

2024

NORTH AMERICAN BARLEY SCAB EVALUATION NURSERY (NABSEN) REPORT

Thomas Baldwin

***Abraham Hangamaisho**

Department of Plant Pathology North Dakota State University

***Address all enquiries regarding this report to Abraham Hangamaisho, address enclosed**

Collaborating Scientists

Richard D. Horsley Professor & Barley Breeder Department of Plant Sciences North Dakota State University P.O. Box 5051 Fargo, ND 58105-5051, U.S.A. Phone: (701) 231-8142 Fax: (701) 231-8474 Email: Richard.Horsley@ndsu.edu	James Tucker Agriculture & Agri-Food Canada Research Centre P.O. Box 1000A, R.R. #3 Brandon, Manitoba R7A 5Y3 Canada Phone: (431) 338-1791 Fax: (204) 728-3858 Email: JTucker@agr.gc.ca
Thomas Baldwin Assistant Professor Department of Plant Pathology Fargo, North Dakota 58102 (USA) 306 Walster Hall Telephone (208) 244-8635 Facsimile: (701) 231-7851 Email: Thomas.t.baldwin@ndsu.edu	Ana Badea Research Scientist, Barley Breeding and Genetics Brandon Research and Development Centre Agriculture and Agri-Food Canada 2701 Grand Valley Road Brandon, MB R7A 5Y3 Tel: (204) 578 -6573 Fax: (204) 578 -6524 E -mail: Email: ana.badea@agr.gc.ca
Abraham Hangamaisho Research Specialist Department of Plant Pathology NDSU Dept 7660, PO Box 6050 Fargo, ND 58108-6050 Phone (701) 729-9283 Email: abraham.hangamaisho@ndsu.edu	Kevin P. Smith Assistant Professor Department of Agronomy and Plant Genetics University of Minnesota St. Paul, MN 55108 phone (612) 624-1211 fax (612) 625-1268 Email: smith376@umn.edu
Max Fraser Research Technician 3515 Richards Lake Road Fort Collins, CO 80524 Cell Phone: (970) 402-0985 Email: max.fraser@anheuser- busch.com	Ruth Dill-Macky Associate Professor Department of Plant Pathology University of Minnesota St Paul MN 55108 Phone: (612) 625-2227 Fax: (612) 625-9728 Email: ruthdm@umn.edu

INTRODUCTION

Elite barley lines from university cooperators and industry partners are planted each year at five misted nurseries comprising North American Barley Scab Evaluation Nursery (NABSEN). These nurseries are located in the state of North Dakota, Minnesota, and the Canadian province of Manitoba providing a broad range of barley growing regions. The 2024 NABSEN was grown at Fargo, Casselton, Osnabrock and Langdon, ND; St. Paul and Crookston MN, and Brandon, Manitoba. Nurseries were either misted or non-misted (dryland). Dryland nurseries provide conditions similar to those found in commercial fields. Disease in misted fields was more severe than growers would observe in most years and entries with only moderate FHB resistance may have higher disease levels. Dryland nurseries allow discrimination of entries with moderate to low levels of FHB resistance. Each nursery included a set of common checks. The checks were Chevron, and Quest (resistant six-row checks), Explorer and AAC Synergy (new for NABSEN since 2022), Stander (susceptible six-row checks), and Conlon (resistant two-row check). At all locations, the percentage severity of FHB was determined around the middle dough stage by determining the ratio of infected kernels to total kernels on 10-20 spikes per entry and then multiplying by 100.

RESULTS

There was no DON, FHB disease severity, and incidence taken at Casselton, also no FHB disease severity and incidence taken at Osnabrock dryland nursery. FHB disease severity levels were high at Langdon, Fargo and Crookston, and moderate at St Paul, and Brandon (Table 2). DON levels were highest in Langdon and Crookston, followed by Brandon and moderate at Fargo and St Paul. TR23198, FB24624 and S2M193 had the lowest DON levels, these were equal to or less than the resistant 2-rowed variety ‘Conlon’ in the majority of misted trials. DON levels were

high in misted fields and very low at Osnabrock dryland location (Table 4) Temperatures were below the 30-year average (Table 6) for June and August at most of the locations. Precipitation was below the 30-year average at all locations for July. All locations had near normal precipitation for June (Table 7).

This material is based upon work supported by the U.S. Department of Agriculture under the agreement number (FY20-BA-019). This is a cooperative project with the U.S. Wheat & Barley Initiative. “Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.”

Site details are as follows:

Fargo, & Langdon ND – Thomas Baldwin and Abraham Hangamaisho

- Misted
- Inoculated by grain spawn method
- 3 Replicates
- Disease severity - percentage of infected kernels
- Disease incidence - percentage of infected heads
- DON content (ppm) measured by GC/ECD by Z. Jin, NDSU on a composite sample of 3 replicates
- Days to heading counted from date planted to 50% of heads emerged 50%

Osnabrock, ND – Richard Horsley

- Dryland
- Inoculated by grain spawn method
- 3 Replicates
- Disease incidence or severity – none taken
- DON content (ppm) measured by GC/ECD by Z. Jin, NDSU on a composite sample of 3 replicates

Casselton, ND – Max Fraser

- Dryland
- 3 replicates
- Disease incidence, severity, and DON content (ppm) - none taken (harvested by mistake)

ST. PAUL & CROOKSTON, MN– Kevin Smith and Ruth Dill-Macky

- Misted (Crookston and St. Paul)
- 3 replicates
- Inoculated by grain spawn method.
- Disease severity - percentage of infected kernels
- DON content (ppm) measured by GC/ECD by Z. Jin, NDSU on a composite sample of 3 replicates
- Days to heading counted from date planted to 50% of heads emerged 50%

BRANDON, MANITOBA – Ana Badea and James Tucker

- Misted
- 4 replicates RCB design
- Disease severity - percentage of infected kernels
- Disease incidence - percentage of infected heads
- Days to heading counted from date planted to 50% of heads emerged.
- DON content (ppm) measured by ELISA technique at ECORC, Ottawa on a composite sample of 4 replicates.

List of Tables

Table 1. Mean FHB severity, incidence, heading date, and DON of entries grown in the 2024 NABSEN Nursery at Six locations.....	7
Table 2. Mean FHB severity of entries grown in the 2024 NABSEN Nursery at five	9
Table 3. Mean disease incidence of entries grown in the 2024 NABSEN Nursery at three locations.....	10
Table 4. Mean for DON (ppm) entries grown in 2024 NABSEN Nursery at Six locations	11
Table 5. Mean days to heading after planting of entries grown in 2024 NABSEN Nursery at five locations.	12
Table 6. Temperature (°F) compared to the 30-year average 2024.	13
Table 7. Rainfall (in.) compared to the 30-year average 2024.	14
Table 8. Pedigree and source of breeding lines tested for FHB resistance in 2024.	15

Table 1. Mean FHB severity, incidence, heading date, and DON of entries grown in the 2024 NABSEN Nursery at Six locations.

	Manitoba, Canada				Fargo				Langdon				Crookston			St. Paul			Osnabrock ^a
Line	HD (Avg)	Severity (%)	Incidence (%)	DON (%)	HD (Avg)	Severity (%)	Incidence (%)	DON (%)	HD (Avg)	Severity (%)	Incidence (%)	DON (%)	HD (Avg)	Severity (%)	DON (%)	HD (Avg)	Severity (%)	DON (%)	DON (%)
2ND39010	56.0	10.6	95.0	23.5	60.3	35.9	100.0	10.5	57.0	23.6	96.7	20.9	48.3	13.3	22.8	56.7	17.3	16.5	0.1
2ND40316	55.5	11.0	90.0	20.4	61.0	36.2	100.0	10.7	58.3	25.7	100.0	31.2	48.0	18.3	26.2	56.7	23.3	20.8	0.3
2ND40324	55.3	8.2	90.0	25.0	59.7	34.4	100.0	12.4	57.0	28.2	100.0	28.5	48.0	8.3	23.2	55.0	28.7	23.8	0.0
2ND40351	55.5	11.9	97.5	24.3	60.3	33.6	100.0	8.5	58.0	23.6	96.7	26.5	48.0	11.7	22.3	56.0	20.2	19.3	0.0
2ND40363	55.0	7.1	85.0	21.7	61.3	28.5	96.7	12.8	58.0	21.4	100.0	27.4	47.3	16.7	27.8	56.0	17.5	19.4	0.0
2ND41042	55.0	12.0	97.5	23.0	60.3	24.3	83.3	12.1	56.0	41.4	100.0	31.5	46.7	8.3	10.6	55.0	29.0	16.8	0.1
2ND41060	56.5	13.5	97.5	26.9	62.0	35.3	100.0	18.9	56.7	35.8	100.0	37.8	49.7	16.7	21.2	56.7	19.0	13.9	0.0
2ND41065	56.0	9.7	90.0	20.4	61.0	36.0	100.0	21.2	59.0	22.2	96.7	23.7	48.3	10.0	24.1	55.0	30.8	17.7	0.0
AAC Synergy	56.3	14.0	92.5	32.7	63.7	29.0	100.0	16.9	61.0	18.6	100.0	4.4	53.7	5.0	21.7	60.0	16.5	15.4	0.0
Chevron	56.3	8.1	87.5	13.7	62.3	12.6	96.7	9.0	62.0	9.2	86.7	16.1	55.0	2.7	14.6	59.7	10.0	8.1	0.0
Conlon	54.8	8.4	97.5	13.9	61.7	31.5	100.0	15.4	55.7	24.5	100.0	20.0	48.3	23.3	13.8	53.3	16.2	12.5	0.0
Explorer	56.0	12.6	97.5	29.1	62.3	22.0	66.7	19.8	57.7	25.6	100.0	36.5	51.0	4.0	17.6	58.0	16.8	11.9	0.1
FB23618	57.8	7.8	77.5	22.3	65.3	29.0	100.0	13.9	65.3	10.0	76.7	21.8	59.3	2.0	28.0	62.0	8.8	17.2	0.1
FB24211	55.0	14.5	100.0	29.1	60.3	30.8	100.0	16.8	58.0	20.3	96.7	18.5	48.0	20.0	25.2	56.3	19.5	16.2	0.2
FB24213	56.5	11.3	95.0	25.8	66.7	35.7	100.0	16.0	61.0	14.5	96.7	15.7	52.0	10.0	36.0	61.3	16.8	17.1	0.0
FB24624	56.5	6.3	72.5	10.6	64.3	28.8	100.0	5.1	60.7	12.7	96.7	7.9	58.0	3.0	15.3	59.7	21.0	11.5	0.0
QUEST	55.8	15.8	95.0	24.4	62.3	21.7	96.7	18.1	56.7	30.0	100.0	38.3	49.7	33.3	30.7	55.7	23.8	9.5	0.2
S2M191	55.3	11.6	95.0	17.0	61.7	33.7	100.0	22.3	55.7	20.3	93.3	14.6	48.3	25.0	22.1	55.0	24.7	14.6	0.2
S2M193	55.0	9.9	97.5	15.8	59.0	38.6	100.0	18.1	55.0	26.1	90.0	19.6	46.3	36.7	9.6	54.3	24.8	7.5	0.0
S2M196	56.0	10.5	92.5	35.4	59.7	33.8	100.0	24.0	57.0	26.0	100.0	28.8	51.7	21.7	27.8	54.7	44.3	22.1	0.0
S2M201	56.5	7.4	85.0	30.5	60.7	39.7	96.7	16.1	57.0	16.8	100.0	20.2	49.0	20.0	28.3	56.7	26.7	16.3	0.4
S2M202	55.3	8.5	92.5	22.2	60.0	39.8	100.0	17.1	55.7	37.5	100.0	32.0	47.3	26.7	25.0	55.0	27.1	15.8	0.1
S2M203	56.0	9.1	85.0	28.0	60.7	39.0	100.0	18.2	55.7	29.0	100.0	40.0	46.0	31.7	19.8	54.7	40.2	18.7	0.0
S2M204	54.8	7.5	85.0	15.9	60.3	24.0	100.0	18.2	55.7	17.5	90.0	15.4	47.7	30.0	23.6	55.3	19.2	15.1	0.0
S2M205	54.8	5.0	80.0	24.9	59.7	36.9	100.0	25.6	57.0	21.5	90.0	18.1	47.3	31.7	15.4	55.7	25.2	13.6	0.2
S2M206	56.0	12.4	100.0	23.0	62.3	33.3	100.0	10.1	56.7	41.7	96.7	27.2	48.0	36.7	17.2	56.0	39.1	17.4	0.0
Stander	54.3	43.0	100.0	47.5	62.3	30.7	100.0	38.9	58.7	38.8	100.0	52.6	52.3	28.3	75.5	59.3	12.7	22.6	0.9
TR22196	55.5	14.7	97.5	20.9	63.7	31.5	100.0	10.7	59.0	26.3	100.0	26.9	52.0	13.3	21.4	58.7	15.5	10.8	0.0
TR23100	57.0	15.5	95.0	32.9	65.0	22.8	80.0	7.1	64.0	19.9	100.0	34.3	56.7	7.3	26.0	NA	NA	NA	0.2
TR23101	56.0	12.4	97.5	23.3	63.7	43.2	100.0	4.5	60.0	19.5	100.0	29.9	51.0	28.3	7.1	59.0	11.8	15.4	0.0
TR23198	57.3	8.3	80.0	13.6	66.0	30.7	96.7	5.9	64.0	8.4	86.7	10.7	57.3	2.0	12.5	61.7	8.7	9.4	0.1

TR24292	56.8	15.3	90.0	21.5	65.3	33.5	100.0	7.2	64.0	11.4	100.0	14.9	55.3	10.0	12.5	61.3	13.2	13.2	0.0
TR24293	57.3	7.1	90.0	27.6	66.7	33.0	100.0	14.3	64.0	10.2	86.7	13.1	56.7	9.0	14.0	60.7	12.8	22.3	0.0
TR24684	56.5	7.8	87.5	18.5	66.0	22.1	100.0	12.4	60.3	22.4	96.7	19.9	53.3	12.3	24.4	59.0	13.3	13.0	0.0
TR24687	56.5	12.8	95.0	28.2	66.7	31.3	100.0	7.7	60.3	15.9	90.0	25.0	53.7	7.3	35.0	59.3	12.0	22.0	0.1

HD (Avg) = Average heading date

^a Not mist irrigated (dry land)

Table 2. Mean FHB severity of entries grown in the 2024 NABSEN Nursery at five

Line	Manitoba, Canada Severity (%)	Fargo Severity (%)	Langdon Severity (%)	Crookston Severity (%)	St. Paul Severity (%)
2ND39010	10.64	35.92	23.56	13.33	17.33
2ND40316	10.98	36.23	25.67	18.33	23.33
2ND40324	8.17	34.37	28.23	8.33	28.67
2ND40351	11.86	33.62	23.65	11.67	20.17
2ND40363	7.14	28.55	21.45	16.67	17.50
2ND41042	12.01	24.30	41.43	8.33	29.00
2ND41060	13.54	35.30	35.82	16.67	19.00
2ND41065	9.74	36.03	22.20	10.00	30.83
AAC Synergy	14.02	28.96	18.60	5.00	16.50
Chevron	8.13	12.60	9.20	2.67	10.00
Conlon	8.36	31.47	24.53	23.33	16.17
Explorer	12.58	22.05	25.57	4.00	16.83
FB23618	7.78	29.03	10.04	2.00	8.83
FB24211	14.54	30.84	20.27	20.00	19.50
FB24213	11.26	35.69	14.49	10.00	16.83
FB24624	6.32	28.84	12.65	3.00	21.00
QUEST	15.77	21.71	29.97	33.33	23.83
S2M191	11.57	33.67	20.33	25.00	24.67
S2M193	9.86	38.58	26.13	36.67	24.83
S2M196	10.53	33.82	26.03	21.67	44.33
S2M201	7.38	39.74	16.81	20.00	26.67
S2M202	8.49	39.84	37.47	26.67	27.07
S2M203	9.07	39.05	28.97	31.67	40.17
S2M204	7.55	23.97	17.47	30.00	19.17
S2M205	5.05	36.93	21.46	31.67	25.17
S2M206	12.36	33.28	41.68	36.67	39.13
Stander	43.04	30.66	38.82	28.33	12.67
TR22196	14.71	31.51	26.34	13.33	15.50
TR23100	15.50	22.84	19.90	7.33	NA
TR23101	12.43	43.21	19.53	28.33	11.83
TR23198	8.32	30.74	8.35	2.00	8.67
TR24292	15.35	33.45	11.43	10.00	13.17
TR24293	7.06	33.00	10.24	9.00	12.83
TR24684	7.76	22.13	22.40	12.33	13.33
TR24687	12.83	31.27	15.92	7.33	12.00

Table 3. Mean disease incidence of entries grown in the 2024 NABSEN Nursery at three locations.

Line	Manitoba, Canada Incidence (%)	Fargo Incidence (%)	Langdon Incidence (%)
2ND39010	95.00	100.00	96.67
2ND40316	90.00	100.00	100.00
2ND40324	90.00	100.00	100.00
2ND40351	97.50	100.00	96.67
2ND40363	85.00	96.67	100.00
2ND41042	97.50	83.33	100.00
2ND41060	97.50	100.00	100.00
2ND41065	90.00	100.00	96.67
AAC Synergy	92.50	100.00	100.00
Chevron	87.50	96.67	86.67
Conlon	97.50	100.00	100.00
Explorer	97.50	66.67	100.00
FB23618	77.50	100.00	76.67
FB24211	100.00	100.00	96.67
FB24213	95.00	100.00	96.67
FB24624	72.50	100.00	96.67
QUEST	95.00	96.67	100.00
S2M191	95.00	100.00	93.33
S2M193	97.50	100.00	90.00
S2M196	92.50	100.00	100.00
S2M201	85.00	96.67	100.00
S2M202	92.50	100.00	100.00
S2M203	85.00	100.00	100.00
S2M204	85.00	100.00	90.00
S2M205	80.00	100.00	90.00
S2M206	100.00	100.00	96.67
Stander	100.00	100.00	100.00
TR22196	97.50	100.00	100.00
TR23100	95.00	80.00	100.00
TR23101	97.50	100.00	100.00
TR23198	80.00	96.67	86.67
TR24292	90.00	100.00	100.00
TR24293	90.00	100.00	86.67
TR24684	87.50	100.00	96.67
TR24687	95.00	100.00	90.00

Table 4. Mean for DON (ppm) entries grown in 2024 NABSEN Nursery at Six locations

	Manitoba, Canada	Fargo DON (%)	Langdon DON (%)	Crookston DON (%)	St. Paul DON (%)	Osnabrock^a DON (%)
Line	DON (%)					
2ND39010	23.47	10.5	20.9	22.80	16.53	0.1
2ND40316	20.44	10.7	31.2	26.23	20.83	0.3
2ND40324	25.01	12.4	28.5	23.20	23.80	0.0
2ND40351	24.34	8.5	26.5	22.30	19.30	0.0
2ND40363	21.74	12.8	27.4	27.80	19.43	0.0
2ND41042	23.05	12.1	31.5	10.57	16.83	0.1
2ND41060	26.89	18.9	37.8	21.20	13.87	0.0
2ND41065	20.39	21.2	23.7	24.10	17.70	0.0
AAC						
Synergy	32.73	16.9	4.4	21.65	15.40	0.0
Chevron	13.73	9.0	16.1	14.60	8.13	0.0
Conlon	13.88	15.4	20.0	13.80	12.47	0.0
Explorer	29.07	19.8	36.5	17.57	11.93	0.1
FB23618	22.35	13.9	21.8	28.00	17.20	0.1
FB24211	29.09	16.8	18.5	25.15	16.23	0.2
FB24213	25.85	16.0	15.7	35.97	17.13	0.0
FB24624	10.57	5.1	7.9	15.27	11.49	0.0
QUEST	24.42	18.1	38.3	30.73	9.53	0.2
S2M191	16.98	22.3	14.6	22.07	14.63	0.2
S2M193	15.82	18.1	19.6	9.57	7.47	0.0
S2M196	35.43	24.0	28.8	27.83	22.10	0.0
S2M201	30.50	16.1	20.2	28.30	16.27	0.4
S2M202	22.23	17.1	32.0	24.97	15.80	0.1
S2M203	27.99	18.2	40.0	19.83	18.73	0.0
S2M204	15.89	18.2	15.4	23.60	15.10	0.0
S2M205	24.86	25.6	18.1	15.40	13.57	0.2
S2M206	23.03	10.1	27.2	17.15	17.37	0.0
Stander	47.53	38.9	52.6	75.53	22.57	0.9
TR22196	20.90	10.7	26.9	21.35	10.83	0.0
TR23100	32.85	7.1	34.3	26.00	NA	0.2
TR23101	23.28	4.5	29.9	7.05	15.40	0.0
TR23198	13.62	5.9	10.7	12.53	9.37	0.1
TR24292	21.49	7.2	14.9	12.50	13.17	0.0
TR24293	27.63	14.3	13.1	14.03	22.27	0.0
TR24684	18.51	12.4	19.9	24.37	13.00	0.0
TR24687	28.15	7.7	25.0	35.00	22.03	0.1

^a Not mist irrigated (dry land)

Table 5. Mean days to heading after planting of entries grown in 2024 NABSEN Nursery at five locations.

Line	Manitoba, Canada HD (Avg) ¹	Fargo HD (Avg) ¹	Langdon HD (Avg) ¹	Crookston HD (Avg) ¹	St. Paul HD (Avg) ¹
2ND39010	56.00	60.33	57.00	48.33	56.67
2ND40316	55.50	61.00	58.33	48.00	56.67
2ND40324	55.25	59.67	57.00	48.00	55.00
2ND40351	55.50	60.33	58.00	48.00	56.00
2ND40363	55.00	61.33	58.00	47.33	56.00
2ND41042	55.00	60.33	56.00	46.67	55.00
2ND41060	56.50	62.00	56.67	49.67	56.67
2ND41065	56.00	61.00	59.00	48.33	55.00
AAC Synergy	56.25	63.67	61.00	53.67	60.00
Chevron	56.25	62.33	62.00	55.00	59.67
Conlon	54.75	61.67	55.67	48.33	53.33
Explorer	56.00	62.33	57.67	51.00	58.00
FB23618	57.75	65.33	65.33	59.33	62.00
FB24211	55.00	60.33	58.00	48.00	56.33
FB24213	56.50	66.67	61.00	52.00	61.33
FB24624	56.50	64.33	60.67	58.00	59.67
QUEST	55.75	62.33	56.67	49.67	55.67
S2M191	55.25	61.67	55.67	48.33	55.00
S2M193	55.00	59.00	55.00	46.33	54.33
S2M196	56.00	59.67	57.00	51.67	54.67
S2M201	56.50	60.67	57.00	49.00	56.67
S2M202	55.25	60.00	55.67	47.33	55.00
S2M203	56.00	60.67	55.67	46.00	54.67
S2M204	54.75	60.33	55.67	47.67	55.33
S2M205	54.75	59.67	57.00	47.33	55.67
S2M206	56.00	62.33	56.67	48.00	56.00
Stander	54.25	62.33	58.67	52.33	59.33
TR22196	55.50	63.67	59.00	52.00	58.67
TR23100	57.00	65.00	64.00	56.67	NA
TR23101	56.00	63.67	60.00	51.00	59.00
TR23198	57.25	66.00	64.00	57.33	61.67
TR24292	56.75	65.33	64.00	55.33	61.33
TR24293	57.25	66.67	64.00	56.67	60.67
TR24684	56.50	66.00	60.33	53.33	59.00
TR24687	56.50	66.67	60.33	53.67	59.33

¹ Day to heading counted from date planted to 50% of heads emerged 50%

Table 6. Temperature (°F) compared to the 30-year average 2024.

Location	May	June	July	August
Fargo, ND	1.0	-1.0	2.0	0.0
Langdon, ND	0.0	-1.0	2.0	-1.0
St. Paul, MN	2.8	-0.7	-0.6	-0.5
Crookston, MN	1.0	-1.0	1.0	-1.0
Manitoba	1.1	-2.0	2.9	0.0

Table 7. Rainfall (in.) compared to the 30-year average 2024.

Location	May	June	July	August
Fargo, ND	2.62	0.19	-1.54	0.04
Langdon, ND	3.23	1.10	-0.53	1.90
St. Paul, MN	1.95	2.88	1.80	1.03
Crookston, MN	1.99	1.02	-1.85	3.81
Manitoba	1.87	0.86	-1.64	-0.85

Table 8. Pedigree and source of breeding lines tested for FHB resistance in 2024.

Entry	Line*	Alias	Pedigree*	Row Type	Source*
1	S2M191		S2M179 (TM15.002-12) / 2ND32829	2	Univ. of Minn
2	S2M193		TM14.013-27 / S2M180 (TM15.002-19)	2	Univ. of Minn
3	S2M196		TM16.108-16/S2M182 (TM15.162-27)	2	Univ. of Minn
4	S2M201		TM15.162-27//TM16.001-07/TM16.241-01	2	Univ. of Minn
5	S2M202		TM15.162-27-1/TM16.261-020	2	Univ. of Minn
6	S2M203	TM18.140-035	TM15.162-27//TM16.001-07/TM16.241-01	2	Univ. of Minn
7	S2M204	2MS20_3272-008	TM17.272-02 / TM17.276-09	2	Univ. of Minn
8	S2M205	2MS20_3272-021	TM17.272-02 / TM17.276-09	2	Univ. of Minn
9	S2M206	TM19.003-008	TM16.283-016/TM17.302-07	2	Univ. of Minn
10	2ND39010		2ND32658/2ND32824	2	North Dakota State University
11	2ND40316		2ND32657/2ND34960	2	North Dakota State University
12	2ND40324		2ND32657/2ND34960	2	North Dakota State University
13	2ND40351		2ND32657/2ND34960	2	North Dakota State University
14	2ND40363		2ND32657/2ND34960	2	North Dakota State University
15	2ND41042		2ND32529/2ND35677	2	North Dakota State University

Entry	Line*	Alias	Pedigree*	Row Type	Source*
16	2ND41060		2ND32529/2ND35677	2	North Dakota State University
17	2ND41065		2ND32657/2ND35530	2	North Dakota State University
18	TR22196	SM191604	TR15153/SM130596	2	CDC
19	TR23198	SM202056	TR17169/TR15152	2	CDC
20	TR23100	SM202337	CDC Churchill/TR14146	2	CDC
21	TR23101	SM201205	CDC Copper/CDC Churchill	2	CDC
22	TR24292	BM1429-009	AAC Synergy/TR13144	2	AAFC
23	TR24293	BM1706DT-471	AAC Synergy/BM0805-239	2	AAFC
24	FB24211	OB1878-ON-50	SM140841/2ND33821	2	AAFC
25	FB24213	BM1710-133	TR15155/BM0805-239	2	AAFC
26	FB23618	J17048001	CDC AUSTENSON/AB WRANGLER	2	FCDC
27	FB24624	K19074003	TR19654/CLAYMORE	2	FCDC
28	TR24684	J17013060	AAC CONNECT/TR17635	2	FCDC
29	TR24687	J17017023	AAC SYNERGY/TR17635	2	FCDC
30	QUEST	Check	FEG18-20/M110	6	
31	Conlon	Check		2	
32	Explorer	Check	Beatrix/Marnie	2	
33	AAC Synergy	Check	TR02267/Newdale	2	
34	Chevron	Check		6	
35	Stander	Check		6	