IMPROVING WHEAT VARIETIES FOR NEBRASKA

2001 STATE BREEDING AND QUALITY EVALUATION REPORT

Report to the

NEBRASKA WHEAT DEVELOPMENT, UTILIZATION
AND MARKETING BOARD

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I. INTRODUCTION

Wheat variety development research in Nebraska is cooperative effort between the Agricultural Research Division, IANR of the University of Nebraska-Lincoln, and the Agricultural Research Service/USDA, Northern Plains Area. Winter wheat breeding, which includes variety, line, and germplasm development, is a major component of the state wheat improvement research. This report will deal only with the state portion of the total wheat breeding effort (located in the Department of Agronomy and Horticulture at the University of Nebraska-Lincoln). Very important contributions come from state, and federal researchers in the department and at the Nebraska research and extension centers, from state and private researchers in South Dakota, Wyoming, Kansas, Oklahoma, Texas, and Colorado, from researchers in the Department of Plant Pathology (both state and federal), from plant pathologists located at the USDA Cereal Disease Laboratory, St. Paul, Minnesota, and USDA entomologists at Manhattan, Kansas and Stillwater, Oklahoma. All of these programs invest time and funds in this program. Grants from the Nebraska Wheat Development, Utilization and Marketing Board provide key financial support for this research. Without the Wheat Board's support, much of the state breeding efforts would be curtailed and many of the wheat quality analyses to evaluate our breeding material would not be available.

II. THE 2000-2001 NEBRASKA WHEAT CROP

1. Growing Conditions

The 2000-2001 crop was planted into generally moist soils. Planting was generally on time, though weather did allow us narrow windows for planting. The winter was cold and long while there was little or no winterkilling in commercial fields, the breeding program lost lines from the F_2 to F_6 generation and many lines in regional nurseries indicating this was the most severe winter in the past 5 years. In the spring, moisture was adequate to above average in most of Nebraska, however for brief periods drought and high temperatures were severe in southwestern to central Nebraska. Drought also affected parts of western Nebraska, but generally the season was cooler than normal. The drought proceeded through harvest, which was at the normal harvest time. Overall, this was a season that highlighted the Nebraska-developed wheat varieties with their good winterhardiness and drought tolerance. It was a “Nebraska” year. There was sufficient early season moisture to lead to the most severe epidemic of stripe rust in the last 16 years and most likely longer. As the temperatures rose, leaf and stem rust were found. There were few other diseases or insect problems in the state. In general, Wahoo, Millennium, Alliance, and Wesley (more so in production fields, than in the state variety trial) performed well across or in specific sections of the state.

2. Diseases

Foliar diseases are highly dependent on moisture and somewhat on temperature. The cool spring with adequate moisture led to severe stripe rust infection throughout Nebraska and caused economic losses. Stripe rust is rare in Nebraska (only seen once before in the previous 16 years) because it requires cool temperatures, freestanding moisture, and a source of inoculum. In most years, one of more of these factors

is missing (usually cool temperatures and the source of inoculum). As the temperatures increased, leaf rust and stem rust were found in eastern Nebraska. Many other diseases (wheat streak mosaic virus, barley yellow dwarf virus, leaf rust, stem rust, and various leaf blotches) can be extremely destructive under the appropriate conditions and will continue to need close monitoring. Unfortunately, karnal bunt was found again in Texas and we will continue to monitor this situation. Drs. John Watkins and Roy French continue to be invaluable in disease identification, survey, and understanding.

3. Insects

In general, most insect pests were at low levels on wheat in 2001. Russian wheat aphid damage was small and required little spraying. Chinch bugs and Hessian fly were generally minor. Wheat curl mite, the vector for wheat streak mosaic virus, and aphids, the vectors for barley yellow dwarf virus, were generally unimportant insect pests though they can carry devastating diseases.

4. Wheat Production

The 2001 Nebraska Wheat Crop was estimated at 59,200,000 bu, which represented a 37.0 bu/a state average yield on 1,600,000 harvested acres. 1,750,000 acres were planted to winter wheat. The 2001 crop was similar to the 2000 crop (59,400,000 bu harvested from 1,650,000 acres with a 36.0 bu/a state average yield). Both the 2000 and 2001 crops were much lower than the 1999 crop (86,400,000 bu from 1,800,000 harvested acres with a 48 bu/a state average yield), 1998 crop (82,800,000 bu harvested from 1,800,000 acres with a 46 bu/a yield average), the 1997 crop (70,300,000 bu harvested from 1,900,000 acres with a 37.0 bu/a yield average), and the 1996 crop (73,100,000 bu harvested from 2,150,000 acres with a 34 bu/a yield average). Despite continued genetic improvement, the main determinant in wheat production seems to be acres harvested and weather (which also affects disease pressure).

5. Cultivar Distribution

With our newer releases, Alliance (16.0% of the state) replaced Arapahoe (13.4%) as the most popular variety in Nebraska. Pronghorn is the third most widely grown variety followed by 2137 and Niobrara. Alliance is the variety having the greatest impact since the release of Arapahoe, but its impact is more localized as Alliance does not have the broad adaptation in eastern Nebraska that Arapahoe had. It is expected that the former Arapahoe acreage will eventually be divided by three modern releases, Millennium, Culver, and Wahoo.

While no wheat listed below has all of the characteristics of an ideal wheat, the diverse wheats provide the grower an opportunity to choose high yielding, high quality wheats that have resistance or tolerance to the diseases or insects prevalent in his or her region. Cultivars developed by the cooperative USDA-University of Nebraska wheat improvement program occupied 73% of the state acreage. Other public varieties occupied 17% and private varieties occupied 10% of the state acreage.

In looking at the variety survey, one area of concern is the increasing production of stem rust susceptible wheats. Currently, the popular 2137, Karl/Karl 92, and Buckskin are susceptible to stem rust. They cumulative occupy 19.2% of Nebraska's acreage. Buckskin is grown in region with low risk for stem rust, but 2137 and Karl/Karl 92 are grown in the high risk stem rust areas. It is hoped that resistant varieties such as Wesley, Wahoo, and Millennium will reduce the Karl/Karl 92 and 2137 acreage.

NEBRASKA—WHEAT VARIETIES
ESTIMATED PERCENTAGES PLANTED TO EACH VARIETY, 1994-2001

Variety	1994	1995	1996	1997	1998	1999	2000	2001
2137	-----	-----	-----	-----	1.4	3.6	8.2	**10.4**
Agripro Abilene	3.0	4.1	4.2	2.2	2.4	2.7	2.7	**2.5**
Agripro Hondo								**1.2**
Agripro Laredo	-----	1.2	1.1	-----	-----	----	----	**0.0**
Agripro Ogallala	-----	-----	2.2	1.5	1.6	1.2	1.4	**2.2**
Agripro Thunderbird	10.0	7.8	5.9	5.7	3.5	3.9	2.8	**1.9**
Agripro Tomahawk	3.9	3.1	2.9	2.5	2.6	1.6	1.0	**0.0**
Akron	-----	-----	-----	-----	-----	1.6	1.5	**0.0**
Alliance	-----	-----	2.7	7.3	8.4	10.4	15.1	**16.0**
Arapahoe	32.9	33.6	31.7	30.1	28.3	25.0	19.8	**13.4**
Buckskin	5.5	4.0	5.8	6.0	6.5	5.0	2.9	**4.7**
Centura	11.1	8.0	9.2	9.8	7.7	7.7	6.9	**3.7**
Culver								**3.1**
Ike	-----	-----	1.6	1.3	1.5	-----	-----	**0.0**
Jagger	-----	-----	-----	-----	-----	1.1	2.9	**2.4**
Karl/Karl 92	3.8	6.9	7.3	6.9	6.6	5.5	4.4	**4.1**
Niobrara	-----	-----	1.4	6.5	7.5	11.4	10.3	**9.3**
Pronghorn	-----	-----	-----	-----	4.6	7.8	6.9	**10.9**
Redland	6.3	4.3	3.4	1.2	1.0	-----	-----	**0.0**
Scout & Scout 66	1.6	3.4	2.4	1.6	2.3	1.0	-----	**0.0**
Siouxland	6.4	4.0	4.7	3.2	1.2	1.1	1.5	**0.0**
Vista	-----	4.6	3.6	4.6	3.9	2.1	2.7	**1.7**
Wesley								**1.1**
Windstar	-----	-----	-----	-----	-----	1.3	1.6	**1.6**
Other Public Varieties	6.0	5.9	4.9	5.4	5.9	4.1	5.4	**7.6**
Other Private Varieties	3.3	1.9	0.8	3.1	1.9	1.9	2.0	**2.2**

6. New Cultivars

In 2001, no new varieties were recommended for release. Wahoo was released in 2000.

III. FIELD RESEARCH

1. Increase of New Experimental Lines

Based on last year's results and our recent releases, five lines were advanced for large-scale

increase at the Nebraska Foundation Seed Division for possible release in 2002. Five lines were advanced to small-scale increases at the Nebraska Foundation Seed Division. They are:

NE97426	BRIGANTINA/2*ARAPAHOE
NE97465	SD3055/KS88H164//NE89646 (=COLT*2/PATRIZANKA)
NE97638	NE90614 (=BRL/4/PKR*4/AGT//BEL.198/LCR/3/NWT/BRL)/NE87612 (=NWT//WRR*5/AGT/3/NE69441)
NE97669	VISTA/KS87H6//ARLIN
NE97689	NE90614 (=BRL/4/PKR*4/AGT//BEL.198/LCR/3/NWT/BRL)/NE87612 (=NWT//WRR*5/AGT/3/NE69441)

All of these lines have good winterhadiness, stem rust resistance, agronomic performance and in our trials acceptable end-use quality. NE97426 is an awnless, semi-dwarf wheat that may have potential in grazing/haying and grain systems. NE97465 is a long coleoptile, tall wheat that would have potential in western NE and Wyoming where tall wheat varieties are needed (the Buckskin, Centura, Pronghorn regions of these two states). It has extraordinary yielding ability (nearly 120 bu/a in Indiana), but the key criterion for release will be if it can do well in our tough environments (25 to 40 bu/a rainfed environments). If it competes again well this year, it will be released as there are few tall wheat varieties being produced. NE97638 and NE97689 are sister lines that are semi-dwarfs and tend to be genetically lower in test weight. Of the two lines NE97689 has a slightly better yield record and would be considered the more likely to be released. NE97669 is a good yielding semi-dwarf wheat, but will need an additional year of testing before we will know if it competes with NE97689 and NE97638.

As state experiment stations expand their focus on regional efforts, we will need to discuss how best to release lines that were initially developed in one state, but have utility in other states or niche markets. Currently, this is not a problem because many state experiment stations have compatible release procedures for hard red winter wheat. However, there are different marketing mechanisms for hard white wheat (i.e. grower organizations, or contract production via seed companies and milling companies). The market place will continue to diversify and regionalize especially for niche market wheats (purple, blue, organic, etc.), hence it should be expected that new relationships will be developed which may include marketing publicly varieties outside the state of origin in small multistate niche areas

With the release of new varieties Cougar, Culver, Millennium, Nuplains, Wahoo, and Wesley many of the most advanced current breeding lines are not expected to be released.

2. Nebraska Variety Testing

Numerous entries and three seed treatments were included in some or all of the locations in the Fall Sown Small Grain Variety Tests in 2000. Fourteen dryland (including one ecofallow) and two irrigated, were harvested for yield data.

In 2001, the top ten entries for dryland production were:

	Average Yield bu/a		Average Yield bu/a
Wahoo	56.4	NE97689	53.5
Millennium	55.2	NE97638	53.2
Alliance	54.9	NW97S182	53.1
NE97669	54.5	NE97426	52.4
NE97465	53.9	Arapahoe	51.7

In 2000, the top ten entries for dryland production were:

Entry	Average Yield	Entry	Average Yield
	bu/a		bu/a
Wahoo	48.8	Culver	47.0
Trego	48.3	NUPLAINS	46.9
Alliance	48.0	NW97S343	46.9
NIOBRARA	47.2	2137	46.8
Millennium	47.1	NW97S154	46.5

In 1999, the top ten entries for dryland production were:

Entry	Av. Yield bu/a	Entry	Av. Yield bu/a
2137	63.9	NE94653	60.9
Wesley	63.3	NE94482	60.4
Millennium	61.2	NE95473	60.2
NE94654	61.1	NW97S195	60.1
Niobrara	60.9	NE93613	59.3

Of the released lines tested in all locations except the irrigated test, Heyne had the lowest grain yield (39.1 bu/a) which was as expected when winterkilling was severe. The yield of the nurseries is similar to most years and greater than 2000 indicative of the adequate levels of winterhardiness of most varieties and the slight reduction due to stripe rust. These yield levels are higher than the state average yield indicating our nurseries tend to be on better production areas than many parts of the state.

3. Irrigated Wheat Trials:

A major improvement in our irrigated trials occurred in 1999 with the coordination of irrigated testing between Nebraska and Wyoming (thanks to Drs. D. Baltensperger and J. Krall). The top ten lines for grain

yield in 2001 were:

Entry	Average Yield	Entry	Average Yield
	bu/a		bu/a
Millennium	84	Jagger	79
NI98438	83	NE97669	79
NuFrontier	82	NW97S278	79
Wahoo	81	Betty	78
NE97638	80	Wesley	77

The top ten lines for grain yield in 2000 were:

Entry	Average Yield	Entry	Average Yield
	bu/a		bu/a
XH9801	108	GM1002	104
AP7510	107	QT7406	104
XH3207	107	QT7588	103
XH7463	105	NW97S278	102
XH9815	105	XH9806	102

The top ten lines for grain yield in 1999 were:

Entry	Avg. Yield (bu/a)	Entry	Avg. Yield (bu/a)
XH1888	90	Millennium	86
Betty (W)	88	NE94482	86
XH9806	87	NE94653	83
NE95473	86	Jagger	83
2137	86	Ogallala	82

The irrigated data this year showed the benefits of winterhardiness coupled with adequate straw strength. With the exodus of hybrid wheat companies from the Great Plains, only pure lines were tested and they did well.

As in the past, we have an experimental line irrigated nursery. The nursery is grown under irrigation in western Nebraska and under dryland conditions throughout the state. The goal of this nursery is to identify higher yielding lines under irrigation and under higher rainfall conditions, which periodically occur in Nebraska. As in the past Wesley performed very well. Abilene also performed well, but 2137 was hurt by the winter. A number of experimental lines also performed well. The results of the irrigated nursery in 2001 were:

Entry	Variety	Wsurv.	Linc.	RankL	Allianc.	RankA	Sidney	RankS	Test Wt	Dryland	RankDr	State	RankST
							Irr	Irr	Irr	Avg.		Avg.	
			bu/a		bu/a		bu/a		lbs/bu	bu/a		bu/a	
1	NI00413	8.46	74.45	20	34.82	26	93.11	21	55.10	**54.64**	**20**	**67.46**	**20**
2	NI00416	9.93	87.58	1	41.15	12	86.51	34	54.95	**64.37**	**4**	**71.75**	**9**
3	NI00432	9.88	75.69	16	28.12	41	91.13	24	55.80	**51.91**	**28**	**64.98**	**30**
4	NI00438	9.37	63.62	39	24.78	45	95.75	17	55.85	**44.20**	**44**	**61.38**	**34**
5	NI00439	7.93	57.78	47	26.01	44	86.51	32	53.75	**41.90**	**48**	**56.77**	**45**
6	NI99416	8.72	64.93	36	42.41	8	89.81	28	56.10	**53.67**	**23**	**65.72**	**28**
7	NI98438	9.12	77.04	14	40.34	16	99.06	10	56.75	**58.69**	**12**	**72.15**	**7**
8	NI00433	9.49	70.63	24	41.85	9	90.47	26	54.55	**56.24**	**16**	**67.65**	**19**
9	NI00436	9.25	57.31	48	29.04	38	91.13	25	54.50	**43.18**	**46**	**59.16**	**37**
10	NI00437	9.61	63.54	40	37.82	23	74.62	44	54.60	**50.68**	**30**	**58.66**	**38**
11	NI01801	7.26	68.12	27	21.50	48	72.64	46	55.75	**44.81**	**43**	**54.09**	**47**
12	NI01802	7.59	63.37	41	24.69	46	73.96	45	53.50	**44.03**	**45**	**54.01**	**48**
13	NI01803	10.89	65.92	33	28.20	40	103.68	5	55.25	**47.06**	**39**	**65.93**	**26**
14	NI01804	10.36	74.45	19	38.97	19	96.41	15	53.45	**56.71**	**14**	**69.94**	**15**
15	WESLEY	10.05	86.12	2	46.04	4	105.66	3	54.20	**66.08**	**1**	**79.27**	**2**
16	NI01805	9.50	75.47	17	33.86	28	88.49	31	55.65	**54.67**	**19**	**65.94**	**25**
17	NI01806	9.10	78.77	9	41.51	11	97.73	11	52.90	**60.14**	**8**	**72.67**	**6**
18	NI01807	9.60	80.88	6	42.62	7	91.79	22	54.90	**61.75**	**7**	**71.76**	**8**
19	NI01808	9.79	82.71	3	48.83	3	106.32	1	54.40	**65.77**	**2**	**79.29**	**1**
20	NI01809	3.05	43.74	50	7.34	50	0.20	50	54.30	**25.54**	**50**	**17.09**	**50**
21	NI01810	8.82	78.83	8	30.96	34	99.06	9	54.25	**54.90**	**18**	**69.62**	**16**
22	NI01811	10.10	79.07	7	29.75	36	90.47	27	53.15	**54.41**	**21**	**66.43**	**24**
23	NI01812	10.83	78.72	10	40.83	13	101.70	7	53.95	**59.78**	**10**	**73.75**	**5**
24	NI01813	11.15	72.65	21	40.43	15	97.08	13	51.55	**56.54**	**15**	**70.05**	**14**
25	NI01814	9.96	74.86	18	40.63	14	95.75	16	54.20	**57.75**	**13**	**70.41**	**13**
26	NI01815	9.37	77.88	12	51.61	1	84.53	36	52.95	**64.75**	**3**	**71.34**	**10**
27	NI01816	9.50	67.75	28	28.59	39	78.59	42	56.10	**48.17**	**36**	**58.31**	**40**
28	NI01817	8.82	81.78	4	36.14	25	93.78	20	54.65	**58.96**	**11**	**70.57**	**12**
29	NI01818	10.40	69.87	26	33.95	27	82.55	37	55.25	**51.91**	**27**	**62.12**	**31**
30	2137	10.79	64.97	35	39.76	18	79.90	39	54.35	**52.37**	**25**	**61.54**	**33**
31	NI01819	9.83	54.01	49	32.19	31	88.49	29	50.35	**43.10**	**47**	**58.23**	**41**
32	NI01820	8.69	70.53	25	40.13	17	95.09	18	55.50	**55.33**	**17**	**68.58**	**18**
33	NI01821	7.66	66.20	32	30.04	35	85.85	35	54.90	**48.12**	**37**	**60.70**	**36**
34	NI01822	5.82	63.76	38	31.45	32	79.24	41	56.20	**47.61**	**38**	**58.15**	**42**
35	NI01823	9.78	77.69	13	18.90	49	105.00	4	56.05	**48.30**	**35**	**67.20**	**22**
36	NI01824	3.04	60.60	44	29.53	37	105.66	2	55.60	**45.07**	**42**	**65.26**	**29**
37	NI01825	7.88	72.39	22	36.24	24	91.79	23	57.10	**54.32**	**22**	**66.81**	**23**
38	NI01826	8.52	61.51	43	38.86	20	97.07	14	56.55	**50.19**	**32**	**65.81**	**27**
39	NI01827	4.96	62.08	42	38.33	21	82.55	38	54.90	**50.21**	**31**	**60.99**	**35**
40	NI01828	9.98	78.29	11	41.77	10	101.70	6	55.70	**60.03**	**9**	**73.92**	**3**

41	NI01829	9.92	81.31	5	45.00	6	95.09	19	56.30	**63.16**	**6**	**73.80**	**4**
42	NI01830	7.74	65.44	34	38.19	22	71.98	47	52.40	**51.82**	**29**	**58.54**	**39**
43	NI00831	9.29	67.03	29	27.02	42	77.26	43	55.20	**47.03**	**40**	**57.10**	**44**
44	NI01832	9.40	66.71	30	26.81	43	79.25	40	54.25	**46.76**	**41**	**57.59**	**43**
45	ABILENE	9.27	76.96	15	49.99	2	86.51	33	56.55	**63.48**	**5**	**71.15**	**11**
46	NI01833	5.86	58.31	46	23.24	47	67.36	49	52.85	**40.78**	**49**	**49.64**	**49**
47	NI01834	7.45	58.45	45	45.66	5	97.73	12	55.10	**52.06**	**26**	**67.28**	**21**
48	NI01835	8.26	66.61	31	31.22	33	67.36	48	54.85	**48.92**	**33**	**55.06**	**46**
49	NI01836	7.32	71.77	23	33.50	29	101.70	8	56.45	**52.64**	**24**	**68.99**	**17**
50	NI01837	8.65	64.23	37	33.10	30	88.49	30	56.00	**48.67**	**34**	**61.94**	**32**
	Mean	8.76	70.05		34.87		88.07		54.79	**52.46**		**64.33**	
	CV	10.85	6.25		16.36		8.06		4.26				
	LSD	1.59	7.34		9.57		11.90		3.92				

The results of the irrigated nursery in 2000 are:

Entry	VARIETY	Lincoln	Alliance	Dryland Avg	Rank	SidneyIRR	RankS	Test weight	State Avg.	Rank
		bu/a	bu/a	bu/a		bu/a		lbs/bu	bu/a	
1	NI00401	43.45	52.04	47.75	45	98.59	19	57.40	64.69	29
2	NI00402	42.85	54.02	48.44	43	86.36	30	54.40	61.08	39
3	NI00403	46.03	63.10	54.57	27	58.84	49	59.15	55.99	47
4	NI00404	58.60	61.64	60.12	4	73.37	43	57.60	64.54	30
5	NI00405	40.20	45.59	42.90	49	68.78	47	53.15	51.52	50
6	NI00406	53.38	45.22	49.30	41	100.12	18	56.10	66.24	24
7	NI00407	46.16	51.62	48.89	42	84.07	33	59.40	60.62	41
8	NI00408	57.77	55.43	56.60	17	80.25	34	50.75	64.48	31
9	NI00409	53.71	52.05	52.88	33	76.42	38	53.80	60.73	40
10	NI00410	54.75	61.94	58.35	8	90.18	28	55.60	68.96	16
11	NI00411	50.16	62.99	56.58	18	77.19	36	54.10	63.45	34
12	NI00412	56.12	52.36	54.24	28	56.56	50	55.40	55.01	49
13	NI00413	48.09	47.42	47.76	44	110.05	7	61.65	68.52	19
14	NI00414	59.32	65.10	62.21	2	93.23	21	55.20	72.55	10
15	NI00415	39.56	51.15	45.36	48	100.88	15	57.05	63.86	33
16	NI00416	55.64	55.81	55.73	23	100.88	17	55.15	70.78	12
17	NI00417	54.70	60.86	57.78	10	89.41	29	58.15	68.32	20
18	NI00418	43.11	48.63	45.87	47	74.89	39	56.00	55.54	48
19	NI00419	48.62	57.62	53.12	32	92.47	22	58.10	66.24	25
20	NI00420	52.29	49.02	50.66	39	90.94	26	57.60	64.08	32
21	NI00421	58.80	64.44	61.62	3	100.88	16	54.05	74.71	4
22	NI00422	52.78	59.26	56.02	20	90.95	24	56.05	67.66	21
23	NI00423	57.09	50.94	54.02	29	62.67	48	54.30	56.90	46
24	NI00424	51.63	56.07	53.85	30	90.18	27	52.70	65.96	26
25	NI00425	56.21	54.40	55.31	25	76.43	37	52.85	62.35	37
26	NI00426	55.12	43.89	49.51	40	73.37	42	56.75	57.46	45
27	NI00427	58.91	56.43	57.67	11	72.60	44	47.70	62.65	35
28	NI00428	57.05	44.55	50.80	38	71.84	45	54.35	57.81	44

29	NI00429	54.92	59.78	57.35	14	90.95	25	51.35	68.55	18
30	NI00430	61.59	55.60	58.60	7	80.25	35	47.60	65.81	27
31	NI00431	47.63	46.42	47.03	46	104.70	10	53.10	66.25	23
32	NI00432	39.63	35.41	37.52	50	108.52	8	58.65	61.19	38
33	NI00433	54.76	64.00	59.38	6	114.64	2	57.55	77.80	2
34	NI00434	61.39	58.31	59.85	5	101.64	14	55.80	73.78	7
35	NI00435	52.70	61.61	57.16	15	91.71	23	55.55	68.67	17
36	NI00436	72.30	62.49	67.40	1	101.64	13	59.00	78.81	1
37	NI00437	57.97	57.17	57.57	12	112.34	4	56.95	75.83	3
38	NI00438	55.84	48.91	52.38	34	102.40	12	59.85	69.05	15
39	NI00439	55.87	47.41	51.64	36	114.64	1	54.85	72.64	9
40	NI99410	66.41	48.73	57.57	13	85.59	31	55.50	66.91	22
41	NI99411	59.50	53.06	56.28	19	102.41	11	53.65	71.66	11
42	NI99416	42.50	64.92	53.71	31	104.70	9	58.30	70.71	13
43	NI99428	57.23	59.04	58.14	9	71.07	46	53.40	62.45	36
44	NI99429	53.75	58.18	55.97	21	84.07	32	52.95	65.33	28
45	NI99432	47.71	54.58	51.15	37	74.13	41	54.30	58.81	43
46	NI98427	51.98	51.94	51.96	35	74.13	40	54.25	59.35	42
47	NI98438	44.63	69.43	57.03	16	96.30	20	55.40	70.12	14
48	WESLEY	62.41	48.59	55.50	24	113.10	3	59.95	74.70	5
49	2137	52.74	58.73	55.74	22	110.81	5	56.80	74.09	6
50	ABILENE	56.53	53.06	54.80	26	110.81	6	60.95	73.47	8
	Average	53.24	54.82			89.86		55.60		
	CV	7.83	7.84			13.79		3.47		
	LSD	7.00	7.21			16.10		2.51		

The results of the irrigated nursery in 1999 are:

		----------DRYLAND----------					-------Irrigated-------	
ENTRY	VARIETY	Lincoln	North Platte	Alliance	AVG.	Rank	Sidney	Rank
		bu/a	bu/a	bu/a	bu/a		bu/a	
1	NI99401	41.48	46.95	41.73	43.39	47	55.58	48
2	NI99402	58.18	50.73	40.98	49.96	24	75.31	12
3	NI99403	48.48	73.70	39.93	54.04	12	68.34	26
4	NI99404	42.60	64.73	35.98	47.77	36	69.23	22
5	NI99405	33.00	74.00	38.33	48.44	32	71.89	18
6	NI99406	30.35	61.43	51.85	47.88	35	65.91	35
7	NI99407	53.13	69.93	40.83	54.63	11	61.78	40
8	NI99408	47.80	64.98	46.88	53.22	15	65.36	36
9	NI99409	37.55	55.88	45.70	46.38	39	51.98	49
10	NI99410	45.65	64.90	48.05	52.87	16	82.60	3
11	NI99411	44.20	68.93	39.55	50.89	22	74.00	13
12	NI99412	58.10	77.50	41.28	58.96	2	69.03	23

13	NI99413	35.50	64.63	45.85	48.66	30	66.87	32
14	NI99414	29.40	56.05	51.65	45.70	40	76.87	9
15	NI99415	40.35	42.15	48.18	43.56	46	80.09	6
16	NI99416	40.55	74.65	49.93	55.04	8	72.07	16
17	NI99417	57.45	61.93	50.35	56.58	4	64.07	38
18	NI99418	39.05	66.35	60.18	55.19	7	73.96	14
19	NI99419	54.13	58.55	45.63	52.77	18	65.20	37
20	NI99420	38.05	50.93	50.55	46.51	38	60.74	42
21	NI99421	47.70	50.10	50.25	49.35	27	70.05	21
22	NI99422	51.55	68.75	44.35	54.88	10	58.40	44
23	NI99423	40.33	48.93	37.20	42.15	48	55.63	47
24	NI99424	45.18	51.58	35.50	44.09	44	58.25	46
25	NI99425	29.83	53.03	48.05	43.64	45	68.85	24
26	NI99426	45.68	55.18	44.90	48.59	31	71.89	17
27	NI99427	48.63	47.35	39.28	45.09	41	66.58	33
28	NI99428	43.15	57.63	46.20	48.99	29	80.36	5
29	NI99429	33.63	56.88	21.35	37.29	50	86.05	2
30	NI99430	38.55	63.60	47.05	49.73	26	58.36	45
31	NI99431	38.85	59.18	47.30	48.44	33	71.85	19
32	NI99432	36.78	77.83	39.45	51.35	21	80.78	4
33	NI99433	40.90	69.38	37.53	49.27	28	60.76	41
34	NI99434	40.85	52.83	40.50	44.73	42	68.42	25
35	NI99435	36.13	74.73	49.75	53.54	13	66.04	34
36	NI99436	50.50	62.08	38.73	50.44	23	68.11	27
37	NI99437	54.23	69.08	36.48	53.26	14	60.49	43
38	NI99438	40.93	76.83	38.80	52.19	19	67.82	28
39	NI99439	37.75	47.30	37.75	40.93	49	44.45	50
40	NI98411	40.15	53.95	39.00	44.37	43	63.71	39
41	NI98413	31.30	75.20	51.83	52.78	17	67.36	30
42	NI98414	42.63	73.40	52.40	56.14	5	71.78	20
43	NI98427	44.60	76.08	35.08	51.92	20	78.27	7
44	NI98437	38.75	61.90	43.88	48.18	34	73.82	15
45	NI98438	38.93	88.68	53.43	60.35	1	75.34	11
46	NI97405	27.63	66.93	47.73	47.43	37	75.38	10
47	YUMA	45.48	64.98	38.90	49.79	25	67.56	29
48	RAWHIDE	46.25	75.98	43.70	55.31	6	76.89	8
49	2137	50.10	67.85	46.93	54.96	9	90.40	1
50	ABILENE	55.20	76.13	42.63	57.99	3	67.05	31
	GRAND	42.74	63.44	43.78	49.99		68.83	

MEAN					
CV	21.52	13.27	18.56		10.59
LSD	15.42	14.11	13.62		12.22

In 2001, eight lines were continued for further testing in the irrigated nursery and 2 lines were advanced to the Nebraska Triplicate Nursery (NTN). In 2000, ten lines were continued for further testing in the irrigated nursery, and five lines were advanced to the NTN. In 1999, three lines from this nursery were advanced to the NTN and eight lines were retained for further testing in the irrigated nursery. One concern that we have is that relatively few lines seem to perform well for two consecutive years in the irrigated trials. As such, we have decided to be slightly less stringent on our selection strategy because the year-to-year variation may reflect the limited number of replications we have in this trial and field position effects. We have also changed to alpha-lattices to help remove field variation. Progress continues to be made in developing germplasm adapted irrigated production for Nebraska.

4. Nebraska Intrastate Nursery:

The Nebraska Intrastate Nursery (NIN) was planted at eight locations (Lincoln, Clay Center, North Platte, McCook, Grant, Sidney, Alliance, and Mead) and harvested at seven locations. North Platte was lost to hail. Most trials had four replications, but McCook, Grant, and Mead had two replications. With the exception of McCook and Grant where drought was severe, most nurseries would be considered as being average to above average. In particular, the nurseries at Lincoln and Mead were very good. On a collaborative project with CSU, the NIN is grown at Akron (2 replications) and we grow the equivalent nursery at Sidney. Wesley, Millennium, Wahoo, and Alliance performed very well among the released varieties, but a number of excellent experimental lines are progressing well towards future release. The data for the 2001 NIN are:

		----------bu/a----------									bu/a	
Entry	Variety	Linc.	Mead	ClayC	McCook	Grant	Sidney	Allian.	**St. Avg.**	**St. Rank**	Akron	Rank
1	**WESLEY**	**78.8**	**71.8**	**84.2**	**31.1**	**38.6**	**45.5**	**54.4**	**57.75**	**2**	31.6	14
2	**ALLIANCE**	**71.5**	**68.4**	**82.7**	**23.8**	**31.2**	**44.9**	**62.8**	**55.06**	**11**	32.9	12
3	NE96579	70.8	59.4	65.2	36.8	25.6	40.9	50.4	**49.88**	**42**	21.2	49
4	NE96737	70.7	57.7	69.7	40.6	28.4	44.7	57.5	**52.76**	**28**	42.2	1
5	NE97465	74.4	69.2	71.0	37.3	26.6	42.9	53.0	**53.48**	**22**	35.6	9
6	NE98425	70.9	58.3	54.0	41.2	33.7	45.7	52.3	**50.87**	**39**	27.4	27
7	NE97638	81.8	69.6	74.3	26.4	28.9	41.2	54.2	**53.78**	**20**	19.5	52
8	NE97669	79.9	55.8	76.1	28.6	26.8	47.5	47.4	**51.74**	**35**	35.8	8
9	NE98530	72.1	54.6	71.8	33.2	24.9	41.9	45.2	**49.10**	**46**	25.9	33
10	**WINDSTAR**	**73.0**	**69.4**	**71.3**	**37.8**	**27.0**	**44.1**	**58.6**	**54.45**	**15**	24.4	41
11	NE97689	76.6	67.7	75.0	36.0	16.8	46.9	54.9	**53.39**	**23**	15.0	58
12	N97V121	79.1	55.5	70.9	39.1	37.9	44.9	54.7	**54.58**	**14**	23.0	45
13	NE98424	75.9	50.7	51.0	35.1	27.7	44.7	51.7	**48.12**	**49**	33.0	11
14	NE97426	75.6	65.7	71.0	44.9	27.0	42.0	54.8	**54.42**	**16**	25.1	38
15	NE98466	74.8	60.8	79.6	39.1	33.3	40.1	52.6	**54.33**	**17**	25.8	34
16	NE98471	76.5	68.0	68.5	30.1	27.1	39.9	49.4	**51.37**	**36**	28.9	20
17	NE98503	76.6	62.9	75.9	28.2	21.7	43.1	58.1	**52.35**	**30**	23.0	46
18	NE98564	74.3	59.1	64.0	29.9	31.9	44.2	52.8	**50.89**	**38**	20.9	50

19	NE98589	77.5	64.4	78.1	33.2	20.6	41.9	52.9	**52.66**	**29**	29.1	19
20	CULVER	76.8	65.1	68.9	32.0	28.2	44.0	54.7	**52.81**	**27**	26.2	32
21	MILLENNIUM	79.3	70.3	78.5	39.0	31.2	41.4	52.4	**56.02**	**5**	36.5	5
22	**WAHOO**	**73.2**	**64.8**	**79.9**	**42.0**	**20.8**	**47.2**	**59.4**	**55.34**	**10**	35.1	10
23	**ARAPAHOE**	**75.0**	**65.1**	**72.3**	**33.3**	**28.2**	**45.3**	**53.6**	**53.26**	**24**	28.0	23
24	NE98632	74.3	64.7	66.1	29.8	29.2	43.9	54.3	**51.75**	**33**	23.5	44
25	NE98684	70.4	67.0	73.8	38.1	24.4	45.0	58.5	**53.90**	**19**	24.5	40
26	NE98692	79.7	69.9	76.8	34.9	20.8	40.8	59.9	**54.69**	**12**	21.7	48
27	NI98418	65.7	42.5	50.9	35.5	24.4	37.4	47.1	**43.34**	**59**	15.3	57
28	NI98439	71.9	70.1	81.2	36.5	24.0	40.7	47.4	**53.10**	**25**	25.5	37
29	NI99412	67.3	43.1	49.6	36.6	25.2	41.7	53.2	**45.25**	**56**	25.7	35
30	NI99416	75.8	64.9	72.4	36.7	28.7	41.8	54.5	**53.55**	**21**	24.6	39
31	NI98414	82.0	74.3	81.6	38.0	26.4	45.1	50.3	**56.82**	**4**	31.4	15
32	NE99410	68.8	67.0	69.5	34.6	22.3	36.6	54.2	**50.42**	**41**	27.0	28
33	NE99424	77.5	56.2	51.8	35.9	29.6	43.2	40.9	**47.87**	**51**	28.4	21
34	NE99445	74.8	52.3	44.7	31.3	33.3	44.9	54.6	**47.99**	**50**	39.4	2
35	NE99464	80.9	71.3	80.9	35.5	32.0	45.6	57.0	**57.61**	**3**	37.0	4
36	NE99469	77.8	65.9	63.5	39.5	35.2	43.0	53.2	**54.02**	**18**	28.4	22
37	NE99489	76.3	67.5	76.5	36.8	29.0	45.7	59.4	**55.90**	**7**	26.3	31
38	NE99495	83.0	59.9	75.5	39.0	30.3	46.8	55.0	**55.64**	**8**	36.1	6
39	NE99510	73.7	55.8	58.3	35.1	25.9	44.2	53.6	**49.50**	**44**	17.5	55
40	**NIOBRARA**	**74.7**	**59.9**	**57.9**	**29.2**	**24.9**	**39.8**	**46.7**	**47.58**	**52**	17.7	54
41	**COUGAR**	**69.7**	**56.6**	**75.6**	**32.6**	**24.1**	**38.0**	**50.7**	**49.60**	**43**	24.3	42
42	NE99513	73.6	53.9	57.5	32.6	22.4	40.4	44.8	**46.47**	**54**	18.0	53
43	NE99529	82.0	54.7	64.6	34.9	21.8	40.9	46.9	**49.41**	**45**	26.9	29
44	NE99533	81.2	61.8	78.6	40.3	30.6	44.5	54.6	**55.95**	**6**	26.5	30
45	NE99542	76.6	57.4	78.8	37.4	27.0	42.4	46.1	**52.23**	**31**	13.0	59
46	NE99543	78.2	76.7	79.1	41.6	16.0	42.6	54.6	**55.54**	**9**	20.5	51
47	NE99552	76.2	51.2	64.1	39.8	14.7	41.6	52.3	**48.55**	**47**	25.6	36
48	NE99554	74.1	61.4	68.0	41.4	26.6	46.9	51.7	**52.86**	**26**	27.9	25
49	NE99575	66.4	53.8	51.0	41.8	23.9	36.8	51.7	**46.49**	**53**	13.0	60
50	**PRONGHORN**	**64.4**	**63.7**	**66.7**	**36.7**	**23.4**	**43.3**	**55.1**	**50.46**	**40**	31.2	16
51	**SCOUT66**	**63.5**	**51.9**	**62.8**	**27.6**	**19.6**	**38.4**	**50.2**	**44.83**	**57**	38.2	3
52	NE99578	68.2	30.3	24.3	34.9	23.8	40.9	48.1	**38.64**	**60**	29.7	18
53	NE99579	90.6	64.7	80.8	38.1	28.6	47.9	56.0	**58.09**	**1**	27.9	24
54	NE99585	65.2	46.6	47.7	33.9	24.3	46.0	49.6	**44.76**	**58**	36.0	7
55	NE99656	83.9	68.3	74.6	37.9	25.3	42.2	50.3	**54.64**	**13**	15.6	56
56	NE99675	76.5	55.9	47.3	36.3	25.2	38.8	45.3	**46.45**	**55**	23.8	43
57	N99L012	79.3	63.4	69.7	36.3	24.5	39.9	49.0	**51.74**	**34**	27.7	26
58	N99L033	78.5	57.1	68.2	37.6	25.6	37.9	51.7	**50.96**	**37**	21.9	47
59	**CHEYENNE**	**62.9**	**67.3**	**61.7**	**30.1**	**24.8**	**38.6**	**54.3**	**48.52**	**48**	30.8	17
60	**BUCKSKIN**	**74.6**	**72.3**	**67.0**	**27.9**	**24.3**	**41.9**	**54.4**	**51.75**	**32**	32.0	13
	GRAND MEAN	74.92	61.26	67.89	35.35	26.44	42.67	52.58	51.59		26.8	
	CV	7.84	6.19	8.56	10.04	14.56	8.28	9.43			18.8	
	LSD	6.87	6.34	6.79	5.93	6.44	4.13	5.80			8.4	

Fifty-five entries were received and analyzed from the 2000 NIN. Thirteen varieties were included in this group as checks. The wheat protein of the entire nursery (on a 14% moisture base) ranged from: 12.50% (NE99513) to 15.45% (NE98425). Five entries were noted to have superior quality characteristics. NE98589 and NE99542 had both strong mixing properties and bread quality scores of: Very Good- (External); Very Good+ and Very Good respectively (Crumb grain); and Very Good- (Texture quality). NE99543 and NE99585 both had the desirable "bright white" crumb color. The bread scores for these entries were also superior: Good+(External); Very Good and Very Good+, respectively (Crumb grain); and Very Good- and Very Good, respectively (Texture quality.) NE 99552 also had desirable milling and bread-baking characteristics, with scores of Good (External) Very Good+ (Crumb grain), and Very Good+ (Texture).

Only one experimental line was noted to have less desirable quality potential and has been dropped from further consideration for possible release. N99L033 milled poorly with a mill flour yield of 65.8%. This line also had poor dough handling characteristics, an undesirable yellow crumb color, and mediocre bread-baking characteristics. Care should be taken in interpreting these data as protein was relatively high in this year, which probably masked some flaws in some of the lines. For example, NE98564 and N99L012 both had little mixing tolerance. However they had acceptable if not exceptional scores for the other parameters. The additional thirty-six experimental lines had acceptable quality characteristics and were either advanced or discontinued on the basis of their agronomic performance.

Twenty-six experimental lines were retained for continued testing in the 2002 NIN. Twelve released varieties were also retained to represent the primary varieties grown in Nebraska.

The results for the 2000 NIN are:

Yield (bu/a)

ENTRY	VARIETY	Lincoln	Mead	ClayCen	McCook	Sidney	Alliance	**State Avg.**	**St. Rank**
1	**ARAPAHOE**	**52.6**	**62.5**	**37.6**	**14.7**	**57.9**	**58.3**	**47.26**	**56**
2	**NIOBRARA**	**60.1**	**69.2**	**48.3**	**20.9**	**62.0**	**64.6**	**54.17**	**22**
3	NE94654	66.8	78.7	46.0	26.2	66.7	60.6	**57.48**	**5**
4	NE95473	62.2	68.7	46.5	33.9	63.4	58.2	**55.48**	**12**
5	NE95510	58.4	64.8	49.7	27.3	59.3	67.5	**54.49**	**19**
6	NE95553	59.0	61.9	39.4	21.1	53.3	49.1	**47.29**	**55**
7	NE96579	67.7	72.2	45.7	20.0	61.2	56.7	**53.90**	**24**
8	NE96649	54.2	61.4	39.8	15.8	59.1	62.5	**48.79**	**51**
9	NE96654	56.1	58.8	42.1	19.9	51.5	55.5	**47.32**	**54**
10	NE96737	58.2	67.3	44.5	30.5	62.6	63.0	**54.35**	**20**
11	**ALLIANCE**	**56.4**	**62.7**	**41.3**	**32.7**	**67.1**	**69.4**	**54.93**	**16**
12	**WINDSTAR**	**53.5**	**59.6**	**47.1**	**22.6**	**57.4**	**65.6**	**50.95**	**37**
13	NE97426	62.2	62.3	46.7	20.2	61.7	64.8	**52.98**	**28**
14	NE97465	63.7	68.0	43.4	19.3	54.6	59.2	**51.36**	**34**
15	NE97489	58.4	57.8	42.1	24.8	54.8	59.5	**49.57**	**45**
16	NE97558	43.6	61.7	46.5	27.1	53.4	60.9	**48.85**	**50**
17	NE97612	63.6	63.6	45.4	28.3	51.7	47.1	**49.94**	**42**
18	NE97638	61.2	67.8	47.6	35.5	65.1	70.7	**57.99**	**4**
19	NE97669	53.9	64.9	42.7	30.9	67.8	60.5	**53.45**	**25**

20	NE97670	56.0	58.1	48.2	23.7	60.2	55.4	**50.26**	**41**
21	**COUGAR**	**48.1**	**56.0**	**45.0**	**19.4**	**50.5**	**55.5**	**45.74**	**57**
22	**PRONGHORN**	**57.5**	**53.1**	**38.6**	**22.8**	**56.1**	**58.4**	**47.75**	**52**
23	SCOUT66	51.2	47.7	36.8	23.9	52.8	54.6	**44.49**	**59**
24	NE97675	50.9	69.5	44.3	26.7	55.1	51.5	**49.66**	**44**
25	NE97689	51.8	79.3	48.4	39.7	72.7	70.3	**60.37**	**1**
26	NI97423	51.5	66.2	46.6	18.3	59.2	54.8	**49.42**	**47**
27	N97V121	60.2	69.8	52.5	36.2	61.7	64.4	**57.47**	**6**
28	NE98410	54.2	64.9	41.2	27.0	54.9	56.6	**49.81**	**43**
29	NE98416	59.4	61.9	40.8	30.8	60.4	54.8	**51.35**	**35**
30	**WESLEY**	**67.8**	**65.7**	**52.4**	**32.1**	**57.8**	**60.5**	**56.05**	**8**
31	**CULVER**	**61.1**	**67.8**	**43.5**	**33.3**	**64.2**	**61.2**	**55.18**	**14**
32	**MILLENNIUM**	**57.2**	**69.6**	**50.1**	**23.2**	**62.7**	**62.3**	**54.18**	**21**
33	NE98424	67.8	65.8	47.0	23.0	63.6	60.9	**54.68**	**18**
34	NE98425	57.7	60.4	51.2	29.7	59.7	58.3	**52.82**	**29**
35	NE98445	59.9	68.4	45.4	34.6	57.5	46.7	**52.07**	**32**
36	NE98466	63.1	72.4	44.2	30.3	65.2	54.6	**54.94**	**15**
37	NE98471	63.0	70.6	49.4	38.8	62.9	70.9	**59.24**	**2**
38	NE98476	49.9	63.7	40.5	27.2	57.2	57.4	**49.33**	**48**
39	NE98502	48.9	52.7	38.6	29.7	54.2	62.1	**47.68**	**53**
40	NE98503	63.7	67.1	45.4	28.4	66.9	63.3	**55.80**	**9**
41	NE98530	52.8	71.4	43.0	17.7	61.0	51.6	**49.56**	**46**
42	NE98564	55.2	69.3	46.0	25.0	60.1	64.8	**53.39**	**26**
43	NE98574	59.8	64.8	40.9	31.0	59.3	48.9	**50.79**	**38**
44	NE98589	53.9	70.4	45.8	32.6	64.0	65.5	**55.36**	**13**
45	NE98594	52.8	67.8	48.3	24.1	57.5	60.1	**51.75**	**33**
46	NE98602	53.5	64.9	46.0	23.7	60.6	56.0	**50.78**	**39**
47	NE98632	69.7	76.7	51.1	21.2	63.3	68.0	**58.33**	**3**
48	NE98646	60.8	65.0	45.3	24.8	63.7	59.7	**53.23**	**27**
49	**BUCKSKIN**	**39.5**	**47.7**	**36.3**	**20.6**	**49.7**	**53.0**	**41.13**	**60**
50	**CHEYENNE**	**52.7**	**59.2**	**33.2**	**23.1**	**49.1**	**51.0**	**44.70**	**58**
51	NE98684	50.7	64.8	43.7	37.0	67.8	69.7	**55.60**	**11**
52	NE98691	55.5	65.4	45.3	18.0	57.4	53.2	**49.15**	**49**
53	NE98692	58.7	72.2	49.4	26.9	61.7	65.5	**55.73**	**10**
54	NE98714	55.6	61.0	50.1	19.6	69.1	59.1	**52.41**	**30**
55	NI98418	56.2	58.1	47.3	31.0	67.8	69.1	**54.92**	**17**
56	NI98438	54.3	64.1	43.7	18.8	63.7	57.5	**50.35**	**40**
57	NI98439	60.2	69.1	51.4	28.5	68.7	62.1	**56.66**	**7**
58	NI97405	63.4	64.1	45.0	28.7	59.8	62.7	**53.96**	**23**
59	NI97435	46.0	67.2	44.4	22.0	62.4	65.0	**51.16**	**36**
60	NI99412	59.6	72.3	49.6	17.6	60.4	54.9	**52.40**	**31**
	Average	57.05	64.99	44.97	26.03	60.22	59.76	52.17	
	CV	17.18	8.33	12.34	20.94	8.68	10.32	13.49	
	LSD	11.46	9.05	6.49	9.11	6.11	7.21	8.44	

The results for the 1999 NIN are:

		yield (bu/a)								State Rank
ENTRY	VARIETY	Linc.	Mead -	Cl.Cent	N.Platte	McCook	Grant -	Alliance	Average	
1	ARAPAHOE	53.5	51.2	35.4	48.0	66.9	31.9	55.7	48.9	48
2	NIOBRARA	51.2	50.2	35.0	57.1	66.1	37.2	63.6	51.5	27
3	NE93405	63.2	55.0	37.4	51.1	58.8	28.1	50.3	49.1	47
4	COUGAR	62.1	55.6	27.2	56.1	61.1	32.9	51.0	49.4	43
5	CULVER	64.0	53.3	34.2	60.6	72.7	33.8	62.1	54.4	13
6	NE93613	62.7	57.0	33.5	62.5	74.4	31.2	58.7	54.3	16
7	Millennium	57.6	62.3	35.7	56.2	51.5	32.3	54.5	50.0	39
8	NE94482	66.2	61.5	26.1	68.9	70.6	33.6	54.0	54.4	12
9	NE94589	60.6	47.5	24.6	58.6	69.2	29.9	61.5	50.3	33
10	ALLIANCE	56.7	51.7	25.4	68.2	75.9	38.0	68.1	54.8	9
11	VISTA	60.5	50.5	29.2	70.4	67.8	34.8	48.7	51.7	26
12	NE94653	58.1	62.1	40.2	76.8	63.6	37.9	58.8	56.8	3
13	NE94654	53.8	52.7	44.2	62.8	62.6	34.3	63.2	53.4	20
14	NE94655	53.2	53.6	35.4	61.6	56.6	33.0	54.3	49.7	42
15	NE95473	59.9	65.6	37.8	68.4	69.5	38.2	55.0	56.3	4
16	NE95510	62.7	64.8	36.6	62.0	69.9	41.8	63.0	57.2	2
17	NE95553	65.2	52.7	28.5	55.1	49.5	26.8	54.1	47.4	53
18	NE96435	58.4	42.9	19.8	60.1	60.7	35.3	59.7	48.1	51
19	NE96573	56.3	53.9	30.0	59.7	56.1	32.1	57.6	49.4	45
20	NE96579	70.2	62.9	36.2	60.6	70.1	31.6	54.5	55.1	8
21	WINDSTAR	54.9	45.4	23.1	54.1	72.2	32.4	60.2	48.9	50
22	NE96618	61.4	50.5	28.8	57.9	62.5	32.9	55.5	49.9	40
23	NE96632	50.7	47.6	24.3	52.1	61.8	35.5	56.9	47.0	55
24	NE96649	59.9	48.5	28.6	47.5	72.9	33.1	63.3	50.5	31
25	NE96654	64.1	57.5	39.9	61.1	57.5	32.6	63.1	53.7	17
26	NE96676	58.2	39.7	31.8	50.4	58.3	33.6	56.1	46.9	56
27	NE96737	72.1	53.3	36.3	57.0	64.1	34.6	57.1	53.5	19
28	NE93427	68.5	62.0	39.0	54.1	69.8	39.1	49.5	54.6	10
29	NE97407	71.7	42.5	33.5	54.9	63.5	28.6	54.1	49.8	41
30	NE97421	68.1	37.0	28.8	54.4	61.4	38.4	63.4	50.2	36
31	BUCKSKIN	46.1	43.4	22.2	45.3	56.4	34.2	54.0	43.1	58
32	CHEYENNE	48.6	45.4	19.0	42.9	51.9	30.9	53.7	41.8	60
33	NE97426	70.0	51.2	31.0	54.0	75.0	31.6	55.0	52.6	24
34	NE97465	71.7	61.5	35.1	57.0	68.2	36.8	60.3	55.8	5
35	NE97489	51.1	46.9	37.7	51.8	53.9	32.5	63.0	48.1	52
36	NE97518	64.0	49.7	30.1	64.5	73.4	29.2	45.4	50.9	30
37	NE97553	56.9	46.7	32.8	52.8	65.9	28.3	45.8	47.0	54
38	NE97558	56.8	55.5	30.6	57.9	62.5	32.9	61.4	51.1	29
39	NE97612	63.9	59.3	43.9	55.0	60.0	36.5	51.1	52.8	22
40	NE97638	53.8	59.9	38.1	60.6	75.0	33.8	59.3	54.3	14
41	PRONGHORN	62.9	53.7	23.5	59.1	54.6	40.8	57.3	50.3	34
42	SCOUT66	45.2	40.1	14.4	54.2	57.4	37.8	45.4	42.1	59
43	NE97669	60.2	56.5	25.1	62.1	78.5	37.8	61.2	54.5	11
44	NE97670	66.7	58.6	35.5	66.2	70.4	37.5	54.8	55.7	6

45	NE97675	54.3	57.1	39.1	65.9	61.6	39.1	54.9	53.2	21
46	NE97689	52.2	55.9	33.8	64.6	79.7	38.5	62.3	55.3	7
47	NE97693	51.2	39.5	25.7	52.5	39.7	41.1	60.0	44.2	57
48	NE97716	58.3	63.4	25.8	70.9	54.4	33.6	56.4	51.8	25
49	NI97423	63.8	55.7	34.2	66.1	70.5	41.4	43.3	53.6	18
50	WESLEY	64.4	58.9	26.7	67.4	69.9	36.2	56.7	54.3	15
51	N96L1226	63.7	46.2	30.0	66.5	72.3	26.7	40.4	49.4	44
52	N96L1229	52.9	48.5	31.6	66.5	63.2	31.3	48.4	48.9	49
53	N97L162	55.9	42.1	30.3	62.8	70.3	34.1	49.9	49.4	46
54	N96V039	65.1	56.4	31.7	65.2	51.9	35.3	52.8	51.2	28
55	N97V031	68.4	51.8	35.8	62.1	62.6	31.5	39.6	50.3	35
56	N97V121	72.1	54.8	40.7	77.7	70.8	44.0	44.5	57.8	1
57	NE97519	60.5	49.7	32.4	71.3	61.9	27.7	48.6	50.3	32
58	NE97614	69.8	45.8	30.3	68.5	78.4	23.8	52.5	52.7	23
59	NE97664	64.7	46.6	23.0	70.6	66.2	28.3	51.1	50.0	38
60	NE95546	63.3	53.1	29.8	64.7	70.9	23.7	44.9	50.1	37
	GRAND MEAN	60.4	52.4	31.4	60.2	64.7	33.9	55.0	51.2	
	CV	14.7	10.0	21.6	14.2	9.4	15.4	11.0		
	LSD	10.4	8.7	7.9	14.3	10.2	8.7	7.1		

5. Nebraska Triplicate Nursery:

The same comments about the NIN data apply to the Nebraska Triplicate Nursery (NTN). Wesley, Alliance, and number of experimental lines had very good years. Data for the 2001 NTN follow:

		----------bu/a----------									
Entry	Variety	Winsur	McCook	Linc.	ClayC.	Mead	Grant	Allian.	Sidn.	St. Avg.	St. Rank
1	NE00403	8.42	41.6	76.8	62.9	65.6	39.2	56.7	36.4	**54.17**	**15**
2	NE00429	9.72	34.3	74.5	74.4	74.2	39.1	62.4	37.9	**56.67**	**8**
3	NE00435	8.78	32.6	70.4	64.1	72.2	39.4	63.6	37.7	**54.28**	**14**
4	NE00436	8.07	31.0	66.2	63.5	66.5	38.2	54.2	37.9	**51.08**	**30**
5	NE00439	7.90	33.7	87.1	60.5	60.9	41.1	46.2	37.9	**52.48**	**24**
6	NE00443	7.69	24.0	65.6	45.4	53.5	35.9	45.6	31.9	**43.13**	**50**
7	NE00446	6.37	23.9	60.6	32.7	49.5	29.4	54.2	39.0	**41.32**	**54**
8	NE00447	9.42	31.9	68.0	66.0	65.4	37.7	64.3	47.6	**54.42**	**12**
9	NE00452	8.69	34.1	65.5	67.3	62.8	26.6	51.5	40.7	**49.77**	**34**
10	NE00456	8.95	35.4	72.4	68.8	64.5	35.9	58.6	42.8	**54.06**	**16**
11	NE00469	8.43	32.0	68.5	71.6	67.6	30.9	57.9	38.9	**52.49**	**23**
12	NE00479	8.11	23.7	81.2	73.7	70.8	34.2	52.8	36.8	**53.31**	**20**
13	NE00480	6.39	28.0	58.4	56.2	47.8	35.0	45.5	38.5	**44.19**	**46**
14	NE00481	8.24	23.4	80.5	66.2	75.0	32.4	50.3	39.7	**52.50**	**22**
15	Alliance	8.51	34.7	70.9	79.8	68.8	41.2	58.4	39.9	**56.25**	**9**
16	NE00485	4.58	33.4	66.9	16.7	27.3	32.9	51.7	33.1	**37.43**	**60**
17	NE00488	8.35	30.8	76.0	62.2	68.5	34.1	51.6	36.4	**51.38**	**29**
18	NE00493	6.61	24.9	61.7	36.6	38.9	25.2	51.3	32.3	**38.70**	**59**
19	NE00495	7.06	26.9	65.9	42.5	54.2	30.0	46.9	37.4	**43.43**	**49**
20	NE00500	8.72	26.0	67.1	62.1	65.9	29.6	47.9	36.3	**47.82**	**40**
21	NE00507	9.19	33.1	69.0	58.0	66.6	38.0	55.7	41.4	**51.69**	**27**

22	NE00525	8.07	33.8	56.5	61.6	57.3	41.3	64.0	39.2	**50.52**	**32**
23	NE00532	4.17	20.7	69.9	34.9	40.2	37.5	42.9	34.4	**40.07**	**58**
24	NE00540	6.64	36.8	76.5	33.2	62.2	38.3	54.7	34.1	**47.98**	**38**
25	NE00544	8.89	35.4	77.1	72.6	72.9	40.2	61.2	43.6	**57.59**	**5**
26	NE00548	8.54	30.1	62.4	58.1	66.0	38.0	52.2	34.2	**48.70**	**36**
27	NE00556	7.63	31.9	69.7	61.2	65.7	41.6	53.0	41.3	**52.05**	**26**
28	NE00559	8.02	36.7	68.7	59.6	58.3	29.0	45.5	37.9	**47.96**	**39**
29	NE00564	9.37	36.0	81.3	83.1	82.3	33.5	52.7	37.8	**58.10**	**4**
30	Pronghorn	8.78	30.3	59.2	72.0	84.4	30.0	56.3	40.9	**53.30**	**21**
31	NE00566	8.19	28.5	68.6	68.7	70.5	32.5	57.9	40.1	**52.39**	**25**
32	NE00571	8.58	29.5	73.8	56.8	55.5	39.2	52.7	41.0	**49.79**	**33**
33	NE00578	8.35	28.5	69.0	81.0	77.0	41.0	55.6	40.2	**56.03**	**10**
34	NE00597	7.05	25.8	62.4	45.6	50.8	33.0	49.1	33.9	**42.95**	**51**
35	NE00606	6.85	23.2	53.7	58.2	57.8	35.6	58.5	36.2	**46.20**	**44**
36	NE00609	8.10	34.4	83.1	69.3	68.1	36.5	52.9	42.2	**55.22**	**11**
37	NE00611	8.66	30.2	66.7	71.8	76.6	38.5	54.8	37.1	**53.69**	**19**
38	NE00616	8.55	24.1	79.2	80.0	77.0	34.3	47.1	36.7	**54.03**	**17**
39	NE00624	7.14	34.8	66.9	68.2	57.4	39.6	55.5	34.3	**50.96**	**31**
40	NE00627	5.90	28.9	71.4	53.4	53.7	32.4	54.8	36.9	**47.36**	**42**
41	NE00633	7.29	32.6	74.1	60.6	68.7	40.2	60.7	39.7	**53.79**	**18**
42	NE00636	6.60	33.9	81.4	58.4	63.9	31.0	55.9	36.3	**51.53**	**28**
43	NE00638	7.75	31.5	75.6	58.2	58.0	33.0	56.0	35.0	**49.60**	**35**
44	NE00639	8.88	32.4	77.2	77.4	80.9	35.4	50.1	44.0	**56.77**	**7**
45	Wesley	8.99	28.5	90.9	90.4	69.6	30.1	62.4	36.9	**58.41**	**3**
46	NE00642	6.41	24.5	56.7	42.3	45.7	28.6	54.5	35.5	**41.13**	**55**
47	NE00645	6.90	26.5	63.8	52.5	41.5	23.8	48.7	37.6	**42.04**	**53**
48	NE00649	7.96	29.5	77.1	69.4	56.2	25.1	45.4	35.2	**48.26**	**37**
49	NE00658	8.94	32.7	87.3	89.5	79.8	34.6	50.1	41.7	**59.37**	**1**
50	NE00665	7.41	28.0	58.2	52.9	53.5	22.3	55.8	37.3	**43.98**	**48**
51	NE00669	8.61	26.4	62.7	57.8	60.2	27.8	59.2	38.3	**47.49**	**41**
52	NE00679	8.91	27.5	76.9	82.7	83.4	33.4	57.7	37.0	**56.94**	**6**
53	NE00687	8.87	27.7	89.7	86.0	77.3	30.4	63.6	38.6	**59.03**	**2**
54	NE00691	4.82	27.0	64.7	40.4	34.6	34.4	48.7	32.2	**40.28**	**57**
55	NE00698	8.43	28.8	76.0	83.0	72.4	30.0	53.1	36.7	**54.30**	**13**
56	NI00414	6.09	29.1	75.0	48.8	54.3	33.5	53.8	31.5	**46.56**	**43**
57	NI00434	6.48	30.9	61.5	44.2	47.4	29.5	52.2	33.6	**42.77**	**52**
58	NI00433	6.83	30.5	65.7	46.0	57.6	36.3	43.8	41.8	**45.96**	**45**
59	NI00436	5.80	25.9	69.7	36.2	47.4	30.8	41.7	32.9	**40.67**	**56**
60	NI00437	7.06	29.2	69.2	39.4	51.3	35.1	46.2	38.7	**44.15**	**47**
	Avg.	7.74	30.03	70.71	60.61	62.07	34.05	53.47	37.72	**49.81**	
	CV		10.848	8.693	12.320	9.975	6.446	10.71	7.819		
	LSD		5.446	8.321	10.109	10.349	3.668	7.75	3.992		

Fifty-four entries were received for analysis from the 2001 Triplicate Nursery. This is the first year that large-scale analyses have been performed on this group of samples. The varieties Alliance and Pronghorn were included in the group as checks. The wheat protein (on a 14% moisture base) for the entire group

ranged from: 10.85% (NE00645) to 13.75% (NE00698). Three entries stood out as having superior quality characteristics. The promising lines are: NE 00544. This line exhibited strong mixing properties. It also received good bread-quality scores in the categories of color, loaf volume, grain, and texture. The lines NE00616 and NE00665 also had good mixing and bread-baking quality traits. NE00616 stands out on the basis of its excellent crumb color, while NE00665 has exceptional milling qualities. Five entries were dropped because of poor quality characteristics. These are: NE00542 and NE00609 were very poor milling types; both had a tendency to plug the mill, and had relatively low mill-flour yields of 68.3% and 65.1% respectively. NE00443 had inferior dough-handling properties; very yellow crumb grain color; and weak tolerance to mixing. NE00447 had poor loaf volume, crumb grain and texture, as well as an undesirable yellow crumb color. NE00636 had poor (weak) mixing properties and crumb texture. The additional forty-four entries had acceptable quality characteristics. These lines were advanced or dropped on the basis of agronomic performance. Twenty-two lines were advanced for further testing in the 2002 NIN.

Data for the 2000 NTN follow:

		Yield (bu/a)							
ENTRY	VARIETY	Lincoln	Mead	Clay Cen	McCook	Sidney	Alliance	Average	**Rank**
1	NI99412	64.5	93.2	44.3	26.9	78.9	57.2	60.82	**5**
2	NI99416	58.1	69.9	46.4	34.7	89.9	61.0	60.02	**6**
3	NI98414	51.4	78.0	45.7	28.6	89.4	57.3	58.40	**18**
4	NE99404	50.9	69.3	40.1	34.9	68.3	55.3	53.14	**49**
5	NE99405	55.8	64.8	42.1	33.0	70.3	40.5	51.07	**56**
6	NE99406	55.6	68.4	43.5	38.7	82.6	45.6	55.72	**36**
7	NE99407	48.6	54.1	43.7	35.5	85.8	58.0	54.28	**43**
8	NE99410	56.7	65.1	45.0	38.4	87.7	67.1	60.01	**7**
9	NE99411	51.7	67.9	43.8	29.7	71.6	49.7	52.40	**54**
10	NE99413	48.5	66.6	44.2	22.3	72.6	49.7	50.65	**57**
11	NE99417	47.0	60.4	35.5	31.1	74.2	47.1	49.23	**60**
12	NE99418	56.4	70.5	38.7	35.9	73.8	57.9	55.54	**37**
13	NE99424	52.7	81.1	46.4	35.8	82.9	50.7	58.26	**21**
14	NE99428	58.1	71.6	39.8	30.5	80.3	52.4	55.45	**39**
15	ALLIANCE	58.2	74.9	44.2	35.4	89.1	55.1	59.48	**9**
16	NE99430	43.0	74.4	40.7	29.0	84.2	51.5	53.78	**47**
17	NE99431	55.3	74.7	37.8	34.8	71.8	54.4	54.79	**42**
18	NE99437	43.9	68.0	43.9	36.8	74.7	57.8	54.17	**45**
19	NE99441	64.2	60.4	36.1	32.7	76.1	48.9	53.06	**51**
20	NE99443	48.4	68.5	40.3	33.6	87.9	60.1	56.46	**33**
21	NE99445	57.1	76.8	50.0	34.5	91.0	57.2	61.08	**4**
22	NE99464	63.9	60.5	47.7	37.9	78.7	52.0	56.78	**31**
23	NE99469	61.6	66.5	44.7	34.3	85.6	63.5	59.37	**11**
24	NE99471	54.1	67.7	38.1	29.3	77.3	59.0	54.25	**44**
25	NE99489	60.9	68.1	46.7	33.1	85.3	61.5	59.27	**13**
26	NE99495	55.7	78.3	45.8	38.7	87.7	50.4	59.43	**10**
27	NE99496	51.6	69.5	39.8	39.1	81.1	56.3	56.23	**35**
28	NE99504	50.8	77.5	37.0	35.4	80.5	58.2	56.57	**32**
29	NE99508	55.3	68.3	45.2	34.3	76.5	58.5	56.37	**34**

30	PRONGHORN	49.7	63.9	38.8	27.0	75.0	62.2	52.77	**52**
31	NE99510	65.2	77.8	42.8	34.3	81.8	55.7	59.59	**8**
32	NE99512	54.9	71.8	41.8	28.1	72.0	55.9	54.10	**46**
33	NE99513	60.3	69.7	42.5	40.5	78.2	60.6	58.64	**17**
34	NE99521	53.6	71.1	52.3	28.6	78.8	56.5	56.82	**30**
35	NE99529	57.0	81.5	46.3	31.7	79.2	49.0	57.44	**27**
36	NE99533	57.4	86.4	54.6	46.7	85.1	60.2	65.06	**1**
37	NE99534	47.4	72.7	36.9	34.3	68.1	53.8	52.19	**55**
38	NE99541	59.0	67.6	38.6	31.2	82.3	53.0	55.29	**40**
39	NE99542	53.5	71.6	40.0	37.7	87.6	59.9	58.39	**19**
40	NE99543	60.2	76.4	43.3	37.9	87.4	64.0	61.54	**3**
41	NE99552	61.3	73.9	44.0	24.3	84.7	61.5	58.29	**20**
42	NE99554	54.0	80.2	44.2	34.4	75.6	58.9	57.88	**23**
43	NE99555	45.6	74.9	40.3	30.1	81.0	48.2	53.35	**48**
44	NE99559	56.3	75.6	45.1	23.8	80.7	51.2	55.45	**38**
45	2137	59.2	77.8	46.1	36.0	84.1	51.5	59.13	**14**
46	NE99575	55.9	67.5	38.6	34.2	97.3	62.2	59.28	**12**
47	NE99578	57.9	65.2	46.0	35.3	88.4	55.7	58.07	**22**
48	NE99579	57.4	81.7	44.2	27.9	82.3	52.3	57.64	**24**
49	NE99585	51.2	87.1	52.2	31.7	78.1	45.4	57.60	**25**
50	NE99604	55.8	65.5	41.3	20.8	66.3	49.8	49.91	**59**
51	NE99617	56.3	70.6	37.4	28.6	85.6	64.9	57.23	**28**
52	NE99626	53.7	70.9	36.8	18.8	68.7	55.1	50.65	**58**
53	NE99636	53.6	67.4	39.1	27.9	79.6	51.1	53.13	**50**
54	NE99656	49.8	72.0	43.9	30.6	87.9	61.1	57.56	**26**
55	NE99669	56.2	71.7	44.1	28.5	75.2	56.0	55.28	**41**
56	NE99675	67.8	82.9	39.5	22.4	86.1	53.8	58.73	**15**
57	N99L011	51.3	73.8	43.4	34.9	80.9	56.9	56.86	**29**
58	N99L012	69.6	78.1	41.0	36.9	89.1	55.0	61.63	**2**
59	N99L031	48.5	71.2	40.4	19.5	89.4	46.6	52.59	**53**
60	N99L033	64.8	76.2	47.1	35.4	68.5	60.0	58.67	**16**
	Average	55.4	72.2	42.8	32.3	80.7	55.4		
	CV	10.2	6.5	7.5	11.4	7.0	9.4		
	LSD	7.7	7.8	4.4	6.2	7.6	7.1		

Data for the 1999 NTN follow:

ENTRY	VARIETY	Linc.	Mead	Cl. Cent.	N. Platte	McCook	Grant	Alliance	Average	State
		bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	Rank
1	NE98404	62.3	50.5	35.4	56.8	58.1	30.4	55.3	49.8	55
2	NE98405	68.6	43.9	34.7	44.5	65.6	46.7	60.6	52.1	46
3	NE98410	67.1	52.3	27.3	69.5	68.1	51.3	56.5	56.0	21
4	NE98416	63.5	58.9	26.5	72.3	76.8	38.4	59.8	56.6	19
5	NE98424	69.5	49.4	36.6	66.1	76.8	39.4	61.4	57.0	15
6	NE98425	75.2	57.8	26.8	65.1	74.5	48.1	54.7	57.4	10
7	NE98445	69.9	69.3	30.0	64.7	59.5	44.7	58.3	56.6	18

8	NE98454	66.5	60.7	33.3	66.2	64.7	34.9	53.6	54.3	35
9	NE98455	75.7	60.2	36.0	62.0	69.0	39.9	54.3	56.7	17
10	NE98466	78.6	60.6	42.2	65.6	62.1	38.8	53.3	57.3	11
11	NE98468	73.0	73.3	31.3	69.1	58.1	46.7	59.0	58.6	5
12	NE98471	78.9	66.3	26.3	72.6	64.6	42.4	66.7	59.7	2
13	NE98476	77.1	61.9	32.5	74.0	66.3	38.0	50.4	57.2	12
14	NE98493	67.9	57.9	19.3	65.1	60.8	45.0	48.0	52.0	47
15	ALLIANCE	62.5	39.1	20.6	60.4	81.6	37.0	63.8	52.1	45
16	NE98499	68.9	41.0	19.8	55.7	68.8	36.2	65.8	50.9	50
17	NE98502	65.5	61.6	30.3	62.4	64.7	43.2	59.1	55.3	24
18	NE98503	68.3	61.5	27.2	70.3	71.0	42.8	64.8	58.0	8
19	NE98522	73.8	59.0	29.3	65.1	60.0	37.6	61.0	55.1	26
20	NE98529	72.8	55.4	26.7	60.5	60.8	38.5	54.1	52.7	44
21	NE98530	78.3	60.0	42.2	71.9	74.5	39.7	54.7	60.2	1
22	NE98535	58.7	60.9	25.9	68.3	62.9	41.0	64.0	54.5	31
23	NE98537	64.5	60.7	35.4	64.1	59.5	38.0	54.8	53.9	36
24	NE98548	68.6	45.1	27.2	66.3	69.6	40.4	64.5	54.5	30
25	NE98552	64.4	57.8	33.4	46.9	64.1	34.3	50.0	50.1	53
26	NE98564	67.7	65.8	32.9	66.4	74.5	37.5	68.7	59.1	4
27	NE98569	66.7	59.0	32.4	58.6	63.0	34.1	44.4	51.2	48
28	NE98574	61.6	56.6	25.9	65.5	68.7	39.7	63.5	54.5	32
29	NE98577	68.4	44.3	23.7	60.9	58.8	36.5	59.6	50.3	52
30	ARAPAHOE	62.4	41.6	31.9	52.1	67.9	36.4	60.5	50.4	51
31	NE98578	65.7	59.2	24.1	55.9	56.8	34.3	60.9	51.0	49
32	NE98589	78.4	58.8	27.5	64.4	70.6	36.0	61.8	56.8	16
33	NE98594	59.8	54.7	36.5	64.7	70.0	37.3	60.3	54.7	28
34	NE98602	71.7	61.7	33.5	65.1	63.0	34.6	58.5	55.4	23
35	NE98632	77.3	60.0	40.5	67.8	67.1	37.6	64.2	59.2	3
36	NE98646	54.8	45.7	23.7	72.3	87.7	40.1	61.3	55.1	27
37	NE98655	65.4	45.1	39.9	47.5	56.4	33.0	56.9	49.2	56
38	NE98657	65.0	58.2	33.4	48.2	64.9	44.1	67.3	54.4	33
39	NE98662	63.1	45.3	30.5	58.0	73.1	41.5	60.7	53.1	41
40	NE98666	66.1	52.3	26.1	58.3	71.3	36.6	63.7	53.5	39
41	NE98667	68.0	45.4	25.8	66.6	65.7	41.8	62.2	53.6	37
42	NE98675	59.6	52.7	28.1	64.4	59.0	43.2	66.4	53.3	40
43	NE98684	58.6	45.3	31.5	68.4	79.3	43.4	48.2	53.5	38
44	NE98686	56.8	45.2	21.7	66.4	68.5	32.5	58.6	49.9	54
45	JAGGER	56.2	26.3	13.6	66.5	56.2	44.1	64.3	46.7	60
46	NE98691	81.0	52.5	28.9	67.7	70.7	27.1	55.1	54.7	29
47	NE98692	72.2	63.0	31.6	59.2	72.3	36.0	65.0	57.0	14
48	NE98694	58.3	52.1	25.5	67.8	53.1	32.5	54.9	49.2	57

49	NE98696	73.5	55.9	28.5	67.6	71.8	32.3	62.9	56.1	20
50	NE98714	55.5	43.9	21.1	62.9	62.8	28.9	55.5	47.2	59
51	NE98708	70.1	52.0	32.1	67.8	62.7	32.5	52.4	52.8	43
52	NE98714	68.2	42.0	22.8	74.1	78.3	46.1	56.8	55.4	22
53	NE98717	66.3	55.9	30.4	61.9	65.7	37.2	52.2	52.8	42
54	NI97444	64.2	47.5	26.5	52.1	66.7	30.6	47.4	47.8	58
55	NI98418	76.3	53.5	23.0	64.1	76.1	42.5	68.6	57.7	9
56	NI98438	50.7	43.3	32.4	70.1	86.3	41.9	56.2	54.4	34
57	NI98439	75.0	64.5	39.1	67.5	58.8	44.4	58.3	58.2	7
58	NI97405	62.0	47.3	31.0	67.7	74.6	40.7	62.6	55.1	25
59	NI97435	58.1	47.9	28.4	86.0	79.0	38.1	61.8	57.0	13
60	2137	78.1	55.2	26.6	75.7	77.0	41.0	55.4	58.4	6
	GRAND MEAN	67.4	53.7	29.5	64.3	67.7	38.8	58.8	54.3	
	CV	11.0	11.5	17.8	14.7	10.2	13.8	11.3		
	LSD	10.0	10.3	7.1	15.8	11.5	9.0	9.0		

6. Regional Nurseries

The Southern Regional Performance Nursery (SRPN) and Northern Regional Performance Nursery (NRPN) were harvested at Lincoln, Sidney, and Alliance. The seed from Colorado was infected with common bunt (**not karnal bunt**, but another soil/seed borne disease that found in the Great Plains) and was not harvested at Lincoln to protect our seed from being contaminated. Common bunt can be treated with chemicals, but the best practice is to avoid the disease altogether. We hope our rotations and climate will reduce the possibility of future common bunt infections. Yields were as follows:

Data for 2001 SRPN: ----------bu/a----------

Entry	Variety	Origin	Wsurv.	Linc.	Sidn.	Allian.	St. Avg	St. Rank
1	CI 1442	check	10.00	55.4	27.3	29.2	**37.31**	**36**
2	CI 13996	check	9.33	68.9	32.6	36.2	**45.91**	**15**
3	PI 495594	check	9.00	67.5	34.0	29.0	**43.48**	**24**
4	TX95A1161	TX A&M	9.67	68.8	36.9	22.6	**42.78**	**26**
5	TX95A3091	TX A&M	9.00	77.8	40.1	28.3	**48.77**	**9**
6	TX97A0122	TX A&M	9.33	77.2	37.3	25.6	**46.67**	**14**
7	TX97A0219	TX A&M	10.00	74.9	37.8	33.2	**48.61**	**10**
8	TX97A0244	TX A&M	9.33	76.1	43.2	34.5	**51.24**	**5**
9	TX97D6377	TX A&M	9.00	63.0	28.4	29.6	**40.34**	**32**
10	TX98D1170	TX A&M	7.00	74.9	32.0	38.3	**48.41**	**11**
11	TX97V2838	TX A&M	3.67	50.6	32.0	19.7	**34.09**	**38**
12	TX98V9315	TX A&M	9.33	54.5	35.6	23.1	**37.72**	**35**
13	TX98V9618	TX A&M	8.33	47.6	38.3	20.3	**35.38**	**37**
14	TX98V9930	TX A&M	1.00	29.0	29.1	16.6	**24.89**	**39**
15	OK94P549-99-6704	OSU	7.00	66.6	36.1	30.2	**44.29**	**19**
16	OK96717-99-6756	OSU	7.00	69.2	28.8	24.4	**40.80**	**31**

17	OK97508	OSU	9.00	57.3	36.1	25.1	**39.50**	**33**
18	OK98680	OSU	8.00	66.6	33.7	29.0	**43.10**	**25**
19	OK96705-99-6745	OSU	9.33	62.0	35.0	35.0	**44.00**	**21**
20	OK93P656-RMH3299	OSU	6.00	64.3	35.4	25.8	**41.84**	**28**
21	G97380	Goertzen Seed	8.33	63.9	36.0	23.4	**41.10**	**30**
22	G97209	Goertzen Seed	6.33	58.0	31.4	26.0	**38.46**	**34**
23	T122	Trio	8.33	56.3	36.2	31.0	**41.16**	**29**
24	T001X	Trio	10.00	69.4	41.9	25.9	**45.70**	**16**
25	T002X	Trio	9.67	74.0	39.7	20.3	**44.66**	**18**
26	T003X	Trio	10.00	65.3	44.5	25.1	**45.00**	**17**
27	KS98HW151-6	KSU	10.00	69.3	34.9	27.8	**43.99**	**22**
28	KS98HW220-5	KSU	6.33	72.9	36.4	22.2	**43.84**	**23**
29	KS920709-B-5-2	KSU	10.00	91.2	47.5	27.4	**55.37**	**1**
30	KS920946-B-15-2	KSU	10.00	87.1	32.6	25.3	**48.36**	**12**
31	CO970498	CSU	10.00	0.1	34.6	30.8	**21.86**	**42**
32	CO970531	CSU	9.00	0.1	31.1	42.2	**24.47**	**40**
33	CO970547	CSU	9.67	0.1	38.2	31.6	**23.31**	**41**
34	CO970940	CSU	6.67	0.1	27.4	11.4	**12.98**	**45**
35	CO980894	CSU	8.00	0.1	39.3	21.2	**20.21**	**44**
36	CO980889	CSU	8.00	0.1	37.0	25.4	**20.82**	**43**
37	NE98632	UNL	10.00	75.9	38.4	49.6	**54.64**	**2**
38	NE97V121	UNL	9.67	79.0	41.1	43.4	**54.51**	**3**
39	NI98439	UNL	10.00	78.2	47.3	28.8	**51.42**	**4**
40	NE97465	UNL	9.00	72.3	39.9	30.5	**47.56**	**13**
41	NE98466	UNL	10.00	59.4	41.1	32.2	**44.24**	**20**
42	NE98564	UNL	10.00	74.5	43.8	33.3	**50.57**	**6**
43	NW97S278	ARS-LNK	10.00	76.5	39.0	34.0	**49.85**	**8**
44	NW97S218	ARS-LNK	7.00	63.3	33.7	29.6	**42.23**	**27**
45	W97-234	Agripro	9.33	79.3	37.6	33.3	**50.05**	**7**
	Average		8.57	58.63	36.454	28.609	**41.23**	
	CV		13.56	10.18	10.271	18.870		
	LSD		1.58	8.10	5.082	7.328		

Data for the 2001 NRPN: ----------bu/a----------

Entry	Variety	Class	Origin	Linc.	Sidn.	Allian.	St. Avg.	St. Rank
1	CI 1442	HRW	check	37.9	35.2	38.9	37.32	30
2	CI 17439	HRW	check	58.5	30.4	40.1	42.96	28
3	PI 511307	HRW	check	81.6	43.1	46.6	57.11	5
4	PI 584997	HRW	check	78.8	38.0	41.4	52.72	12
5	PI 612576	HWW	check	70.6	45.0	40.0	51.88	17
6	NE97689	HRW	UNL	71.2	48.1	41.4	53.55	10
7	NE98471	HRW	UNL	79.7	49.9	39.2	56.23	6
8	NE97638	HRW	UNL	92.5	43.3	40.6	58.82	3
9	NE98503	HRW	UNL	86.2	48.2	43.4	59.25	2
10	NI98418	HRW	UNL	39.5	46.6	36.3	40.78	29
11	NE97669	HRW	UNL	92.5	48.1	46.4	62.34	1

12	NE96579	HRW	UNL	71.8	49.7	43.4	54.98	7
13	NE96737	HRW	UNL	72.4	48.6	51.8	57.60	4
14	NI99412	HRW	UNL	64.2	50.8	49.5	54.81	8
15	NE98564	HRW	UNL	72.1	45.6	39.7	52.46	13
16	NW97S182	HWW	ARS-LNK	75.7	43.9	44.1	54.60	9
17	NW97S218	HWW	ARS-LNK	76.4	42.7	34.8	51.32	18
18	NW97S278	HWW	ARS-LNK	63.9	43.8	45.3	50.99	19
19	NW97S114	HWW	ARS-LNK	68.6	41.5	37.8	49.31	22
20	96MD7413-58	HRW (partial waxy	ARS-LNK	65.4	41.1	50.2	52.25	15
21	96MD7413-36	HRW (partial waxy	ARS-LNK	61.7	45.3	38.4	48.45	24
22	96MD7110-71	HRW (partial waxy	ARS-LNK	47.9	45.3	39.3	44.19	27
23	NW97S078	HWW	ARS-LNK	72.5	41.4	43.4	52.42	14
24	NW97S092	HWW	ARS-LNK	71.0	37.4	24.9	44.45	26
25	NW97S112	HWW	ARS-LNK	63.9	43.3	35.2	47.45	25
26	NW97S295	HWW	ARS-LNK	65.9	45.8	37.0	49.56	21
27	SD92107-3	HRW	SDSU	70.8	37.3	47.5	51.88	16
28	SD92107-5	HRW	SDSU	66.5	38.4	54.7	53.20	11
29	SD97W604	HWW	SDSU	66.7	37.6	42.8	49.02	23
30	SD97457	HRW	SDSU	70.8	35.8	44.1	50.26	20
	GRAND MEAN			69.24	43.04	41.93	51.40	
	CV			16.76	10.91	18.53		
	LSD			15.84	6.41	10.61		

In the SRPN, few Nebraska experimental lines are entered because they tend to be too late for that nursery. The better experimental lines for Nebraska tend to be entered in the NRPN where they performed well. However, high yielding, early lines are a need for Nebraska and increased efforts in selecting these types will continue. In the past, one early generation nursery was grown in Kansas to identify lines that are early with good performance characteristics, however, that became impossible with the Kansas restrictions on out-of-state seed.

7. Multiple-Location Observation Nursery

Six replications (locations) in Nebraska (Lincoln, Mead, McCook, Grant, Sidney, and Alliance) and one location from Kansas (grown by Goertzen Seeds at Haven which is near Wichita) of this nursery were harvested and used for selection. Clay Center was not harvested due to winterkilling. Due to the size of this nursery, spatial variation continues to be a concern at many locations. Enhanced statistical analyses for these trials continue to be sought. Fifty-five lines from this nursery and two lines from the irrigated nursery were advanced to the Nebraska Triplicate Nursery. In reviewing the pedigrees of the lines in this nursery, it is apparent that most of the elite germplasm involves relatively narrow crosses (e.g. Nebraska x Nebraska lines or Nebraska x regional lines x Nebraska lines). The effective use of germplasm introductions seems to require at least two cycles of selection (the first selections from crosses involving introductions lead to parents and crosses with those parents may lead to varieties).

8. Early Generation Nurseries

a. Single-plot Observation Nursery

Sixteen hundred sixty-five lines including checks were evaluated at Lincoln in 2001. Of the 1665 lines and checks, 1477 where red seeded and 188 where white seeded. Most of the white seeded lines were pure white, while any segregating red and white line was grown among the red lines. Of this group, 422 were harvested and over 375 samples were submitted for Quadrumat Junior milling, flour protein content, and dough mixing properties. As in the past, the turn-around time in the Wheat Quality Laboratory was excellent (all quality evaluations completed by the end of August). On the basis of agronomic and quality performance, 260 red wheat and 30 white wheat lines were selected for further testing.

b. Headrow Nursery

Over 42,500 headrows were planted at Mead. In general, the headrow nursery had an excellent start due to early planting (our two plating crew effort) and adequate moisture, but were injured severely by the winter. Due to thin stands, weeds were a major problem and we had to use backpack sprayers to spray around the headrows to reduce the weed pressure. Fortunately, a late dry period also slowed weed growth. We harvested over 1900 lines and planted 1793 red and white wheat lines. Of the red and white wheat lines, 216 where sent to Dr. Baltensperger for planting at Scottsbluff in our irrigated observation nursery, 109 for testing for herbicide tolerance, and 39 lines to Gary Hein to test for wheat steak mosaic virus tolerance. We are extremely fortunate to have these tests done in Nebraska because it is difficult to ship seed to other states.

a. F3 bulk hybrids

The F3 bulk hybrid nursery contained 872 bulks and check plots. All plots were planted at Mead and most were planted at Sidney. Most bulks survived the winter and were above average for selection. Heads were selected from the Mead bulks and the seed quality would be considered as above average. The number of F3 bulks is large. Over 40,000 head rows were selected for fall planting. The headrows were planted early into good moisture while we were planting our western nurseries. Their emergence and stand was excellent. The project goal remains to have sufficiently good segregating F3 material to select about 40 - 45,000 headrows.

b. F2 bulk hybrids

The F2 bulk hybrid nursery contained 875 red (including segregating red and white) and 193 white bulks and check plots. These bulks generally survived the winter, but some were winterkilled (those involving wintertender parents) and some were damaged by rodents and birds. As in the past, we continue to share our bulks with other programs (Western Plant Breeders and offered to other states) and receive bulks from other programs. Due to the large number of bulks, about 618 were advanced as individual bulks for further consideration in 2001 from our program. An additional 41 bulks were received from Colorado to augment our breeding program.

9. Winter Triticale Nursery

In 2001, two forage triticale varieties were released for commercial sale (NE422T [formerly NE96T422] through Nupride Genetics Network and Gro-Green Plus [formerly NE96T441] through Star Seed Inc. of Kansas). NE422T is a forage winter triticale (*X.Triticosecale rimpaui* Wittm.) cultivar developed cooperatively by the Nebraska Agricultural Experiment Station and the USDA-ARS (Dr. Ken Vogel). It was jointly released in 2001 by the developing institutions. NE422T was selected from the cross Trical/UB-UW26 where Trical is most likely Trical 100 (a forage triticale developed by Resource Seed Inc., a subsidiary of Goldsmith Seed Company, Gilroy, CA) and UB-UW26 is an unknown winter triticale germplasm line given to the breeding program in the 1980s. NE422T is an F_3-derived F_4 line that was released primarily for its superior forage production in rainfed winter cereal production systems in Nebraska.

NE422T is an awned, white-glumed cultivar whose primary use will be as an annual forage crop. Its field appearance is most similar to 'Trical 100'. Kernels are red colored, elliptical, large, and slightly wrinkled (as is common with triticale). After heading, the canopy is moderately closed and upright. The flag leaf is recurved and not twisted at the boot stage. The foliage is green with a waxy bloom at anthesis. The peduncle is not pubescent. The spike is oblong in shape and middense. The glume is pubescent, tan, narrow, and midlong and the glume shoulder is wanting. The beak has an acuminate tip. The spike is usually nodding at maturity. Based on plump kernels, the kernel has no collar, a large brush of long length, rounded cheeks, large germ, and a narrow and deep crease.

NE422T was performance tested as NE96T422 in Nebraska grain yield nurseries starting in 1997 and in forage yield trials in 1997 and 1998. In two years of forage testing in Nebraska cultivar performance trials, NE422T has performed extremely well throughout most of Nebraska in rainfed production systems. The average Nebraska rainfed forage yield cut at the R2 (fully headed but the peduncle not fully emerged) to R4 (anthesis, Nebraska scale) of NE422T (6 environments) was 9070 kg/ha dry matter; with an average *in vitro* dry matter digestability of 63.9% and an average protein content of 9.0%. These data compare favorably with Newcale (a grain triticale: 8730 kg/ha, 67.9%, and 8.5%) and Trical 100 (8530 kg/ha; 63.5%, and 9.0%). For further comparison, the forage yields of NE422T were higher than two commonly grown wheat cultivars Arapahoe (7200 kg/ha, 67.7%, 8.5%) and Pronghorn (7930 kg/ah, 67.0%, 8.6%). The wheat cultivars are earlier than NE422T and were cut at the R4 to S0 (caryopsis visible, Nebraska scale). NE422T has a good grain yield (10 environments; 2790 kg/ha) for a forage triticale. The grain yield was higher than Trical 100 (2040 kg/ha), but lower than grain triticale cultivars (Presto, 3620 kg/ha; Newcale, 3120 kg/ha). For comparison, the grain yield of Arapahoe was 3050 kg/ha, which is lower than the grain triticale yields and might be explained by triticale yield nurseries generally be planted near, but earlier than the wheat yield trials. The main advantages of NE422T when compared to most other forage triticale cultivars, within its area of adaptation, is its high forage yield coupled with a good grain yield (needed for efficient seed production) and its broad adaptation in rainfed production systems.

Other measurements of performance from comparison trials show that NE422T is late in maturity, about 7 days later than Newcale, 6 days later than Presto, 5 days later than Arapahoe, and 1 day earlier than Trical 100. The mature plant height of NE422T, a tall triticale (58 in; 148 cm) is 3 in (7.5 cm) taller than Trical 100, 12 in (31 cm) taller than Presto and Newcale, and 19 in (49 cm) taller than Arapahoe. NE422T has moderate straw strength for a tall, forage triticale. NE422T is slightly

better than Trical 100 lodging, but worse than Presto, Newcale, and Arapahoe. The winter hardiness of NE422T would be consider as good, similar to Trical 100 which is one of the most winter hardy triticale cultivars currently available to grower, and comparable to an average winter wheat for this trait.

Based on field observations, NE422T is moderately resistant to the currently prevalent races of stem rust (caused by *Puccinia graminis Pers.: Pers. f. sp. tritici* Eriks & E. Henn; most likely containing *Sr31*) and leaf rust (caused by *P. triticina* Eriks.). Like most ryes and triticale varieties, NE422T is moderately resistant to wheat streak mosaic virus. Ergot (*Claviceps purpurea* (Fr:Fr) Tul.) has not been found in the cultivar when the disease was present in the other triticale varieties under similar growing conditions. NE422T has an average grain volume weight for triticale.

In positioning NE422T, based on performance data to date, it should be well adapted to most rainfed winter annual forage production systems, with high forage yield potential in most of Nebraska. It should also perform well as a second crop in irrigated productions, where NE422T in planted following a harvested summer annual crop and the forage is harvested the following year before planting another annual summer crop. In these cropping systems, water would not be limiting and three crops could be harvested in two years. It should perform well in similar growing areas in adjacent states.

NE422T has been uniform and stable since 1999. Less than 0.5 % of the plants were rogued from the Breeder's seed increase in 1999. The rogued variant plants were taller in height (10 - 20 cm, 1:10,000 plants), or were shorter in height (25 to 30 cm) and later in maturity (3 to 4 d later, 1:8000 plants). Up to 1% (10:1000) variant plants may be encountered in subsequent generations. The Nebraska Foundation Seed Division, Department of Agronomy, University of Nebraska-Lincoln, Lincoln, NE 68583 had NE422T foundation seed available to qualified certified seed enterprises in 2000. The U.S. Department of Agriculture will not have seed for distribution. The seed classes will be Breeder, Foundation, Registered, and Certified. The Registered seed class will be a nonsalable seed class. NE422T will be submitted for registration and plant variety protection under P. L. 10577 with the certification option. A research and development fee will be assessed on certified seed sales of NE422T and Gro-Green Plus.

Visual selection was used to select early generation lines and head rows for advancement. The key to improved triticale varieties remains access to improved triticale germplasm and efforts continue to increase germplasm diversity. Triticale research has replaced our research on feed wheat. Two lines NE95T426 and NE95T427 are under large scale increase for possible release as grain triticales.

The triticale nurseries this year were above average at Lincoln, average at Mead, and below average due to drought at Sidney. Lincoln data is suspect because the plots were staggered, impossible to trim to a uniform length, and data had to be adjusted by measuring each plot separately. Data for 2001 are:

			---------bu/a using 60 lbs/bu----------					(in)	
ENTRY	**VARIETY**	**TYPE***	**Linc.**	**Sidn.**	**Mead**	**St. Avg.**	**St. Rank**	**Avg. HD****	**Avg. HT*****
1	PRESTO	G	79.2	38.0	55.2	**57.46**	**9**	22.17	42.55
2	NE95T426	G	80.4	34.2	52.0	**55.54**	**13**	23.00	40.61
3	NE95T427	G	101.6	34.9	55.6	**64.02**	**2**	23.00	42.11
4	NE96T420	G	73.7	30.6	50.4	**51.56**	**20**	23.84	43.80
5	NE422T	F	68.1	32.1	52.8	**51.00**	**23**	29.84	53.78
6	NE96T431	G	58.6	32.4	32.9	**41.31**	**30**	23.50	40.65
7	Gro-Green Plus	F	65.6	29.8	69.3	**54.92**	**15**	29.84	50.92

8	NE98T413	G	69.7	27.1	42.2	**46.35**	**27**	21.50	43.08
9	NE98T424	G	84.8	38.0	58.2	**60.33**	**4**	22.84	42.72
10	NEWCALE	G	89.8	21.6	42.6	**51.32**	**21**	21.34	40.46
11	NE98T425	FO/G	97.1	25.8	53.1	**58.64**	**6**	23.17	43.04
12	NE98T428	G	77.3	24.4	49.9	**50.54**	**25**	23.75	44.81
13	NE98T448	G	81.0	28.9	65.0	**58.29**	**8**	23.42	45.34
14	NE99T404	G	71.9	34.5	47.5	**51.31**	**22**	23.84	39.69
15	NE99T440	G/F	74.6	31.0	59.8	**55.13**	**14**	20.84	42.21
16	NE99T441	F	74.8	24.4	58.7	**52.62**	**18**	24.59	45.54
17	NE99T448	F	88.6	38.7	61.9	**63.08**	**3**	20.92	44.83
18	NT00409	G	84.0	37.7	50.2	**57.29**	**11**	22.34	40.58
19	NT00410	G	89.5	31.5	54.5	**58.52**	**7**	22.25	40.46
20	ARAPAHOE	CG	60.6	43.1	58.9	**54.19**	**16**	23.17	35.55
21	NT00418	G	95.4	31.0	54.1	**60.16**	**5**	22.34	39.98
22	NT00419	G	90.0	30.5	51.6	**57.37**	**10**	22.34	39.71
23	NT00421	A-/FO	76.0	32.2	48.3	**52.18**	**19**	25.25	45.96
24	NT00427	G	64.8	25.2	38.2	**42.75**	**29**	25.59	44.86
25	NT00428	G	89.6	39.6	64.4	**64.52**	**1**	23.75	41.21
26	NT00432	G	86.3	33.5	48.1	**55.95**	**12**	23.34	42.35
27	NT00436	G	73.9	33.9	50.2	**52.65**	**17**	22.84	39.75
28	NT00449	FO	70.1	36.0	45.5	**50.55**	**24**	22.50	44.80
29	NT00459	FO	61.0	19.5	49.0	**43.20**	**28**	24.84	48.64
30	TRICAL	CF	60.5	24.4	58.8	**47.89**	**26**	30.09	50.51
	Average		77.95	31.48	52.63	54.02		23.73	43.35
	CV		12.30	19.15	8.63				
	LSD		13.09	8.23	7.73				

* Type: Forage (F) or Grain (G); A- is awnletted

** Anthesis date, Days after April 30 (data from Lincoln and Mead)

*** Plant Height in inches (data from Lincoln, Mead, and Sidney)

The data from the 2000 Triticale Variety Trial are:

			----------Yield (bu/a)*----------						
ENTRY	VARIETY	TYPE	Lincoln	Sidney	Mead	Average	Rank	HDL	HTL
1	PRESTO	G**	68.74	76.01	53.19	65.98	4	11.1	41.2
2	NE95T426	G	83.93	73.00	65.13	74.02	2	12.3	41.6
3	NE95T427	G	77.12	69.85	76.90	74.62	1	13.3	42.4
4	NE96T420	G	56.73	92.87	53.71	67.77	3	14.2	41.5
5	NE96T422	F	54.10	65.60	41.79	53.83	22	21.8	48.1
6	NE96T431	G	58.90	71.99	55.57	62.15	7	12.5	40.7
7	NE96T441	F	69.08	61.55	43.06	57.90	16	20.8	45.2
8	NE98T413	G	61.62	64.93	61.35	62.63	6	11.0	43.5
9	NE98T424	G	68.28	57.74	65.17	63.73	5	11.4	42.8
10	NEWCALE	G	60.65	58.06	49.08	55.93	21	12.2	41.8
11	NE98T425	FO/G	54.28	61.20	63.82	59.77	10	11.8	42.5
12	NE98T428	G	57.28	68.43	53.63	59.78	9	12.0	41.8
13	NE98T448	G	64.03	59.86	55.02	59.64	11	12.8	41.9

14	NE99T404	G	59.55	67.02	54.98	60.52	8	12.7	41.1
15	NE99T440	G/F	59.82	67.10	48.97	58.63	14	12.7	42.1
16	NE99T441	F	69.43	57.70	51.53	59.55	12	16.0	43.2
17	NE99T448	F	57.93	73.78	39.72	57.14	17	15.4	40.8
18	NT00409	G	71.10	73.30	64.96	69.79	9	13.0	43.0
19	NT00410	G	68.85	69.90	63.01	67.25	12	11.0	44.0
20	ARAPAHOE	CG	47.84	45.72	51.20	48.25	27	13.2	32.4
21	NT00418	G	78.20	82.85	63.00	74.68	3	11.0	43.0
22	NT00419	G	69.50	89.20	62.83	73.84	4	12.0	41.0
23	NT00421	A-/FO	70.25	34.50	70.40	58.38	33	15.0	43.0
24	NT00427	G	82.30	70.65	68.03	73.66	5	12.0	47.0
25	NT00428	G	99.80	68.80	55.56	74.72	2	12.0	44.0
26	NT00432	G	101.45	47.95	66.98	72.13	6	12.0	35.0
27	NT00436	G	73.65	60.00	81.52	71.72	8	13.0	44.0
28	NT00449	FO	78.05	34.00	56.63	56.23	39	14.0	49.0
29	NT00459	FO	68.70	48.60	57.78	58.36	34	17.0	48.0
30	TRICAL	CF	60.29	23.88	42.93	42.37	29	23.5	44.0

* The bushel used in these calculations is 60 lbs/bu so the measurements are directly comparable to wheat. The official triticale bu is 48 lbs/bu.

**

Grain or forage type.

The data from the 1999 Triticale Variety Trial are:

			----------Yield----------							
			bu/a	bu/a	bu/a	AVG.				
ENTRY	VARIETY	TYPE	Lincoln	Mead	Average	Rank	HTL	HDL	HTM	HDM
1	PRESTO	G**	69.5	31.3	50.4	22	47.0	24.5	49.0	25.5
2	TSW250783	G	72.9	37.2	55.1	17	44.0	25.0	48.5	27.0
3	NE92T422	G	64.7	33.3	49.0	25	46.5	24.0	48.5	23.5
4	NE95T423	G	64.1	63.1	63.6	7	49.0	24.5	49.5	24.5
5	NE95T424	G	69.8	51.7	60.7	10	49.5	24.5	48.5	24.5
6	NE95T426	G	83.5	75.6	79.6	1	47.0	23.0	47.0	24.0
7	NE95T427	G	82.4	68.0	75.2	3	50.0	22.5	48.0	25.0
8	NE95T436	G	64.3	34.2	49.3	24	49.5	24.5	53.0	25.5
9	NE96T413	G	72.3	34.6	53.4	20	50.5	24.5	50.5	25.0
10	NE96T420	G	72.2	60.8	66.5	5	49.0	24.5	49.5	24.5
11	NE96T422	F	56.1	34.5	45.3	27	60.0	29.0	63.5	30.0
12	NE96T431	G	73.6	72.1	72.9	4	47.0	24.0	48.5	25.5
13	NE96T441	F	48.1	30.3	39.2	28	57.5	29.5	61.5	30.0
14	NE97T432	G	69.3	23.0	46.1	26	47.5	24.5	48.0	25.0
15	NEWCALE	G	64.9	43.7	54.3	19	50.0	19.5	49.5	25.5
16	NE97T433	G	65.5	43.3	54.4	18	46.0	23.5	50.0	27.0
17	NE98T403	G	66.6	58.1	62.4	9	46.5	24.5	49.0	25.5
18	NE98T404	G	67.2	53.4	60.3	11	48.5	24.5	49.5	25.5
19	NE98T405	G	83.4	27.6	55.5	16	50.0	22.0	49.5	25.0

20	NE98T413	G	77.0	55.8	66.4	6	51.5	23.0	51.0	25.5
21	NE98T424	G	75.2	81.8	78.5	2	53.5	23.0	53.5	26.0
22	NE98T425	G	70.3	56.7	63.5	8	50.5	24.5	50.0	25.5
23	NE98T426	G	57.5	41.7	49.6	23	51.5	23.5	50.5	25.5
24	NE98T427	G/F	70.2	41.5	55.9	15	52.0	25.0	53.5	27.5
25	NE98T428	G	66.9	50.0	58.4	13	53.0	25.0	51.5	26.5
26	NE98T429	G	60.1	18.3	39.2	29	58.0	25.0	59.5	27.5
27	NE98T448	G	67.5	50.9	59.2	12	52.0	25.0	53.5	26.5
28	NE98T450	G	63.4	51.5	57.5	14	53.0	25.0	53.5	27.5
29	ARAPAHOE	CG	52.8	53.1	52.9	21	42.5	23.5	43.5	25.5
30	TRICAL	CF	35.8	20.9	28.4	30	57.0	31.0	63.5	31.0
	GRAND MEAN		66.9	46.6	56.8		50.3	24.5	51.5	26.1
	CV		14.5	33.9			3.9	3.0	3.1	3.4
	LSD		13.2	26.8			3.3	1.3	2.8	1.5

*using a 60 lbs/bu for easy comparison to winter wheat yields. The actual standard for triticale is a 48 lbs/bu

**G is grain type and F is forage type.

10. Wheat Transformation and Tissue Culture Studies

Wheat transformation continues to be a key strategic effort in the wheat improvement overall effort. In our current research, we are emphasizing trying to develop wheat lines with improved Fusarium head blight (FHB) resistance as part of the US Wheat and Barely Scab Initiative. This is a collaborative effort between Dr. T. Clemente and Ms. S. Sato of the Transformation Core facility (does our wheat transformation), Dr. J. Watkins and Ms. J. Schimelfenig of the Department of Plant Pathology (does the screening of conventionally bred and transgenic wheat lines with FHB) and Drs. A. Mitra and M. Dickman, also of the Department of Plant Pathology who are studying new concepts in disease resistance. Ms. S. Mitra has been very helpful in maintaining the plants and doing much of the transgene analysis. So far, we have concentrated on putting in the following genes: a) inhibitors of apoptosis (programmed cell death): ced9, IAP, and BCL X(L), b) lactoferrin and a related derived protein, lactoferricin, and c) related antifungal proteins that have been derived based on similar protein structures. We have created over 10 events for these genes and are increasing the seed of them now. We have lines from the T_1 to T_5 and are screening those for FHB tolerance. We continue to seed levels of FHB tolerance in the transgenic lines. However a concern remains that the assay is very difficult and false positives and negatives are possible. Great progress has been made in our screening techniques and we added a field misting system to support our fieldwork. We believe by repeated screening that we have a few lines ready to enter field testing next spring under the misting system that were consistently FHB tolerant in the greenhouse. Transgenic lines with FHB tolerance are being crossed to known FHB susceptible and resistant lines. The cross to the FHB susceptible line will help understand the inheritance of the putative FHB tolerance and the cross to the FHB resistant lines will indicate if the transgenic line can increase the level of FHB resistance above what is currently the best level of FHB tolerance in conventionally bred lines.

11. Chromosome Substitution Lines

This research was undertaken with the expectation as we learned more about the wheat genome, we

would be able to develop better breeding strategies. It is done in collaboration with Drs. Kent Eskridge, Kulvinder Gill, Ismail Dweikat, and Dan Nettleton. Dr. Mustafa Erayman, a former graduate student, has continued as a postdoc. Todd Campbell, and Hikmet Budak are graduate students who actively working various aspects of this project. Mustafa is "binning" the known probes for chromosome 3A using deletion stocks developed at Kansas State University. His research is helping us understand the recombinational map and the physical map for chromosome 3A. This effort is needed to fill in the gaps in our map and to determine the physical size of the critical chromosome regions. Todd and Hikmet are increasing the number of markers on our map for chromosome 3A. We currently have about 20 markers on chromosome 3A. Todd has just completed his evaluation of 98 recombinant inbred chromosome lines (RICLs) for Cheyenne (CNN)-Wichita (WI) chromosome 3A lines [e.g. CNN(RICLs3A)] in the field. Todd has more replications in each testing location than we have had in the past, so he should be able to more tightly link markers to traits of interest and to thoroughly study genotype x environmental interactions. He has found two QTL loci that affect grain yield. Hikmet has evaluated WI(RICLs3A) for the first year and has planted numerous locations for the second year. Hikmet's study uses the mirror image set of lines to Todd's CNN(RICLs3A) and will determine if the genes/QTLs in WI(CNN3A) which reduce the yield of WI(CNN3A) compared to WI are at the same location as the genes/QTLs in CNN(WI3A) which increase the yield of CNN(WI3A) compared to CNN.

In a separate effort, Mr. Yehia Mater in collaboration with Dr. Ismail Dweikat and Bob Graybosch is developing a new 1A.1R chromosome in which he hopes to combine the best attributes of 1A.1R from Amigo with 1B.1R from Kavkaz. This research is possible due to the elegant cytogenetic manipulations of Dr. Adam Lukaszewski (Univ. of California—Riverside) who created 1A.1R lines where the 1R was previously on 1B in Kavkaz.

12. White Wheat

Dr. Bob Graybosch, USDA-ARS and I continue our orderly transfer of white wheat germplasm to the state wheat breeding. The cooperation has been excellent and the goal will be to continue the cooperative USDA-University of Nebraska wheat improvement effort, while building a unified cultivar release program. The goals of the white wheat breeding effort will continue to be those of needed by the market and well recognized by Dr. Peterson. Specifically white wheats need to be truly white, dual purpose (capable of making noodles or bread), and should not discolor over time in fresh noodle products. As the transition occur, it is expected that white and red wheat breeding will be seamless and there will not be a special section in the report. After a good first three years of testing, Nuplains had a tough year in its first commercial year out as did many white wheat varieties (note Heyne was the lowest yielding line in the trial), largely due to its being susceptible to stripe rust. Promising experimental lines were identified. NW97S182 finished 7th in the 2001 Nebraska State Variety Trial, and NW97S278 did very well in the CO irrigated trials (data can be found via a link on L. Nelson's on-line report). Both will be in the Nebraska State Variety Trial for 2002, and we will make a decision on their fate next summer. Efforts continue to develop "pure" white wheat so there will less concern about mixed white and red seed and grain in the marketing channels. As with the creation of most new markets, marketing remains an issue. We will most likely be forced to consider how best to release wheat varieties to develop an emerging market.

13. Collaborative Research on Wheat Diseases

Dr. John Watkins, Department of Plant Pathology, and his staff continue to inoculate our experimental lines with wheat stem rust and Fusarium head blight (FHB, research funded by the U.S. What and Barley Scab Initiative), and as time permits with wheat leaf rust. The greenhouse tests were excellent for stem rust. In the field, we had a pretty successful stem rust field inoculation---enough to identify resistant plants without having so much that we overwhelmed our sources of resistance. John's efforts to determine the virulence patterns of leaf rust in Nebraska have greatly helped understand this important disease and why some previously resistant lines became susceptible and other previously susceptible lines are becoming for resistant. His efforts are closely coordinated with Dr. Don McVey, USDA-ARS, Cereal Disease Lab, who provides stem rust inoculum and who also tests our lines with a set of stem rust races to identify the resistance genes in those lines. Dr. Watkins and his staff will also take leadership for screening lines in our transgenic lines for FHB in the greenhouse and our breeding lines for FHB in the field.

Work continues on introgressing the resistance from *Agropyron* (the first real resistance/tolerance to wheat streak mosaic virus developed by Dr. Joe Martin, Kansas State University at Hays, Kansas and his co-workers) into adapted wheat varieties. A number of lines that may have this source of resistance were given to Gary Hein who is testing them in the field in Scottsbluff, NE.

14. Considerations on Nursery Sites

We continue to study the best way to test lines in Nebraska. We have eight testing sites, 2 in the panhandle (Sidney and Alliance), 3 in the southwest district (Grant, North Platte, and McCook), 1 in the southcentral district (Clay Center), and 2 in eastern Nebraska (Lincoln and Mead). To limit the number of plots that need to be planted and harvested, the 3 southwestern testing sites are based on trials with two replications, whereas the other sites have 4 replications with the exception of Mead with two replications. North Platte remains the testing site for the regional nurseries and graduate student research. Hence we have similar sized nurseries at North Platte, McCook, and Grant. Efforts continue to develop better analytical methods for data analysis. We (Dr. Kent Eskridge and I) believe that alpha-lattices with very small incomplete blocks (2 to 4 entries per block) will greatly help our data evaluation. This research is ongoing and will require years of data before we can be sure we are analyzing our data in the best possible fashion.

15. Global Change Research

One of the newer areas that the project hopes to become involved in is global change scenarios. A large, interdisciplinary effort involving crop modeling (Dr. A. Weiss), crop physiology and production (Dr. T. Arkebauer, Dr. Drew Lyon, Dr. Madhavan), cereal chemistry (Dr. R. Graybosch and Brian Beecher), biometrics (Dr. K. Eskridge), and plant breeding (Dr. Baenziger) has been formed. The goal of this group will be to develop experimental techniques that will allow us to predict what may occur under various global change scenarios (e.g. global warming, elevated CO_2, etc.) and to identify germplasm that may ameliorate these changes. We built at Mead, the first "field chambers" in the Great Plains to study enhanced CO_2 and warming scenarios and continue to try to bring them into operation. We also developed smaller and more durable chambers which were highly successful, but expensive to operate. The benefit of this research is that it allows the breeding program to work with a highly interdisciplinary team who can provide insight into future breeding objectives. This work is future oriented, but with the variable climate of Nebraska, many of the possible scenarios (e.g. drought or heat stress, or rapid weather change) occur annually in one or another part of Nebraska, hence has immediate impact. The work of Al Weiss is providing extremely useful

information on wheat growth and development and how plants respond to the environment.

IV. GREENHOUSE RESEARCH

In 2001, the F_1 wheat populations were grown mainly in the Lincoln Greenhouses to avoid possible losses to winterkilling, but a small sample was sent to Arizona for seed increase. Based on the results from Arizona, we decided to increase all of the populations that did not need further crossing in Arizona. This reduced our greenhouse space and should provide much greater quantities of seed. In future, it is hoped that only parents and those F_1 plants that need additional crosses, and research projects will be grown in the greenhouse.

V. PROPRIETARY RESEARCH

With the advent of plant biotechnology, the necessity and desirability of interacting with commercial companies has increased. We continue to breed herbicide tolerant wheat with one company and with a second company, have negotiated their having access to our germplasm for developing herbicide (different chemistry) tolerant wheat.

We received our second year of research and development fees from are agreement with a commercial seed company for the exclusive release of our winter barley germplasm. A number of new barley lines were sent to the company as possible new products. The forage triticale germplasm was released with a research and development fee, also. While currently, none of wheat lines are released with a research and development fee, we are currently revisiting this issue. With declining wheat production and increasing costs, alternative sources of revenue will be needed. In addition, we wonder if limited releases can foster commercial development in niche markets. For example, so far the most stable and successful white wheat releases are through partnerships with milling companies.

With the current level of private sector investments in research, additional public-private interactions are to be expected. A key goal will be to develop working relationships that benefit the producer, the customer, and the public good.

VI. Spring-Sown Wheat Research

A small spring-sown wheat breeding effort was initiated in 1997. Dr. D. Baltensperger coordinates the spring wheat trials at Sidney, and is considering additional trials at other Nebraska sites. He works closely with Dr. D. Lyon on intensified cropping systems as it is expected that spring wheat will be used in new cropping systems. Crosses will continue to be made at Lincoln.

VI. ALLIED RESEARCH

The wheat breeding or variety development project is only one phase of wheat improvement research at the University of Nebraska-Lincoln. The project interacts and depends on research in wheat germplasm development, wheat quality, wheat nutritional improvement, wheat cytogenetics, plant physiology and production practices, and variety testing. Much of the production research is located at the research and extension centers. All components are important in maintaining a competitive and improving wheat industry in Nebraska. The allied research is particularly necessary as grain classification and quality standards change and as growers try to reduce their production costs.

The program also depends on interactions and collaborations with the Wheat Board, Nebraska Wheat Growers Association, regional advisory boards, Foundation Seeds Division, Nebraska Crop Improvement Association, the milling and baking industry, and other interested groups and individuals. The Nebraska Wheat Quality Laboratory cooperates closely with the Wheat Quality Council and baked the large-scale cooperator samples. Numerous groups have visited the laboratory and participated in discussions on quality and marketing. Through these interactions, the program is able to remain focused and dedicated to being a premier provider of quality varieties, information, and technologies to help maintain the Nebraska Wheat Industry.

Summary

The 2001 Nebraska Wheat Crop was estimated at 59,200,000 bu, which represented a 37.0 bu/a state average yield on 1,600,000 harvested acres. 1,750,000 acres were planted to winter wheat. The 2001 crop was similar to the 2000 crop (59,400,000 bu harvested from 1,650,000 acres with a 36.0 bu/a state average yield). Both the 2000 and 2001 crops were much lower than the 1999 crop (86,400,000 bu from 1,800,000 harvested acres with a 48 bu/a state average yield), 1998 crop (82,800,000 bu harvested from 1,800,000 acres with a 46 bu/a yield average), the 1997 crop (70,300,000 bu harvested from 1,900,000 acres with a 37.0 bu/a yield average), and the 1996 crop (73,100,000 bu harvested from 2,150,000 acres with a 34 bu/a yield average). Despite a long winter, commercial production was generally little affected by winterkilling. Stripe rust (a disease only seen once before in the previous 16 years) was the main disease in 2001. Leaf and Stem rust were also present in eastern Nebraska. Other diseases and insects were minor. Despite continued genetic improvement, the main determinant in wheat production seems to be acres harvested and weather (which also affects disease pressure).

Alliance (16.0% of the state) replaced Arapahoe (13.4%) as the most popular variety in Nebraska. Pronghorn is the third most widely grown variety followed by 2137 and Niobrara. Alliance is the variety having the greatest impact since the release of Arapahoe, but its impact is more localized as Alliance does not have the broad adaptation in eastern Nebraska that Arapahoe had. It is expected that the former Arapahoe acreage will eventually be divided by three modern releases, Millennium, Culver, and Wahoo.

No new wheat varieties were released in 2001, but 5 lines were advanced to large scale increase for possible release in 2002. The five lines include one awnless semi-dwarf (NE97426), three awned semi-dwarfs (NE97638, NE97669, and NE97689), and one tall wheat (NE97465). If the 2002 data are similar to the 2001 data, then the tall wheat and one of the semi-dwarf wheat varieties will be recommended for release. The remaining three wheat all may have merit in niche markets. It is expected that we will modify our release mechanisms to allow for research and development fees. With rising costs, this may be the only way to develop long-term support for the project.

Two forage triticale varieties were released for commercial sale (NE422T [formerly NE96T422] to Nupride Genetics Network and Gro-Green Plus [formerly NE96T441] to Star Seed Inc. of Kansas). Both will have research and development fee.

Basic research studies continue in developing transgenic wheat, herbicide tolerant wheat, disease and insect resistant wheat, superior data analytical techniques, and how to better understand wheat grain yield and agronomic traits in global climate change.

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