We appreciate the numerous contributions that made this bulletin possible.

* We thank all of the farmers who contributed time, labor, and/or use of land and equipment for trials or demonstrations conducted on their farms.

* We thank the Extension Educators, University researchers and specialists, and other individuals who helped manage the trials and who collected, analyzed, and reported the data.

* We thank all of the organizations that provided funding for the trials. (Funders for each trial are listed at the end of each report.)

* We thank the following organizations for contributing resources to print and distribute this bulletin:

University of Minnesota Extension Service
www.extension.umn.edu

North Central Region – SARE
www.sare.org/ncsare

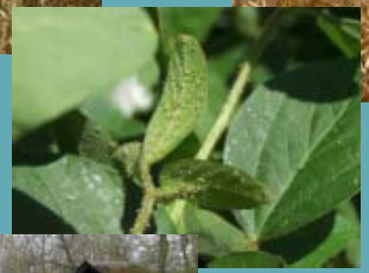
Minnesota Soybean Research and Promotion Council
www.mnsoybean.org

Minnesota Wheat Research and Promotion Council
www.smallgrains.org

On-Farm Cropping Trials

Northwest and West Central Minnesota

January 2003



UNIVERSITY OF MINNESOTA
Extension
SERVICE

Donkey Grazing on Plumeless Thistle

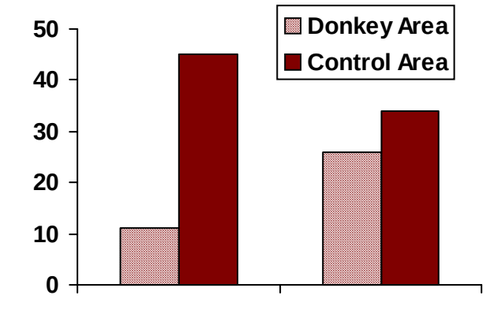
Otter Tail County

Purpose of Study
To determine if grazing, by donkeys can reduce plumeless thistle infestations in a pasture.

Cooperator: Dan and Mary Hanson
Nearest Town: Parkers Prairie
Trial Performed on: Grass pastures (1st year data)
Date of Trial: Pasture season 2002

	Blossom (number/plant)#	Plant Height (inches)
Donkey area	11	26
Control area	45	34

#Averages from 125 plumeless thistles



Results
Plumeless thistle is a highly invasive biennial plant that reproduces only by seed. Long term management strategies for this plant needs to focus on reducing or eliminating seed production to allow infestations in pastures to decrease over time. At the Hanson farm demonstration site, six pastures were established in areas with abundant plumeless thistle infestations (three pastures with one donkey each and three check areas with beef cows). In September, plant height, blossom number and the presence or absence of seed was determined on 25 plants in each pasture. Observations made during the year include: 1) donkeys actively consume plumeless thistle blossoms and to a lesser extent leaves or stems; 2) donkeys did not graze actively on plumeless thistle if there was abundant grass or legume forage available; 3) blossom feeding by the donkeys stimulated additional branching and late blossom production by the plant; 4) there was no seed produced by the late blossoms on grazed plants.

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Partnerships: Dr. Carlyle Holen and Dr. Bobby Holder and Northwest Research and Outreach Center

2002 On-Farm Cropping Trials For Northwest and West Central Minnesota

The University of Minnesota is pleased to provide you with the results of the 2002 on-farm field cropping trials conducted in northwest and west central Minnesota.

This is the fourth 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, Regional Extension Educators, and specialists who conducted these trials and their names are listed with the results. Also, thank you to our task force and our graphic designer, Theresa Hébert.

The studies in this booklet are divided into either Research or Demonstration chapters. Included is a description of the difference between the two. Whenever possible, research plot data were analyzed using statistics.

For more information about any of the studies included in this report, please contact the Regional Extension Educator or specialist listed. We invite your input on priorities you believe are important for Minnesota crop producers and have included an evaluation on page 3 for you to complete and mail to the address printed on the back of the evaluation form.

Sincerely,

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Table of Contents

Research Trials

Demonstration Plots

Bt Hybrids

Company	Hybrid	Maturity	Stand Count (x 1000)	Lodging#	Test Weightt (lb/bu)	Moisture (%)	Yield* (bu/a)
DeKalb	33-08	83	33.0	1	58	17.1	148.9
DeKalb	334-BT	83	32.0	0	55	19.3	137.4
Garst	NB 999YG1	85	33.0	0	51	21.4	139.7
Golden Harvest	6389BT	87	31.5	3	53	20.9	149.1
Golden Harvest	6131BT	82	32.5	9	54	19.7	150.5
Hyland	HLBX2073BT	85	29.0	1	55	19.7	138.0
Legend	LS6982BT	82	34.0	1	51	21.4	110.9
Renk	RK232BT	85	35.5	1	50	24.4	122.9
Seeds 2000	2852BT	85	27.0	2	52	20.1	142.0
Stine	9201BT	88	32.5	5	50	23.0	142.8
Vanseed[1]	279BT	79	27.5	0	51	22.5	127.7
Wensmen[1]	5018BT	80	29.5	1	54	23.7	120.6
Wensmen	5088BT	85	32.0	1	50	23.3	129.5
Vanseed	2820RRBT	85	28.0	1	50	23.0	132.2

* 20% hail damage in late summer across field.
Yields adjusted to 15.5% moisture.
Actual count of stalks broken in a 1/500th of an acre.
[1] Water damage from spring rains effected these yeilds.

Conventional

Company	Hybrid	Maturity	Stand Ct (x 1000)	Lodging#	Test Weight (lb/bu)	Moisture (%)	Yield* (bu/a)
AgriPro	9055	82	28.5	2	55	20	138.2
Hyland	HL2292	85	30.5	1	52	21.4	120.5
Legend[1]	LS6781	81	26.5	1	53	19.7	126.5
MidStates	MG6820	82	29.5	3	-	19.7	128.9
MidStates	MG6860	86	31.0	1	54	19.5	126.0
Mycogen	2141	81	30.5	1	59	19.5	139.5
Mycogen	2242	85	32.0	2	53	19.7	137.6
NK Brand	N17-R3	82	32.5	1	54	20.1	142.1
Pioneer[1]	39A26	80	28.0	1	57	18.6	125.6
Pioneer	39D81	85	32.1	6	55	18.8	141.2
Pioneer[1]	39H84	81	33.0	0	57	17.8	143.7
Renk[1]	RK192	80	29.0	3	52	19.7	130.7
Seeds 2000	2861	86	28.0	3	-	19.7	130.3
Thunder	2184	85	26.0	0	53	19.7	121.8
UAP Dynagro	51P88 -RR	84	32.0	3	54	18.7	140.9
UAP Dynagro	52P14 -RR	89	30.5	2	52	21.8	131.9

* 20% hail damage in late summer across field.
* Yields adjusted to 15.5% moisture
# Actual count of stalks broken in a 1/500th of an acre
[1] Water damage from spring rains effected these yields.

Purpose of Study
Evaluate the performance of corn hybrids for yield, test weight, and moisture content in a demonstration strip trial.

Cooperator: Skaurud Grain Farm
Nearest Town: Mahnomen
Soil Type: Rockwell sandy loam
Tillage: Fall chiseled and field cultivated with colpacker
Previous Crop: Soybeans
Hybrid: See table
Planting Date: May 24, 2002
Row Width: 22"
Fertilizer: 7 gal/a 10-34-0 Starter, 1 qt/a Zn, 300 lb/a Urea (46-0-0)
Herbicide: Conventional Plot - 3.5 pt/a Celebrity Plus, 6.4 oz/a Activator 90, 2 lb/a ammonium sulfate
Roundup Ready Plot - 2 pt/a Touchdown, 1 lb/a ammonium sulfate
Planting Populations: 32,000
Harvest Date: November 8, 2002

For additional information:
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Soybean Variety Demonstration

Norman County

Purpose of Study
To compare conventional soybean varieties for differences in yields, moisture content, and test weight in a demonstration strip trial.

Cooperator: Larry Hellerud
Nearest Town: Ada
Soil Type: Bearden silty clay loam
Tillage: Fall chiseled, spring cultivated
Previous Crop: Wheat
Variety: See table
Planting Date: May 28, 2002
Row Width: 6"
Fertilizer: None
Herbicide: 3 pts/a Prowl, 3 oz/a Raptor, 8 oz/a Altra Blazer
Plant Populations: 1.75 bu/a
Harvest Date: October 18, 2002

Company	Variety	Maturity	Moisture (%)	Test Weight (lb/bu)	Yield* (bu/a)
Croplan	L0332	0.3	12.3	56.9	50.1
Croplan	L0717	0.7	12.1	56.1	45.1
Golden Harvest	H-0440	0.4	12.9	55.7	40.8
Mallard	550	0.5	12.1	56.7	40.4
U of M	MN0201	0.2	11.9	56.2	40.1
U of M	MN0301	0.3	11.9	56.2	41.2
U of M	MN0302	0.3	13	56.4	37.1
Mycogen	5081	0.8	13.2	55.7	39.2
Stine	S0300-0	0.3	12.7	56.6	38.3
Average Yield					**41.4**

* Yields adjusted to 13% moisture

For additional information:
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pazde002@umn.edu

Funding: Participating seed companies

2002 On-Farm Cropping Trials Booklet Evaluation Form

We want to know what you think about this booklet. Please take a few minutes to fill out this evaluation form and mail it to the address on the back of this sheet. Your comments will help shape the future on-farm cropping research and the booklet.

1.) Where did you receive a copy of this booklet? (Check all that apply)
- ☐ In the mail
- ☐ An Extension Educator
- ☐ The local Coop
- ☐ At crop production meetings or field days
- ☐ Other _____

2.) In general, how will you use the On-Farm booklet? (Check all that apply)
- ☐ Read at least some
- ☐ Skim
- ☐ Save for future reference
- ☐ Pass on to a friend
- ☐ Recycle or discard without using
- ☐ Other _____

3.) How would you rate the On-Farm booklet in terms of:

	Excellent				Poor
Design	1	2	3	4	5
Communicating information on our projects	1	2	3	4	5
Clarity and readability	1	2	3	4	5
Interest to you	1	2	3	4	5
Soybean aphid article (page 22)	1	2	3	4	5
Subsoiling in Minnesota article (page 19)	1	2	3	4	5

4.) How would you describe your profession? (Check all that apply)
- ☐ Farmer/rancher
- ☐ University of Minnesota Faculty
- ☐ Seed/equipment dealer
- ☐ Nonprofit organization
- ☐ State/Federal employee
- ☐ Crop consultant
- ☐ Other _____

5.) I typically get my information about production practices from: (Check all that apply)
- ☐ Other farmers/ranchers
- ☐ Books
- ☐ Farm journals and newsletters
- ☐ Extension or other agency personnel
- ☐ The Internet
- ☐ Other _____

6.) Which information in the booklet was most useful to you in your work?

7.) What research topics would you like to see covered in future booklets?

8.) Do you plan to make any changes in your agricultural practices as a result of information provided in this booklet?

9.) What do you feel would be the economic impact of changing these practices?

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Company	Variety	Maturity	Moisture (%)	Test Weight (lb/bu)	Yield* (bu/a)
Asgrow	AG0501	0.5	12.0	57.6	41.9
Asgrow	AG0801	0.8	11.6	57.7	46.3
Atlas	B076RR	0.7	13.0	58.3	42.4
Croplan	RT0312	0.3	11.3	57.4	40.0
Croplan	RT0890	0.8	11.5	57.9	46.9
Croplan	RT0874	0.8	12.7	57.0	44.4
Dekalb	DKB0651	0.6	11.9	57.3	40.5
Garst	0211RR	0.2	11.4	57.2	35.1
Garst	0601RR	0.6	11.6	58.0	41.6
Golden Harvest	0544RR	0.5	12.4	56.4	37.6
Hyland	Raven	00.8	11.3	57.2	38.8
Hyland	Regal	0.5	12.0	57.8	41.8
Legend	0601RR	0.6	11.7	57.9	41.0
Legend	LS0201RR	0.2	11.6	57.9	35.0
NK Brand	S06-L6	0.6	11.1	57.2	43.8
Prairie Brand	PB0321	0.3	11.6	56.3	41.1
Prairie Brand	PB0799	0.7	11.2	57.7	43.0
Seeds 2000	0051RR	00.5	12.1	57.1	38.0
Seeds 2000	2021RR	0.2	12.0	57.7	34.6
Stine	S0500-4	0.5	11.3	57.1	42.0
Thunder	2200RR	00.9	12.3	56.7	34.3
Thunder	2203RR	0.3	11.9	57.3	41.9
UAP Dynagro	R0503	0.5	12.2	57.1	40.0
Vanseed	0760RR	0.7	12.3	57.1	41.6
Wensman	W2033RR	0.3	12.8	57.1	34.7
Wensman	W2054RR	0.5	11.8	58.3	44.2
Average Yield					**42.4**

* Yield adjusted to 13% moisture

Purpose of Study
To compare Roundup Ready soybean varieties for differences in yield, moisture content, and test weight in a demonstration strip trial.

Cooperator: Glen and Danny Brandt
Nearest Town: Ada
Soil Type: Glyndon loam
Tillage: Fall chiseled and cultivated, spring triple K once
Previous Crop: Wheat
Variety: See table
Planting Date: May 25, 2002
Row Width: 22"
Fertilizer: 18-46-60 fall, 10-34-0 spring
Herbicide: 2.5 pts/a Prowl
Plant Populations: 1.75 bu/a
Harvest Date: October 17, 2002

Partnerships: West Central Ag, Tri-Angle Agronomy, Seed Dealers
Funding: Participating seed companies

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Soybean Variety Differences with White Mold

Pope County

Purpose of Study

The purpose of the study was to evaluate variety differences in regard to white mold. The site was a irrigated field which was irrigated three times with ½ inch of water each time.

Cooperator: Bob Jacobs
Nearest Town: Glenwood
Soil Type: Esterville sand
Tillage: DMI last fall, spring cultivated
Previous Crop: Corn
Planting Date: May 24, 2002
Hybrid: Refer to plot results
Row Width: 30"
Fertilizer: Broadcast (active amount 9-23-60 applied this spring) in addition, 150 lbs fertilizer applied with the planter of 4.5-11.5-31 and 75 lbs pell lime
Herbicide: 2 qts Roundup applied with two applications
Planting Population: 145,000
Harvest Populations: 130,000
Harvest Date: October 15, 2002

Results

This site has a history of white mold. However, it was not a large factor on this plot because temperature conditions were not favorable for white mold development (temperatures were too hot at flowering time).

				White Mold Rating*	
Company	**Variety**	**Yield (bu/a)**	**Test Weight (lb/a)**	**West Plot**	**East Plot**
Asgrow	AG0801	48.8	58.0	1	2
Dahlco	9092RR	44.9	58.0	1	1
Dahlco	DS 9090RR	49.2	58.0	1	1
Dahlco	X1131RR	46.8	58.5	1	1
DeKalb	DKB06-51	48.3	57.5	1	1
DeKalb	DKB10-51	51.4	58.0	1	1
NK Brand	S08-R4	49.9	58.0	1	1
Pioneer	90B74	43.8	58.0	1	1
Pioneer	91B03	47.9	58.0	1	1
Pioneer	91B12	51.1	58.0	2	2
Pioneer	91B33	52.8	58.0	1	1
Stine	S0806-4	50.6	57.5	2	2
Stine	S0990-4	53.3	57.5	2	2
Stine	S1007-4	52.9	58.0	1	1
Ziller	BT7101R	51.8	58.0	2	2
Ziller	BT7106R	51.1	58.0	2	3

* White mold was rated as 1=new, 2=scattered white mold, or 3=up to 1%.

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Partnership: Bruce Ferris, Bruce Potter,
and Pope County Corn and Soybean Growers Association
Funding: Minnesota Soybean Growers Association

What are Research Trials?

Research plots are randomized and replicated in the field or across geographic locations. Randomization reduces the chances of one treatment being favored in any way. Replication is used to increase precision in identifying treatment differences. Randomization and replication allows a statistical analysis of experimental treatment means and field variation. This analysis will help determine whether detected differences are real due to experimental treatments or due to random chance and field variation. Research trials can be replicated in space (different fields or locations), time (across years), or both.

Some comparisons of treatments may result in no statistically significant differences. When this occurs, it is not appropriate to conclude which treatment is superior. A difference of one or two (or even 10 to 15) bushels per acre between treatment means may or may not represent a true yield advantage. If a non-significant yield advantage from one trial at one location is consistent across other locations or years, statistical analysis across the locations or years may show true differences in treatments do exist. A minimum difference between treatment means, called the least significant difference (LSD), is required for the observed difference to be attributed to the treatments.

T1	C	T2	C
C	T1	C	T2
T1	T2	T2	T1
T1	T2	T2	T1

C = Check Plot Treatment T1 = Treatment 1 T2 = Treatment 2

Example of a research plot design – In this example there are four replications of three treatments. The location of each treatment was assigned totally at random (Completely Randomized Design).

T1	C	T2	C
C	T1	T1	T2
T2	T2	C	T1

C = Check Plot Treatment T1 = Treatment 1 T2 = Treatment 2

Example of a research plot design – In this example there are four replications of three treatments. The location of each treatment was "blocked" within each replication (Randomized Complete Block Design).

Purpose of Study
Evaluation of released barley varieties for grain yield and grain quality in northwest Minnesota.

Cooperator: Gary Jennen
Wayne Zimmerman
Brian Hest
Ray Swenson
Roger Hagen
Curtis Swanson
Jim Kukowski
Gerald Olsonowski

Nearest Town: Fergus Falls
Ulen
Perley
Oklee
East Grand Forks
St. Hilaire
Strathcona
Humboldt

Soil Type: Sandy loam to clay loam
Tillage: Varied with cooperator
Previous Crop: Wheat, soybeans, canola
Variety: See table
Planting Date: May 1 to May 18, 2002
Row Width: 7"
Fertilizer: Applied by cooperator
Herbicide: Buctril, Puma
Harvest Date: July 30 to August 23, 2002
Experimental Design: Randomized complete block with 2 replications

Source	Variety	2002		2001		2000		2000-2002				
		Yield (% of mean)	Actual Yield (bu/a)	Yield (% of mean)	Actual Yield (bu/a)	Yield (% of mean)	Actual Yield (bu/a)	Plant Height (inches)	Plump (%)	Test Weight (lb/bu)	Protein (%)	Actual Yield (bu/a)
U of M	Lacey*	105.9	67.5	104.4	73.8	105.9	83.9	29.1	82.1	44.2	13.5	75.1
NDSU	Foster*	104.2	66.4	105.0	74.2	105.2	83.3	30.3	87.2	42.1	12.8	74.6
U of M	Robust*	96.2	61.3	97.6	69.0	97.6	77.3	31.7	81.4	43.6	13.7	69.2
NDSU	Conlon*	96.2	61.3	95.2	67.3	95.3	75.5	28.1	90.8	46.2	13.5	68.0
Anheuser Busch	Legacy*	95.6	60.9	100.9	71.3	-	-	-	-	-	-	-
NDSU	Drummond*	92.0	58.6	96.9	68.5	95.9	76.0	29.4	81.2	42.8	13.5	67.7
LSD (0.05)		**13.0**		**6.6**		**5.5**			**3.1**	**0.7**	**0.2**	
Mean (bu/a)			**63.7**		**70.7**		**79.2**		**84.5**	**43.8**	**13.4**	

*AMBA approved malting barley cultivars

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Funding: Minnesota Barley Council

What are Demonstration Plots?

The purpose of demonstration plots is to allow visual observation of differences between two or more treatments. However, demonstration plots, such as strip tests, may have a serious problem with field variability, which can make the results misleading. A statistical approach is a more meaningful way to compare treatments.

Replication is a key part of statistical methods because it addresses variability within a treatment due to other factors. However, farmers may not be willing to replicate treatments in a strip plot trial, with the same treatments applied to all farms. Thus, each farm is a replicate.

A second concern in the validity of demonstration plots is biasing results by placing a favorite treatment on a preferred block of land. This can be avoided by randomly allocating treatment positions in the field by some independent means (e.g. drawing numbers from a hat). Randomization of treatments within a field is an extremely important factor contributing to the final reliability of the results.

C	T1	T2

C = Check Plot Treatment T1 = Treatment 1 T2=Treatment 2

Example of a demonstration plot design – Here three treatments are compared. However, with no replication, there is no assessment of natural variability and differences between treatments cannot be validated statistically.

C	T1	T2
C	T1	T2
C	T1	T2
C	T1	T2

C = Check Plot Treatment T1 = Treatment 1 T2=Treatment 2

Example of a demonstration plot design – Here three treatments are compared. However, with no randomization, there is no assessment of natural variability and differences between treatments cannot be validated statistically.

Both replication and randomization are necessary for treatments to be analyzed statistically in order to determine whether or not differences between treatment means are real.

Tile Drainage in Northwest Minnesota Evaluation

Red Lake & Polk Counties

Purpose of Study
To determine the effect of tile drainage on crop yields in northwest Minnesota.

Cooperator: Keith and Ray Swenson
NWROC
Nearest Town: Brooks (B)
Crookston (C)
Soil Type: Vallers loam (B)
Fargo clay loam (C)
Fertilizer: Wheat 90 lb N/a, 41 lb P/a, 45 lb K/a,
Soybeans 30 lb N/a, 50 lb P/a

Results
Data was collected at Brooks in 2001 and 2002, and in Crookston in 2002. Results are presented in the following graphs. A relatively small yield benefit to tile was observed at Brooks. Tile drainage showed a larger benefit at Crookston, with all crops showing a response. Sugarbeet yield is of particular interest, with the 40' spacing giving a yield benefit of 4 T/a, and a sucrose benefit of 1005 lb/a. Statistical analysis is being conducted for this trial and will be available early 2003.

Brooks

	Wheat (bu/a)		Soybeans (bu/a)	
Tile Spacing (ft)	**2001**	**2002**	**2001**	**2002**
No Tile	51	42	27	31
80	53	45	28	31
50	52	48	27	31
40	49	40	25	30

Crookston

Tile Spacing (ft)	Wheat (bu/a)	Soybeans (bu/a)	Sugarbeets (T/a)	Sugarbeets Sucrose (lb/a)
No Tile	48	37	24	7050
60	53	40	26	7444
40	54	38	28	8055
25	58	40	27	7623
15	55	43	25	6835

For additional information:
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Partnerships: Dr. Gary Sands, Dr. Jochum Wiersma,
Dr. Terry Hurley, Dr. Hans Kandel
Funding: University of Minnesota Rapid Response Fund,
Minnesota Wheat Research and Promotion Council,
Prinsco, Inc., Field Drainage, Inc.

Clay County

Phosphorus Mobilization by Buckwheat Evaluation

Cooperator: Dan Olsgaard **Nearest Town:** Comstock
Lee Thomas Felton
Soil Type: Fargo clay and Bearden loam
Tillage: Variable
Previous Crop: Buckwheat as a green manure crop in 2001 and Soybean in 2002
Variety: Toyopro (Comstock)
Pioneer 9091 (Felton)
Planting Date: May 22, 2002
Row Width: 22"
Fertilizer: Buckwheat was established in 2001 as a green manure crop and incorporated between flowering and seed set
Herbicide: None, both fields are certified organic
Harvest Date: October 16 and November 6, 2002
Experimental Design: Randomized complete block with 3 or 4 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 sequester soil P and other nutrients, suppress weeds, and provide habitat to beneficial insects.

Results
Soil conditions were extremely wet in 2001 which delayed planting and reduced the buckwheat biomass at the Olsgaard location, less so 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" was applied at both locations for the crop year 2000 and may explain the abrupt increase in P concentration between years. Soil pH increased and soil organic matter was reduced following buckwheat at the Olsgaard location.

The nutrient composition of the soybean plant was significantly different between treatments at both locations. However, these differences had no effect on grain yield at either location.

The Tachinid fly was the predominant beneficial insect across locations. The green lacewing and hover fly also occurred in greater numbers in the buckwheat compared to most of the other beneficial insects (data not shown).

	2001[#]	June 1, 2002			
Olsgaard	**Soil P (Olson) (ppm)**		**pH**	**K (ppm)**	**OM (%)**
Buckwheat	14.0	26.0	7.6	595	7.3
Fallow	14.0	26.3	7.4	678	7.7
LSD (0.10)		**NS**	**0.1**	**NS**	**0.4**
Thomas					
Buckwheat	7.0	22.3	7.9	241	5.8
Fallow	7.0	17.0	7.9	238	5.8
LSD (0.10)		**NS**	**NS**	**NS**	**NS**

[#] Prior to planting buckwheat

Olsgaard	Soybean Yield[1] (bu/a)
Buckwheat	18.6
Fallow	18.8
LSD (0.10)	**NS**
Thomas	
Buckwheat	42.4
Fallow	42.6
LSD (0.10)	**NS**

[1]Severe hail damage two weeks prior to harvest at Olsgaard location

	Soybean Biomass				
Olsgaard	**P (ppm)**	**Fe (ppm)**	**K (ppm)**	**Na (ppm)**	**Zn (ppm)**
Buckwheat	2645.6	184.3	21260	13.3	18.2
Fallow	2423.4	114.2	22628	8.6	19.6
LSD (0.10)	**130**	**NS**	**NS**	**NS**	**NS**
Thomas					
Buckwheat	3244	795.4	14598	54.9	17.0
Fallow	2826	437.1	17277	32.4	14.5
LSD (0.10)	**NS**	**NS**	**2466**	**16.2**	**2.4**

Partnership: Dr. Denise Olson
Funding: SARE

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Flame-Weeding in Organic Blue Corn

Clay County

Purpose of Study

To determine weed control, corn yield, and crop damage using a flame-weeder operated at 4, 6, and 8 mph.

Cooperator: Lynn Brakke
Nearest Town: Comstock
Soil Type: Bearden silt loam
Tillage: Spring field cultivated
Previous Crop: Soybeans
Hybrid: 2751 BC
Planting Date: May 20, 2002
Row Width: 22"
Herbicide: None, certified organic field
Fertilizer: 3 ton/a composted poultry manure
Harvest Date: October 23, 2002
Experimental Design: Randomized complete block with 4 replications
Flaming Date: June 16, 2002

Results

Flame-weeding is an effective weed control option for organic corn. Broadleaf and grass weeds were effectively controlled at all speeds. Ground speed had no effect on corn population or grain yield, despite some leaf burning at the four mile/hour rate.

Speed	Population (plants/a)	Yield* (bu/a)
4 mph	22,869	65.2
6 mph	24,354	68.6
8 mph	22,869	67.8
LSD (0.05)	**NS**	**NS**

*Grain yield was reduced due to hail

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Partnership: University of Minnesota Northwest Regional Partnership and Brakke Organic Farms
Funding: University of Minnesota Northwest Regional Partnership and Brakke Organic Farms

Northwest Region

Red River Valley Spring Wheat Evaluation

Cooperator: Gary Jennen — **Nearest Town:** Fergus Falls
Wayne Zimmerman — Ulen
Brian Hest — Perley
Ray Swenson — Brooks
Roger Hagen — E Grand Forks
Curtis W. Swanson — St. Hilaire
Jim Kukowski — Strathcona
Gerald Olsonowski — Humbolt
Soil Type: Sandy loam to clay loam
Tillage: Varied with cooperator
Previous Crop: Wheat, canola, and soybeans, varied with cooperator
Planting Date: April 19 to May 21, 2002
Row Width: 7"
Fertilizer: Applied by cooperator
Herbicide: Buctril or Puma
Harvest Date: July 30 - August 23, 2002
Experimental Design: Randomized complete block with 2 replications

Purpose of Study

Evaluation of released wheat cultivars for grain yield, lodging, and grain quality in northwest Minnesota

Source	Variety	2002		2001		2000		2000-2002 Average				
		Yield (% of mean)	Actual Yield (bu/a)	Yield (% of mean)	Actual Yield (bu/a)	Yield (% of mean)	Actual Yield (bu/a)	Plant Height (inches)	Lodging (1-5)	Test Weight (lbs/bu)	Protein (%)	Yield (bu/a)
Northstar Genetics	Mercury	112.6	51.5	108.7	57.6	108.9	65.7	27.7	2.7	58.9	14.1	58.3
SDSU	Oxen	109.2	49.9	107.9	57.2	104.7	63.1	29.8	2.5	58.6	14.8	56.7
Northstar Genetics	Dandy	108.3	49.5	106.3	56.3	104.2	62.8	31.5	2.4	59.9	14.4	56.2
AgriPro	Ivan	107.3	49.0	103.1	54.6	105.6	63.7	29.5	2.0	58.5	13.6	55.8
U of M	Verde	110.4	50.5	102.3	54.2	102.2	61.6	30.7	2.8	58.8	14.0	55.4
NDSU	Reeder	102.6	46.9	103.3	54.7	102.5	61.8	31.0	2.4	58.2	14.9	54.5
AgriPro	Norpro	98.8	45.2	101.7	53.9	104.8	63.2	29.3	2.0	58.5	14.6	54.1
U of M	HJ 98	103.2	47.2	98.6	52.3	103.7	62.5	29.6	4.1	57.8	14.2	54.0
NDSU	Alsen	105.3	48.1	99.6	52.8	95.6	57.6	31.2	2.3	60.2	15.2	52.8
Pioneer Hi-Bred	P2375	97.2	44.4	99.3	52.6	98.5	59.4	29.9	4.3	59.2	14.4	52.1
SDSU	Russ	98.1	44.8	97.9	51.9	97.6	58.9	32.4	3.0	57.7	14.3	51.9
SDSU	Ingot	92.4	42.2	95.7	50.7	96.8	58.4	33.3	3.3	61.2	14.9	50.4
NDSU	Parshall	92.3	42.2	93.4	49.5	92.8	56.0	34.2	2.8	59.3	15.1	49.2
U of M	Marshall	86.3	39.4	91.2	48.3	95.5	57.6	29.0	3.0	57.7	14.2	48.4
AgriPro	Gunner	78.0	35.6	86.0	45.6	86.6	52.2	32.6	2.5	58.9	15.4	44.5
Agriculture Canada	AC Vista*	87.9	40.2	97.6	51.7	-	-	-	-	-	-	-
AgriPro	Hanna	84.6	38.7	-	-	-	-	-	-	-	-	-
AgriPro	Knudson	123.0	56.2	-	-	-	-	-	-	-	-	-
SDSU	Walworth	107.4	49.1	107.4	56.9	-	-	-	-	-	-	-
SDSU	Briggs	108.6	49.6	-	-	-	-	-	-	-	-	-
Tri-Gen Geneitcs	Ozzie	88.7	40.5	88.2	46.7	-	-	-	-	-	-	-
WPB	Granite	97.6	44.6	-	-	-	-	-	-	-	-	-
LSD (0.05)		**12.1**		**7.7**		**5.7**		**-**	**-**	**0.8**	**0.3**	
Mean (bu/a)			**45.7**		**53.1**		**60.3**	**-**	**-**	**58.9**	**14.5**	

* AC Vista is a hard white spring wheat

Funding: Minnesota Wheat Research and Promotion Council

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Organic Wheat Variety Evaluation

Clay County

Purpose of Study
To evaluate different spring wheat varieties grown under a certified organic production system. Entries came from either an organic or a conventional seed source.

Cooperator: Lynn Brakke
Nearest Town: Comstock
Soil Type: Borup loam
Tillage: Fall chiseled, spring cultivated
Previous Crop: Soybeans
Planting Date: May 17, 2002
Row Width: 9"
Fertilizer: 900 lbs/a of "Cluck" 4-4-2 was applied fall 2001
Weed Control: Harrowing 2.5 mph on May 22, 31, June 7, 21, 2002 and handweeding after heading
Harvest Date: August 19, 2002
Experimental Design: Randomized complete block with 4 replications

Variety[3]	Yield[1] (bu/a)	Protein (%)	Test Weight (lb/bu)	Height (inches)	Pigweeds (ft²) (at heading)	Scab Score[2] (0-3)	Rust on Flag Leaf (%)
Parshall-O	38.0[4]	15.9	56.3	33.3	0.37	0.8	4.0
Ingot	35.3	15.4	56.1	34.2	0.44	1.0	17.5
Walworth	34.5	15.8	54.7	31.6	0.38	0.5	15.8
Stoa-O	33.0[4]	16.4	54.7	36.6	0.40	1.1	12.5
Reeder	32.7	16.2	53.6	32.0	0.51	1.1	6.5
Parshall	32.6[4]	15.9	56.0	34.2	0.40	0.3	5.0
Saxon	31.0	16.4	52.4	32.4	0.37	2.1	2.0
Waldron	29.1	16.3	54.3	38.1	0.23	2.0	13.8
Alsen	28.5	15.5	55.5	30.4	0.47	0.8	6.3
BacUp	26.2	16.1	57.0	33.6	0.37	0.6	7.5
Gunner	24.7	16.3	54.1	33.1	0.30	1.8	18.8
Vista	22.7	16.6	49.8	31.8	0.44	1.9	27.5
Chris	18.3	16.4	53.6	37.6	0.53	2.5	11.3
Coteau	17.6	15.7	52.4	36.7	0.30	1.5	13.8
Stoa	16.6[4]	16.6	50.6	35.7	0.74	1.5	11.3
Plata	15.7	16.5	51.7	26.1	0.26	1.5	10.0
Glupro	15.5	16.4	51.7	40.5	0.56	2.5	15.0
Red Fife	7.6	16.1	52.6	40.6	0.58	2.4	27.5
LSD (0.05)	**4.1**	**NS**	**3.0**	**1.2**	**0.21**	**0.8**	**7.4**

[1] Corrected to 13.5% moisture
[2] Scab score: 0=no scab, 3=severe scab
[3] O = Organic seed source
[4] Variety response may be related to seed lot (variety response may be related to seed lot)

Results
Parshall (organic seed source) significantly out-yielded many of the tested varieties, but did not significantly differ in yield from Ingot and Walworth. In this trial no differences in protein levels were observed. Chris and Glupro had the highest scab ratings. Vista and Red Fife were the most susceptible to the prevailing rust races in Comstock. Stoa had the most pigweeds per ft².

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Partnership: Paul Porter
Funding: OFRF-ND

Red Lake & Pennington Counties

Niger Seeding Rate and Nitrogen Evaluation

Cooperator: Mark and Michelle Naplin (SH)
Greg and Deb Whalen (O)
Nearest Town: St. Hilaire (SH) and Oklee (O)
Soil Type: Sandy loam
Tillage: Fall chiseled, spring cultivated
Previous Crop: Wheat
Variety: EarlyBird
Planting Date: May 17, 2002 (SH)
May 14, 2002 (O)
Row Width: 6"
Fertilizer: 0, 20, 40, 60 lb N/a
Seeding Rate: 3, 6, and 9 lb/a
Weed Control: 1.5 pts/a Treflan
Swathing: September 27, 2002 (SH)
October 1, 2002 (O)
Harvest Date: October 14, 2002 (SH)
October 15, 2002 (O)
Experimental Design: Randomized complete block with 4 replications

Purpose of Study
To evaluate the response of EarlyBird niger to four nitrogen fertility levels and three seeding rates.

	Yield (lb/a)		Population (plants/ft²)		Crop Height (inches)		Bloom (%)	
	St.Hilaire	Oklee	St.Hilaire	Oklee	St.Hilaire	Oklee	St. Hilaire	Oklee
Seeding Rate							6-Aug	14-Aug
3 lb acre	244	475	4.2	6.0	26.1	44.5	5.1	28.0
6 lb acre	360	476	8.7	10.6	30.6	46.0	11.7	33.9
9 lb acre	377	543	14.2	15.3	32.4	45.7	17.0	36.9
LSD (0.05)	**77**	**NS**	**1.1**	**1.0**	**2.9**	**NS**	**5.0**	**7.1**
Nitrogen Application Rate								
0 lb acre	245	514	8.6	11.6	27.4	43.3	12.3	26.7
20 lb acre	311	512	8.8	11.2	29.7	45.9	10.6	30.4
40 lb acre	351	484	9.7	10.8	29.3	46.5	11.4	37.5
60 lb acre	400	482	9.0	9.0	32.4	45.8	10.8	37.1
LSD (0.05)	**89**	**NS**	**NS**	**1.2**	**3.4**	**2.2**	**NS**	**8.1**

Results
At Oklee no significant yield differences were observed due to N rate or seeding rate. Increased N levels tended to increase the crop height at both locations. There was no significant N fertilizer by seeding rate interaction at either location. At St. Hilaire seeding rates of 6 or 9 lb yielded significantly greater than the 3 lb seeding rate, and 40 and 60 lb N resulted in significantly greater yields than 0 lb N.

Partnerships: Paul Porter, Dave LeGare
Funding: ND-SBARE

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Niger Time of Swathing Evaluation

Red Lake & Pennington Counties

Purpose of Study

To evaluate the yield of EarlyBird niger to 4 swathing dates, starting one week before average first frost date (September 20th) compared to straight combining after a killing frost.

Results

This niger variety blooms over an extended period until frost. Swathing on the earliest date reduced yields at both locations. Visual observations suggested more shatter loss with straight combining.

Cooperator: Mark and Michelle Naplin (SH)
Greg and Deb Whalen (O)
Nearest Town: St. Hilaire (SH) and Oklee (O)
Soil Type: Sandy loam
Tillage: Fall chiseled, spring cultivated
Previous Crop: Wheat
Variety: EarlyBird
Planting Date: May 17, 2002 (SH)
May 14, 2002 (O)
Row Width: 6"
Fertilizer: 35-40-20-10S, 4 Zn, 3 Cu (SH)
40-60-50-10S, 4 Zn, 3 Cu (O)
Herbicide: 1.5 pts/a Treflan
Harvest Date: October 14, 2002 (SH)
October 15, 2002 (O)
Frost Date: October 2, 2002 (SH)
October 6, 2002 (O)
Experimental Design: Randomized complete block with 4 replications

	Yield (lb/a)		Population (plants/ft²)		Height (inches)	
	St. Hilaire	Oklee	St. Hilaire	Oklee	St. Hilaire	Oklee
Swathing Date						
13-Sep	169	240	8.7	9.4	34.7	45.9
20-Sep	262	401	10.8	10.8	36.1	48.4
27-Sep	242	363	8.9	10.9	33.9	47.9
4-Oct	285	421	9.5	9.7	34.4	46.9
Straight Combining						
14 and 15 Oct	227	372	10.8	9.3	36.3	46.9
LSD (0.05)	**70**	**89**	**NS**	**NS**	**NS**	**NS**

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Partnerships: Paul Porter, Dave LeGare
Funding: ND-SBARE

Polk County

Organic Wheat Variety Evaluation

Cooperator: Jim and Pat Todahl
Nearest Town: Fertile
Soil Type: Flaming sandy loam
Tillage: Fall chiseled, spring cultivated
Previous Crop: Soybeans
Variety: See table
Planting Date: May 27, 2002
Row Width: 8"
Fertilizer: 3 ton/a turkey manure, fall 2001
Weed Control: Harrowing, 2 times
Herbicide: None, field is certified organic
Harvest Populations: See table
Harvest Date: August 23, 2002
Experimental Design: Randomized complete block with 4 replications

Purpose of Study

To evaluate different spring wheat varieties grown under a certified organic production system. Entries came from either an organic or a conventional seed source.

Results

Walworth significantly out-yielded many of the tested varieties, but did not differ significantly in yield from Parshall. In organic production protein premiums can be a major part of the income. Glupro provided the highest protein percent. End of the season weed pressure among the varieties differed significantly.

Variety	Yield[1] (bu/a)	Protein (%)	Test Weight (lb/bu)	Height (inches)	Population (million/a)	Lodging[2]	Weed Pressure[3]
Walworth	41.3	14.1	53.7	30.0	1.33	1.8	2.1
Parshall-O[4]	38.3	14.3	57.4	30.5	1.36	2.0	2.5
Parshall	35.5	14.5	56.2	32.1	1.34	1.6	1.9
Stoa-O	34.8	14.3	54.1	33.0	1.37	1.6	2.3
Saxon	34.3	14.2	51.9	30.6	1.33	2.0	2.3
Stoa	31.6	14.5	54.2	34.4	0.96	1.9	2.8
Alsen	31.3	15.1	55.1	28.8	1.39	1.9	2.6
Waldron	30.6	15.1	53.7	34.7	1.39	1.8	2.5
Ingot	30.6	15.1	54.6	32.9	1.43	1.4	1.9
Reeder	30.1	14.4	53.8	29.0	1.28	1.6	1.8
BacUp	25.9	15.2	55.6	28.9	1.34	4.0	3.9
Coteau	23.8	14.4	53.9	33.4	1.38	2.3	2.6
Vista	23.2	13.5	49.4	29.7	1.24	3.9	3.4
Chris	22.7	14.4	55.1	33.6	1.00	2.9	3.3
Gunner	21.8	14.8	56.2	32.0	1.49	2.5	1.9
Plata	20.7	13.4	52.8	25.4	1.46	2.9	2.3
Glupro	20.5	15.6	52.4	34.5	1.23	2.1	2.3
Red Fife	12.2	13.4	55.5	35.4	1.10	2.9	3.9
LSD (0.05)	5.6	0.8	2.4	2.2	0.16	0.7	1.0

[1] Corrected to 13.5% moisture
[2] Lodging score 1=no lodging, 5=flat on the ground
[3] Weed pressure score at the end of the season 1=no weeds, 5=very weedy
[4] O=organic seed source

Partnership: Paul Porter
Funding: Minnesota Association of Wheat Growers

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Effect of In-Season N on Water Stressed Wheat

Polk County

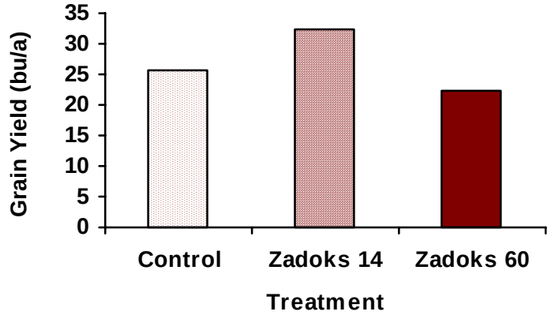
Purpose of Study
To determine the effect of added in-season nitrogen on yield and quality on yellowing wheat due to excess precipitation.

Cooperator: Northwest Research and Outreach Center
Nearest Town: Crookston
Soil Type: Bearden-Colvin complex
Tillage: Fall moldboard plowed, spring cultivated
Previous Crop: Corn
Variety: Alsen
Planting Date: May 2, 2002
Row Width: 6"
Fertilizer: 80 lb/a NH_3 and 50 lb/a 18-46-0
Herbicide: Bronate 0.8 pt/a
Planting Populations: 1.8 million seeds/a
Harvest Date: August 13, 2002
Experimental Design: Randomized complete block with 4 replications

Result
The addition of 40 pounds on nitrogen on June 19, 2002 at the 3.5 leaf growth stage of wheat (Zadoks 14) significantly increased wheat yields 6.8 bushels compared to the control treatment with no added nitrogen. The treatment of 40 pounds of nitrogen added on July 1, 2002 at the beginning of flowers growth stage of wheat (Zadoks 60) had no effect on wheat grain yield.

Treatment	Grain Yield (bu/a)	Residual Soil [3] NO_3-N (ppm)
Control	25.6	44.1
40 N (Zadoks 14)[1]	32.4	45.5
40 N (Zadoks 60)[2]	22.5	35.5
LSD (0.05)	**2.0**	

[1] Zadoks 14 is 3.5 leaf-stage
[2] Zadoks60 is beginning of flowering
[3] Residual soil N sampled August 22, 2002



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Partnership: Northwest Research and Outreach Center

Organic Oat Variety Evaluation

Polk County

Cooperator: Jim and Pat Todahl
Nearest Town: Fertile
Soil Type: Flaming sandy loam
Tillage: Fall chiseled, spring cultivated
Previous Crop: Soybeans
Variety: See table
Planting Date: May 27, 2002
Row Width: 8"
Fertilizer: 3 ton/a turkey manure applied fall 2001
Weed Control: Harrowed 2 times
Planting Population: 1.5 million seeds/a
Harvest Date: August 23, 2002
Experimental Design: Randomized complete block with 4 replications

Purpose of Study
To evaluate yield and test weight of oat varieties grown under a certified organic production system.

Results
Differences in yield, test weight, crop height, population and lodging were found in this study. The top three yielding varieties were significantly greater yielding than the four lowest yielding varieties.

Variety	Yield[1] (bu/a)	Test weight (lb/bu)	Crop Height (inches)	Population (million plants/a)	Lodging[2]	Weed Pressure[3]
Morton	74.9	33.3	41.6	1.19	1.6	1.3
Richard	65.3	32.4	40.3	1.10	3.5	1.8
HiFi	64.6	33.8	39.9	1.17	1.4	1.3
Wabasha	62.6	32.6	37.3	1.28	3.8	1.6
Sesqui	61.3	33.1	37.8	1.13	4.0	1.6
Youngs	55.7	33.0	45.6	1.14	3.0	1.9
Buff	53.5	41.3	37.0	1.14	4.4	1.9
Hytest	51.6	33.1	40.4	1.39	4.8	1.8
Ebeltoft	50.8	34.7	37.9	1.04	2.9	1.5
Leonard	49.5	30.4	39.4	1.16	4.8	1.9
LSD (0.05)	**10.8**	**2.3**	**1.5**	**0.14**	**1.3**	**NS**

[1] Corrected to 14% moisture
[2] Lodging score: 1=no lodging, 5=flat on the ground
[3] Weed pressure score at end of the season: 1=no weeds, 5=very weedy

Partnership: Paul Porter
Funding: Minnesota Association of Wheat Growers

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Organic Oat Variety Evaluation

Clay County

Purpose of Study
To evaluate yield, test weight, crop height, rust, and weed pressure of different oat varieties grown under a certified organic production system.

Cooperator: Lynn Brakke
Nearest Town: Comstock
Soil Type: Borup loam
Tillage: Fall chisel, spring cultivated
Previous Crop: Soybeans
Variety: See table
Planting Date: May 17, 2002
Row Width: 9"
Fertilizer: 900 lbs/a "Cluck" 4-4-2 applied fall 2001
Weed Control: Harrowed 2.5 mph on May 22, 31, June 7 and 12, 2002. Handweeding after heading
Harvest Date: August 19, 2002
Experimental Design: Randomized complete block with 4 replications

Results
Differences in yield, test weight, crop height, pigweed numbers and rust levels were found in this study. Morton was significantly greater yielding than the five lowest yielding varieties. Buff, a hulless variety, had the lowest yield but the highest test weight.

Variety	Yield[1] (bu/a)	Test Weight (lb/bu)	Crop Height (inches)	Pigweeds[2] (ft^2)	Rust[3] (0-9)
Morton	86.7	29.2	45.8	0.40	0.0
HiFi	83.3	27.1	43.0	0.35	0.0
Richard	78.6	27.2	44.0	0.35	6.8
Ebeltoft	76.5	28.5	39.4	0.35	2.3
Leonard	75.8	23.0	42.6	0.31	4.5
Sesqui	72.7	28.0	41.8	0.31	0.0
Wabasha	71.1	27.2	39.7	0.47	2.3
Hytest	67.0	31.0	43.0	0.09	9.0
Youngs	60.0	24.2	45.1	0.45	6.8
Buff	50.1	39.9	40.2	0.54	0.0
LSD (0.05)	**12.4**	**2.0**	**1.4**	**0.15**	**3.7**

[1] Corrected to 14% moisture
[2] Pigweeds/m^2 poking above canopy on June 28, 2002
[3] 0=no rust on plants, 9=rust on all plants

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Partnership: Paul Porter
Funding: OFRF-ND

Mechanical Weed Control in Organically Grown Wheat

Polk County

Cooperator: Jim and Pat Todahl
Nearest Town: Fertile
Soil Type: Flaming sandy loam
Tillage: Fall chiseled, spring cultivated
Previous Crop: Soybeans
Variety: Reeder and Gunner
Planting Date: May 27, 2002
Row Width: 7"
Weed Control: Certified organic field
Plant Populations: 1.4 million seeds/a
Harvest Date: August 23, 2002
Experimental Design: Randomized complete block with 3 replications

Purpose of Study
To evaluate the effect of various harrow treatments on stand and yield of two hard red spring wheat varieties grown in an organic system.

Harrowing (# of passes)	Stand Loss		
	Gunner	Reeder	Average
2	23	11	17
3	9	23	16
4	18	13	16
5	11	27	19
LSD (0.05)			**NS**

Gunner	
Treatment	**Yield (bu/a)**
2	22.6
3	22.2
4	20.5
5	21.4
Average	**21.7**
Reeder	
6	34.5
3	38.5
4	30.4
5	31.2
Average	**33.7**
LSD (0.05)	**5.8**

Results
Yield: Averaged over harrow treatments, Reeder significantly out-yielded Gunner (34 bu/a vs. 22 bu/a)

Weed Control: Weed control was not significantly affected by harrow treatment or variety.

Stand: Harrow treatments varied from 2 to 5 passes with a 4 bar spring tooth harrow in a time period from 1 to 21 days after planting. Total stand loss for the various harrow treatments ranged from 9 to 27%. The varieties Gunner and Reeder had similar stand loss for the various harrow treatments. Harrowing is most effective when performed when wheat and weeds are small even though there is more stand loss when wheat is small.

Previous research would suggest that a good rule of thumb for organic wheat farmers is to plant an additional 10% pure live seed for every planned harrow operation. Farmers should always check behind the harrow at the beginning of an operation to evaluate whether or not stand loss is excessive due to soil conditions, equipment setting, or other factors.

Partnership: Paul Porter
Funding: Minnesota Department of Agriculture

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Nitrogen Recommendations for New Wheat Varieties

West Polk & Marshall Counties

Purpose of Study

The objective of this study was to measure the response of new, improved varieties of hard red spring wheat to various rates of nitrogen fertilizer. Response was to be measured in terms of grain yield and grain protein. If varieties respond differently, this could be the basis for more precise nitrogen recommendations and improved efficiency in use of nitrogen fertilizer.

Cooperator: NWROC — Dwight Anderson
Nearest Town: Crookston — Warren
Previous Crop: Wheat
Fertilizer: Ammonium nitrate (33-0-0), see table
Planting Date: Early May, 2002
Harvest Date: Mid-August
Experimental Design: Randomized complete block design with 4 replications

Results

Grain yield at both sites was significantly affected by both variety and the rate of nitrogen applied. For the West Polk site, the response to applied nitrogen varied with variety. At the Marshall location, the response of all varieties to rate of applied nitrogen was similar. Consistent with the results form the West Polk site, a nitrogen rate of 120 lb. per acre appeared to be adequate for optimum yield.

The effect of treatment on protein content of the grain was not as complex. In general, grain protein increased as the rate of applied nitrogen increased. However, the increase did not vary with variety.

Variety	N Applied (lb/a)					
	0	40	80	120	160	Avg
Warren	% Protein					
Alsen	15.1	15.1	15.5	15.7	15.9	15.4
Marshall	13.3	13.7	13.7	14.0	14.4	13.9
Ingot	14.3	15.0	15.1	15.4	15.6	15.1
Oxen	14.7	14.8	14.8	15.0	15.3	14.9
Crookston						
Alsen	15.1	15.1	14.1	15.7	15.0	15.0
Marshall	14.8	16.0	15.0	13.4	14.8	14.8
Ingot	14.6	15.8	15.4	15.3	15.5	15.3
Oxen	15.1	15.4	15.0	14.1	15.1	15.0

	Variety				
N Rate (lb/a)	Alsen	Ingot	Marshall	Oxen	Average
Warren	Yield (bu/a)				
0	43.2	46.7	44.8	46.8	45.4
40	53.8	54.3	50.4	56.4	53.7
80	55.0	58.2	52.1	58.0	55.8
120	55.4	62.6	50.7	61.0	57.4
160	59.9	62.8	54.6	61.2	59.6
Crookston					
0	41.1	29.9	36.3	43.2	37.6
40	36.9	47.2	42.7	44.5	42.8
80	47.4	51.9	50.6	50.7	50.2
120	50.3	53.7	52.7	56.7	53.4
160	58.1	58.1	54.5	58.8	57.4

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Plumeless Thistle Control & Pasture Management Evaluation

Otter Tail County

Purpose of Study

To demonstrate effective chemical and cultural strategies for managing plumeless thistle and to improve the profitability and sustainability of grazing systems.

Cooperator: Mark Niedenfuer
Nearest Town: Vining
Previous Crop: Permanent pasture
Fertilizer: See table
Herbicide: See table
Grazing: Spring and fall, beef cows and calves
Experimental Design: Randomized complete block with 3 replications

Results

August ratings showed control of plumeless thistle ranging from 67 to 100%. Any control over 90% is recognized as excellent for a plant reproducing solely by seed and will over time result in the reduction of newly germinating plants. Fall and rosette application timings appeared to be indifferent as did the addition of nitrogen fertility on visual control of the target weed. As anticipated, legume injury was high with Redeem and Curtail, moderate with 2, 4-D, and very light with 2, 4-DB.

No significant differences were detected with the grass biomass measurements. It was noted that the fertilized plots were greener and began spring regrowth sooner. Legume production was significantly higher with the 2, 4-DB treatments. Fall applications appeared to be somewhat more harmful to the legumes across treatments other than with 2, 4-DB.

	Herbicide			Legume (% Injury)	Plumeless Thistle (% Control)		Biomass 6-03-02* (lb/a)				
Treatment#	Cost ($/a)	Rate (unit/a)	Timing	5-28-02	5-28-02	8-05-02	Grass	Legume	PThistle	Misc	Total
2,4-D	3.15	2 pt	Fall	53	80	92	1473	77	0	71	1621
2,4-D + 60 lb N	3.15	2 pt	Fall	62	70	95	1758	208	148	77	2191
2,4-D	3.15	2 pt	Rosette	53	32	67	1303	159	148	137	1747
2,4-D + 60 lb N	3.15	2 pt	Rosette	67	42	92	1599	208	208	82	2097
2,4-DB	22.00	4 pt	Fall	18	35	75	1495	444	214	219	2371
2,4-DB + 60 lb N	22.00	4 pt	Fall	8	37	78	1824	548	148	0	2519
2,4-DB	22.00	4 pt	Rosette	12	35	93	1462	334	219	142	2158
2,4-DB + 60 lb N	22.00	4 pt	Rosette	12	27	96	1703	214	142	225	2284
Redeem	12.20	1.5 pt	Fall	70	100	99	1320	77	0	66	1462
Redeem + 60 lb N	12.20	1.5 pt	Fall	62	100	100	1610	66	0	71	1747
Redeem	12.20	1.5 pt	Rosette	88	75	100	1566	88	230	142	2026
Redeem + 60 lb N	12.20	1.5 pt	Rosette	87	78	100	1616	246	142	214	2218
Curtail	8.75	2 pt	Fall	93	100	100	767	0	0	71	838
Curtail + 60 lb N	8.75	2 pt	Fall	47	95	100	1714	66	0	0	1780
Curtail	8.75	2 pt	Rosette	75	60	100	1260	181	71	142	1654
Curtail + 60 lb N	8.75	2 pt	Rosette	85	73	100	1506	71	137	148	1862
Nontreated				0	0	28	1331	295	159	159	1944
LSD (0.05)				**38**	**31**	**32**	**NS**	**272**	**145**	**NS**	**742**

* Weights reported on a dry matter basis
# Treatments with N were applied at 60 lb/a (46-0-0) in the fall of 2001

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Plumeless Thistle Herbicide Evaluation

Otter Tail County

Purpose of Study

Demonstrate effective chemical and cultural strategies for managing plumeless thistle and improve the profitability and sustainability of grazing systems.

Cooperator: Rick Frobem
Nearest Town: Henning
Previous Crop: Permanent pasture
Variety: Pasture mix of grass and legumes
Fertilizer: May 1, 2002/N (46-0-0) broadcast applied
Weed Control: Mowing in previous years
Grazing Dates: June 15 - September 1, 2002 with beef cows and calves
Experimental Design: Randomized complete block with 3 replications

Results (see data on next page)

Plumeless thistle is a relatively new noxious and invasive weed predominately located in central and west central MN. It is a biennial plant reproducing by seed only and commonly found in pastures, CRP, and wastelands. Management of plumeless thistle must focus on reducing seed production in the attempt for long term control. Research was conducted at a cow/calf beef operation in an actively grazed pasture with a severe plumeless thistle infestation.

All herbicides and rates provided excellent plumeless thistle control when applied to plumeless thistle at the rosette stage, in year one. Delayed spraying (bolt stage) still provided very good control with Redeem and Curtail at both rates but control was poor with 2, 4-D and Clarity, suggesting that selecting the correct herbicide was more critical at some application timings than others. Fall ratings were obtained the first year to illustrate soil residual control of newly emerging plumeless thistle. Redeem and Clarity at all rates and timing provided excellent control. Grass injury was noted in some plots but not measured while legume injury was significant in all treated plots ranging from 80 (2, 4-D at 2 pt – bolt) to 100% (Redeem at 1.5 pt – rosette).

In year two of the study, treatments were repeated. No significant differences were found in grass production leading researchers to believe minimal damage occurred to the grasses with the herbicide usage. Even though significant legume injury was visually recorded the previous year, biomass production differences were non-significant. Plumeless thistle biomass differences were the result of herbicide carry-over control from the previous year. 2, 4-D treatments at rosette and bolting stages had thistle biomass statistically similar to the non-treated even with visual control ratings above 90%. This is probably due to the slowness of the growth regulator type mode of action. Visual and biomass ratings identified complete control with Redeem and Curtail regardless of variables and Clarity applied at the rosette stage.

The research was conducted to determine and illustrate the best approaches to effectively control plumeless thistle. All herbicides were found to be effective but some of the success was dependent upon thistle growth stage. Cost to treat varied from $3.15/a 2, 4-D to $12.20/a (Redeem at 1.5 pt) and must be included in the evaluation of approaching a problem site. Considerable thought must also continue beyond the successful control of plumeless thistle as the pasture system must be managed to incorporate proper soil fertility, presence of desirable plants, and animal grazing parameters to insure a competitive natural system leading to pasture sustainability and profitability.

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Partnership: University of Minnesota Central Regional Partnership, Minnesota Department of Agriculture
Funding: University of Minnesota Central Regional Partnership

Organic Soybean Management Evaluation

Polk & Clay Counties

Cooperator: Jim and Pat Todahl, Lynn Brakke
Nearest Town: Fertile (F), Comstock (C)
Soil Type: Flaming sandy loam (F); Bearden silty clay loam (C)
Tillage: Fall chiseled, spring cultivated (F); Fall chiseled, spring multiweeder (C)
Previous Crop: Wheat
Variety: MN0201
Planting Date: May 27, 2002 (F); May 17, 2002 (C)
Row Width: 8" (F) and 22" (C)
Fertilizer: 3 ton/a turkey manure applied fall 2000 (F) and composted poultry manure had been added in previous years (C)
Inoculation: Soybeans seed was inoculated with Rhizobia bacteria
Weed Control: Harrowed 1 time. Due to wet weather, weeds were not adequately controlled (F); Harrowed and hand weeded (C)
Harvest Date: October 10, 2002 (F) and September 26, 2002 (C)
Experimental Design: Randomized complete block with 4 replications

Purpose of Study

To evaluate soybean response to organic soil amendments ASA 50 and compost tea at two rates under a certified organic production system.

Results

The soil amendments did not influence yield compared with the control treatment. The oil content was greater than the control plot when compost tea at ½ gallon per acre was applied at the Fertile location.

	Yield (bu/a)		Protein (%)		Oil (%)	
Treatment	**Comstock***	**Fertile**	**Comstock**	**Fertile**	**Comstock**	**Fertile**
Control	25.7	28.1	35.6	39.6	16.5	17.5
Compost tea 1/2 gal/a	25.8	28.6	35.1	39.3	16.6	17.7
Compost tea 1 gal/a	24.4	29.0	35.3	39.8	16.7	17.4
ASA 50 1/2 gal/a	22.2	26.7	35.4	39.6	16.4	17.5
ASA 50 1 gal/a	23.9	24.8	35.7	39.6	16.3	17.5
LSD (0.10)	**NS**	**NS**	**NS**	**NS**	**NS**	**0.2**

* Yield was reduced by a late season hail storm.

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Funding: University of Minnesota Northwest Regional Partnership

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Effect of "Black Gold" Compost Rates on Organic Soybean Yield & Weed Density

Polk & Roseau Counties

Purpose of Study

The Black Gold composting project started as a means of economic development for rural counties and to increase income from livestock. To make this product a viable source of nutrients for the organic grower there's a need to determine that the finished product would pass as an organic product. Weed seeds need to be destroyed in order to minimize weed competition in the producer's field. This years compost tests used a mixture of turkey litter and dairy manure.

Cooperator: Michael Klawitter and Albert Penas
Nearest Town: Euclid and Greenbush
Fertilizer: Compost (see table)
Weed Control: Cultivation
Experimental Design: Randomized complete block with 4 replications

Treatment	Euclid				Greenbush		
	Yield (bu/a)	Protein (%)	Oil (%)	Population (x1000)	Yield (bu/a)	Protein (%)	Oil (%)
Check	23.7	37.0	16.7	193.1	48.1	36.4	18.0
5 Ton	25.8	37.7	17.1	184.4	44.0	36.7	17.9
8 Ton	25.2	37.2	17.0	197.4	46.7	36.9	17.9
12 Ton	25.8	37.6	16.8	190.2	46.6	37.3	17.7
LSD (0.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

Results

There were no significant differences found at either location with respect to yield, protein concentration or oil percentage. Plant population and weed densities were not significantly different at the Euclid site showing that composting is efficient at killing weed seeds. This is the first year of this study and environmental conditions during the 2002 growing season were far from ideal. Additional research will be conducted next year.

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Funding: Minnesota Department of Agriculture Sustainable Agriculture Grant

Otter Tail County

Plumeless Thistle Herbicide Evaluation (cont.)

2001 Data	Cost ($/a)	Rate (unit/a)	Timing	Plumeless Thistle (% Control)	Plumeless Thistle (% Control)	PT Residual (% control)*	Legume Injury (%)
Treatment				**6-21-01**	**9-13-01**	**9-13-01**	**7-13-01**
2,4-D	3.15	2 pt	Rosette	87	98	47	88
2,4-D	3.15	2 pt	Bolting	43	65	40	80
2,4-D 2,4-D	3.15 3.15	2 pt 2 pt	Rosette Fall	76	91	44	87
Clarity + NIS	11.80	1 pt + 0.5%	Rosette	95	98	80	97
Clarity + NIS	11.80	1 pt + 0.5%	Bolting	53	62	48	92
Redeem	12.20	1.5 pt	Rosette	99	100	100	100
Redeem	12.20	1.5 pt	Bolting	87	97	100	99
Redeem Redeem	6.10 6.10	0.75 pt 0.75 pt	Rosette Fall	94	100	100	99
Curtail	8.75	2 pt	Rosette	100	100	100	99
Curtail	8.75	2 pt	Bolting	80	85	100	93
Curtail Curtail	4.35 4.35	1 pt 1 pt	Rosette Fall	93	99	87	92
Nontreated w/N fert			Rosette	0	0	0	0
LSD (0.05)				**12**	**16**	**39**	**7**

2002 Data	Cost ($/a)	Rate (unit/a)	Timing	Plumeless Thistle (plants/ft²)	Plumeless Thistle (% Control)		Biomass 6-03-02** (lb/a)				
Treatment				**5-28-02**	**5-28-02**	**8-05-02**	**Grass**	**Legumes**	**PThistle**	**Misc**	**Total**
2,4-D	3.15	2 pt	Rosette	1.1	60	92	1594	0	400	252	2245
2,4-D	3.15	2 pt	Bolting	2.4	50	95	1977	159	235	307	2678
2,4-D 2,4-D	3.15 3.15	2 pt 2 pt	Rosette Fall	0.9	79	98	1627	142	148	197	2114
Clarity + NIS	11.80	1 pt + 0.5%	Rosette	1.5	85	100	1796	71	0	230	2098
Clarity + NIS	11.80	1 pt + 0.5%	Bolting	0.8	38	97	2103	153	77	312	2645
Redeem	12.20	1.5 pt	Rosette	0.2	98	100	1857	0	0	225	2081
Redeem	12.20	1.5 pt	Bolting	0.3	96	100	1928	0	0	203	2130
Redeem Redeem	6.10 6.10	0.75 pt 0.75 pt	Rosette Fall	0.0	100	100	1933	0	0	93	2026
Curtail	8.75	2 pt	Rosette	0.5	99	100	1720	0	0	290	2010
Curtail	8.75	2 pt	Bolting	0.0	95	100	1610	0	0	340	1950
Curtail Curtail	4.35 4.35	1 pt 1 pt	Rosette Fall	0.0	100	100	1747	71	0	153	1972
Nontreated w/N fert			Rosette	8.1	0	0	1632	159	214	252	2256
LSD (0.05)				**3.9**	**27**	**6**	**NS**	**NS**	**155**	**NS**	**NS**

*Control of new fall rosettes from herbicide residual activity
**Weights reported on dry matter basis

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Soybean Maximum Yield Evaluation

Wilkin, Norman, Polk, Pennington, Marshall, Roseau, & Kittson Counties

Purpose of Study

Soybean is second only to wheat in acreage in northwestern Minnesota. Soybean yields must increase for farmers in the region to profitably produce soybeans in the future. The treatments, which were chosen for the Maximum Economic Production experiment, were based on input from soybean farmers and observations from Extension Educators in the region as possible limiting factors to maximum production of soybean.

Cooperator: Geral Nordick **Nearest Town:** Rothsay
Larry Hellerud — Ada
Ellsworth Danielson — Fosston
Keith Christensen — Thief River Falls
Brian Jenson — Stephen
Cenex West Plant — Roseau
Archie Lundell — Kennedy

Planting Date: May 20-31, 2002
Row Width: 10"
Variety: MN 0302 (south sites) and Mycogen 5007 (north sites)
Harvest Dates: September 20 - October 5, 2002
Experimental Design: Randomized complete block with 4 replications

Results

The Ada, Stephen and Roseau locations were abandoned during the season due to excess flooding of the plots on several occasions. The Kennedy location was harvested; however, excess moisture at this location had damaged in too many plots to be included in the results. Protein and oil content were measured on sub-samples using an InfraTec 1229 grain analyzer. At the Thief River Falls location the P_2O_5 was applied with the seed at planting. Yields were significantly reduced at the Thief River Falls site by placing the P_2O_2 in contact with the seed. There were no significant differences measured at the Rothsay site. There was a significant difference in protein content at the Fosston site with treatment 4 compared to treatments 2 & 6 however the differences are not explainable with this experimental design.

Treatment	Rhizobia Inoculation*	Seed Treatment Fungicide*	Iron Seed Coating*	P_2O_5*	Cost ($)
1	Yes	Yes	Yes	Yes	36.70
2	No	Yes	Yes	Yes	33.40
3	Yes	No	Yes	Yes	34.10
4	Yes	Yes	No	Yes	25.70
5	Yes	Yes	Yes	No	16.90
6	No	No	No	No	0.00

* Variables: Material & Rate
Inoculation — Cell-Tech SCI @ 4.25oz/100 lb seed
Iron seed coat — 1 lb actual iron/a (6% iron chelate)
Fungicide — Apron Max RTA @ 5 oz/100 lb seed
Phosphorus — 90 lb P_2O_5/a

	Rothsay			Fosston			Thief River Falls		
Treatment	Yield (bu/a)	Protein (%)	Oil (%)	Yield (bu/a)	Protein (%)	Oil (%)	Yield (bu/a)	Protein (%)	Oil (%)
1	40.8	34.0	20.3	53.0	35.2	19.0	30.7	34.5	17.7
2	42.2	34.1	20.0	49.9	35.6	19.0	29.6	34.6	17.5
3	42.4	34.3	19.3	51.4	35.0	19.2	30.6	35.5	17.5
4	42.6	34.2	20.3	46.7	34.9	19.3	26.6	35.4	17.3
5	42.8	34.5	19.8	52.9	35.6	19.1	38.5	34.7	17.3
6	41.6	34.5	20.1	50.4	35.2	19.1	33.9	35.0	17.4
LSD (0.05)	**NS**	**NS**	**NS**	**NS**	**0.6**	**NS**	**6.2**	**NS**	**NS**

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Co-Investigators: Doug Holen, Zach Fore, Hans Kandel, Bill Craig, Ken Pazdernik, Nathan Johnson, Curtis Nyegaard, George Rehm, and Seth Naeve

Organic Soybean Variety Evaluation

Polk & Clay Counties

Purpose of Study

To evaluate soybean variety response under two management systems: hand weeded and seeded in rows (Comstock) and no weed control and solid seeded (Fertile). Both locations are certified organic.

Cooperator: Jim and Pat Todahl **Nearest Town:** Fertile (F)
Lynn Brakke — Comstock (C)

Soil Type: Flaming sandy loam (F)
Bearden silty clay loam (C)
Tillage: Fall chiseled, spring cultivated (F)
Fall chiseled, spring multiweeder (C)
Previous Crop: Wheat
Variety: See table
Planting Date: May 27, 2002 (F)
May 17, 2002 (C)
Row Width: 8" (F) and 22" (C)
Fertilizer: 3 ton/a turkey manure applied fall 2000 (F) and composted poultry manure had been added in previous years (C)
Inoculation: Soybeans seed was inoculated with Rhizobia bacteria
Weed Control: Harrowed 1 time. Due to wet weather, weeds were not adequately controlled (F)
Harrowed and hand weeded (C)
Harvest Date: October 10, 2002 (F) and September 26, 2002 (C)
Experimental Design: Randomized complete block with 4 replications

	Yield (bu/a)		Protein (%)		Oil (%)	
Variety	Comstock[1]	Fertile[2]	Comstock	Fertile	Comstock	Fertile
Bygland	34.2	7.8	31.8	35.8	17.2	18.6
MN0301	31.3	4.5	30.6	35.3	17.9	19.2
NK S0880	31.1	10.8	33.3	36.0	17.8	19.2
Nornatto	29.8	3.5	28.8	35.4	16.2	17.1
Jim	28.4	9.7	31.6	35.8	16.7	18.0
Atwood	27.7	13.9	31.4	36.5	17.4	18.8
Viper	27.0	5.9	34.4	36.3	17.6	19.1
Traill	26.6	6.9	33.9	36.5	16.2	17.7
Proto	26.4	13.6	38.2	39.2	15.0	16.8
MN0302	26.3	8.9	32.1	36.8	17.7	19.0
UM3	26.2	4.7	32.5	36.1	14.5	17.2
Panther	24.1	10.2	36.9	38.2	16.8	18.1
MN0201	24.0	11.1	34.7	39.6	16.3	17.5
Norpro	23.6	8.0	36.4	39.9	15.8	17.1
Dannatto	22.9	4.5	30.5	36.8	17.1	17.8
Minnatto	21.3	2.3	36.2	38.9	14.8	15.9
Nannatto	20.3	2.4	30.6	37.9	15.8	17.2
Average	26.5	7.6	33.2	37.1	16.5	17.9
LSD (0.05)	**3.6**	**NS**	**1.0**	**0.8**	**0.6**	**0.2**

[1] Yields were significantly reduced due to a late season hail storm
[2] Yields were low due to heavy weed pressure

Results

There were significant yield differences in Comstock. Varieties differed in their response to weed pressure. Proto had the greatest protein content. MN0 301 had the greatest oil content. Overall, protein and oil content were greater in Fertile compared to Comstock.

Partnership: Paul Porter
Funding: University of Minnesota Northwest Regional Partnership

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Soybean Phosphorus Rate Evaluation

Polk County

Purpose of Study
To determine if phosphorus fertility is required and at what rate on low testing phosphorus soils in northwest Minnesota with the newer soybean varieties available.

Cooperator: Ron Peterson
Nearest Town: Crookston
Soil Type: Ulen loamy fine sand
Tillage: Chisel plowed
Previous Crop: Sugarbeets
Variety: Legend 009
Planting Date: May 25, 2002
Row Width: 22"
Fertilizer: See table
Herbicide: Rezult at recommended rates
Planting Populations: 180,000
Harvest Date: September 20, 2002
Experimental Design: Randomized complete block with 4 replications
Soil Test: 7 ppm P_2O_5 (Olsen)

Results
There was a yield and protein concentration response to phosphorus rates. Soybean yields increased from 37.6 bu/a with no added phosphorus to 43.1 bu/a with the addition of 90 pounds of P_2O_5/a. Protein concentration increased from 31.8 percent with no added phosphorus to 33.8 percent with the addition of 90 pounds of P_2O_5.

Treatment (lbs P_2O_5/a)	Yield (bu/a)	Protein (%)	Oil (%)	Yield Increase (bu/a)	Gross Return* ($/a)	Net Return** ($/a)
0	37.6	31.8	16.5	-	-	-
15	40.2	32.1	16.4	2.6	$13.00	$9.70
30	40.1	32.8	16.5	2.5	$12.35	$5.75
45	40.9	32.9	16.2	3.3	$16.50	$6.60
60	41.6	32.5	15.7	3.9	$19.60	$6.40
75	42.6	33.4	16.6	4.92	$24.60	$8.10
90	43.1	33.8	16.3	5.5	$27.50	$7.70
LSD (0.05)	**3.3**	**1.0**	**NS**			

* based on $5.00 local price
** based on P_2O_5 at $0.22/lb

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Partial Funding: Minnesota Soybean Research and Promotional Council

Otter Tail County

Soybean Aphid Insecticide Evaluation

Cooperator: Dan and Phil Jennen
Nearest Town: Fergus Falls
Soil Type: Silt loam
Tillage: Disk ripper
Previous Crop: Corn
Variety: Pioneer 90B74
Planting Date: May 25, 2002
Row Width: 15"
Fertilizer: 23-60-50 applied as DAP + potash
Herbicide: Two applications of Glyphosate at 1 qt each
Insecticides: R3 on July 25, 2002
Harvest Date: September 28, 2002
Experimental Design: Randomized complete block with 4 replications

Purpose of Study
Evaluate insecticide efficacy and residual control on soybean aphid populations.

Treatment	Rate (product/a)	Yield (bu/a)	Seeds (per lb)	Aphid rating[1]/plant - days post			
				4	7	21	28
Warrior T	1.92 oz	52.4	3044	1.1	1.6	5.8	4.9
Actara 25WG	24 oz	50.8	3006	1.3	1.8	4.3	3.4
Assail 70WG	1.14 oz	50.1	3016	1.4	2.0	4.9	3.9
Asana XL	9 oz	49.3	3021	1.5	1.7	3.9	2.5
Assail 70 WG	2.28 oz	49.2	2980	1.0	1.5	2.0	1.8
Penncap-M	2 pt	48.6	3170	1.2	2.4	5.7	6.4
Mustang	3.9 oz	48.1	3097	1.9	2.2	5.9	5.8
Warrior T	3.8 oz	47.8	3066	1.1	1.2	4.7	3.5
Asana XL	6.4 oz	47.7	3019	1.6	1.9	4.7	2.6
Provado	3.2 oz	47.2	3074	1.4	2.2	6.1	5.0
Mustang	4.3 oz	46.9	3219	2.8	2.6	5.2	5.8
Lorsban	2 pt	46.4	3114	1.3	1.8	5.7	5.6
Lorsban	1 pt	45.1	3236	1.7	2.3	6.3	6.4
Dimethoate	1 pt	45.1	3305	2.8	3.7	6.5	6.2
Monitor	1 pt	45.0	3198	1.3	1.8	4.8	4.5
Untreated		42.1	3444	3.9	5.0	6.7	7.0
LSD (0.05)		**3.8**	**153**	**1.0**	**0.99**	**1.0**	**1.2**

[1]Aphid rating scale: 1=0 aphids, 2=1-10, 3=11-25, 4=26-50, 5=51-100, 6=101-200, 7=200+

Results
Insecticides were applied at a 'late' time (R3 or the beginning of pod set). All insecticides provided significant reductions in aphid numbers 4 days after treatment. Differences in residual control were evident at the 21 and 28 day evaluations, with better 'long-term' control provided by insecticides Warrior T, Asana XL, Actara (not labeled on soybean) and Assail (not labeled on soybean). Yield differences ranged from 6 to 10 bu/a. Much of the increase in yield can be attributed to better seed fill. In this study, the kernel weight and seeds per pound data suggests that the differences, in yield are due to the effects of aphid feeding on grain fill.

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Partnerships: Dave Noetzel, Bobby Holder, and Northwest Research and Outreach Center
Funding: Minnesota Soybean Research and Promotion Council

Soybean Aphid Aerial Insecticide Evaluation

Otter Tail County

Purpose of Study
Compare soybean aphid control with an insecticide using air and ground application.

Cooperator: Mark Schoening
Nearest Town: Underwood
Soil Type: Silt loam
Tillage: No till
Previous Crop: Wheat
Variety: Asgrow 0801
Planting Date: May 20, 2002
Row Width: Air seeder with 4" bands on 10" centers
Fertilizer: None
Herbicide: May 21, 2002 - Glyphosate at 2 pints
July 9, 2002 - Glyphosate at 1.5 pints
Insecticide Treatments: May 30, 2002 - Warrior at 3 oz. by plane with 5 gallons carrier
May 30, 2002 - Warrior at 3 oz. by ground with 12 gallons of carrier
Harvest Date: October 2, 2002
Experimental Design: Strip trial - ANOVA was performed using within sample variance as the error term to test differences among treatments

Results
Warrior T provided excellent initial control of soybean aphid and appeared to be suppressing aphid populations 24 days after application with both application methods. Small differences between the ground and aerial application were observed in residual activity and seed/lb. There were no differences in yield due to application method.

Treatment	Warrior Rate (product/a)	Water Volume (gallons/a)	Aphid ratings[1]/plant -days post			Yield (bu/a)	Seeds/lb
			2	17	24		
Ground	3 oz	12	2.3	3.6	5.1	51.2	2692
Airplane	3 oz	5	2.9	4.8	5.9	50.7	2888
Untreated	-	-	6.4	6.9	7.0	41.8	3050
LSD (0.05)			**0.76**	**0.69**	**0.71**	**3.2**	**84**

[1]Aphid rating scale: 1=0 aphids, 2=1-10, 3=11-25, 4=26-50, 5=50-100, 6=101-200, 7=200+

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Polk County

Soybean Conventional & Roundup Ready Variety Evaluation

Cooperator: Ellsworth Danielson
Nearest Town: Fosston
Soil Type: Sandy loam
Tillage: Cultivated
Previous Crop: Wheat
Variety: See tables
Planting Date: May 31, 2002
Row Width: 10"
Fertilizer: None
Herbicide: Roundup and Rezult at recommended rates
Populations: 180,000
Harvest Date: October 3, 2002
Experimental Design: Randomized complete block with 4 replications

Purpose of Study
To evaluate yield potential of conventional and Roundup Ready varieties in the inter-beach soils of northwest Minnesota.

Results
The conventional variety trial consisted of eleven varieties with a yield range of 41.4 to 56.5 bushels per acre. Variety comparisons with yields greater than 5.0 bushel differences are significantly different from each other. The Roundup Ready variety trial consisted of seventeen varieties with a yield range of 42.6 to 57.8 bushels per acre. Variety comparisons with yields greater than 10.1 bushel differences are significantly different from each other.

Roundup Ready

Company	Variety	Yield (bu/a)
Syngenta-NK Brand	SOO-N7RR	57.8
NorthStar Genetics	NS0314RR	54.8
Thunder	2301RR	53.9
Asgrow	501	53.4
Hyland	Rugged RR	52.5
Wensman	20091RR	50.8
Legend	LS0709	50.5
Atlas	5B009RR	48.8
Legend	LS0201RR	47.9
Syngenta-NK Brand	SOO-J4RR	47.8
NorthStar Genetics	NS0206RR	47.6
Thunder	2200RR	47.3
DeKalb	0651RR	47.1
Atlas	5B020RR	44.7
Wensman	2033RR	44.4
Pioneer	90B11	44.0
Hyland	Raven	42.6
LSD (0.05)		**10.1**
Average Yield		**49.2**

Conventional

Company	Variety	Yield (bu/a)
Legend	LS009	56.5
NorthStar Genetics	NS0001	56.3
NorthStar Genetics	NS0002	56.1
NDSU	Barnes	55.1
Pioneer	90B43	55.0
Legend	LS0557	54.0
Syngenta-NK Brand	SOO-A6	50.1
NDSU	Traill	48.5
U of M	MN0302	45.8
Mycogen	5007	45.0
Hyland	Emerson	41.4
LSD (0.05)		**5.0**
Average Yield		**51.3**

Funding: Seed companies

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2002 Season Offers Learning Opportunities with Soybean Aphids

by Doug Holen

With the 2002 growing season at an end, it's always interesting to reflect on the climate and production factors contributing to yield for the year. Most areas in the region experienced delayed planting due to the extended cold and wet spring and later went through extended periods of dry and heat. The last obstacle was the removal of crops during a challenging harvest time with uncooperative weather and slow crop maturation. Scouting throughout the season revealed several pest problems including alfalfa weevil, European corn borer, and grasshoppers, white mold, root rot, and leaf diseases, pigweeds, kochia, and Canada thistle. Research efforts focused on soybean aphids (SBA) as the Fergus Falls area realized economic thresholds midway through the season.

The outbreak offered the unique opportunity to concentrate research efforts on a new pest. The first thing learned was the SBA's ability to overwinter in WC MN. Many aphid species, that are pests on crops in Minnesota, are not able to survive our cold winters, this insect survived the winter in locations across the state. Several buckthorn species have been identified as suitable hosts for overwintering, which means SBA won't have any trouble finding a place to spend the winter in Minnesota. Scouting can be done efficiently with this knowledge by beginning at field margins closest to wooded areas or wind obstructions such as buildings which tend to encourage landing of SBAs in flight. Areas with significant SBA populations tended to be in close proximity to metropolitan areas (towns) and wooded acreage.

The outbreak in 2002 was different from observations made in 2001 when SBA caused widespread damage to southern Minnesota soybeans. In 2001, soybean aphids tended to build to high populations and then developed a winged generation that migrated to other areas. In 2002, aphid populations sustained large populations (500-4000/plant) for 30 to 40 days, with no migration generation produced. Aphid colonies on plants did not stay in the same location on the plant through the growing season. Initial populations were located primarily on the top trifoliate leaves, and as the population increased, later in the season, were located throughout the plant, including leaves (up and down plant), stems, and/or pods.

University of Minnesota research plots were initiated and monitored throughout the season west and east of Fergus Falls at producer sites identified with heavy SBA infestations. SBA counts were collected prior to insecticide application and populations were monitored post treatment. Data collected included insecticide evaluations for immediate and residual control, and yield and quality consequences to soybean plants. Significant differences in yield, seeds/lb., and oil content were found at both sites. Specific insecticides provided better initial and residual control when compared to each other and the untreated checks. Air and ground application methods were found to be equally effective but could differ depending on the choice of insecticide. Both sites resulted in approximately ten bushel yield decreases in the non treated plots. Much of the yield loss can be accounted for by reduced seed size, but surprisingly, this was not detectable by measuring test weight differences. Additional testing will be done in 2003 to evaluate application timing to quantify SBA number and plant stage interactions as well as variety susceptibility differences.

Will Subsoiling Increase Crop Yields in Minnesota?

by Jodi DeJong-Hughes

Every so often there is interest about subsoiling that is initiated by a favorable report from some locality. But can that local report be applied to our Minnesota glacial till soils?

Subsoiling is a very aggressive tillage operation that breaks up the soil usually to a depth of 12-18 inches. The theory behind subsoiling is to shatter a compacted layer deep in the soil to allow increased water movement, better aeration, and access to additional nutrients for plant growth.

Heavy equipment and tillage implements can damage the soil structure. Soil structure is important because it determines the ability of a soil to hold and conduct water, nutrients, and air necessary for plant growth and is the number one defense against soil compaction.

There has been a great deal of research conducted on deep plowing with the goal of alleviating subsoil compaction. The results are mixed. However, a majority of research conducted in the Midwest, has reported no change or a decrease in yield due to the effects of subsoiling. As early as the 1950's, Midwest researchers were seeing no effect or negative effects from subsoiling. Later, research in Iowa reported no meaningful changes in corn production. They found that subsoiling at a depth of 24 inches decreased the corn yield by 9.7 bushels the first year and 6.4 bushels per acre the following year.

There has been extensive soil compaction research conducted in Southern Minnesota by Ward Voorhees of the USDA/ARS Soils Laboratory. Results of a Waseca study reported that subsoiling to a depth of 16 inches failed to increase yields for neither corn or soybeans and actually decreased corn yield by 11 bushels per acre in one of the two years.

One reason why subsoiling fails to increase crop yield, may be due to unfavorable soil moisture conditions at the time of subsoiling. If the soil is wet, subsoiling will be ineffective. To achieve effective subsoiling the operator must be certain the soil is fracturing to the depth of the shank. If the shank is reaching a depth of 18 inches it is very difficult to determine if the soil is shattering at that depth.

Another reason for the failure of subsoiling to increase crop yield is that subsequent wheel traffic can re-compact the loosened soil. Loosened subsoil has very little bearing capacity, meaning it can't support much weight. Johnson and Voorhees discovered that an ordinary 2-wheel drive tractor, that weighed less than 5 ton an axle, was sufficiently heavy enough to re-compact the loosened soil down to a depth of 16 inches. For that reason, controlled traffic becomes an important management tool.

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