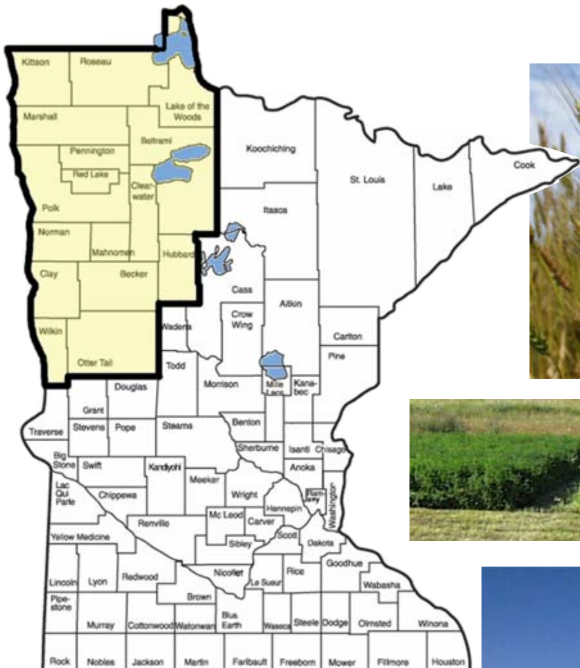
On-Farm Cropping Trials

Northwest and West Central Minnesota

January 2005



UNIVERSITY OF MINNESOTA

Extension

SERVICE

2004 On-Farm Cropping Trials
For Northwest and West Central Minnesota

The University of Minnesota is pleased to provide you with the results of the 2004 on-farm field cropping trials conducted in northwest and west central Minnesota.

This is the sixth year for the trials booklet. It was developed to increase the awareness and impact of the many on-farm cropping projects conducted in Minnesota. The booklet contains summary information for projects on a wide range of management issues for corn, soybeans, small grains, and other regional crops.

This project was made possible thanks to the hard work of many people. This includes farmers, County and Regional Extension Educators, and specialists who conducted these trials, and their names are listed with results. Also, thank you to our task force and our graphic designer, Mary Gieseke.

Whenever possible, research plot data was analyzed using statistics. The LSD (Least Significant Difference) numbers beneath columns in tables are statistical measures of variability. If the differences between two treatments equals or exceeds the LSD value, the higher yielding treatment probably was superior in yield. If the difference is less than the LSD the treatment difference is probably due to environmental factors. An "NS" notation in a column indicates no significant difference for that characteristic.

For more information about any of the studies included in this report, please contact the Extension Educator or specialist listed. We invite your input on priorities you believe are important for Minnesota crop producers.

Sincerely,

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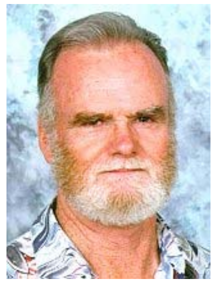

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Northwest Research and Outreach Center (NWROC)
Crookston, Minnesota

The mission of the NWROC is to contribute, within the framework of the Minnesota Agricultural Experiment Station (MAES) and the College of Agricultural, Food and Environmental Sciences, to the acquisition, interpretation and dissemination of research results to the people of Minnesota, with application to the knowledge base of the United States and World. Within this framework, major emphasis is placed on research and education that is relevant to the needs of northwest Minnesota, and which includes projects initiated by Center scientists, other MAES scientists and state or federal agencies.

Research Areas

- Agronomy
- Dairy & Beef Science
- Entomology
- Natural Resources
- Plant Pathology
- Soil Science
- Soil & Water Quality
- Small Grains Extension
- Sugarbeets
- Potatoes

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Source: 2004 On-Farm Cropping Trials Northwest and West Central Minnesota
U of MN Extension Service, published January 2005

Evaluation of Phosphorus and Potassium Rates on Soybean as a Tool to increase Yield and Protein

Cooperator: Ron Peterson
Nearest town: Crookston
Variety: Legend 0082
Planted: June 15, 2004
Harvested: Oct. 12, 2004
Soil test:

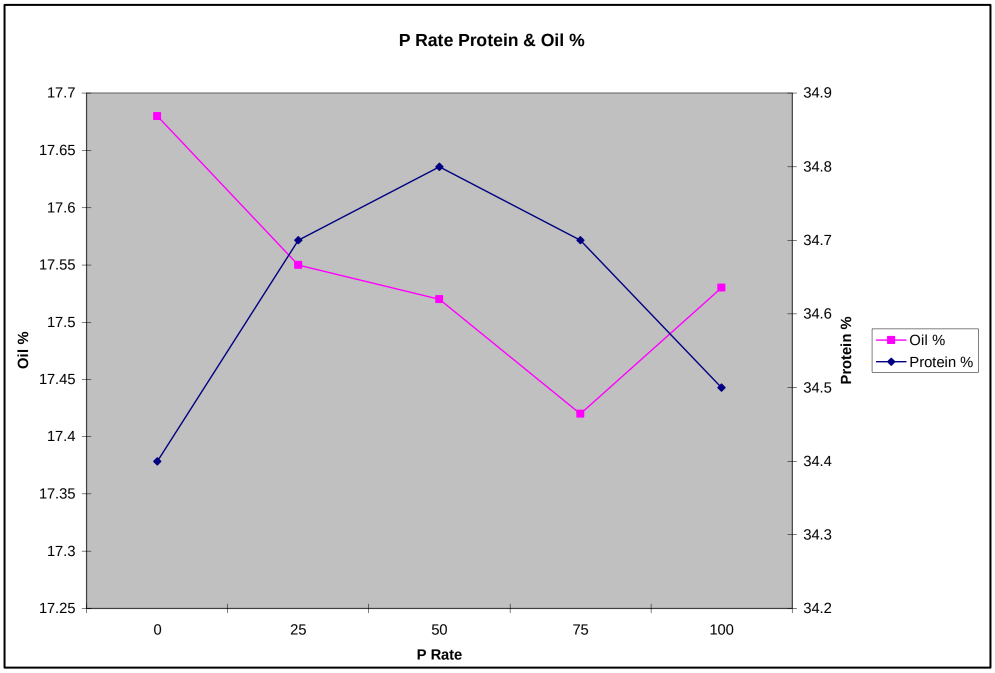
Olsen P	3ppm
Potassium	60ppm
Organic matter	4.7%
pH	8.3

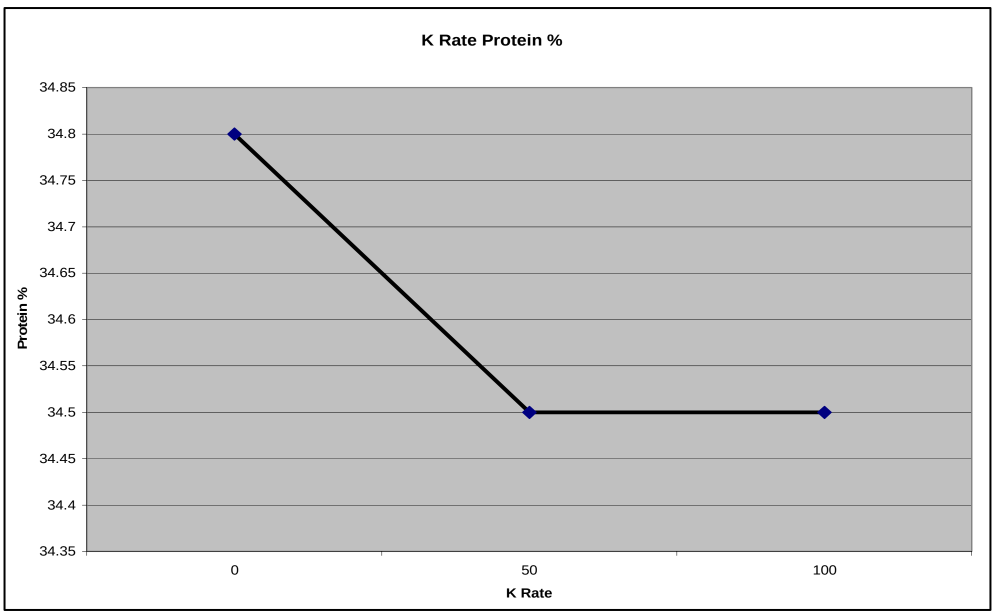
Purpose of study:

New soybean cultivars with higher yield potentials have been developed for the region over the past ten years and this prompted the idea to conduct a phosphorus and potassium rate study to determine if the phosphorus and potassium nutritional needs of the crop were still being met from residual phosphorus and potassium in the soil. Previous research showed significant increases in yield and protein with the addition of phosphorus fertilizer and to a lesser extent potassium fertilizer on lower testing soils. In 2004, soybean phosphorous and potassium rate experiments were conducted at two locations in Northwestern Minnesota on soils testing low to medium for P_2O_5 and K_2O.

Results:

One of the sites had to be abandoned in 2004 due to poor stands and excessive frost damage in August. At the site harvested, there was a significant increase in protein up to the 50 pound per acre rate of P_2O_5 and a significant decrease in oil percent up to the 75 pound rate of P_2O_5 rate per acre as can be seen in Graph 1. Whether these small differences are economic is another question. The addition of potassium fertilizer significantly decreased protein by 0.3 % with the 25 and 50 pound rates per acre as noted in Graph 2. There were no significant differences for soybean grain yield. The abnormal growing conditions and August frost make interpretations from this data challenging.





Funding:
Minnesota Soybean Research and Promotion Council

For additional information:
Russ Severson George Rehm
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Source: 2004 On-Farm Cropping Trials Northwest and West Central Minnesota
U of MN Extension Service, published January 2005

Comparison of Soybean Production Techniques with Plant Disease Development in the Red River Valley

Introduction

Soil-borne disease issues continue to plague soybean production across Minnesota. Routinely, heavy soils and wet fields promote root disease development. Generally, an initial period of low disease pressure is expected when growing a newly introduced crop in a region. Spread of soil-borne pathogens requires the presence of a suitable host before populations can cause widespread crop damage. The objective of this research was to determine if specific production practices such as rotation, tillage, varieties grown, soil fertility, or herbicide application contributed to disease development.

Materials and Methods

A survey was conducted during the 2004 growing season where 36 fields located in 11 NW MN counties from the Canadian border to Wilkin and Ottertail counties, were identified for specific cropping histories of interest (Table 1). Producer records and observations provided crop production practice histories beginning in 1997 and extending through the survey year. During July, soil samples and a total of 25 soybean plants (growth stages: unifoliate to first trifoliate leaves) were collected. Collected plants were rated for leaf and root disease, and leaves stored for serology tests (soybean mosaic virus, alfalfa mosaic virus, and bean pod mottle virus). The percent leaf area killed from disease and root rot ratings (where 0=healthy, 1=discolored, 2=defined lesion, and 3=root rot) were assigned each plant that was collected. Root tissue isolations were made to isolate those pathogens present. During August, soil was collected once again and analyzed for soybean cyst nematode. Plants in the R2-R5 growth stages were examined for leaf and root disease and leaves were stored for serology tests as described above. Root tissue isolations were conducted and chlorosis ratings were taken from each plant on a 0 to 4 scale were 0= no chlorosis and 4=severe chlorosis.

Results and Discussion

Crop rotation use varied widely between fields. Soybean was grown eight of eight years in a single field while five fields had three years of continuous soybean. Planting two consecutive years of soybean was common.

The cool, wet growing season during 2004 promoted diseases caused by pathogens with lower temperature requirements for infection and disease development. Brown spot (caused by *Septoria glycines*) was the most severe aboveground disease, while downy mildew (caused by *Peronospora manshurica*) and bacterial blight (caused by *Pseudomonas savastanoi* pv. *glycinea*) were much less prevalent. Downy mildew infections increased substantially between the first and second plant collections. Root diseases were widespread and often severe. Fusarium root rot (caused by *Fusaria* spp.) was most prevalent. Pythium root rot (caused by *Pythium* spp.), Phytophthora root rot (caused by *Phytophthora sojae*), and Rhizoctonia root rot (caused by *Rhizoctonia solani*) were also present, but to a lesser degree. Correlations indicate a significant relationship between root rot ratings from plants collected during July and cropping system (Figure 1), and significance between plants collected during August and cropping system (Figure 2). *Fusaria* spp. populations (pathogenic as well as saprophytic) were correlated with herbicide use, and *Rhizoctonia* spp. populations were correlated with cropping system. Serology tests from plant tissues collected in July and August from all fields were uniformly negative for soybean mosaic virus, alfalfa mosaic virus, and bean pod mottle virus. No soybean cyst nematodes were detected.

Yield data remains incomplete, making additional comparisons difficult. Many fields were damaged due to an untimely frost. Reported yields range from 0 to 40 bu/a.

Further studies are needed to investigate the relationship that specific classes of herbicides have with increasing or decreasing populations of Fusaria spp. recovered from soybean plant roots.

Partnership/Funding:
Minnesota Soybean Research and Promotion Council
NW Research and Outreach Center and U of M Extension Service

For additional information:
Charla Hollingsworth, Carlyle Holen
Doug Holen, Hans Kandel
Zach Fore

Source: 2004 On-Farm Cropping Trials Northwest and West Central Minnesota
U of MN Extension Service, published January 2005

Comparison of Soybean Production Techniques with Plant Disease Development in the Red River Valley *(continued)*

Table 1. Field cropping history categories of fields that were surveyed.

Soybean Rotation 7 years to present	Conventional (Conv)	Roundup Ready (RR)	Organic (Org)
No soybean	4	4	---
1 - 3 yrs soybean	4	6	5
> 3 yrs soybean	6	7	---
TOTAL	14	17	5

Figure 1. Root disease ratings (scale of 0 to 3) from soybean plants collected during the July survey. Line graph points reflect the copping system (None=no soybean history, 1-3= 1-3 yrs of soybean in the last 7 years, >3= more than 3 years of soybean in the last 7 years; Roundup Ready, Conventional, or Organic and the number of fields contributing to each point (4 fields, 6 fields, etc.).

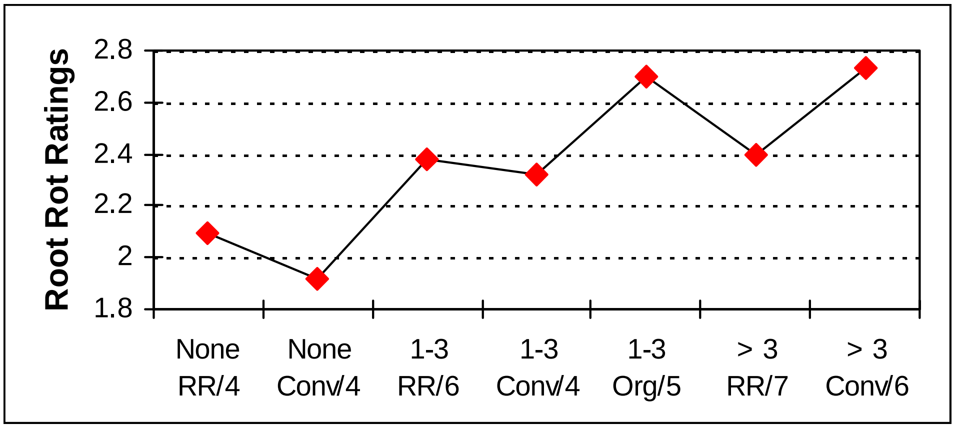
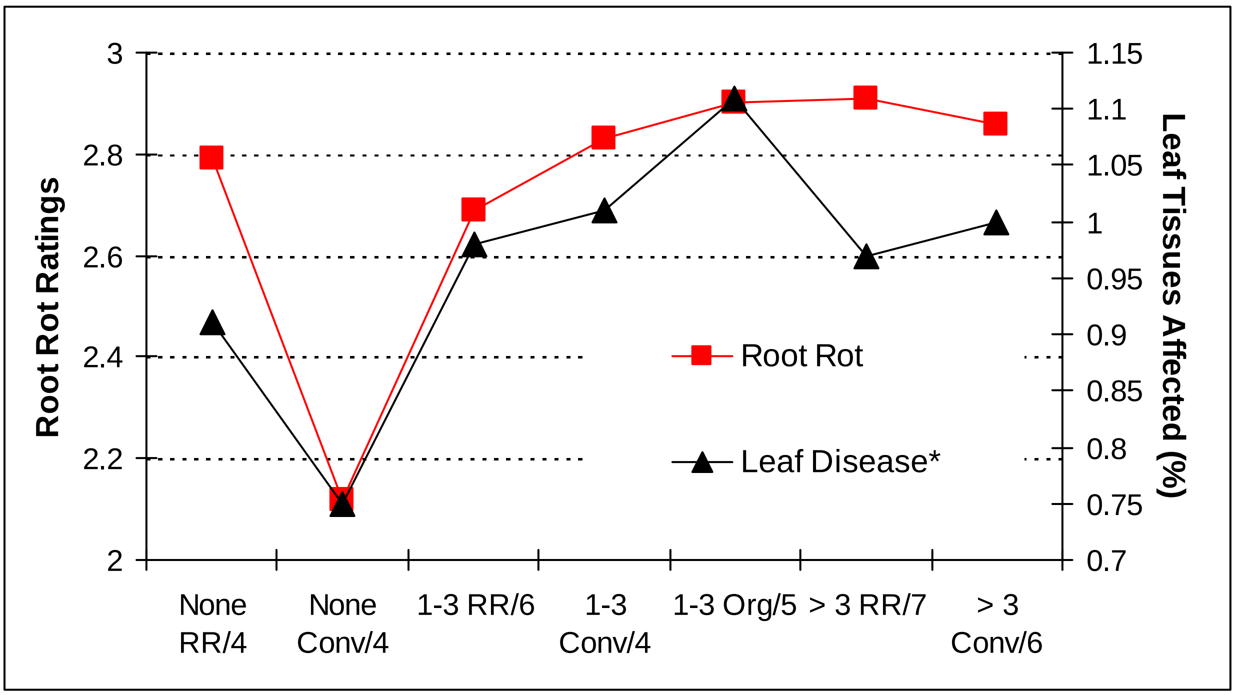


Figure 2. Root rot ratings and percent leaves killed due to disease from soybean plants collected during the August survey. See axis key in Fig. 1. *Percent leaf disease was significantly correlated with cropping system.



Soybean Varietal Trials —Polk County

Cooperator: Chris & Ken Hove, Tyler & Harold Ross
Nearest Town: Fosston, Crookston
Previous Crop: Corn, Sugarbeets
Planting Date: May 18, May 18
Seeding Rate: 180,000 live seeds/acre
Harvest Date: October 27, October 18
Row Width: 6”
Fertilizer: None
Soil Tests:

Fosston

NO_3-N	
0-6"	12lb/a
6-24"	57lb/a
0-24"	69lb/a

Olsen P	5ppm
Potassium	83ppm
Sulfur	30lb/a
Zinc	.72ppm
O.M.	3.10%
Carbonates	0.40%
Salts	.13mmho/cm
pH	7.7

Crookston

NO_3-N	
0-6"	14lb/a
6-24"	27lb/a
0-24"	41lb/a

Olsen P	14ppm
Potassium	208ppm
Sulfur	82lb/a
Zinc	.62ppm
O.M.	3.70%
Carbonates	3.30%
Salts	.43mmho/cm
pH	8.2

Purpose of Study:
Evaluate 39 roundup-ready and 15 conventional soybean varieties in 2 environments in 2004.

Results:
The record cold 2004 growing season was detrimental to soybean production. Cool wet soil conditions early caused Valor herbicide injury at both locations. The Rezult herbicide applications caused leaf injury and delayed plant growth with both applications. The frost on August 20 severely injured all varieties and the later maturing varieties suffered the most as they had full canopy. This was the first year we had green seed evaluation as a variable in the variety results.

Conventional Herbicide:
2.5 oz/a Valor preemergent
1.8 pt Basagran + 1.8 pt Poast + 1 qt crop oil/a (Rezult)
1.8 pt Basagran + 1.8 pt Poast + 1 qt crop oil/a (Rezult)

Roundup Herbicide:
2.5 oz/a Valor preemergent
1 qt Roundup Ultramax/a

Experimental Design: Randomized complete block with 4 replications

Partnership/Funding: Polk County Extension Service & Polk County Soybean Growers Assoc.
Funded by company entrants

For additional information:
Russ Severson
Jim Stordahl

Source: 2004 On-Farm Cropping Trials Northwest and West Central Minnesota
U of MN Extension Service, published January 2005

Soybean Varietal Trials —Polk County *(continued)*

Crookston Roundup Ready Soybean Variety Trial 2004

Company	Variety	Yield	Yield	Protein	Protein	Oil	Seed Count	Green Seed
		(bu/a)	(% mean)	(%)	(% mean)	(%)	(seed/lb)	(%)
DEKALB	DKB009-51	34.7	150.9	36.2	99.2	17.3	2407	35.0
LEGEND	LS 0094	34.7	150.9	36.2	99.2	17.6	3148	0.0
PIONEER	90M60	33.6	146.1	35.8	98.1	17.2	2436	1.5
DYNA GROW SEEDS	DG 30D09	33.1	143.9	36.0	98.6	17.2	3718	0.0
AGSOURCE SEEDS	9009RR	32.0	139.1	35.8	98.1	17.2	3851	0.0
ASGROW	AG00802	30.3	131.7	37.4	102.5	16.6	2472	0.0
DYNA GROW SEEDS	DG 34G02	29.4	127.8	35.8	98.1	17.7	3391	0.0
ASGROW	AG031	29.3	127.4	36.2	99.2	17.1	2969	0.0
INTERSTATE SEED	Garst XR05P40	27.8	120.9	36.1	98.9	17.8	2744	55.0
LEGEND	LS 0093	27.8	120.9	36.6	100.3	17.1	3848	0.0
CROPLAN GENETICS	RT0041	27.7	120.4	36.2	99.2	17.3	2842	0.5
CROPLAN GENETICS	RT0269	27.5	119.6	36.2	99.2	17.7	3147	0.0
STINE	S0086-4	26.5	115.2	35.6	97.5	17.9	3068	0.0
PROSEED	RR EXP 0.2E	26.4	114.8	35.8	98.1	17.2	2910	0.0
WENSMAN SEED	20091	25.7	111.7	36.6	100.3	17.3	3742	0.3
THUNDER SEEDS	23005RR	24.8	107.8	37.6	103.0	17.1	2944	0.0
NU-TECH SEEDS	NT 0252RR	24.6	107.0	37.3	102.2	16.8	3013	35.0
PIONEER	90M20	24.3	105.7	36.0	98.6	17.5	2653	1.5
AGSOURCE SEEDS	9023RR	24.2	105.2	35.9	98.4	17.7	3313	0.0
GOLD COUNTRY SEED	GCS 923 RR	24.1	104.8	36.8	100.8	17.2	3942	0.0
PETERSON SEEDS	PFS O502RR	23.9	103.9	36.2	99.2	17.1	3072	3.8
INTERSTATE SEED	Garst 0095RR	23.0	100.0	37.7	103.3	16.0	3800	3.2
DYNA GROW SEEDS	DG 38D05	22.5	97.8	36.1	98.9	17.3	3308	1.3
AGSOURCE SEEDS	90075RR	22.4	97.4	38.0	104.1	16.0	4053	5.0
DEKALB	DKB005-51	22.4	97.4	37.5	102.7	17.1	2457	0.0
THUNDER SEEDS	2303RR	20.6	89.6	36.7	100.5	16.8	3409	1.2
LEGEND	LS 0553	19.0	82.6	37.4	102.5	17.1	2894	0.5
HYLAND SEED	HX 326	18.8	81.7	37.8	103.6	16.3	3698	0.3
PIONEER	90B51	17.7	77.0	36.9	101.1	17.4	2876	2.8
GOLD COUNTRY SEED	GCS 2305 RR	17.6	76.5	36.5	100.0	17.5	3158	2.0
HYLAND SEED	RR RUGGED	16.3	70.9	35.7	97.8	18.0	2348	4.8
PETERSON SEEDS	PFS 0305RR	16.3	70.9	36.3	99.5	17.2	3025	6.0
INTERSTATE SEED	Garst 0443RR	16.2	70.4	36.0	98.6	17.8	2925	5.2
HYLAND SEED	RR RAMSEY	15.4	67.0	37.9	103.8	17.0	2753	0.8
PROSEED	RR 1030	13.4	58.3	36.4	99.7	17.3	2914	2.8
STINE	S0206-4	13.2	57.4	37.4	102.5	17.0	2818	1.5
NU-TECH SEEDS	NT 0626	12.6	54.8	36.7	100.5	16.8	3121	36.5
PROSEED	RR 20-40	11.5	50.0	34.7	95.1	18.5	2605	2.5
NU-TECH SEEDS	NT 0414RR	6.2	27.0	36.4	99.7	17.0	3222	6.8
mean		23.0		36.5		17.2	3103	5.5
LSD 0.05		5.7		0.7		0.4	315	15.7

Soybean Varietal Trials —Polk County *(continued)*

Fosston Roundup Ready Soybean Variety Trial 2004

Company	Variety	Yield	Yield	Protein	Protein	Oil	Seed Count	Green Seed
		(bu/a)	(% mean)	(%)	(% mean)	(%)	(seeds/lb)	(%)
DYNA GROW SEEDS	36R01	30.3	131.7	35.7	98.3	18.2	2504	3.5
NU-TECH SEEDS	NT 0252RR	29.4	127.8	36.9	101.7	17.6	2675	36.2
PIONEER	90M60	29.0	126.1	36.6	100.8	17.7	2380	3.2
STINE	S0086-4	28.2	122.6	35.2	97.0	18.8	2659	0.0
ASGROW	AG00802	28.0	121.7	37.6	103.6	16.7	2464	0.0
PIONEER	90M20	27.4	119.1	36.1	99.4	18.0	2704	0.0
PETERSON SEEDS	PFS 0305RR	26.8	116.5	36.4	100.3	17.9	2890	0.5
GOLD COUNTRY SEED	GCS 2305 RR	26.3	114.3	36.4	100.3	18.0	2823	0.8
DEKALB	DKB009-51	26.3	114.3	36.2	99.7	17.8	2347	0.0
DYNA GROW SEEDS	33J05	26.0	113.0	36.3	100.0	17.9	2838	0.2
ASGROW	AG0301	25.9	112.6	35.1	96.7	18.2	2697	0.0
PIONEER	90B51	25.1	109.1	36.2	99.7	18.3	2455	8.2
THUNDER SEEDS	2303RR	24.8	107.8	36.3	100.0	17.8	2842	0.0
PROSEED	RR 1030	24.8	107.8	35.5	97.8	18.4	2521	2.8
CROPLAN GENETICS	RT0269	24.7	107.4	35.2	97.0	18.8	2740	0.0
PROSEED	RR EXP 0.2E	24.4	106.1	35.4	97.5	18.0	2751	0.0
PETERSON SEEDS	PFS O502RR	24.0	104.3	35.6	98.1	18.0	2729	0.0
AGSOURCE SEEDS	9009RR	23.9	103.9	37.0	101.9	17.5	3087	0.0
THUNDER SEEDS	23005RR	23.3	101.3	37.6	103.6	17.5	2566	0.0
DYNA GROW SEEDS	39P03	23.0	100.0	36.5	100.6	17.6	3148	0.0
LEGEND	LS 0094	23.0	100.0	36.0	99.2	17.6	3246	0.0
INTERSTATE SEED	Garst 0211RR	22.7	98.7	35.4	97.5	18.6	2375	0.0
HYLAND SEED	RR RUGGED	22.6	98.3	35.4	97.5	18.5	2480	0.0
WENSMAN SEED	20091	22.5	97.8	36.2	99.7	17.8	3592	0.0
AGSOURCE SEEDS	90075RR	22.4	97.4	37.3	102.8	17.0	3544	6.2
AGSOURCE SEEDS	9023RR	22.2	96.5	35.4	97.5	18.6	2808	0.0
CROPLAN GENETICS	RT0041	22.2	96.5	37.5	103.3	17.4	2536	0.0
LEGEND	LS 0093	21.6	93.9	36.8	101.4	17.6	3439	0.0
GOLD COUNTRY SEED	GCS 923 RR	21.0	91.3	36.8	101.4	17.5	3337	0.0
LEGEND	LS 0553	19.8	86.1	37.2	102.5	17.7	2500	0.0
NU-TECH SEEDS	NT 0626	19.7	85.7	36.4	100.3	17.4	2879	15.8
HYLAND SEED	HX 326	18.7	81.3	35.8	98.6	17.9	3152	0.0
INTERSTATE SEED	Garst D041RR	18.7	81.3	36.6	100.8	18.2	2270	0.0
DEKALB	DKB005-51	18.3	79.6	38.2	105.2	16.5	2675	0.0
NU-TECH SEEDS	NT 0414RR	17.8	77.4	36.4	100.3	17.8	2828	3.0
HYLAND SEED	RR RAMSEY	17.3	75.2	37.3	102.8	17.8	2406	0.0
STINE	S0206-4	17.1	74.3	36.2	99.7	17.8	2852	0.0
INTERSTATE SEED	Garst XR05Y86	14.4	62.6	36.1	99.4	18.0	3010	7.0
PROSEED	RR 20-42	12.6	54.8	36.2	99.7	18.0	3062	4.2
mean		23.0		36.3		17.9	2790	2.3
LSD 0.05		3.3		0.7		0.3	290	4.8

Soybean Varietal Trials —Polk County *(continued)*

Crookston Conventional Soybean Trial 2004

Company	Variety	Yield	Yield	Protein	Protein	Oil	Seed Size	Green seed
		(bu/a)	(% mean)	(%)	(% mean)	(%)	(seed/lb)	(%)
HYLAND SEED	QUINCY	26.2	206.3	35.6	95.4	17.9	2785	2.8
LEGEND	LS 0090	22.1	174.0	36.8	98.7	17.3	3036	0.0
NDSU	TRAILL	21.1	166.1	38.6	103.5	16.0	2769	0.5
U of M	MN0071	18.7	147.2	37.3	100.0	17.3	2686	0.8
PIONEER	90B43	14.9	117.3	36.5	97.9	17.2	3036	5.5
THUNDER SEEDS	598	14.2	111.8	37.8	101.3	17.0	3334	2.5
HYLAND SEED	EMERESON	13.8	108.7	36.4	97.6	18.0	2807	7.8
LEGEND	LS 0557	11.3	89.0	37.9	101.6	16.7	3694	7.5
THUNDER SEEDS	4030	10.6	83.5	35.3	94.6	17.8	3416	37.5
U of M	MN 0302	9.3	73.2	37.4	100.3	17.5	3313	1.8
U of M	MN0304	7.8	61.4	36.9	98.9	17.6	3447	11.8
EARTHWISE	EWP PA-07	7.2	56.7	39.4	105.6	16.6	1987	4.5
EARTHWISE	OT-03-12	5.8	45.7	37.4	100.3	15.6	6743	0.0
HYLAND SEED	T2004	4.3	33.9	37.2	99.7	16.8	2779	23.8
EARTHWISE	OT-03-10	2.7	21.3	38.5	103.2	15.2	6008	0.0
mean		12.7		37.3		17.0	3456	7.1
LSD 0.05		8.2		1.2		0.9	843	16.2

Fosston Soybean Conventional Varietey Trial 2004

Company	Variety	Yield	Yield	Protein	Protein	Oil	Seed Size	Green Seed
		(bu/a)	(% mean)	(%)	(% mean)	(%)	(seed/lb)	(%)
LEGEND	LS 0090	24.2	131.5	38.6	100.5	16.6	3143	0.0
HYLAND SEED	QUINCY	24.0	130.4	36.8	95.8	17.7	2733	0.0
HYLAND SEED	T2004	23.7	128.8	38.2	99.5	17.1	2597	0.0
HYLAND SEED	EMERESON	22.5	122.3	36.8	95.8	18.4	2377	0.0
PIONEER	90B43	22.0	119.6	37.8	98.4	17.4	2677	2.2
NDSU	TRAILL	21.5	116.8	39.4	102.6	15.8	3056	0.0
U of M	MN0304	19.3	104.9	37.9	98.7	17.8	2522	4.2
U of M	MN0071	17.6	95.7	39.2	102.1	16.5	2610	0.0
THUNDER SEEDS	598	16.2	88.0	38.2	99.5	17.4	3261	11.0
THUNDER SEEDS	4030	15.7	85.3	37.4	97.4	17.7	2881	13.0
LEGEND	LS 0557	15.6	84.8	38.2	99.5	17.1	3283	18.8
EARTHWISE	EWP PA-07	15.3	83.2	39.4	102.6	17.2	1705	0.0
EARTHWISE	OT-03-10	14.0	76.1	40.3	104.9	14.4	4455	0.0
U of M	MN 0302	13.7	74.5	38.0	99.0	17.5	3102	4.5
EARTHWISE	OT-03-12	11.0	59.8	39.4	102.6	14.4	6466	0.0
mean		18.4		38.4		16.9	3125	3.6
LSD 0.05		3.1		0.7		0.9	769	5

Determining Wheat Crop Injury Levels by Tank-Mixing Fungicide and Herbicides Early in the Growing Season

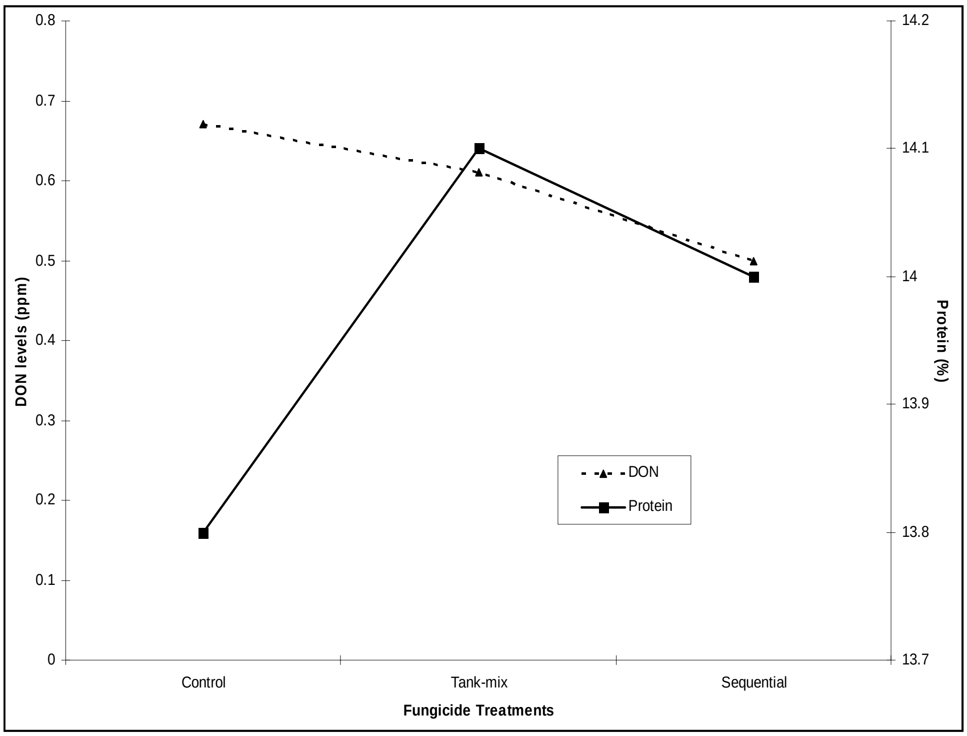
Cooperator: NW Research & Outreach Center
Nearest Town: Crookston
Soil Type: Bearden silt loam
Previous Crop: Hard red spring wheat
Variety: Alsen
Planting Date: April 30, 2004
Row Width: 6”
Herbicide: Puma + Bronate Advanced
Harvest Date: September 2, 2004
Experimental Design: Randomized complete block with 4 replications

Purpose of Study:
To determine if there were detrimental yield and quality effects arising from plant injury during the 2004 growing season as a result from applying half-rates of fungicides tank-mixed with herbicides at the 4-5 leaf growth stage.

Results:

There were no detrimental effects on yield when half -rates of fungicides ‘Tilt’, ‘Quilt’, or ‘Stratego’ were applied early (4-5 leaf growth stage) in a tank-mix with ‘Puma’ + ‘Bronate Advanced’ herbicides in a single application, compared to the control plot that didn’t receive fungicide, and a sequential fungicide application where the fungicide was applied separately from the herbicide on the same day. A tank-mix application of ‘Headline’, ‘Puma’, and ‘Bronate Advanced’ decreased grain yield 7% or 6.2 bu/a, increased the vomitoxin levels (DON) in grain by 51% or 0.33 ppm, and increased the number of spikelets on heads exhibiting Fusarium head blight (FHB) symptoms by 71% when compared to a sequential application. Tank-mix applications of ‘Stratego’ also resulted in increased DON levels by 30% or 0.19 ppm. The tank-mix application of ‘Quilt’ decreased the number of FHB-infected heads across whole plots (FHB incidence) by 57%, but increased plant leaf injury six days after application by 30% over the sequential treatment. Overall, DON levels were greatest with the herbicide only treatment (Figure 1). A tank-mix application of fungicide reduced DON levels by 9% compared to the control treatment. But, applying fungicide sequentially resulted in a 25% reduction in DON levels when compared to the control. Compared to the control treatment, tank-mixing fungicide with herbicides increased grain protein by 2%, while the sequential treatment resulted in a 1% increase in protein. Grain test weight, thousand kernel weight, and FHB field severity (FHB head severity x FHB incidence/100) were not affected by fungicide application methods.

Figure 1. Results of significant contrasts between the control (herbicides without fungicide), tank-mix, and sequential treatments for levels of grain vomitoxin (DON) and protein.



For additional information:
Russ Severson and Char Hollingsworth

Determining Wheat Crop Injury Levels by Tank-Mixing Fungicide and Herbicides Early in the Growing Season *(continued)*

Effect of early fungicides tank-mixed with a herbicide on yield and quality of Alsen spring wheat

		Tank-mix	Sequential +	significance
	Tilt + Herbicide			
Yield	bu/a	82.5	84.8	NS
Protein	%	14.1	14.1	NS
DON	ppm	0.51	0.67	NS
FHB	severity %	6.13	8.45	NS
FHB	incidence	1.00	1.75	NS
Injury	%	6.33	8.08	NS
	Quilt + Herbicide			
Yield	bu/a	84.2	82	NS
Protein	%	14.2	14.1	NS
DON	ppm	0.65	0.54	NS
FHB	severity %	5.69	7.88	NS
FHB	incidence	1.50	3.50	*
Injury	%	5.15	7.35	*
	Headline + Herbicide			
Yield	bu/a	84.4	90.6	**
Protein	%	14.0	14.0	NS
DON	ppm	0.65	0.32	***
FHB	severity %	13.69	4.00	**
FHB	incidence	2.00	2.25	NS
Injury	%	7.35	5.40	NS
	Stratego + Herbicide			
Yield	bu/a	83.6	83.1	NS
Protein	%	14.2	13.8	NS
DON	ppm	0.64	0.45	*
FHB	severity %	7.00	9.63	NS
FHB	incidence	1.50	2.00	NS
Injury	%	7.73	6.02	NS
	Control (herbicide only)			
Yield	bu/a	82.2		
Protein	%	13.8		
DON	ppm	0.67		
FHB	severity %	9.19		
FHB	incidence	2.00		
Injury	%	6.75		

	Tank-mix	Sequential	Significance
DON ppm	0.61	0.50	**
	Control	Tank-mix	Significance
DON ppm	0.67	0.61	**
Protein %	13.8	14.1	**
	Control	Sequential	Significance
Protein %	13.8	14.0	***

+Sequential is applying the fungicide first followed by a separate herbicide application.
NOTE: *, **, and *** indicate that linear contrasts were significant at the $P = 0.10$, $P = 0.05$, and $P = 0.01$ levels, respectively.

Source: 2004 On-Farm Cropping Trials Northwest and West Central Minnesota
U of MN Extension Service, published January 2005

Red River Valley On-Farm Wheat Disease Management Trials
Kittson, Roseau, Red Lake, Norman, and Wilkin Counties

Cooperators: Gerald and Carol Olsonawski, Jim and Marilyn Kukowski, Ray and Barbara Swenson, Brian and Theresa Hest, Bruce and Kim Brenden

Nearest Towns: Hallock, Strathcona, Oklee, Perley, and Rothsay

Previous Crop: Barley near Rothsay, soybean at other locations

Varieties: Alsen, Knudson, Oxen, Reeder and Walworth

Row Width: 6 inches

Herbicide: Puma and Bronate Advanced at 4-5 leaf growth stage for wheat

Experimental Design: Randomized complete block

Purpose of Study:

To determine whether diseases of wheat (leaf spots and Fusarium head blight) can be managed by tailoring disease management strategies to complement the levels of resistances in varieties by using the following fungicide treatments.

- Tilt (2 fl oz/acre) applied at the 4-5 leaf growth stage
- Headline (6 fl oz/acre) applied at full flag leaf emergence
- Tilt (2 fl oz/acre) applied at the 4-5 leaf stage and Headline (6 fl oz/acre) applied at full flag leaf emergence
- Folicur (4 fl oz/acre) applied at early flowering
- Tilt (2 oz/acre) applied at the 4-5 leaf stage and Folicur (4 fl oz/acre) applied at early flowering
- No fungicide applied

Results:

Fungicide treatment gains, or losses, were calculated at $3.70/bushel wheat grain and with $4.50/acre application costs for all treatments except Tilt at the 4-5 leaf stage. Increases or reductions in grain quality are hard to quantify, so discounts and grain marketing issues must be considered in addition to the information presented in this report. Both grain yield AND quality must be taken into account when developing comprehensive disease management strategies.

Partnership and Funding Information:
Funded by the Minnesota Wheat Research and Promotion Council and supported by NWROC (Chris Motteberg, NWROC Small Grains Pathology Program) and grower-cooperators.

For additional information:
Charla Hollingsworth

Red River Valley On-Farm Wheat Disease Management Trials Kittson, Roseau, Red Lake, Norman, and Wilkin Counties *(continued)*

Rothsay

Plots of susceptible varieties not treated with fungicide had the most severe flag leaf tissue damage (as high as 90+% of flag leaf tissues killed per plot) (Figure 1). Vomitoxin (DON) averages varied across varieties, ranging from 0.9 ppm (Alsen, Tilt and Folicur) to 5.1 ppm (Reeder, no fungicide) (Figure 2). Grain yield averages ranged from 70 bushels/acre (Reeder, no fungicide) to 92 bushels/acre (Knudson, Tilt and Folicur); test weight averages ranged from 61 lbs./bu (Reeder, Headline) to 64 lbs./bu (Oxen, Tilt and Folicur); thousand-kernel weight averages ranged from 30.6 grams (Walworth, no fungicide) to 37.4 grams (Knudson, Folicur), and protein averages ranged from 13.2% (Knudson, Tilt and Folicur) to 14.6% (Walworth, Folicur).

Figure 1. Treatment averages of flag leaf tissues killed due to leaf spot and rust diseases on wheat at the mid-dough stage near Rothsay.

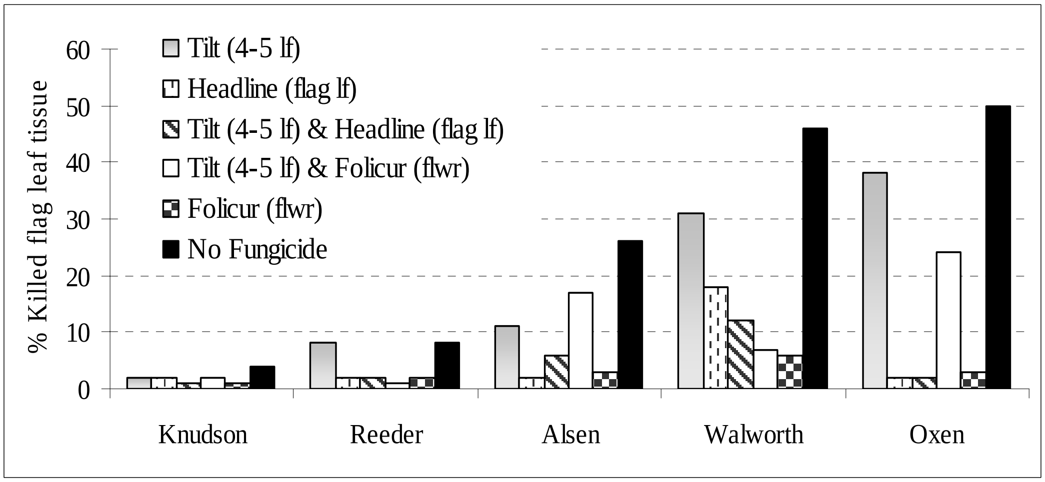
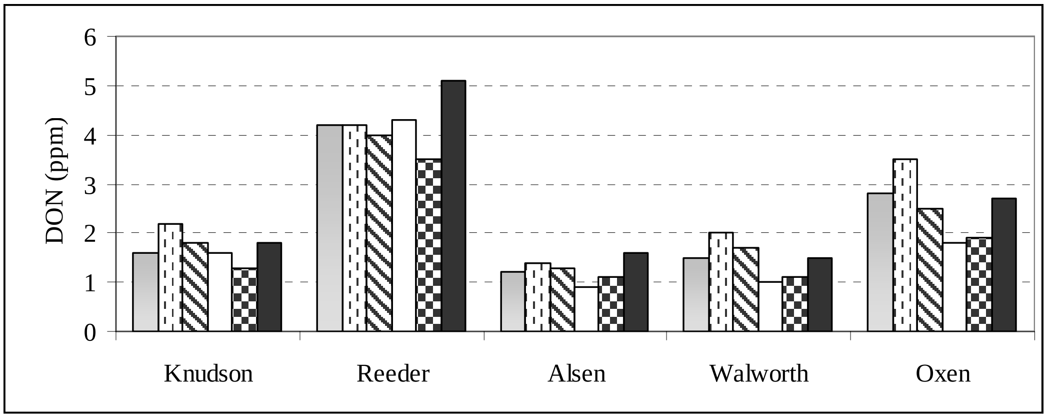


Figure 2. Vomitoxin (DON) averages in wheat grain across treatments at Rothsay (same treatment legend as above).



Based only on grain yield results, the overall economic trend was toward loss if fungicide was applied on Alsen (from -$2.75/acre for Tilt to -$25.75/acre for Tilt and Folicur) and toward gains by applying fungicide on Walworth (from +$2.80/acre for Tilt to +$32.34/acre for Tilt and Folicur). Fungicide treatments of other varieties resulted in various outcomes. Only one fungicide treatment on Knudson was profitable (from +$4.59/acre for Tilt and Folicur to -$25.05/acre for Headline), and only one treatment on Reeder triggered loss (from -$11.52/acre for Tilt and Headline to +$15.11/acre for Folicur). Oxen, on the other hand, was evenly split with two fungicide treatments costing money and three treatments resulting in gains (from -$0.53/acre for Tilt to +12.73/acre for Tilt and Folicur).

Red River Valley On-Farm Wheat Disease Management Trials Kittson, Roseau, Red Lake, Norman, and Wilkin Counties *(continued)*

Perley

Leaf disease injury was more moderate at this site compared with Rothsay (as high as 60+% of flag leaf tissues killed per plot) (Figure 3). Vomitoxin (DON) averages varied across varieties and treatments ranging from 0.2 ppm (Alsen, no fungicide) to 1.3 ppm (Reeder, Folicur) (Figure 4). Grain yield averages ranged from 92 bushels/acre (Alsen, no fungicide) to 107 bushels/acre (Walworth, Tilt and Folicur); test weight averages ranged from 63.9 lbs./bu (Knudson, Tilt) to 65.5 lbs./bu (Alsen, Tilt and Folicur); thousand-kernel weight averages ranged from 33.5 grams (Walworth, no fungicide) to 36.6 grams (Alsen, Folicur), and protein averages ranged from 12.1% (Knudson, Tilt and Folicur) to 13.3% (Alsen, Headline).

Figure 3. Treatment averages of flag leaf tissues killed due to leaf spot and rust diseases on wheat at the mid-dough stage near Perley.

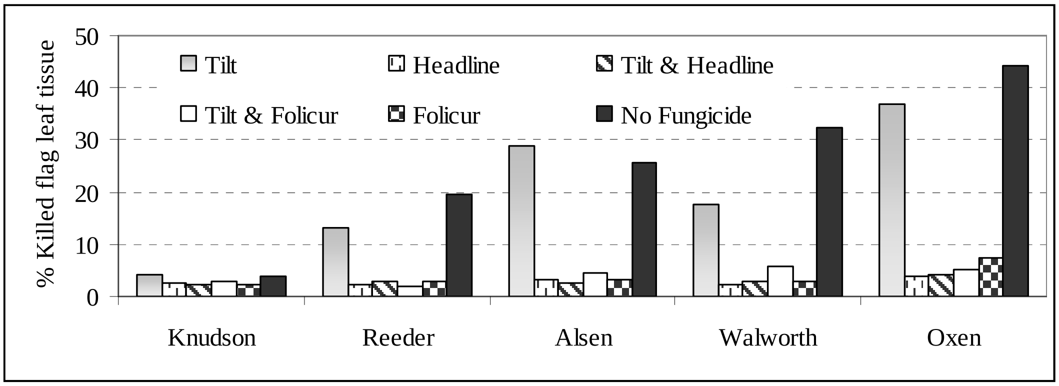
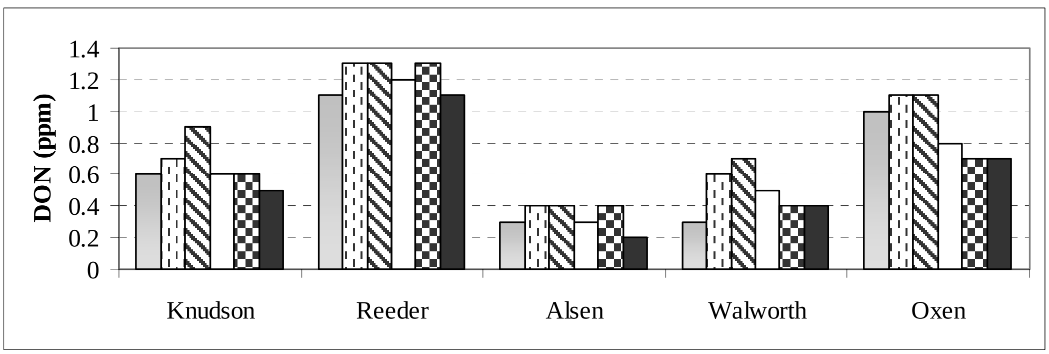


Figure 4. Vomitoxin (DON) averages in wheat grain across treatments at Perley (same treatment legend as above).



Based on grain yield results, the overall economic trend was toward loss if fungicide was applied on Knudson (from -$6.35/acre for Folicur to -$17.07/acre for Tilt and Headline), Reeder (from -$0.90/acre for Tilt to -$18.55/acre for Tilt and Headline), and Walworth (from -$2.48/acre for Headline to -$8.19/acre for Tilt and Headline). Only one fungicide treatment on Oxen was not profitable (from -$2.27/acre for Tilt and Headline to +$8.45/acre for Folicur), while all treatments on Alsen resulted in gains (from +$6.61/acre for Tilt and Headline to +$11.95/acre for Headline).

Red River Valley On-Farm Wheat Disease Management Trials Kittson, Roseau, Red Lake, Norman, and Wilkin Counties *(continued)*

Oklee

Leaf diseases established slowly in the growing season at this site (as high as 30+% of flag leaf tissues killed per plot) (Figure 5). Vomitoxin (DON) averages varied somewhat across varieties (Figure 6), ranging from 0.03 ppm (Alsen, Tilt and Headline) to 0.8 ppm (Reeder, Headline). Grain yield averages ranged from 101 bushels/acre (Oxen, no fungicide) to 119 bushels/acre (Walworth, Folicur); test weight averages ranged from 60.5 lbs./bushel (Oxen, no fungicide) to 64.3 lbs./bushel (Alsen, Headline); thousand-kernel weight averages ranged from 34.1 grams (Walworth, Tilt) to 39.0 grams (Reeder, Folicur), and protein averages ranged from 13.5% (Knudson, Folicur) to 15.4% (Reeder, Headline).

Figure 5. Treatment averages of flag leaf tissues killed due to leaf spot diseases on wheat at the mid-dough stage near Oklee.

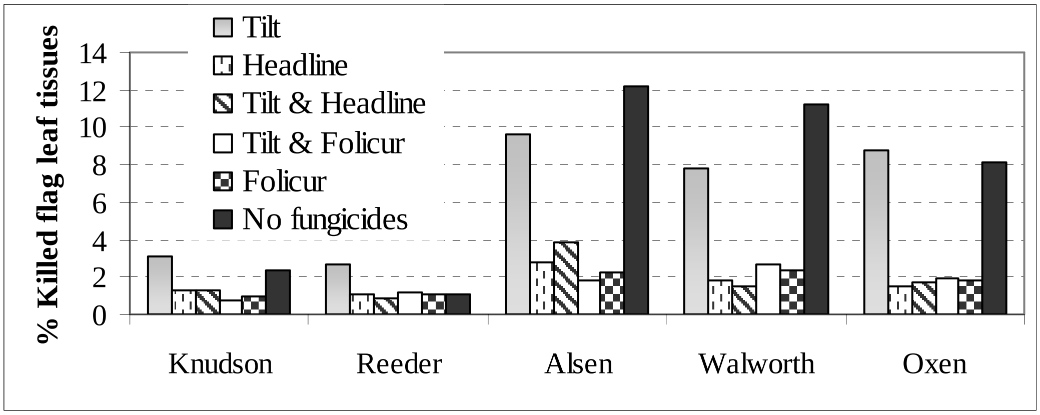
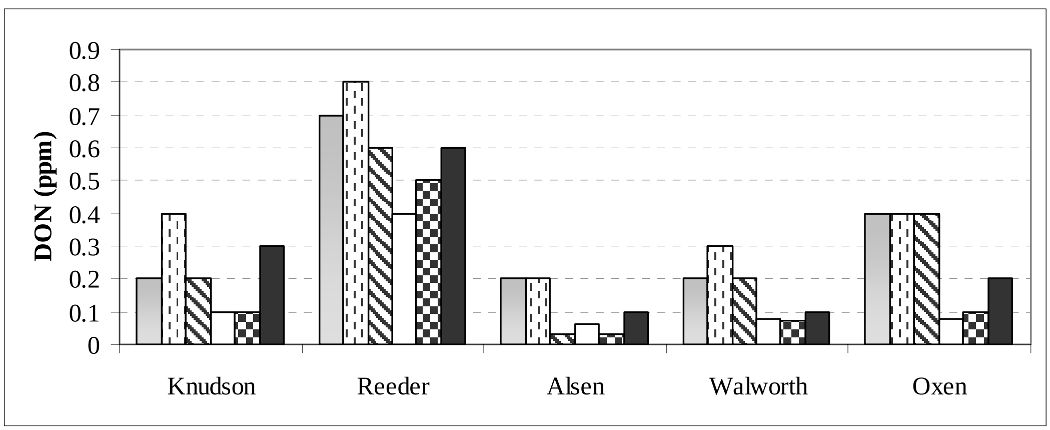


Figure 6. Vomitoxin (DON) averages in wheat grain across treatments near Oklee (same treatment legend as above).



Based on grain yield results, the fungicide treatments resulted in gains when applied to Oxen (from +$12.36/acre for Tilt and Folicur to +$32.67/acre for Headline), and losses when applied to Reeder (from -$2.81/acre for Tilt and Folicur to -$19.50/acre for Headline). One fungicide treatment on Walworth was not profitable (from -$2.75/acre for Tilt to +$15.48/acre for Folicur). Knudson had three treatments that were not profitable (from -$24.68/acre for Headline to +$7.34/acre for Folicur), while Alsen had three profitable treatments (from -$7.46/acre for Folicur to +10.51/acre for Tilt and Folicur).

Red River Valley On-Farm Wheat Disease Management Trials Kittson, Roseau, Red Lake, Norman, and Wilkin Counties *(continued)*

Strathcona

Leaf diseases did not establish at this site (up to 7% of flag leaf tissues killed per plot) (Figure 7). Vomitoxin (DON) averages were low (Figure 8), ranging from 0.08 ppm (Alsen, Tilt) to 0.56 ppm (Reeder, no fungicide). Grain yield averages ranged from 76 bushels/acre (Alsen, Tilt) to 99 bushels/acre (Oxen, Tilt and Folicur); test weight averages ranged from 61.3 lbs./bushel (Reeder, no fungicide) to 62.8 lbs./bushel (Walworth, Folicur); thousand-kernel weight averages ranged from 34.3 grams (Alsen, no fungicide) to 37.9 grams (Knudson, Headline), and protein averages ranged from 13.7% (Knudson, no fungicide) to 14.8% (Reeder, Headline).

Figure 7. Treatment averages of flag leaf tissues killed due to leaf spot diseases on wheat at the mid-dough stage near Strathcona.

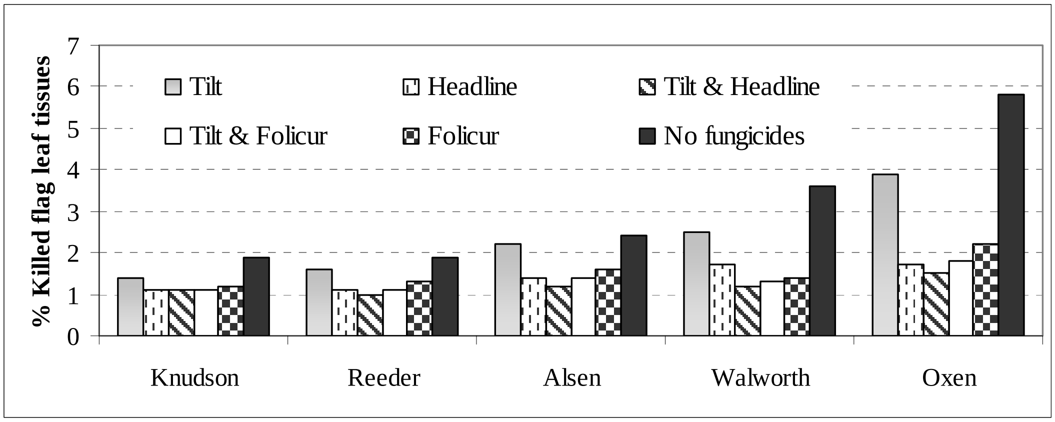
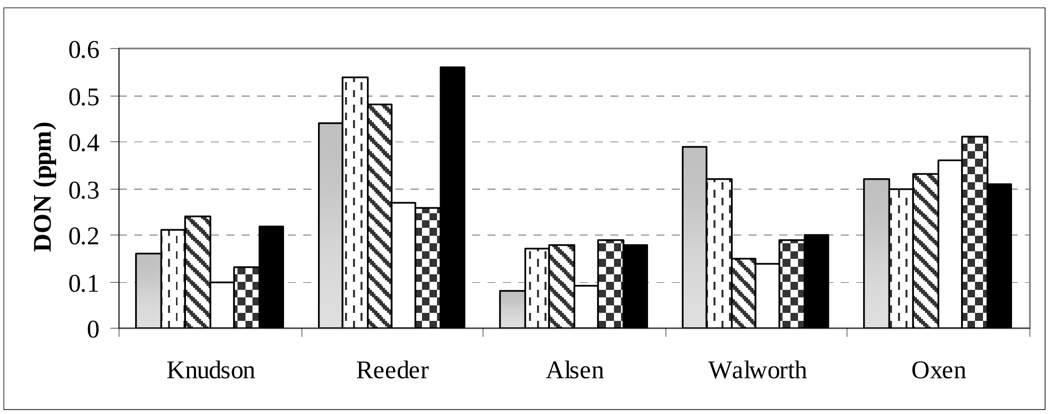


Figure 8. Vomitoxin (DON) averages in wheat grain across treatments near Strathcona (same treatment legend as above).



Based on grain yield results, the overall economic trend was toward loss if fungicide was applied on Reeder (from -$11.26/acre for Tilt to -$45.93/acre for Tilt and Headline), and Oxen (+$2.53/acre for Folicur to -$19.50/acre for Headline). Three treatments netted profits on Alsen (from +$4.75/acre for Folicur to -$6.88/acre for Tilt and Folicur). Two of the five fungicide treatments resulted in gains for Walworth (from -$12.64/acre for Folicur to +$10.84/acre for Headline), and Knudson (from +$10.31/acre for Tilt and Headline to -$30.40/acre for Folicur).

Red River Valley On-Farm Wheat Disease Management Trials Kittson, Roseau, Red Lake, Norman, and Wilkin Counties *(continued)*

Hallock

Leaf disease pressure was relatively low at this site (up to 30% of flag leaf tissues killed per plot) (Figure 9). Vomitoxin (DON) averages varied (Figure 10), ranging from 0.4 ppm (Walworth, Folicur) to 4.8 (Reeder, Headline). Grain yield averages ranged from 83 bushels/acre (Alsen, no fungicide) to 104 bushels/acre (Oxen, Tilt and Folicur); test weight averages ranged from 54.6 lbs./bushel (Oxen, Tilt and Headline) to 59.5 lbs./bushel (Alsen, Tilt and Folicur); thousand-kernel weight averages ranged from 28.0 grams (Oxen, Tilt) to 34.6 grams (Knudson, Tilt and Folicur), and protein averages ranged from 13.5% (Knudson, Tilt and Headline) to 14.9% (Reeder, Folicur).

Figure 9. Treatment averages of flag leaf tissues killed due to leaf spot diseases on wheat at the mid-dough stage near Hallock.

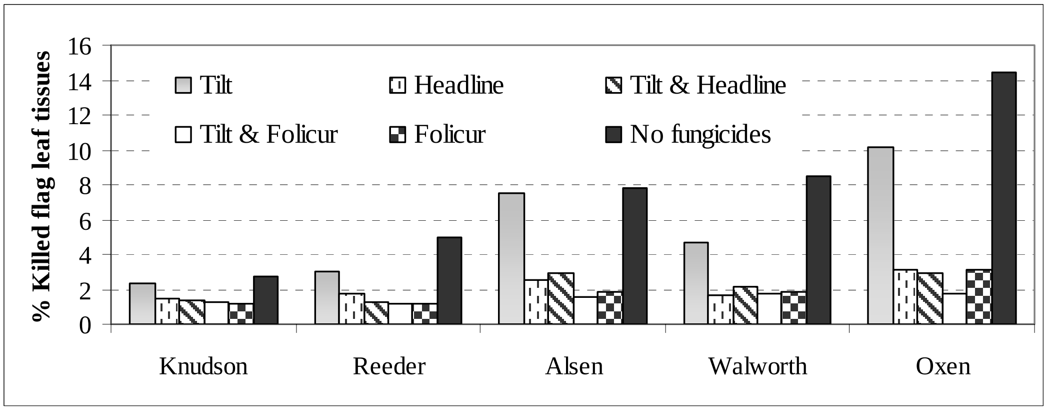
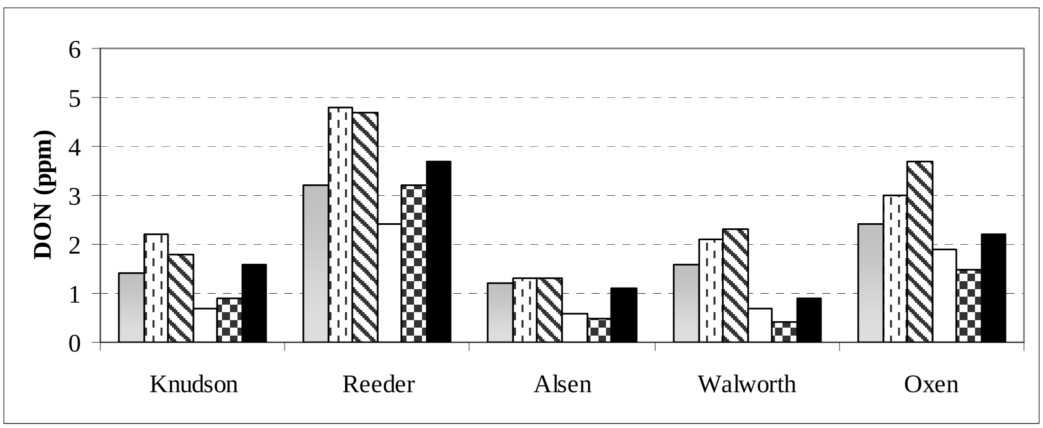


Figure 10. Vomitoxin (DON) averages in wheat grain across treatments near Hallock (same treatment legend as above).



Based on grain yield results, the overall economic trend was toward loss if fungicide was applied on Knudson (from -$1.91/acre for Folicur to -$26.06/acre for Tilt), and toward gains by applying treatments on Reeder (from +$7.24/acre for Tilt to +$23.09/acre for Tilt and Folicur). Only one fungicide treatment was not profitable on Alsen (from -$5.34/acre for Tilt to +$17.33/acre for Folicur), as well as Walworth (from -$1.17/acre for Folicur to +$16.06/acre for Tilt and Folicur). Three fungicide treatments were profitable on Oxen (from -$15.33/acre for Tilt to +$30.49/acre for Tilt and Folicur).

We would like to thank the Minnesota Wheat Research and Promotion Council, grower-cooperators, and NWROC for supporting this research.

Inputs for Wheat Production: What's Economic, What's Not? Polk, Red Lake, Otter Tail Counties

Cooperator: NW Research & Outreach Center, Ray Swenson, Bruce Brendon
Nearest Town: Crookston, Oklee, Rothsay
Previous Crop: Wheat, Soybean, Barley
Variety: Oxen
Planting Date: April 30, April 21, April 19
Row Width: 6"
Fertilizer: U of M recommendations
Herbicide: Puma + Bronate
Harvest Date: September 2, September 1, August 20
Experimental Design: Randomized complete block with four replications

Purpose of Study:

As a result of many years of intensive research, the importance of various inputs for production of hard red spring wheat has been well-defined and economic returns have been calculated. High-yielding varieties have been compared; fertilizer recommendations have been developed and refined over time; and effective herbicide programs have been identified. However, there is less certainty about the economic importance of various combinations of production inputs. The agronomic value of any input can be demonstrated in certain situations, but the economic impact of various input combinations is less well-defined. Growers are annually faced with decisions about what combination of inputs to use. This demonstration project was designed to document the economic impact of several management strategies on production of hard red spring wheat.

Results:

Polk and Otter Tail Counties

Table 1. Description of the production strategies, or 'treatments' used in the input study.

Treatment #	Additional Seed	Herbicide + Fungicide *3-5 lf*	Fungicide + Insecticide *flag lf*	N & Folicur	Seed Treatment
1	yes	yes	yes	yes	yes
2	no	yes	yes	yes	yes
3	yes	yes	yes	yes	no
4	yes	no	yes	yes	yes
5	yes	yes	no	yes	yes
6	yes	yes	yes	no	yes
7	no	no	no	no	no

As in 2003, excellent yields were measured again in 2004 (Table 2). The effect of treatments were consistent at both test sites. Specifically, yields were lower without the combination of Folicur and liquid N (treatment #6) and in the absence of any tested inputs (treatment #7). The omission of other single inputs (treatments #1 – 5) had no substantial negative effects on yield. Relative to increased yield, individual inputs such as added seed, seed treatment, fungicide for control of leaf diseases at the 3-5 leaf stage, and the combination of insecticide and fungicide at the flag leaf stage did not boost yield at either test location.

However, quality of wheat grain continues to be an important issue for Minnesota growers. Differences in treatments significantly affected quality. Leaf spot diseases such as tan spot, septoria leaf and glume blotch, and leaf rust were present at both locations. The Otter Tail site also had widespread and severe bacterial stripe and to a lesser extent, stripe rust. Fungicides do not control bacterial stripe, so it spread readily across plots and treatments. Plots in the Otter Tail County test that received treatments #4 (no fungicide applied at the 3-5 leaf stage) and #7 (no tested inputs) had plants with significantly more diseased leaf tissues compared to the other treatments (Figure 1). There were no significant differences in leaf disease pressures between treatments at the Polk County test site.

Inputs for Wheat Production: What's Economic, What's Not? (*continued*)

Vomitoxin (DON) levels in grain, produced by the scab fungus, were comparable in both locations (Figure 2). The Polk County site had slightly more DON than the Otter Tail site, which may have been due to the amount of wheat residue on the soil surface which served as a source of in-field inoculum. Treatments #6 (no Folicur or insecticide at heading) and #7 (no tested inputs) resulted in significantly increased DON levels compared to the other five treatments (treatments #1-5) at both sites.

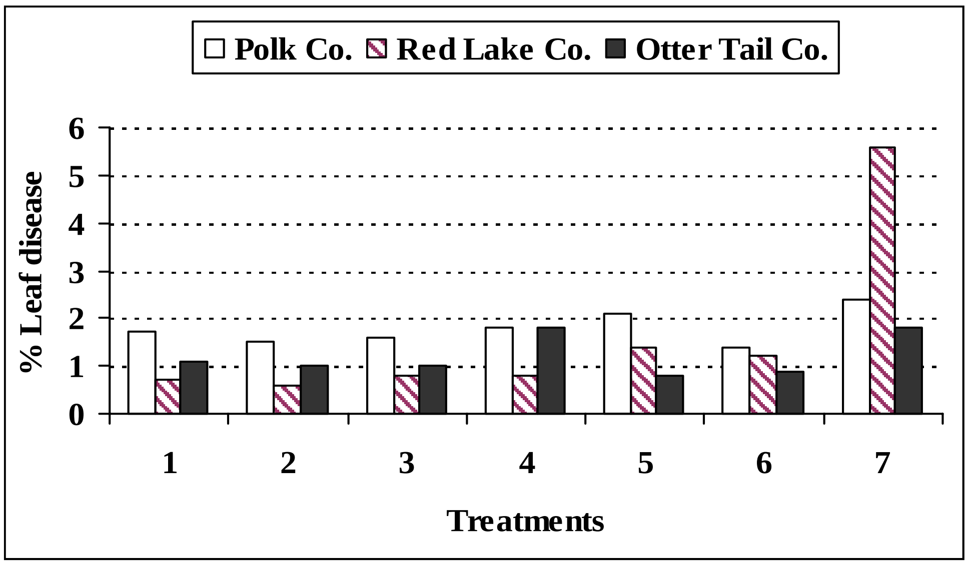
Table 2. Treatment yields in bushel per acre

	Location and Year			
Treatment	Polk Co. 2004	Otter Tail Co. 2004	Red Lake Co. 2004	E. Polk Co. 2003
	- - - - - - - bu per acre - - - - - - -			
1	96.7	82.8	118.8	90.8
2	92.8	80.8	119.7	93.3
3	93.9	82.8	122.7	98.5
4	93.7	83.0	118.8	95.4
5	93.7	83.5	119.3	94.4
6	86.4	76.6	117.0	95.4
7	82.2	72.0	110.6	94.2

Red Lake County

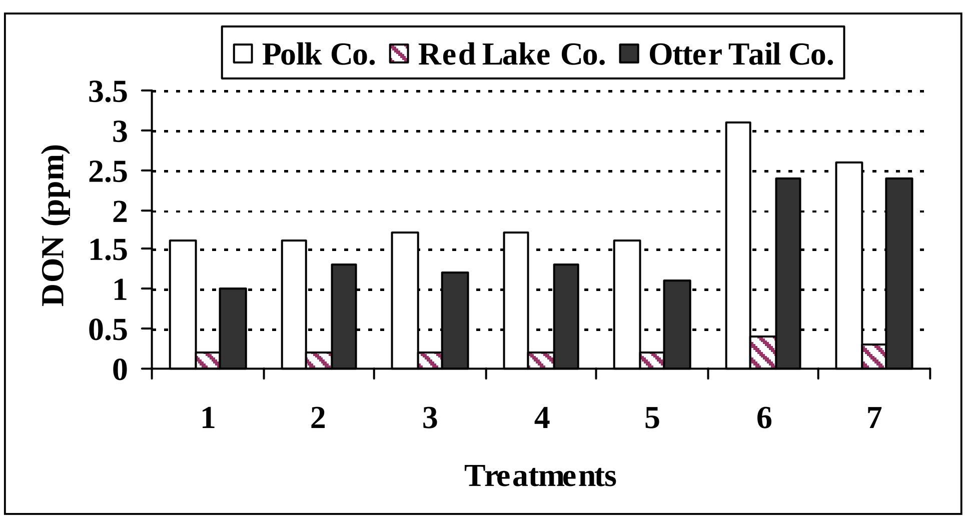
Leaf disease pressure was light at this site early in the growing season but increased rapidly after plants started to mature (Figure 1). The usual fungal diseases were present such as tan spot, septoria leaf and glume blotch, and leaf and stripe rusts. Septoria leaf and glume blotch was more severe at this site than the other test locations. The disease remains somewhat of a mystery, but apparently waits until plants are either close to heading, or headed, before producing symptoms. Disease leaf symptoms were sufficiently controlled when at least one fungicide application was made at, or prior to, the flag leaf stage. Treatment #7 resulted in significantly increased leaf disease symptoms which may have contributed to lighter thousand-kernel weights (TKW) (treatment #1 TKW = 37.83 grams; treatment #7 TKW = 35.01 grams).

Figure 1. Percent leaf tissues killed from leaf spot diseases during July 2004



Scab disease pressure was light at the Red Lake County site. DON levels were low across all treatments indicating *Fusarium* species inoculum was present at low levels (planted into soybean residue) and the environment did not promote disease development. Grain yields held steady even when Folicur was not applied (treatment #6). The results from this study stress the differences that can exist between growing wheat strictly for yield versus for yield AND quality.

Figure 2. Grain sample vomitoxin (DON) levels at harvest for 'Oxen' wheat



Inputs for Wheat Production: What's Economic, What's Not? (*continued*)

Inputs such as the use of Folicur at early-heading can be important to both yield and quality of wheat grain in certain years. Producers are urged to avoid planting small grains into small grain residue, to scout fields for disease problems, and to go to the wheat disease website to determine if the weather supports disease development (http://mawg.cropdisease.com/). The need for inputs such as insecticides and fungicides vary from year to year. Decisions about the use of these inputs should be based on current information, rather than planning or scheduling applications strictly by plant growth stage.

Economic calculations of the seven management strategies, based on grain yield alone.

Treatment			Polk Co.	Red Lake Co.	Ottertail Co.
1	Yield increase bu/a		14.5	8.2	10.8
	Gross return		53.65	30.34	39.96
	Input cost		44.66	44.66	44.66
	Net return $		8.99	(14.32)	(4.7)
2	Yield increase bu/a		10.6	9.1	8.8
	Gross return		39.22	33.67	32.56
	Input cost		43.66	43.66	43.66
	Net return $		(4.44)	(9.99)	(11.1)
3	Yield increase bu/a		11.7	12.1	10.8
	Gross return		43.29	44.77	39.96
	Input cost		42.39	42.39	42.39
	Net return $		0.9	2.38	(2.43)
4	Yield increase bu/a		11.5	8.2	11.0
	Gross return		42.55	30.34	40.7
	Input cost		40.02	40.02	40.02
	Net return $		2.53	(9.68)	0.68
5	Yield increase bu/a		11.5	8.7	11.5
	Gross return		42.55	32.19	42.55
	Input cost		28.52	28.52	28.52
	Net return $		14.03	3.67	14.03
6	Yield increase bu/a		4.2	6.4	4.6
	Gross return		15.54	23.68	17.02
	Input cost		24.05	24.05	24.05
	Net return $		(8.51)	(0.37)	(7.03)
7	Net return $		0.0	0.0	0.0

* Always consider grain quality factors in economic analysis when determining whether management strategies are successful.

Funding:
Minnesota Wheat Research and Promotion Council

For additional information:
Russ Severson   George Rehm
Char Hollingsworth   Doug Holen

Red River Valley On-Farm Yield Trials—Spring Barley

The 2004 Red River Valley On-Farm Yield Trials were grown in 5 locations throughout the northwestern Minnesota region. The locations, cooperators, and planting dates are summarized in Table 1. This year's yields rivaled and even exceeded last year's high yields at each of the locations. Unfortunately, the two northern locations were abandoned as result of the prolonged wet conditions at harvest.

The entries of the 2004 Red River On-Farm Yield Trials, including the breeder and the year of release, are listed in Table 2. Tradition, a new 6-row malting barley released by Anheuser Busch, was added to the trials. AMBA approved Tradition as a malting barley. Testing of Foster was discontinued.

Table 1. Locations of the 2004 Red River Valley On-Farm Yield Trials.

Location	Cooperator	Planting Date	Harvest Date
Rothsay	Bruce Brendon	April 19	August 4
Perley	Brian Hest	April 16	August 4
Oklee	Ray Swenson	April 21	August 16
Strathcona	Jim Kukowski	May 3	-
Humboldt	Gerald Olsonowski	April 26	-

Table 2. Spring barley entries on the Red River Valley On-Farm Yield Trials (2002-2004).

Breeder	Cultivar	Type	Year Released	2002	2003	2004
Anheuser Busch	Legacy*	6-row	2000	x	x	x
	Tradition*	6-row	2004			x
NDSU	Conlon*	2-row	1995	x	x	x
	Drummond*	6-row	2000	x	x	x
U of MN	Robust*	6-row	1983	x	x	x
	Lacey*	6-row	2000	x	x	x

* AMBA approved malting barley cultivars.

For additional information:
Jochum Wiersma

Red River Valley On-Farm Yield Trials—Spring Barley *(continued)*

Interpretation of the Data:

One-, two- and three-year averages are reported. Within the table, the varieties are listed alphabetically. No single location data is presented to avoid misinterpretation of data. Single environment data has to be interpreted with caution. Performance data across multiple environments; single location/ multiple years, or multiple locations/single year, and/or a combination of years and locations is more reliable. Performance data of individual locations is only available upon request. No data may be reproduced without written consent of the author.

In Table 3, the highest performer for each trait is printed in bold. The grain yield is expressed as a percentage of the trial mean with the overall mean in bu/a listed below. Presenting the data this way allows for better comparisons over years. Secondly, variety selection is based on the relative ranking of the cultivars, rather than the absolute yield. Comparisons between varieties should only be made within each column and not between columns or between tables. In addition to the overall mean for the trial, the Least Significant Difference is printed at the bottom of each column. The LSD is calculated using an alpha level of 5%. This indicates, if and when the observed difference between two varieties is larger than LSD unit that with 95% confidence the observed difference is a real difference rather than experimental error.

Table 3. Grain yield expressed as a percentage of the trial mean across locations for 2004 and multi-year (2002-2004) comparisons and agronomic characteristics of cultivars entered in the Red River Valley On-Farm Yield Trials.

Cultivar	*Across All Locations*							
	Grain Yield			*3-Year Data*				
	1 year	*2 year*	*3 year*	*Plant Height*	*Lodging***	*Plump*	*Test Weight*	*Protein*
	------ *(% of mean)* ------			*(inches)*	*(1-9)*	*(%)*	*(lb/bu)*	*(%)*
Conlon*	89.2	89.3	91.8	29.1	7.1	**91.9**	**46.8**	13.2
Drummond*	101.6	97.9	96.5	29.9	4.0	85.3	43.7	13.3
Lacey*	**114.8**	106.0	**106.4**	30.6	3.9	87.1	45.2	13.4
Legacy*	104.0	**106.2**	103.4	31.7	**3.6**	85.8	42.7	**13.0**
Robust*	93.8	93.5	94.7	32.8	4.2	86.2	44.2	13.4
Tradition	96.6	-	-	-	-	-	-	-
CV	6.8	6.3	8.3	9.3	32.6	4.5	2.3	3.8
LSD 0.05	10.1	5.5	6.1	1.7	1.0	3.8	0.7	0.3
Mean	135.0	129.9	98.6	30.6	4.4	86.9	44.6	13.2

* AMBA approved malting barley cultivars.
****** 1=erect and 9=flat

Source: 2004 On-Farm Cropping Trials Northwest and West Central Minnesota
U of MN Extension Service, published January 2005

Red River Valley On-Farm Yield Trials—Spring Wheat

The 2004 Red River Valley On-Farm Yield Trials were grown in 5 locations throughout the northwestern Minnesota region. The locations, cooperators, and planting dates are summarized in Table 1. This year's yields rivaled and even exceeded last year's high yields at some of the locations and were the highest ever recorded in the history of the Red River On-Farm Yield Trials. Each of the location was harvested just in time, such that grain quality did not suffer from the prolonged wet period at harvest.

The entries of the 2004 Red River On-Farm Yield Trials, including the breeder and the year of release, are listed in Table 2. Testing of 'Ingot' was discontinued. New releases that were added to the test included 'Freyr', 'Granger', 'Polaris', 'Steele', and 'Trooper'.

Table 1. Location of the 2003 Red River Valley On-Farm Yield Trials

Location	Cooperator	Planting Date	Harvest Date
Rothsay	Bruce Brendon	April 19	August 20
Perley	Brian Hest	April 16	August 18
Oklee	Ray Swenson	April 21	September 1
Strathcona	Jim Kukowski	May 3	September 18
Humboldt	Gerald Olsonowski	April 26	September 1

Table 2. Hard Red Spring Wheat entries in the Red River On-Farm Yield Trials (2002-2004)

Breeder	Cultivar	Year Released	2002	2003	2004
AgriPro	Norpro	2000	x	x	x
	Hanna	2001	x	x	x
	Knudson	2001	x	x	x
	Freyr	2004			x
Northstar Genetics	Mercury	1998	x	x	x
	Polaris	2004			x
NDSU	Parshall	1999	x	x	x
	Reeder	1999	x	x	x
	Alsen	2000	x	x	x
	Dapps	2003		x	x
SDSU	Oxen	1996	x	x	x
	Walworth	2000	x	x	x
	Briggs	2002	x	x	x
	Granger	2004			x
Univ. of Minnesota	Verde	1995	x	x	x
	Oklee	2003	x	x	x
Western Plant Breeders	Granite	2001	x	x	x
	Trooper	2004			x

For additional information:
Jochum Wiersma

Red River Valley On-Farm Yield Trials—Spring Wheat *(continued)*

Interpretation of the Data:

One-, two-, and three-year averages for grain yield are reported. Within Table 3, the varieties are listed alphabetically. No single location data is presented to avoid misinterpretation of data. Single environment data has to be interpreted with caution. Performance data across multiple environments, either single location/multiple year, or multiple location/single year, and/or a combination of years and locations is more reliable. Performance data of individual locations is only available upon request. No data may be reproduced without written consent of the author.

In Table 3, the highest performer for each trait is printed in bold. The grain yield is expressed as a percentage of the trial mean with the overall mean in bu/a listed below. Presenting the data this way allows for better comparisons over years. Secondly, variety selection is based on the relative ranking of the cultivars, rather than the absolute yield. Comparisons between varieties should only be made within each column and not between columns or between tables. In addition to the overall mean for the trial, the Least Significant Difference (LSD) is printed at the bottom of each column. The LSD is calculated using an alpha level of 5%. This indicates that, if and when the observed difference between two varieties is larger than the LSD unit, with 95% confidence the observed difference is a real difference rather than experimental error.

Table 3: Grain yield expressed as a percentage of the trial mean across all locations 2004 and multi-year (2002-2004) comparisons and agronomic characteristics of cultivars entered in the Red River Valley On-Farm Yield Trials.

Cultivar	*Across All Locations*						
	Grain Yield			*3-Year data*			
	1 year	*2 year*	*3 year*	*Plant Height*	*Lodging**	*Test Weight*	*Protein*
	----------- *(% of mean)*-----------			*(inches)*	*(1-9)*	*(lb/bu)*	*(%)*
Alsen	98.1	97.9	96.8	31.1	3.2	61.1	14.7
Briggs	99.3	100.5	102.1	31.8	4.3	**61.9**	14.4
Dapps	89.9	89.2	--	--	-	--	--
Freyr	98.7	--	--	--	-	--	--
Granger	**108.4**	--	--	--	-	--	--
Granite	98.9	98.1	97.7	**29.2**	**1.2**	60.6	**15.3**
Hanna	95.8	96.7	92.4	35.9	3.7	59.5	14.4
Knudson	104.2	104.6	**107.7**	29.8	3.6	61.0	13.7
Mercury	102.8	102.7	104.2	27.7	3.8	59.5	13.7
Norpro	100.3	101.7	96.7	**29.2**	2.9	58.9	14.1
Oklee	97.1	101.5	100.6	29.6	4.3	**61.9**	14.6
Oxen	98.9	105.1	104.2	29.8	3.3	59.4	14.1
Parshall	88.4	92.2	89.6	34.7	3.4	60.2	14.6
Polaris	107.8	--	--	--	-	--	--
Reeder	98.2	100.3	98.9	31.4	2.9	59.4	14.4
Steele	97.6	--	--	--	-	--	--
Trooper	103.9	--	--	--	-	--	--
Verde	104.4	**106.0**	105.8	30.6	3.3	60.0	13.7
Walworth	97.1	99.9	99.4	37.5	5.0	59.8	14.3
C.V.	6.9	7.6	9.0	29.7	28.9	2.3	3.0
LSD 0.05	7.7	6.1	5.9	4.4	0.7	0.9	0.3
Mean	87.6	85.5	67.9	31.5	3.5	60.2	14.3

* 1=erect and 9 = flat

Source: 2004 On-Farm Cropping Trials Northwest and West Central Minnesota
U of MN Extension Service, published January 2005

Irrigated Corn Silage Hybrid Evaluation—Otter Tail County

Cooperator: Dan Dreyer
Nearest Town: Otter Tail
Soil Type: Sandy-loam (mostly sand)
Tillage: Field Cultivator
Previous Crop: Soybean (37 bu/a)
Planting Date: April 28, 2004 (good soil moisture)
Row Width: 30"
Planting Rate Target: 34,320 seeds/a
Fertilizer: Preplant Broadcast=200#N, 15#P, 30#K, 5#S, some B and Zn
June 25, 2004=120#N as anhydrous
July 18, 2004=35#N as 28% (fertigation)
July 26, 2004=35#N as 28% (fertigation)
Herbicide: Pre-emergence=Dual II Magnum
June 15, 2004=Distinct
Pesticides: Planter Box Applied "Kernel Guard"
Harvest Date: October 2, 2004
Circular harvest pattern using 3-row pull-behind chopper into dump box and transported with 2 grain trucks. Weights obtained at farm with platform scale. Chopper had kernel processor. Cutting height averaged 14 inches.
Experimental Design: Randomized complete block, 3 replications

Table 1. Relative maturity (RM), whole-plant moisture (moist), silage yield and quality traits for irrigated corn hybrids planted at Ottertail, MN (Otter Tail County) in 2004.

			Yield [1]		Quality (concentration)[2]					Milk Yield [3]	
Brand/ Hybrid	**RM**	**Moist**	**DM**	**silage**	**CP**	**NDF**	**IVD**	**NDFD**	**Starch**	**Ton**	**Acre**
	rating	**(%)**	**(- ton/ acre -)**		**(---------------- % -----------------)**					**(lb/ ton)**	**(lb/ acre)**
Pioneer 38W21	91	58.0	6.8	16.2	7.3	48	75	48	26	2,900	19,800
Monsanto DKC 42-95	92	67.7	6.2	19.1	8.1	46	78	52	27	3,180	19,600
Mycogen 2M405	97	71.1	6.8	23.6	8.3	52	75	51	18	2,830	19,200
Pioneer 37R71	97	68.1	6.7	20.9	7.9	49	76	51	21	2,880	19,200
Garst 8865	90	64.6	6.2	17.5	7.6	48	76	50	25	3,060	19,000
Pioneer 37D02	97	68.1	6.8	21.2	7.8	52	74	50	20	2,760	18,700
Monsanto DKC 37-14	87	62.7	6.0	16.1	8.1	46	77	50	27	3,090	18,500
Dyna Gro 5227	100	69.9	6.8	22.6	7.7	52	73	49	19	2,690	18,300
Hyland Seeds HL S067	102	74.0	7.1	27.4	8.8	57	73	52	14	2,550	18,200
Monsanto DKC 40-05	90	62.8	6.2	16.7	7.7	50	74	49	22	2,850	17,800
Hyland HL S058	99	74.4	6.4	25.0	7.8	54	73	50	15	2,550	16,300
Pioneer 37A91	97	64.5	5.7	16.1	7.7	51	74	49	21	2,760	15,800
Mycogen 2D421	95	68.6	6.2	19.6	7.2	57	72	51	15	2,550	15,700
Hyland Seeds HL SR59	99	75.1	6.2	24.9	7.4	54	74	52	13	2,360	14,600
Mean		**67.8**	**6.4**	**20.5**	**7.8**	**51**	**75**	**50**	**20**	**2,790**	**17,900**
LSD 0.10		**1.7**	**N.S.**	**2.6**	**0.6**	**3**	**2**	**2**	**3**	**230**	**3,100**

[1] DM yield is whole-plant corn yield at 100% dry matter; Silage yield is whole-plant corn yield at harvest moisture.
[2] Quality concentration description expressed as a % of DM, except NDFD which is expressed as a % of NDF.
[3] Milk production was estimated using spreadsheet MILK2000 developed at the University of Wisconsin.

Partnership: U of MN Corn Silage Hybrid Testing Consortium
Funding: Private Seed Companies

For additional information:
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C. Sheaffer D. Swanson J. Halgerson

Managing Plumeless Thistle in Pastures with Donkeys

Plumeless thistle (*Carduus acanthoides* L.) is the most common species of thistle infesting NW Minnesota pastures. In overgrazed pastures this plant often forms dense patches that limits cattle feeding and reduces pasture productivity. Plumeless thistle infestations can be reduced over time with annual applications of herbicides; however, access by spraying equipment to many pastures is limited by steep slopes, rocks, trees, water and other physical barriers. There are numerous references in literature concerning donkeys and their preference for consuming thistle blossoms. The purpose of this research was to evaluate the effectiveness of donkeys in reducing plumeless thistle infestations in established pastures.

In 2003, a 3-year study was established in a grass pasture with moderate to heavy plumeless thistle populations at Deer Creek, Minnesota, and in 2004 a study was established in a pasture with a very heavy infestation of plumeless thistle at Vergas, Minnesota. At each location, treatments consisted of 1) one donkey and one cow/calf pair; and 2) two cow/calf pairs. Pastures were subdivided into six paddocks with approximately 2.5 acres for the donkey and cow/calf pair and 3 acres for the treatment with two cow/calf pairs. The experiment was a randomized complete block design with three replicates. A permanent series of transect lines were established in each pasture to allow sampling from the same sites each year.

Figure 1. Heavily infested pasture at Vergas, MN 2004

Funding and Partnership Information:
Central Regional Partnership, Staples

For additional information:
Vince Crary   Carlyle Holen
Bobby Holder   Doug Holen

Managing Plumeless Thistle in Pastures with Donkeys *(continued)*

Results after two grazing seasons are providing insight into the effectiveness of using donkeys for managing plumeless thistle in pastures. Some of the observations about feeding preferences include; 1) There are differences between donkeys in their preference for consuming plumeless thistle blossoms. All donkeys in the project grazed on P. thistle but some donkeys have a greater affinity for consuming thistle blossoms than others. 2). Donkeys prefer blossoms over stems and leaves of P. thistle. Donkeys ignore the younger plants and do not begin grazing on P. thistle plants until blooms are present. 3) Plumeless thistle plants with heavy grazing pressure are stimulated to continue to produce additional blossoms. Many of the later blossoms produced by the plant will not produce seed.

Table 1. Effects of grazing treatments on plumeless thistle plant number, height and blossom number in 90 sampling areas (10 ft diameter circles) in 2003 and 2004 at Deer Creek, MN.

	2 cow/calf pairs	**1 donkey and 1 cow/calf pair**
2003		
Total number of plants	398	370
Total number of blossoms	6,218	1,628
Ave. P thistle height (inches)	30	27
2004		
Total number of plants	257	265
Total number of blossoms	10,172	1,323
Ave. P thistle height (inches)	35	21

Plumeless thistle populations remained high in both grazing treatments at Deer Creek (Table 1) and it is believed that the reduction in plant numbers between 2003 and 2004 is due to dry weather conditions in the fall. This condition apparently affected germination of new seedlings in 2003 and was not a result of grazing. The number of plumeless thistle blossoms in sampling areas was reduced by 74% in 2003 and 87% in 2004 in the donkey treatment compared to the cattle grazing treatment. Plant height was reduced by 10% and 40% in the donkey treatment compared to the cattle treatment in 2003 and 2004, respectively.

Some pastures may have plumeless thistle populations that are too high for management by donkeys. The Vergas site was abandoned after the first grazing season in 2004. Spring counts of plumeless thistle populations (data not included) often exceeded 100 plants in a 10 ft diameter circle and formed large dense patches of plants (Figure 1). The donkey treatments were not able to provide adequate levels of suppression under this high infestation level. Sites such as this one need an integrated approach that may include herbicides, reduced grazing pressure, increased soil fertility and other practices that increase the competitiveness of the desirable pasture species.

Annual Crops For Emergency Forage—Otter Tail County

Cooperator: David Sjostrom
Nearest Town: Pelican Rapids

For details about the experiment, see "On-Farm Cropping Trials January 2004" pages 27-28.

Purpose of Study:
Wet, cool spring weather and/or alfalfa winter injury often results in the need for emergency forage plantings at less-than-optimum planting dates. Our objective was to compare the relative yield, quality, and emergency forage potential of a range of annual crops as influenced by planting date in west central Minnesota.

Results:
When planting was delayed until mid-June to early July, relatively shorter season corn hybrids and BMR forage sorghum produced forage with the greatest milk production potential per acre. Sudangrass, sorghum-sudan, hybrid pearl millet, and Japanese millet had lower milk production potential per ton of forage but greater crude protein content than corn silage or forage sorghum. Thus, though their DM yields totaled over two cuttings were competitive with corn for the July 2 planting date, their milk yield per acre was less. Nevertheless, where a multi-cut or grazing crop is needed, all would be good options. Millets offer the advantage of no prussic acid poisoning potential. Foxtail millets produced good one-cut yields from late planting dates, but quality was only moderate and may have been improved by harvesting earlier at less mature stages (boot or pre-boot). But foxtail millets produced consistently thick, uniform stands that were competitive with weeds.

Total season forage yield, milk production potential1, and season average forage quality[2] of single- and multiple-cut annual crops as influenced by planting date at Pelican Rapids, MN, 2003. Listed in descending order of milk production potential per acre within planting dates.

Species	Variety	Harvest(s) Days After Planting	Total DM Yld (ton/a)	Total[1] Milk/Acre (lb/a)	Season[1] Milk/Ton (lb/ton)	Season CP %DM	Season[2] RFQ
May 16 Planting							
Corn	81 RM	98 (23K)[3]	5.90	19,800	3,340	8.1	na
Corn	95 RM	104 (21K)	6.75	19,300	2,850	7.3	na
Corn	103 RM	104 (18K)	4.85	15,100	3,150	7.9	na
BMR Forage Sorghum	Dairy Master	104	4.38	12,400	2,830	7.7	144
BMR Sorghum-Sudan	Drip-O-Honey	55,82,124	4.62	9,980	2,170	14.3	123
Sudangrass	Greenleaf	55,82,124	4.76	9,100	1,930	13.8	108
Foxtail Millet	German	77	5.22	8,620	1,650	10.8	94
Sorghum-Sudan	Greantreat IV	55,82,124	4.34	8,380	1,930	15.1	111
Pearl Millet	PP102M Hybrid	55,82,124	3.48	6,840	1,970	15.7	115
Soybean[4]	RM 2.5	104	2.90	6,810	2,330	19.2	138
Barley/Pea	Robust/Trapper	55	3.40	5,490	1,620	14.0	87
Soybean[4]	RM 0.7	95	2.87	5,450	2,190	18.7	124
Barley	Westford	55	3.06	5,240	1,710	16.1	97
Foxtail Millet	Manta Siberian	66	2.93	4,570	1,560	11.1	88
Japanese Millet		55,82,124	2.34	4,560	1,940	14.9	111
Oat/Pea	Jerry/Trapper	55	3.09	3,820	1,250	11.5	69
Chickling Vetch	AC Greenfix	62	1.38	2,990	2,170	24.0	143
Alfalfa[5]		62,91	1.04	2,970	2,860	21.3	209
LSD 0.05			0.89	2,550	220	2.0	13

[1] Milk/acre and milk/ton calculated using Milk2000, Univ. of Wisconsin
[2] Weighted season averages; RFQ = relative forage quality index
[3] Corn plant population at harvest (x1000, per acre); many corn plots were thinner than desired for silage production.
[4] Deer damaged many soybean plots, so yield estimates, particularly for the July 2 planting, are low.
[5] Potato leafhopper injury combined with August drought stunted alfalfa yields, particularly for the July 2 planting.

Partnership or funding information:
MDA Energy and Sustainable Agriculture Program, NCR SARE Producer Grant Program

For additional information:
D. Holen, V. Crary, P. Peterson, M. Endres, C. Sheaffer, D. Swanson, J. Halgerson, J. Larson

Annual Crops For Emergency Forage—Otter Tail County *(continued)*

Total season forage yield, milk production potential1, and season average forage quality[2] of single- and multiple-cut annual crops as influenced by planting date at Pelican Rapids, MN, 2003. Listed in descending order of milk production potential per acre within planting dates.

Species	Variety	Harvest(s) Days After Planting	Total DM Yld (ton/a)	Total Milk/Acre (lb/a)	Season Milk/Ton (lb/ton)	Season CP %DM	Season[2] RFQ
June 16 Planting							
Corn	95 RM	112 (28K)[3]	5.43	16,500	3,010	7.2	na
Corn	81 RM	99 (27K)	5.24	13,500	2,580	6.2	na
BMR Forage Sorghum	Dairy Master	112	4.41	11,600	2,640	8.9	134
Corn	103 RM	112 (27K)	4.32	11,600	2,670	7.2	na
Sudangrass	Greenleaf	38,64,93	3.71	7,610	2,050	16.3	118
Sorghum-Sudan	Greentreat IV	38,64,93	3.15	6,730	2,130	17.7	125
BMR Sorghum-Sudan	Drip-O-Honey	38,64,93	2.81	6,480	2,310	18.1	136
Pearl Millet	PP102M Hybrid	38,64,93	2.80	6,440	2,300	19.5	138
Soybean[4]	RM 2.5	99	2.29	6,370	2,790	17.9	180
Foxtail Millet	German	64	3.43	6,090	1,780	11.4	98
Soybean[4]	RM 0.7	85	2.05	5,610	2,740	21.9	186
Barley/Pea	Robust/Trapper	60	1.74	3,380	1,940	13.5	100
Barley	Westford	60	1.30	3,000	2,300	19.8	128
Foxtail Millet	Manta Siberian	51	1.73	2,950	1,700	15.0	97
Chickling Vetch	AC Greenfix	60	0.87	1,850	2,120	20.9	132
Oat/Pea	Jerry/Trapper	60	1.14	1,710	1,500	15.0	76
Japanese Millet		38,64,93	0.58	1,190	2,040	19.1	123
Alfalfa[5]		60	0.35	1,090	3,130	19.7	240
LSD 0.05			0.89	2,550	220	2.0	13
July 2 Planting							
BMR Forage Sorghum	Dairy Master	96	3.41	9,540	2,810	11.3	147
Corn	81 RM	96 (19K)[3]	2.51	7,280	2,860	9.0	na
Corn	95 RM	96 (15K)	2.50	7,120	2,830	8.5	na
Sorghum-Sudan	Greentreat IV	44,77	2.89	6,180	2,140	18.1	122
Sudangrass	Greenleaf	44,77	2.97	6,070	2,080	15.8	117
Pearl Millet	PP102M Hybrid	44,77	2.64	5,520	2,120	18.3	123
Foxtail Millet	German	69	2.61	5,520	2,140	14.3	116
BMR Sorghum-Sudan	Drip-O-Honey	44,77	2.22	4,920	2,230	17.5	128
Corn	103 RM	96 (20K)	2.76	4,890	2,180	9.6	na
Foxtail Millet	Manta Siberian	51	1.52	3,260	2,150	17.5	120
Soybean[4]	RM 2.5	83	1.23	3,200	2,600	18.6	168
Oat/Pea	Jerry/Trapper	51	1.25	3,040	2,300	20.0	125
Barley/Pea	Robust/Trapper	57	1.26	2,940	2,360	18.1	131
Barley	Westford	69	0.86	2,210	2,580	26.2	154
Japanese Millet		44,77	1.06	2,060	1,900	18.3	111
Chickling Vetch	AC Greenfix	77	0.42	880	2,120	20.7	131
Soybean[4]	RM 0.7	na	na	na	na	na	na
Alfalfa[5]		na	0.00	na	na	na	na
LSD 0.05			0.89	2,550	220	2.0	13

[1] Milk/acre and milk/ton calculated using Milk2000, Univ. of Wisconsin
[2] Weighted season averages; RFQ = relative forage quality index
[3] Corn plant population at harvest (x1000, per acre); many corn plots were thinner than desired for silage production.
[4] Deer damaged many soybean plots, so yield estimates, particularly for the July 2 planting, are low.
[5] Potato leafhopper injury combined with August drought stunted alfalfa yields, particularly for the July 2 planting.

Alfalfa Variety Trial—Otter Tail County

Cooperator: John Wold
Nearest Town: Underwood
Previous Crop: RR Corn
Planting Date: May 6, 2004 (good soil moisture)
Emergence Date: May 17, 2004
Planting Rate Target: 15 lb PLS/a
Row Width: 6 inches
Fertilizer: Heavily manure in spring 2003
Herbicide: June 8, 2004 Raptor 4 oz. + NIS .25%
Harvest dates: July 22, 2004 and September 3, 2004
Experimental Design: Randomized complete block, 4 replications

Seeding year DM yields of alfalfa varieties at Underwood (Otter Tail Co.), MN

Entry (by total yield)	22-Jul	3-Sep	Seeding Year Total	Relative Yield as % of Checks
	------------	(Ton DM/a)	------------	
Released Varieties				
REBOUND 5.0	2.26	1.93	4.20	114
54Q25	2.11	2.00	4.11	112
LIGHTNING III	2.11	1.96	4.08	111
EXTREME	1.97	2.01	3.98	108
A 30-06	2.11	1.86	3.96	108
6415	2.07	1.88	3.94	107
FSG 351	2.01	1.93	3.94	107
FSG 408DP	1.98	1.96	3.94	107
6400HT	1.96	1.96	3.93	107
54V46	1.99	1.93	3.92	107
HYBRIFORCE 420/WET	2.15	1.72	3.86	105
6200HT	1.99	1.74	3.73	102
BOBWHITE	1.96	1.74	3.70	101
WL 319 HQ	2.02	1.64	3.66	99
LEGENDAIRY 5.0	1.91	1.58	3.49	95
Experimentals				
Wyo. BRR - Resistant	2.04	1.86	3.89	106
Checks				
VERNAL	1.90	1.70	3.60	98
ONEIDA VR	2.00	1.96	3.96	108
5312	2.01	1.46	3.46	94
…3 Checks	1.97	1.71	3.68	100
Mean	**2.03**	**1.83**	**3.85**	**105**
LSD 0.05	0.27	0.42	0.57	15

Partnership: U of MN Forage Program

For additional information:
D. Holen P. Peterson C. Sheaffer
D. Swanson J. Larson

Italian Ryegrass Forage Trial—Stearns County

Cooperator: Ken and Ralph Schefers
Nearest Town: Paynesville
Soil Type: Normania loam
Tillage: Chisel plow, disk, and field cultivator
Previous Crop: Corn
Planting Date: 4-30-04
Planting Rate Target: 30 lb/a
Row Width: 6 inches
Fertilizer: Pre-plant incorporated 36 lb N, 72 lb P_20_5, 5 lb Mg, 192 lb Ca, 144 lb S, 1.4 lb B, 1.7 lb Cu, 3 lb Mn, and 3.4 lb Zn per acre 40 lb N/a/harvest as ammonium nitrate after 1st, 2nd, 3rd, and 4th harvests
Harvest Dates: June 29, July 23, Aug. 19, Sept. 27, and Nov. 10
Experimental Design: Randomized Complete Block, 3 replications

2004 Yield Data (100% DM) for selected entries planted at Paynesville, MN

Entry	Description[1]	June 29[2] DM Yld (Ton/a)	July 23 DM Yld (Ton/a)	Aug. 19 DM Yld (Ton/a)	Sept. 27 DM Yld (Ton/a)	Nov. 10 DM Yld (Ton/a)	Total DM Yld (Ton/a)
Barpluto	LMT	1.02	1.88	1.56	1.59	0.50	**6.55**
Barextra	LMT	0.96	1.90	1.66	1.53	0.45	**6.50**
Jumbo	LWT	1.23	2.00	1.32	1.55	0.30	**6.40**
Barextra + Bardelta	65/35	0.97	1.95	1.65	1.31	0.47	**6.35**
Bardelta	LMD	1.04	2.03	1.48	1.28	0.40	**6.23**
Bargrosso	LMT	1.09	1.94	1.45	1.34	0.41	**6.23**
Barmega	LMT	0.90	1.73	1.50	1.39	0.48	**6.00**
Barsiega	LMT	0.80	1.91	1.44	1.43	0.38	**5.96**
Bartali	LMT	0.94	1.78	1.61	1.23	0.35	5.91
Barilia	LMT	1.10	1.76	1.35	1.25	0.41	5.87
Barmultra	LMT	0.84	1.84	1.58	1.15	0.27	5.68
Barprisma	LMD	0.93	1.81	1.27	1.29	0.37	5.67
Flanker	LMD	0.81	1.65	1.25	1.38	0.40	5.49
Barladin	LHT	0.61	1.54	1.43	1.40	0.43	5.41
Barmultra + Bartissimo	65/35	0.67	1.84	1.58	1.01	0.28	5.38
Barelli	LMD	0.67	1.61	1.39	1.30	0.39	5.36
Barsilo	LHD	0.61	1.58	1.40	1.17	0.49	5.25
Barladin + Barsilo	65/35	0.61	1.62	1.36	1.25	0.40	5.24
Bartissimo	LMD	0.68	1.64	1.32	0.98	0.28	4.90
Barfest	Festulolium	0.35	1.45	1.21	1.04	0.22	4.27
BG-34	Perennial Ryegrass	0.31	0.98	1.04	1.24	0.30	3.87
Baridana	Orchardgrass	0.26	0.96	1.20	1.11	0.16	3.69
Robust	Barley	2.36	0.26	--	--	--	2.62
Marathon	Reed Canarygrass	0.18	1.12	0.54	0.71	--	2.55
Jim	Oats	1.54	0.73	--	--	--	2.27
Trial Mean		0.86	1.58	1.41	1.28	0.37	5.19
LSD 0.05		0.18	0.21	0.29	0.26	0.10	0.63

Bold: Not significantly different than highest value using LSD 0.05.
[1] LM= Lolium multiflorum; LW= Lolium multiflorum westerwoldicum; LH= Lolium hybridum; T= tetraploid; D= diploid.
[2] Average 1st, 2nd, 3rd, 4th and 5th harvest plant-moisture content (excluding checks) was 85, 88, 85, 83, and 82%, respectively.

Partnership: U of MN Forage Program
Funding: Barenbrug USA and Minnesota Agriculture Experiment Station

For additional information:
P. Peterson, C. Sheaffer, J. Halgerson
D. Swanson, J. Larson, D. Martens

Effect of Palisade Growth Regulator and Nitrogen Fertility on Perennial Ryegrass Seed Production — Roseau County

Cooperator: Kvien and Vistad
Nearest town: Pine Creek and Roseau
Soil type: Clay loam
Previous crop: Wheat
Cultivar: P101 and WH x TQ
Planting date: May 20, 2003
Row Width: 12”
Fertilizer: 100+30+40
Herbicide: 2,4-D amine + Clarity
Harvest date: August 13, 2004
Experimental Design: Randomized complete block design with a split plot restriction on randomization. Whole plot treat ments were Palisade application dates and subplot treatments were 0 or 40 additional lbs/a nitrogen fertility.

Purpose of Study:
To investigate the effect of the timing of the growth regulator ‘Palisade’ and the effect additional nitrogen fertility levels have on the seed production yield of perennial ryegrass.

Results:
Palisade is a growth regulator that is absorbed by the leaves and crowns of grasses and is translocated to the growing points of the stems where it inhibits cell elongation. Previous research trials have documented shortening of the stem internodes and stronger stems that remain standing longer in the field leading to better pollination and reduced lodging. In previous northern Minnesota research trials, Palisade applications have resulted in an average 25% increase in seed yield. At the Kvien Farm, the early application dates resulted in a 33% increase in seed yield over the untreated plots. At both sites, the late application either did not effect seed yield (Kvien) or reduced the seed yield significantly (Vistad). The timing of the application of Palisade was critical to increasing seed yields with earlier applications dates producing higher seed yields. The additional 40 lbs/a nitrogen fertility did not increase seed yields as anticipated probably due to more than adequate levels of nitrogen fertility, especially at the Vistad Farm, and to the large amount of variability present in the seed yield data.

Table 1. Harvest height and seed yield of perennial ryegrass treated with the growth regulator ‘Palisade’ averaged over two nitrogen fertility rates. Palisade application rate was the recommended 1 pint/acre.

Palisade Treatment	Kvien Farm		Vistad Farm	
Application date	Harvest height	Seed yield	Harvest height	Seed yield
	(inch)	(lb/a)	(inch)	(lb/a)
May 26	30.1	1369	30.5	1283
June 1	29.0	1216	30.5	1305
June 1*	30.4	1197	30.5	1305
June 7	30.9	973	30.9	941
No treatment	30.8	947	30.6	1198
LSD 0.10	0.9	184	NS	177

*Palisade application rate was 0.75 pt/a.

Partnership information:
University of Minnesota College of Agricultural, Food, and Environmental Sciences
Other collaborators: Donn Vellekson, Nancy Ehlke, and Jim Halgerson

For additional information:
Gene Krause

Source: 2004 On-Farm Cropping Trials Northwest and West Central Minnesota
U of MN Extension Service, published January 2005

Tile Drainage in Northwest Minnesota—Red Lake and Polk County

Cooperator: Keith and Ray Swenson, and the Northwest Research and Outreach Center

Nearest Town: Brooks and Crookston

Soil Type: Brooks: Vallers Loam, Crookston: Fargo Clay Loam

Tillage: Fall chiseled, spring cultivated

Purpose of study:
Determine the effect of tile drainage on wheat and soybean yields in northwest Minnesota.

The experiment was designed to remove 0.125 (1/8), 0.25, 0.5 and 0.75 inch of excess moisture per 24 hour period. The removal per 24 hours is called 'drainage coefficient.'

Brooks	Crookston	Drainage coefficient
Tile spacing (feet)	Tile spacing (feet)	
0	0	0
	60	0.125
80	40	0.25
50	25	0.5
40	15	0.75

Results:
At Crookston with tile spacing of 40 and 25 feet (Drainage coefficients 0.25 and 0.5) wheat yields increased compared with the control. The mean wheat yield over 7 environments increased with the tile design of 0.25 and 0.5 inches of excess moisture removal per 24 hour period. Response of the crop to tile depends on the environment. Without excess water during the growing season there may not be a yield advantage.

All tile spacings increased the soybean yields at Crookston in 2004. Frost in August may have distorted the soybean yields. The undrained part of the field suffered more frost damage than other parts of the field.

Wheat and Soybean at Brooks and Crookston 2004 and mean 2001-2004

Wheat

Drainage coefficient	Crookston 2004 Yield (bu/a)	Crookston 2004 Test Weight (lb/bu)	Crookston 2004 Protein (%)	Brooks 2004 Yield (bu/a)	Brooks 2004 Test Weight (lb/bu)	Brooks 2004 Protein (%)	Mean 01-04[1] Yield (bu/a)
0	76.2	66.1	12.6	65.6	63.9	13.3	60.7
0.125	79.2	66.3	12.0				
0.25	80.4	66.5	11.8	63.8	63.6	13.0	64.9
0.5	83.1	66.9	12.2	60.9	63.6	13.5	65.6
0.75	76.6	66.1	12.7	66.0	63.3	14.2	61.8
L.S.D. 0.10	4.2	N.S.	0.6	2.4	0.2	0.5	3.5

Soybean

Drainage coefficient	Crookston 2004 Yield (bu/a)	Crookston 2004 Test Weight (lb/bu)	Crookston 2004 Protein (%)	Crookston 2004 oil (%)	Mean 01-04[2] Yield (bu/a)
0	15.6	66.3	38.8	15.5	28.7
0.125	26.8	66.3	38.5	15.5	
0.25	25.2	66.2	38.0	15.5	30.1
0.5	26.3	66.5	37.9	15.7	30.6
0.75	28.8	66.8	38.7	15.2	31.3
L.S.D. 0.10	2.4	0.4	N.S.	N.S.	N.S.

[1]Mean 01-04 = Brooks 01, 02, 03, 04 and Crookston 02, 03, 04.
[2]Mean 01-04 = Brooks 01, 02, 03 and Crookston 02, 03, 04.

Funding: University of Minnesota Rapid Response Fund
Minnesota Wheat Research and Promotion Council
Prinsco, Inc., Field Drainage, Inc.

For additional information:
Hans Kandel

Partnerships: Gary Sands, U of MN Biosystems and Ag Engineering
Jochum Wiersma, U of MN Northwest Research and Outreach Center
Terry Hurley, U of MN Dep't of Applied Economics

Niger Variety Evaluation—Thief River Falls and Roseau
Pennington and Roseau Counties

	Thief River Falls	Roseau
Cooperator	Ken and Connie Mehrkens	Kelman Kvien
Nearest Town	Thief River Falls	Roseau
Soil type	Clearwater loam	Moranville loamy fine sand
Previous crop	02 soybeans, 03 Wheat	02 Soybeans, 03 wheat
Seed Bed prep	Trust 1.8 pint, cultivation 2x	cultivated 2x
Soil test	21-34-316-28 NPKS in lb/a	24-48-444-48 NPKS in lb/a
Fertilizer	40-30-10-10 NPKS in lb/a	35 lb N/a
Planting date	May 28, 2004	June 15, 2004
Row width	6 inches	6 inches
Seeding depth	3/4 inch	3/4 inch
Seeding rate	6 lb / a	6 lb / a
Herbicides	1.8 pts/a Trust	None applied
	no post emergent herbicide	no post emergent herbicide
Swathing date	September 28, 2004	Early Bird 50—September 27, 2004 Others—September 29, 2004
First Frost date	August 20, 2004	October 2, 2004

Purpose of Study:
To evaluate plant height, bloom differences, yield, and test weight differences of niger varieties grown in NW MN and compare yield with a similar experiment conducted in 2003 in Langdon, ND and Thief River Falls, MN.

Results:
Early frost and a cool season resulted in low yields in 2004. The variety NS031 (EarlyBird 50) bloomed earlier, was shorter, and matured quickest. FinchGold in 2004 yielded significantly more than EarlyBird and EarlyBird 50.

	Roseau				Thief River Falls			Combined[1]	
	Plant Height (inch) Aug 27 04	Bloom (%) Aug 27 04	Yield (lb/a)	Test weight (lb/bu)	Plant Height (inch) Aug 13 04	Bloom (%) Aug 13 04	Yield (lb/a)	2004 Yield (lb/a)	2003 Yield (lb/a)
EarlyBird	45.8	12	91	20.9	42.3	4	82	87	456
Finch Gold	42.5	16	121	23.2	40.5	5	101	111	381
N951	50.3	15	142	20.8	45.5	6	66	104	308
EarlyBird 50	29.0	89	90	29.7	32.5	68	57	73	343
LSD 0.05	4.4	8	35	3.7	2.3	4	17	23	87

[1] 2004 is combined data for Roseau and Thief River Falls. 2003 is combined data for Langdon ND and Thief River Falls MN.

Partnership: NDSU
Funding: NDSU and Northwest Regional Partnership

For additional information:
Hans Kandel
Paul Porter
Dave LeGare

Phosphorus Mobilization by Buckwheat

Cooperators: Dan Olsgaard, Lee Thomas
Nearest Towns: Comstock, Clay County; Felton, Clay County
Soil Type: Fargo Clay, Bearden Loam
Tillage: Variable
Previous Crops: 2001– buckwheat as a green manure crop; 2002 - soybean; 2003 - wheat; 2004 - soybean
Row Width: soybean: 22” wheat: 6”
Fertilizer: None on plot areas
Herbicide: None, both fields are certified organic
Experimental Design: Randomized Complete Block with three (2002) or six (2003) replications.

Purpose of study:

Buckwheat is often claimed to “sequester” soil P for availability to a subsequent crop. The objective was to determine buckwheat’s ability to 1) sequester soil P and other nutrients, 2) suppress weeds, and 3) provide habitat to beneficial insects.

Buckwheat was established in 2001 as a green manure crop in two locations and incorporated after flowering, but before seed set. Soil samples were taken prior to buckwheat establishment in 2001 and from the same sites (within 1 meter) in 2002 in the following soybean crop, and in the 2003 wheat crop. Soybean (2002) and wheat (2003) and soybean (2004) plant samples were collected, at the same locations, and analyzed for P and several other common elements from the two treatment areas. In the fall of 2002, grain yield was also measured, but not thereafter. No other soil amendments were added during the trial.

Results:

Soil conditions were extremely wet in 2001 which delayed planting and reduced the buckwheat biomass at the Olsgaard location. The buckwheat stand was excellent at the Thomas location.

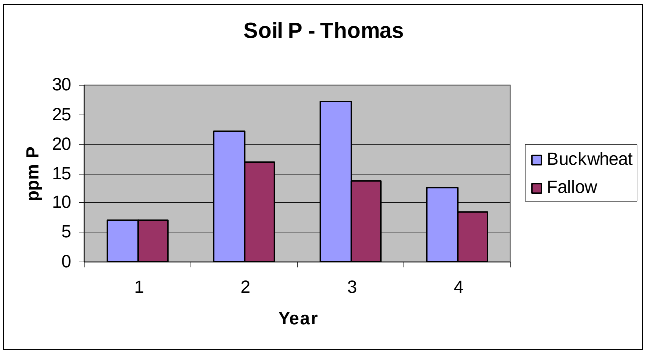
The soil P concentration increased significantly from 2001 to 2002 on both the buckwheat and fallow treatments. Buckwheat did not significantly increase the measurable soil P concentration at either location. “Cluck” (4-4-2) was applied at both locations for the crop year 2000 and may explain the precipitous increase in P concentration between years.

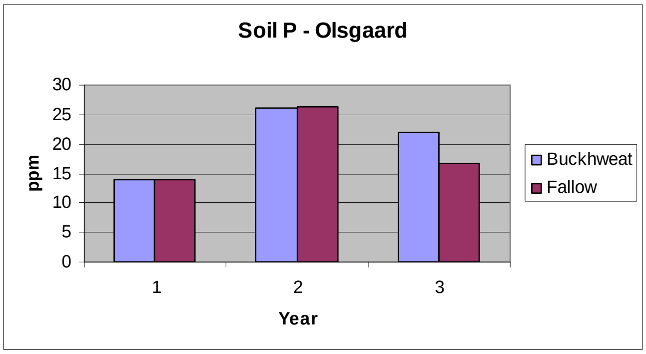
In 2002, the P concentration in soybean biomass increased following buckwheat despite no measurable differences in soil P concentration at the Olsgaard location. At the Thomas location, buckwheat reduced the plant K concentration but caused an increase in Na and Zn concentrations. These differences had no effect on grain yield at either location

In 2003 and 2004, the soil P concentration at the Thomas location was significantly greater ($p<.01$ and $p<.06$) where buckwheat was planted in 2001. The trend was similar at the Olsgaard location in 2003, but the increase was not statistically significant (<.14). This difference may be explained by the difference in buckwheat biomass production, which was significantly greater at the Thomas location. In 2004, the Olsgaard plot area was contaminated.

Buckwheat is very competitive and effectively eliminates weed competition if an adequate stand is established (data not shown). This was clearly the case at both locations.

Buckwheat attracts many types of beneficial insects. Although several groups of beneficial insects were present in the buckwheat in 2001, the average number of individuals trapped within a species was relatively low and did not vary across location. The Tachinid fly was the predominant beneficial insect across locations. The green lacewing and hover fly also occurred in greater numbers compared to most of the other beneficial insects (data not shown).





Funding: North Central Sustainable Agriculture Research and Education (SARE)

Partnerships: Dr. Denise Olson, Entomologist, North Dakota State University

For additional information:
Jim Stordahl and Hans Kandel

Evaluation of Biomass Production of Different Legumes in an Organic System—Red Lake County

Cooperator: Dan Juneau
Nearest Town: Red Lake Falls
Soil Type: Sandy loam
Tillage: Fall chiseled, spring cultivated
Previous Crop: Wheat before the legumes and soybeans before the wheat
Variety: Alfalfa (common), Chickling vetch (Ac Greenfix), Hairy vetch (common), Soybean (Traill), Wheat (Reeder)
Planting Date: 2003 all mid May except hairy vetch which was seeded on May 30th
2004 all mid May
Fertilizer: 3 ton/a turkey manure fall before seeding
Weed Control: Harrowing 3 times
Herbicide: None, field is certified organic
Sampling: Biomass samples were obtained by hand clipping to ground level 1-meter square quadrates at two locations per crop. Material was dried, separated into crop and weed fractions, and weights were recorded.

Purpose of Study:
Chickling vetch is an annual legume with fairly vigorous growth. This experiment was established to evaluate total biomass produced by chickling vetch compared with hairy vetch, soybean, and alfalfa (and the non legume check wheat). Total amount of nitrogen in legume plants is assumed to be 4%. Higher legume biomass production may indicate a higher level of nitrogen added to the system.

Results:
In 2003 chickling vetch produced significantly more legume biomass than hairy vetch. However this was partly due to the later (re)-seeding of hairy vetch. Chickling vetch is a fast growing legume while hairy vetch starts more slowly and typically produces tremendous growth in August and September. Over 2003-04 the total biomass (legume and weed fraction) produced by chickling vetch was significantly more than hairy vetch. Wheat produced significantly more biomass than any of the legumes but does not have the ability to fix nitrogen.

	Sampling 8/12/03			Sampling 8/13/04			Combined 2003-2004		
Crop	Legume Fraction (lb/a)	Weed Fraction (lb/a)	Total Biomass (lb/a)	Legume Fraction (lb/a)	Weed Fraction (lb/a)	Total Biomass (lb/a)	Legume Fraction (lb/a)	Weed Fraction (lb/a)	Total Biomass (lb/a)
Alfalfa				3457	597	4054			
Chickling vetch	4648	1556	6204	3051	1255	4306	3850	1405	5255
Hairy vetch	1850	2010	3859	2654	1235	3888	2252	1622	3874
Soybean	4190	772	4962	2141	1919	4060	3165	1346	4511
Wheat				6874	615	7489			
LSD 0.10	1397	N.S.	N.S.	1147	N.S.	1355	N.S.	N.S.	950

Partnership: Minnesota Department of Agriculture and University of Minnesota Extension Service

For additional information:
Hans Kandel

Foliar Application of Calcium-25^R on Organically Grown Alfalfa, Oat, Wheat, and Soybean, Comstock – Clay County

Cooperator: Lynn Brakke

Nearest Town: Comstock

	Crop			
	Alfalfa	Oats	Wheat	Soybean
Soil Type	Fargo clay	Fargo clay	Fargo clay	Fargo clay
Previous Crop	Soybean	Soybean	Soybean	Wheat
Planting date	4/28/2003	4/26/2004	4/26/2004	5/29/2004
Ca application	6/7/2004	6/7/2004	6/7/2004	7/7/2004
Concentration	4lb/400gallon	4lb/400gallon	4lb/250gallon	4lb/400gallon
Samples taken	7/7/2004			
Harvested		8/18/2004	8/18/2004	10/28/2004
Replications	6	4	6	8
Weed control	None	None[1]	None	Cultivation (3x)

[1] Oats and wheat were seeded with alfalfa. The growing alfalfa suppressed weed growth.

Experimental Design: Randomized complete block with 4-8 replications

Purpose of Study:
Calcium-25^R a foliar applied product, was developed for the market in 1981 by Dr. Andrew J. Welebir of the company Bio-Gard as an organic calcium source. The product is supposed to act as a non–toxic plant growth enhancer. The company claims: "The rapid absorption of Calcium-25^R causes a plant growth stimulating effect that causes such an increase in growth, that all other nutrients from the soil are absorbed by the plant to keep up with the growth increase." The objective of this study was to evaluate the effect of Calcium-25^R when applied on alfalfa, wheat, oats, and soybean grown under a certified organic production system.

Results:
No significant differences in yield and quality were observed in any of the tested crops with or without the application calcium.

Crop	Without Calcium	With Calcium	L.S.D. 0.05
Alfalfa			
Yield (lb/a)	2736	2561	N.S.
Protein (%)	22.8	23.4	N.S.
Relative Forage Quality	173	189	N.S.
Milk per Ton (lb/ton)	2521	2704	N.S.
Oats			
Yield (bu/a)	122	119	N.S.
Test weight (lb/bu)	36.8	37.1	N.S.
Wheat			
Yield (bu/a)	32.3	30.8	N.S.
Test weight (lb/bu)	61.8	61.5	N.S.
Protein (%)	13.1	13.0	N.S.
Soybean[1]			
Yield (bu/a)	7.3	6.4	N.S.
Height (inch)	17.4	16.3	N.S.
All Crops Combined			
Yields expressed as % of non treated crop	100	98.3	N.S.

[1] Poor seed lot resulting in low stand (only 55,000 plants/a). Frost on August 20th affected many top leaves, but plants remained green lower in the canopy.

Funding:
Northwest Regional Partnership

For additional information:
Hans Kandel and Paul Porter

Organic Soybean Variety Evaluation, Comstock—Clay County

Cooperator: Lynn Brakke
Nearest Town: Comstock
Soil Type: Fargo Clay
Tillage: Fall chiseled, spring cultivated
Previous Crop: Wheat
Planting Date: May 29, 2004
Seeding Rate: 217,800 seed/a. For established population, see table.
Row Width: 22 inches
Fertilizer: nothing applied
Weed Control: Soybean was row-crop cultivated June 21 and July 23. Weeds were hand pulled throughout the growing season.
Frost August 20: Many top leaves were affected, but plants remained green lower in the canopy.
Harvest Date: October 13, 2004. Soybean was harvested with small plot combine, dried, cleaned and weighed for grain yield and test weight.
Experimental Design: Randomized complete block with 4 replications

Purpose of Study:
To evaluate iron chlorosis response, crop height, maturity, yield, test weight, protein and oil percent of different soybean varieties grown under a certified organic production system.

Results:
There were significant differences between varieties for all measured traits. All varieties had some yellowing due to iron chlorosis. In selecting appropriate varieties it is important to consider data from more years (see 2002 and 2003 data) and other comparable studies.

Variety Name	6/16/04 Plants/a	7/7/04 Iron[1] Chlorosis (1 - 5)	8/21/04 Height (inches)	9/10/04 Visual[2] Maturity (7-9)	2004 Yield[3] (bu/a)	Test Weight (lb/bu)	Protein (%)	Oil (%)	2003 Yield (bu/a)	2002 Yield (bu/a)
Bravado	150000	2.0	24.0	7.5	30.4	58.9	33.7	16.6	23.8	
Atwood	131000	1.9	22.3	8.0	30.2	59.6	35.9	16.1	31.9	27.7
Legend 0557	131000	3.0	22.5	8.8	30.1	59.7	35.4	16.6		
Jim	150000	1.8	23.8	7.0	29.5	59.1	34.8	15.4		28.4
53803	158000	2.3	23.3	9.0	29.0	59.8	33.3	17.2		
PI091M10	163000	1.8	25.0	9.0	27.5	59.3	34.3	17.2		
Bygland	177000	2.5	23.8	8.0	25.9	58.5	35.2	16.2	30.2	34.2
Norpro	193000	1.8	25.3	8.5	25.4	59.6	37.8	15.2		23.6
Surge	150000	2.6	22.8	9.0	23.6	59.7	34.8	16.7	31.3	
S 0 8 - 8 0	188000	2.9	26.0	8.8	22.7	59.5	34.7	17.1	31.6	31.1
Nornatto	144000	2.8	25.8	7.5	22.6	59.5	33.3	15.4	27.6	20.3
Minori	172000	1.9	23.3	8.8	20.8	59.3	35.0	17.2	30.4	
Colibri	177000	2.4	22.5	7.6	20.6	61.1	34.2	14.1	22.7	
Panther[4]	79000	3.0	21.3	8.8	14.4	58.9	38.7	15.7	29.9	
1F44	136000	2.4	28.0	9.0	13.6	59.5	36.3	16.1		
LSD 0.05	42000	0.8	2.1	0.7	5.6	0.3	0.8	0.4	4.2	3.6

[1] Iron Chlorosis score 1 = no yellowing and 5 = severely chlorotic or dead.
[2] Visual maturity score 7 = Canopy is yellowing. 8 = Canopy still green but lower canopy starts to yellow. 9 = Canopy still green.
[3] Yield bu/a corrected to 13% moisture and 60 lb/bu test weight.
[4] Poor seed lot resulting in low stand.

Funding:
Northwest Regional Partnership and Earthwise Processors

For additional information:
Hans Kandel and Paul Porter

Organic Oat Variety Evaluation, Fertile—Polk County

Cooperator: Jim and Pat Todahl
Nearest Town: Fertile
Soil Type: Flaming sandy loam
Tillage: Fall chiseled, spring cultivated
Previous Crop: Soybean
Variety: See table
Planting Date: April 30, 2004
Row Width: 8 inches
Fertilizer: 3 ton/a turkey manure, fall 2003
Weed Control: Harrowing 3 times
Herbicide: None, field is certified organic
Harvest Populations: See table
Harvest Date: September 1, 2004
Experimental Design: Randomized complete block with 4 replications

Purpose of Study:

To evaluate oat varieties for yield, test weight 1,000-seed weight, and plant height when grown under a certified organic production system.

Results:

Differences in yield, test weight, 1,000 seed weight, and plant height were found in this study. Ebeltoft significantly outyielded many of the other tested oat varieties, but did not differ significantly in yield from Sesqui, HiFi, and Leonard. Hytest and Buff, a hull-less variety, had the highest test weight. Buff had the lowest 1,000- seed weight (no hulls).

Variety	Yield[1] (bu/a)	Test Weight (lb/bu)	1,000-seed Weight (gram)	Plant Height (inches)	Plant[2] Population (million/a)	2003-2004 Yield[1] (bu/a)
Ebeltoft	130.9	34.0	30.3	35.1	1.20	119.1
Sesqui	123.2	34.5	28.5	39.4	1.32	107.8
HiFi	120.5	34.5	28.2	41.3	1.38	115.6
Leonard	115.9	31.3	28.7	38.6	1.24	101.1
Morton	114.9	33.3	30.5	41.3	1.29	113.7
Richard	113.6	33.1	28.6	40.6	1.38	103.5
Wabasha	112.9	34.2	26.7	36.3	1.42	105.2
Youngs	111.1	32.7	35.5	41.8	1.15	109.4
Hytest	91.0	39.7	32.4	42.5	1.45	82.0
Buff[3]	71.8	39.1	23.1	36.5	1.15	68.7
LSD 0.05	15.1	2.5	3.2	2.2	N.S.	

[1] Corrected to 14% moisture.
[2] Stand counts were taken after the third harrowing.
[3] Buff is a hull-less variety.

Partnership: NDSU
Funding: SARE Grant and Northwest Regional Partnership

For additional information:
Hans Kandel and Paul Porter

Organic Oat Variety Evaluation, Comstock—Clay County

Cooperator: Lynn Brakke
Nearest Town: Comstock
Soil Type: Fargo Clay
Tillage: Fall chiseled, spring cultivated
Previous Crop: Soybean
Planting Date: The entire plot area was under seeded with alfalfa on April 24, 2004. Oat was seeded April 26, 2004
Row Width: 9 inches
Fertilizer: 900 lbs/a of "Cluck" 4-4-2 was applied fall 2003
Herbicide: None, field is certified organic
Populations: See table
Harvest Date: August 18, 2004
Experimental Design: Randomized complete block with 4 replications

Purpose of Study:
To evaluate spring oat varieties for yield, test weight, 1,000-seed weight, and plant height when grown under a certified organic production system.

Results:
Differences in yield, testweight, 1,000-seed weight and plant height were found in this study. Lenoard and Sesqui yielded significantly more than Richard, Youngs, Morton, Hytest and Buff. Buff a hull-less variety, had the highest test weight and lowest 1,000 seed weight.

Variety	Yield[1] (bu/a)	Test Weight (lb/bu)	1,000-seed Weight (gram)	Plant Height (inches)	Plant[2] Population (million/a)	Oat[3] Heads (million/a)	2003-2004 Yield[1] (bu/a)
Leonard	128.2	36.3	30.4	42.0	0.68	0.98	133.3
Sesqui	128.2	38.6	28.4	40.3	0.77	0.91	132.0
Wabasha	122.0	36.8	29.5	41.3	0.82	0.92	123.2
HiFi	117.9	37.7	30.4	42.6	0.79	1.24	123.4
Ebeltoft	111.9	35.0	33.3	37.8	0.62	0.84	119.7
Richard	107.8	37.2	33.4	43.9	0.72	0.92	111.8
Youngs	103.8	36.5	39.6	44.9	0.77	1.17	110.2
Morton	95.7	38.4	31.7	44.4	0.84	1.12	117.5
Hytest	90.1	41.7	35.3	42.0	0.82	1.03	93.5
Buff[4]	83.6	47.7	24.9	36.9	0.63	0.99	99.1
LSD 0.05	18.5	1.2	1.2	2.0	N.S.	N.S.	

[1] Corrected to 14% moisture.
[2] Stand counts were taken one month after seeding.
[3] Head count was taken on 7/14/04
[4] Buff is a hull-less variety.

Partnership: NDSU
Funding: SARE Grant and Northwest Regional Partnership

For additional information:
Hans Kandel and Paul Porter

Source: 2004 On-Farm Cropping Trials Northwest and West Central Minnesota
U of MN Extension Service, published January 2005

Organic Wheat Variety Evaluation, Fertile—Polk County

Cooperator: Jim and Pat Todahl
Nearest Town: Fertile
Soil Type: Flaming sandy loam
Tillage: Fall chiseled, spring cultivated
Previous Crop: Soybean
Variety: See table
Planting Date: April 30, 2004
Row Width: 8 inches
Fertilizer: 3 ton/a turkey manure, fall 2003
Weed Control: Harrowing 3 times
Herbicide: None, field is certified organic
Harvest Populations: See table
Harvest Date: September 1, 2004
Experimental Design: Randomized complete block with 4 replications

Purpose of Study:
To evaluate spring wheat varieties for yield, protein, test weight, 1,000-seed weight, plant height, disease and lodging, when grown under a certified organic production system.

Results:
Alsen was the top yielding variety out-yielding many of the other tested varieties, but did not differ significantly in yield from Reeder, Dapps, Walworth and Oklee. Disease response between varieties was significantly different. In organic production protein premiums can be a major part of the income. Glupro provided the highest protein percentage.

Variety	2004 Yield[1] (bu/a)	Protein (%)	Test Weight (lb/bu)	1,000-Seed-weight (gram)	Plant Height (inches) 7/19/04	% Flag Leaf Diseased[2] 7/19/04	Leaf Rust 7/19/04	% of Plot Lodged 8/12/04	Plant Population[3] (million/a)	2003-2004 Yield[1] (bu/a)
Alsen	69.4	14.3	63.0	34.4	36.5	8.8	No	1.0	2.10	52.4
Reeder	67.7	13.8	61.1	34.3	36.3	8.8	No	1.0	1.72	52.6
Dapps	67.1	15.6	61.1	35.5	40.8	6.3	Trace	1.5	1.95	50.9
Walworth	64.7	13.3	59.0	28.5	37.8	20.0	Yes	12.3	2.12	54.4
Oklee	64.5	14.1	61.9	33.2	34.5	10.0	No	1.0	1.95	54.0
Stoa	64.1	13.7	60.3	33.3	41.9	9.6	No	7.5	1.72	50.6
Parshall	61.9	13.9	62.2	33.1	41.8	18.0	Trace	4.5	1.74	48.4
Hanna	61.2	13.4	61.4	34.5	39.5	10.0	No	1.3	1.90	
AC-Cadillac	60.4	14.6	61.8	35.0	41.0	8.8	No	17.5	2.03	51.7
Ingot	60.4	13.5	62.9	31.2	40.3	33.8	Yes	5.3	1.79	51.3
Waldron	51.4	14.2	58.2	33.1	42.0	31.3	Yes	23.5	1.86	41.2
BacUp	50.6	15.6	62.5	33.1	39.3	32.5	Yes	7.3	1.90	41.7
Gunner	48.8	13.9	59.7	26.7	38.3	36.3	Yes	2.0	1.85	41.6
Coteau	45.2	15.2	59.0	31.2	40.5	30.0	Trace	9.5	1.86	35.2
Glupro	43.9	16.6	58.5	33.8	45.0	26.3	Yes	19.3	1.99	37.0
Chris	43.5	13.9	58.1	26.9	41.5	20.0	Yes	27.5	1.84	36.1
RedFiffe	40.5	13.4	58.5	31.3	46.3	17.5	Yes	41.3	1.88	38.3
Acadia	39.4	12.3	54.0	28.8	43.3	70.0	Yes	12.5	1.62	37.9
LSD 0.05	5.2	0.6	2.2	2.3	2.3	9.9		16.8	0.31	

[1] Corrected to 13.5% moisture.
[2] Including leaf rust, septoria and tan spot.
[3] Stand counts were taken after the third harrowing.

Partnership: NDSU
Funding: SARE Grant and Northwest Regional Partnership

For additional information:
Hans Kandel and Paul Porter

Organic Wheat Variety Evaluation, Comstock—Clay County

Cooperator: Lynn Brakke
Nearest Town: Comstock
Soil Type: Fargo Clay
Tillage: Fall chiseled, spring cultivated
Previous Crop: Soybean
Variety: See table
Planting Date: The entire plot area was under seeded with alfalfa on April 24, 2004
Wheat was seeded April 26, 2004
Row Width: 9 inches
Fertilizer: 900 lbs/a of "Cluck" 4-4-2 was applied fall 2003
Weed Control: None
Herbicide: None, field is certified organic
Populations: See table
Harvest Date: August 18, 2004
Experimental Design: Randomized complete block with 4 replications

Purpose of Study:
To evaluate spring wheat varieties for yield, protein, test weight 1,000-seed weight, plant height, alfalfa height, when grown under a certified organic production system.

Results:
The top seven varieties did not significantly differ in yield. Walworth was the top yielding variety at Fertile in 2002 and 2003 and was the third highest yielding variety at Comstock in 2002 and 2003. In organic production protein premiums can be a major part of the income. Coteau and Glupro provided the highest protein percent. We noticed a significant difference in the under seeded alfalfa plant height during the 2003 season, but no differences in 2004. No significant differences in wheat plant population or heads per acre were observed.

Variety	2004 Yield[1] (bu/a)	Protein (%)	Test Weight (lb/bu)	1,000-Seed Weight (gram)	Plant Height (inches) 7/14/04	Alfalfa Height (inches) 7/14/04	Plant[2] Population (million/a)	Wheat[3] Heads (million/a)	2003-2004 Yield[1] (bu/a)
Walworth	45.9	11.7	61.7	32.4	35.9	13.8	0.89	1.98	52.9
Hanna	43.6	11.9	62.0	34.5	42.3	13.5	0.91	2.18	
Ingot	42.1	12.0	63.4	31.5	39.8	12.9	0.91	1.82	51.8
Reeder	40.9	12.0	62.5	34.6	34.3	14.9	0.89	1.77	46.3
Oklee	40.7	11.4	63.1	31.9	32.5	14.3	1.01	1.37	45.3
Dapps	40.3	13.1	61.4	33.9	39.3	14.3	0.95	1.59	48.9
Alsen	40.1	12.7	63.4	34.3	34.5	14.3	0.92	1.68	46.7
Chris	39.1	12.3	60.8	28.1	42.3	14.3	1.03	2.06	43.1
Waldron	39.0	12.7	60.0	32.8	42.8	13.5	0.88	1.68	43.0
Parshall	38.8	12.0	62.8	31.4	38.6	14.1	0.92	1.84	47.1
Stoa	38.4	12.1	60.6	30.2	40.9	14.5	0.83	1.83	48.9
AC-Cadillac	37.5	12.4	62.9	34.3	42.3	13.9	0.87	1.89	47.2
Gunner	36.3	11.7	62.5	28.2	37.8	13.8	0.91	2.06	45.2
RedFife	36.1	10.7	58.3	32.0	46.3	13.3	0.88	1.49	41.5
BacUp	32.6	13.8	62.8	28.8	38.3	14.1	0.96	1.67	37.3
Acadia	32.3	10.7	60.4	31.8	44.5	13.3	0.89	1.70	40.4
Glupro	28.3	14.8	59.0	32.8	48.0	13.3	0.92	1.83	33.1
Coteau	28.1	15.2	58.6	30.4	39.8	14.0	0.94	1.85	35.3
LSD 0.05	6.3	0.7	0.6	1.3	1.6	N.S.	N.S.	N.S.	

[1] Corrected to 13.5% moisture.
[2] Stand counts were taken on 5/26/2004.
[3] Head counts were taken on 7/14/2004.

Partnership: NDSU
Funding: SARE Grant

For additional information:
Hans Kandel and Paul Porter

Source: 2004 On-Farm Cropping Trials Northwest and West Central Minnesota
U of MN Extension Service, published January 2005

NW Minnesota Organic Compost Trial—Red Lake County

Cooperator: Bill Langlois
Nearest Town: Huot
Soil Type: Flaming loamy fine sand
Tillage: Chisel plow
Previous Crop: Oat
Soybean: OAC Atwood
Planting Date: June 19
Row Width: 22"
Fertilizer: None
Herbicide: None
Harvest Date: October 18
Experimental Design: Randomized complete block with 4 replications

Purpose of Study:
To evaluate the residual effects of organic compost rates in year two on yield and quality of organically grown soybean.

Results:
Organic compost rates on organically grown oat in 2003 were significantly increased with increased rates of compost compared to the no compost control plots. Results were not included in the 2003 On Farm Cropping Trials from this research but are published in the 2004 Minnesota Department of Ag Greenbook pp 78-81.

The 2004 plots were established on the exact site of the 2003 trials with no additional compost added to evaluate the residual effect compost may have on crop production in 2004.

Residual effect of compost applied in 2003 on 2004 soybean yield, protein, oil, moisture, seed size and green seed.

2003 Compost T/a	Yield (bu/a)	Protein (%)	Oil (%)	Moisture (%)	Seeds/lb	Green seed (%)
0	13.4	37.0	17.1	16.4	3717	6.7
1	12.8	36.5	17.0	16.2	3814	8.0
2	14.5	36.9	16.7	16.2	3935	6.7
3	12.5	37.5	16.5	17.2	3995	6.3
Significance	**	*	NS	NS	NS	NS
LSD 0.05	1.1	0.8				

The growing season was far from ideal in 2004 for soybean production with late planting and a frost occurring on August 20. Variables yield, protein, pH, N, Mg and CEC were statistically significant however it is difficult to equate this to the previous compost rate applied. There may have been some soil movement from the previous fall and spring tillage in addition to environmental factors during the season confounding the results for 2004.

Residual effect of compost on soil chemical properties.

2003 T/a	**pH**	**SS mmho/cm**	**OM %**	**N #/a**	**P ppm**	**K ppm**	**Ca ppm**
0	7.97	0.10	1.57	8.33	31.7	134.7	2162
1	7.80	0.11	1.43	7.00	31.0	108.3	1626
2	7.83	0.10	1.57	8.67	33.0	128.3	1979
3	7.93	0.12	1.47	11.00	40.7	161.7	2339
Significance		NS	NS		NS	NS	NS
LSD 0.05	0.16			3.19			

2003 T/a	**Mg ppm**	**CEC meq**	**Zn ppm**	**S #/a**	**Fe ppm**	**Na ppm**	**CaCO3 %**
0	194	12.8	1.29	18.7	16.1	10	0.67
1	189	10.0	1.48	13.3	15.3	8.7	0.16
2	226	12.2	1.33	18.0	15.9	11.3	0.30
3	216	13.9	1.63	23.3	15.3	10.3	0.50
Significance			NS	NS	NS	NS	NS
LSD 0.05	32	3.8					

0-6" soil analysis 10/20/04

Funding: Minnesota Department of Agriculture
In partnership with Pembina Trails RC&D

For additional information:
Russ Severson

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www.extension.umn.edu

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www.smallgrains.org

Minnesota Soybean Research and Promotion Council
www.soybeans.umn.edu/home.htm

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