RESULTS OF THE FIFTH HIGH PROTEIN-HIGH LYSINE WHEAT OBSERVATION NURSERY GROWN IN 1979

S. L. Kuhr - Assistant Professor, University of Nebraska - Lincoln
V. A. Johnson - Research Agronomist, Agricultural Research Service, U.S.D.A.; Professor, University of Nebraska - Lincoln
P. J. Mattern - Professor, University of Nebraska - Lincoln

Department of Agronomy
University of Nebraska
Lincoln, Nebraska 68583

February 1, 1983

Not for Publication

Supported by:

Contract No. AID/ta-C-1093
United States International Development Corporation
Agency for International Development
Washington, D.C. 20523

and

Specific Cooperative Agreement No. 58-519B-9-865
United States Department of Agriculture
Agricultural Research Service
Washington, D.C. 20523

ACKNOWLEDGMENTS

Cooperation of nursery collaborators at the locations where the Fifth High Protein-High Lysine Wheat Observation nursery was grown is gratefully acknowledged. Their responsibilities for nursery management and return of the 10-gram wheat samples to Nebraska for quality analyses form the central component of this program. We thank those cooperators who returned agronomic data for evaluating these wheats.

The assistance of personnel in the Plant Production and Protection Division, Food and Agriculture Organization of the United Nations, in making nursery seed shipments to some of the testing sites is acknowledged. We acknowledge the assistance of the CIMMYT wheat personnel stationed at several of the test sites. Gratitude is also expressed to members of APHIS-USDA for expediting passage of the seed shipments both to and from international test sites.

The efforts of Joyce Kovar and the personnel of the Wheat Quality Laboratory of the University of Nebraska are acknowledged. Gratitude also is expressed to Janet Whitehead for her help in preparing this report.

LIST OF TABLES

LIST OF TABLES

SUMMARY

Winter Wheat

The winter wheat nursery consisted of 104 experimental lines. In addition, three check varieties were included three times each for a total of 113 entries. The pedigrees of the entries are given in Table 1. The nursery was distributed to 38 sites in 25 countries in 1978. The sites and the cooperators receiving the seed are identified in Table 3. All data were recorded on a voluntary basis by the cooperators. Data books were not provided to them.

Data for grain yield, protein content, lysine (% of protein), and adjusted lysine (% of protein) are reported from seven sites each. However, only three sites have both grain yield and grain quality data concurrently.

Averaged over seven sites, grain yields ranged from 49.7 q/ha to 10.8 q/ha. The average of all entries was 34.1 q/ha. Centurk, Lancota, and CI 13449 were the check varieties, and averaged 41.7, 39.0, and 17.4 q/ha, respectively. Twelve lines exceeded Centurk in average yield, but the differences were not statistically significant.

Protein values ranged from 20.9% to 13.2%. Lancota averaged 16.3% compared with Centurk at 13.9%. At yield levels comparable with Lancota, four entries had protein values exceeding the average for Lancota.

All of the experimentals were shorter in stature than Lancota and Centurk.

Spring Wheat

The spring wheat nursery contained 96 experimental lines along with three check varieties (three times each) for a total of 105 entries. The identification of the entries is recorded in Table 2. The nursery was distributed to 27 sites in 19 countries in the autumn of 1978. The sites and the cooperators receiving the seed are identified in Table 4.

Data for grain yield, grain protein content, lysine (% of protein), and adjusted lysine (% of protein) are reported from five sites each. Protein data for one additional site are listed, but were not used in any statistical analyses over sites because of missing observations. Plant height data and disease reactions also are reported for the entries.

Grain yields ranged from 60.1 q/ha to 17.8 q/ha when averaged over five sites. Super X was the most productive entry in the nursery. Seventy-five percent of the nursery had mean yields significantly below the average yield of Super X (58.6 q/ha).

Averaged over five sites, protein values ranged from 20.0% to 13.7%. The overall mean was 17.7%. Super X had the lowest overall protein average of 13.8%. Ninety-one percent of the nursery had grain protein values which were significantly higher than the protein average of Super X.

Table 1. Entries in the fifth high protein-high lysine winter wheat observation nursery grown in 1979.

Entry No.	Pedigree
1	Centurk
2	Lancota
3	CI 13449
4	Ciano F67/22A
5	Atl 66/Nap Hal//NB 68570/Centurk
6	"
7	Atl 66/Nap Hal//TX 62A2522-1-4
8	"
9	"
10	Atl 66/Nap Hal//Lancota/Likafen
11	"
12	"
13	"
14	"
15	"
16	"
17	Atl 66/Nap Hal//TX 62A2522-1-4
18	"
19	"
20	"
21	"
22	"
23	"
24	"
25	"
26	"
27	"
28	"
29	"
30	"
31	Atl 66/Nap Hal//Skorospelka 35/NE 701137
32	"
33	"
34	"
35	"
36	Atl 66/Nap Hal//NE 701139/Dwf. Bezostaya
37	Atl 66/Nap Hal//Likafen/NE 701134
38	"
39	"
40	Atl 66/Nap Hal//Rousalka/NE 701134
41	Atl 66/Nap Hal//F226-68/Lancota
42	Atl 66/Nap Hal//Likafen/NE 701134
43	Atl 66/Nap Hal//Norde Desprez 2
44	"
45	"
46	"
47	Atl 66/Nap Hal//NE 701136/Blueboy
48	Atl 66/Nap Hal//Bezostaya 1
49	"
50	"

Table 1. Continued.

Entry No.	Pedigree
51	Centurk
52	Lancota
53	CI 13449
54	Atl 66/Nap Hal//Bezostaya 1
55	Atl 66/Nap Hal//NE 701154/Skorospelka 35
56	Atl 66/Nap Hal//Carifen 12
57	Nap Hal/Atl 66/4/Likafen/3/Atl 66/Cmn/2/Hume
58	"
59	"
60	Nap Hal/Atl 66//NB 68510/Hyslop
61	"
62	"
63	Nap Hal/Atl 66//Lovrin 12
64	Nap Hal/Atl 66//Sort 12-13
65	"
66	Nap Hal/Atl 66//2*Aurora
67	"
68	Nap Hal/Atl 66//CI 13447
69	"
70	"
71	Nap Hal/Atl 66//Krasnodarskaya 39
72	Nap Hal/Atl 66//CI 13449
73	"
74	Nap Hal/CR 8156//NB 68719
75	Nap Hal/Lancer//CB96/Nazareth/3/F73-71
76	Kitakomi-Komugi/3/Nap Hal/Lancer/2/SD 69107
77	Dunav-1/3/Nap Hal/Lancer/2/Bezostaya 1
78	"
79	Dunav-1/3/NE 701136/NS 11-53/2/NB 68570/Aurora
80	GKT-8001//Nap Hal/CI 13449
81	"
82	GKT-8001/3/Nap Hal/Lancer//NE 701136/Centurk
83	"
84	"
85	"
86	Kiszombori-1/3/SD 69111/2/NE 701136/Centurk
87	GK-Fertodi-2/NE 701134
88	Burgas 2/3/Nap Hal/Lancer/2/NE 701136/Centurk
89	Burgas 2//Nap Hal/CI 13449
90	Rousalka/3/Nap Hal/Trader/2/NS 974/NB 69566
91	Lilifen//Nap Hal/Trader
92	Skorospelka 35/3/Nap Hal/Lancer/2/Dwf. Bezostaya/NE 701134
93	Skorospelka 35/2/Nap Hal/CI 13449
94	Blueboy II//Nap Hal/CI 13449
95	NB 68719//Nap Hal/CI 13449
96	"
97	"
98	Greece 78310-A-3/Bez. 1/3/Nap Hal/Lancer/2/Homestead/ Bezostaya 1
99	CI 13449/TAM 102
100	F126-71/3/Nap Hal/Lancer/2/ID 0032

Table 1. Concluded.

Entry No.	Pedigree
101	Centurk
102	Lancota
103	CI 13449
104	NS 447/3/Nap Hal/Lancer/2/NE 701136/Lovrin 13
105	NS 447/3/Nap Hal/Lancer/2/F226-68/NB 69566
106	SD 69103/2/Dwf. Bezostaya/NE 701134/3/Nap Hal/CI 13449
107	"
108	Kiszombori-1//Nap Hal/CI 13449
109	"
110	"
111	TX 65A1503-1//Nap Hal/CI 13449
112	Nap Hal/CI 13449//Centurk
113	F53-70//Nap Hal/CI 13449

Table 2. Entries in the fifth high protein-high lysine spring wheat observation nursery grown in 1979.

Entry No.	Pedigree
1	Super X
2	Local Check
3	Era
4	CNO-7 Cerros/No. 66-Tiba
5	No. 66/Gallo
6	CNO/Son 64-Kl. Rend/CNO'S'-No. 66
7	Tob-CNO'S'/Tob-8156//Bb(18M)CM5403-8PY-1PB
8	"
9	"
10	"
11	"
12	"
13	"
14	(Cal/CC-8156/CNO'S')Cal-Sar, CM-5756-7PY-1PB
15	"
16	"
17	Tob-Turpin/No. 66, CM5214-A-1PY-1PB
18	"
19	"
20	"
21	Bb-CNO//CNO/LR64^2-SR64, RN-CM5437-19PY-8PB
22	(Cal/CC-8156 x CNO'S')CNO'S'-8156, CM5534-3PY-4PB
23	(Cal/CC-8156 x CNO'S')CNO'S'-8156, CM5534-3PY-1PB
24	"
25	"
26	"
27	"
28	"
29	(Cal/CC-8156 x CNO'S')CNO'S'-8156, CM5534-3PY-9PB
30	(Cal/CC-8156 x CNO'S')CNO'S'-8156, CM5534-3PY-11PB
31	"
32	"
33	"
34	CNO-No. 66/Wal/Bb-CNO
35	CC-INIA/CNO-7 Cerros
36	Meng//CNO'S'-No. 66
37	(CFN-CNO'S'//Jar/INIA'S'-Napo)/3/CNO-7 Cerros, CM5461-4PY-7KB
38	Toropi/CNO-INIA'S'//CNO-INIA'S'^{2}, CM5920-10-6-18KB
39	Saric//Cal/Tob
40	CM4483-1PY-4KB
41	CNO-7 Cerros/CNO-Pj 62//Tob-Cfn-Bb
42	Ciano F67/22A
43	"
44	"
45	"
46	"
47	NB 68570/Excelsior//Atl 66/Nap Hal
48	Atl 66/Nap Hal//Dwf. Bez./Lancota
49	"
50	"

Table 2. Continued.

Entry No.	Pedigree
51	Super X
52	Local Check
53	Era
54	Atl 66/Nap Hal//NE 701152/Aurora
55	"
56	"
57	"
58	"
59	"
60	"
61	"
62	"
63	"
64	Atl 66/Nap Hal//Likafen/NE 701134
65	Atl 66/Nap Hal//Rousalka/NE 701134
66	Atl 66/Nap Hal//Norde Desprez 2
67	"
68	Atl 66/Nap Hal//Bezostaya 1
69	"
70	"
71	"
72	"
73	Atl 66/Nap Hal//Rannaya/NE 701136
74	"
75	"
76	Atl 66/Nap Hal//Centurk
77	Nap Hal/Atl 66/4/Likafen/3/Atl 66/Cmn/2/Hume
78	Nap Hal/Atl 66//NB 68510/Hyslop
79	Nap Hal/Atl 66//NS 11-35
80	Nap Hal/Atl 66//Lovrin 12
81	Nap Hal/Atl 66//Sort 12-13
82	"
83	Nap Hal/Atl 66//F22-70
84	"
85	"
86	Nap Hal/Atl 66//Aurora
87	Nap Hal/Atl 66//TR 535
88	"
89	"
90	"
91	"
92	"
93	"
94	"
95	"
96	Nap Hal/Atl 66//Aurora
97	GKT-8001//Nap Hal/CI 13449
98	Burgas 2//Nap Hal/CI 13449
99	F164-71//Nap Hal/CI 13449
100	Nap Hal/CI 13449//Skorospelka 35

Table 2. Concluded.

Entry No.	Pedigree
101	F53-70//Nap Hal/CI 13449
102	"
103	Super X
104	Local Check
105	Era

Table 3. Cooperators and sites participating in the fifth high protein-high lysine winter wheat observation nursery grown in 1979.

Country	Station	Cooperator(s)
Afghanistan	Kabul	Food & Agriculture Officer
"	Kunduz	"
Argentina	Balcarce	Ing. R. Bedogni
"	Bordenave	Ing. S. Garbini and J. R. Lopez
"	Tres Arroyos	Ing. Agr. H. L. Carbajo and G. Kraan
Brazil	Passo Fundo	Dr. Cantidio de Sousa
Chile	Temuco	Dr. Juan Acevedo
Czechoslovakia	Stupice	Plant Breeding Institute
East Germany	Boehnshausen	Dr. A. Meinel
Ecuador	Quito	Dr. E. Ampuero
France	Champigny en Beauce	Jean Claude Leturque
Hungary	Martonvasar	Dr. L. Balla
India	New Delhi	Dr. M. V. Rao
"	Simla	Dr. M. K. Upadhyay
Iran	Hamadan	Dr. H. Kaveh
"	Karaj	"
"	Tehran	Director, ICARDA
Iraq	Sulaimaniya	Dr. Youssef Y. Klaimi
Israel	Tel-Aviv	Dr. Zahir Eyal
Italy	Bologna	Dr. Mauro Buonfiglioli
"	Milano	Dr. Basilio Borghi
Jordan	Amman	Zulkifl Ghosheh
Korea	Suwon	Chang Hwan Cho
Mexico	Toluca	Dr. N. Borlaug
Nepal	Kathmandu	Dr. Prakriti S. Rana
New Zealand	Gore	Dr. D. S. C. Wright
Peru	Lima	Dr. M. Romero
Republic of South Africa	Pretoria	Drs. T. C. Nel, I. B. J. Smit and R. Britz
Spain	Logrono	Dr. P. de la Hera
Syria	Aleppo	Dr. Jit Srivastava
Turkey	Ankara	The Director
"	Erzurum	Dr. Fahrettin Tosun
"	Eskisehir	N. Nuri Taysi
USA	Yuma, AZ	Dr. V. A. Johnson
"	Lincoln, NE	"
"	Manhattan, KS	Dr. Gary Paulsen
"	Stillwater, OK	Dr. E. L. Smith
"	Corvallis, OR	Dr. W. Kronstad

Table 4. Cooperators and sites participating in the fifth high protein-high lysine spring wheat observation nursery grown in 1979.

Country	Station	Cooperator(s)
Afghanistan	Kabul	Food & Agriculture Officer
"	Kunduz	"
Algeria	Algiers	Directeur de Recherche
Argentina	Tres Arroyos	Ing. Agr. H. L. Carbajo
Brazil	Passo Fundo	Dr. Cantidio de Sousa
"	Sal Paulo	Milton B. Rocha
Chile	Santiago	Dr. Ignacio Ramirez
"	Santiago	Drs. P. C. Parodi and I. Nebreda
Ecuador	Quito	Dr. E. Ampuero
Egypt	Alexandria	Dr. A. Bary
India	New Delhi	Dr. M. V. Rao
"	New Delhi	Dr. H. K. Jain
Iran	Karaj	Dr. H. Kaveh
Iraq	Sulaimaniya	Dr. Youssef Y. Klaimi
Italy	Milano	Dr. Basilio Borghi
"	Rieti	Dr. G. Zitelli
Jordan	Amman	Zulkifl Ghosheh
"	Amman	Dr. Mahmoud Duwayri
Nepal	Bhairahawa	Dr. Prakriti S. Rana
New Zealand	Gore	Dr. Don Wright
Pakistan	Islamabad	Dr. M. Tahir
"	Lyallpur	Dr. S. A. Qureshe
Republic of South Africa	Pretoria	Drs. T. C. Nel, I. B. J. Smit, and R. Britz
Spain	Madrid	Javier Salazar
USA	Yuma, AZ	Dr. V. A. Johnson
"	Davis, CA	Dr. Cal Qualset

Fourteen lines produced more crude protein per hectare than did Super X. All of these lines were selections from CIMMYT germplasm.

RESULTS AND DISCUSSION

Winter Wheat

Grain yield data measured in quintals per hectare are shown in Table 5 for each of seven sites. The entries are ranked according to the seven-site average yield. The grain yield averages ranged from 49.7 q/ha to 10.8 q/ha. Entry 87 (GK-Fertodi 2/NE 701134) was the most productive line although it did not rank well at two of the seven sites.

Due to the small size of the harvested plots, a characteristically large CV value of 32.8% was determined in the analysis of variance procedure. The large CV values also appear in the analyses of the data for the check varieties.

Among the check varieties, Centurk had the highest yield of 41.7 q/ha. Lancota and CI 13449 had yield values of 39.0 and 17.4 q/ha, respectively.

Twelve lines had grain yield means equal to or greater than the yield mean of Centurk. None were statistically significantly higher yielding than Centurk, but 56 lines were significantly less productive than Centurk.

Of the 12 lines mentioned above, eight had significantly higher protein than Centurk (Table 7). None were significantly different from Centurk in lysine content. All 12 lines were shorter in stature; seven were significantly shorter than Centurk.

Twenty-two lines were equal to or higher yielding than Lancota, but only four of these lines had higher protein averages than Lancota. Of these, only entry 4 (Ciano F67/22A) had a protein value significantly higher than that of Lancota. All 22 of these lines were shorter than Lancota; 16 were statistically significantly shorter.

Protein values and rankings are shown for all entries at each of seven sites in Table 6. The entries are arranged in descending order according to the seven-site average protein values. The protein averages ranged from 20.9% for entry 31 to 13.2% for entry 103 (CI 13449). The overall average protein value was 16.1%.

Among the check varieties, Lancota had the highest protein content of 16.3% when averaged over the seven sites. Centurk and CI 13449 had protein values of 13.9 and 13.5%, respectively.

It is called to the readers attention that of the seven sites in Table 5, where grain yields are recorded and the seven sites in Table 6, where protein data is presented, that only three sites are common to both sets of data. A three-site analysis was not performed herein;

comparisons are made using data from both analyses. These comparisons should give relatively reliable estimates of the worth of these wheat lines.

Twenty-six lines were significantly higher in protein content than the nursery average of 16.1%. These 26 lines averaged 2.89% in adjusted lysine.

Adjusted lysine values ranged from 3.21 to 2.66% and averaged 2.99%. Centurk, Lancota, and CI 13449 averaged 3.03, 2.85, and 3.17%, respectively. Seven lines had adjusted lysine values which were statistically significantly higher than the overall nursery mean of 2.99%. Data for these seven lines are listed below.

Entry	Grain yield q/ha	Grain protein %	Adjusted lysine %
7	39.7	15.4	3.17
61	36.5	15.3	3.13
89	34.6	15.4	3.14
94	44.4	14.2	3.16
96	40.6	14.8	3.15
97	42.8	14.6	3.17
112	48.9	14.7	3.17

It can be seen that these lines were productive at the seven sites where yield data were recorded. They were, however, only average in protein content, falling between the levels of Centurk and Lancota. On a practical basis, however, due to variations in chemical analyses, these lysine differences may be inconsequential.

Perhaps the best potential combinations of high protein and yield potential in this nursery are found in the lines on the following page.

Stripe rust data were recorded at three sites. These data are reported in Table 8. Lancota and 14 other entries marked with asterisks were relatively free of infection at all three sites.

Stem rust data were recorded at four sites. The infection readings were not too severe at any one site, but five entries marked with asterisks in Table 9 may have demonstrated some active resistance.

Table 10 contains leaf rust data from two sites as well as Septoria and mildew data from one site each. In the mildew column, only those plots which appeared to be resistant were scored.

Entry	Grain yield q/ha	Grain protein %	Adjusted lysine/protein %	Plant height cm
71	43.7	16.7	2.86	93
4	43.3	17.4	2.89	89
91	43.0	16.3	3.11	96
62	39.2	17.2	2.88	93
50	38.7	17.8	2.81	92
41	38.5	17.8	2.92	91
60	38.3	16.9	2.87	81
6	37.8	17.1	2.98	81
37	36.4	19.1	2.96	88
12	36.1	17.0	2.92	88
16	35.9	17.1	2.96	84
55	34.1	17.7	2.84	91
Centurk	41.7	13.9	3.03	97
Lancota	39.0	16.3	2.85	100
CI 13449	17.4	13.5	3.17	78
Nursery mean	34.1	16.1	2.99	83

Spring Wheat

Listed in Table 11 are grain yield data measured in quintals per hectare for each of five sites. The entries are ranked from highest to lowest according to the five-site average yield. Grain yields among the 105 entries ranged from 60.1 to 17.8 q/ha. The top three yields were produced by Super X. The checks, Super X and Era, were joined at each site by a local variety selected by the cooperator. The average values for the checks were 58.6, 37.4, and 33.4 q/ha for Super X, Era, and local varieties, respectively.

Although Super X was the top yielding entry, 23 other entries were not statistically significantly lower in yield. Seventy-nine entries (75% of the nursery) were significantly below the yield level of Super X.

As in the winter wheats, a large coefficient of variation (38.6%) was computed in the yield analysis. The large error term resulted in an LSD value of 17.1 q/ha. Only Super X and entry 34 were significantly greater in yield than the nursery mean of 35.7 q/ha.

Protein values and rankings are shown for each of six sites in Table 12. The data for New Delhi, India are shown, but were not included in the overall analysis of variance due to missing observations.

Averaged over five sites, grain protein values ranged from 20.0 to 13.7%. The overall nursery mean was 17.7%. The local cultivars as checks averaged 16.0% protein. Super X and Era averaged 13.8 and 15.6%, respectively.

Super X had the lowest grain protein values in the nursery. Ninety-six entries (91% of the nursery) had grain which was significantly higher in protein content than that of Super X. Only three lines were significantly higher in protein content than the nursery mean.

Again, one must consider that the locations for yield determinations and protein determinations were not all in common. However, assuming that we can multiply yield values by protein values to find out relative protein production per hectare, then we find that 14 lines surpassed the average protein yield of Super X. These lines were not significantly lower yielding than Super X but were statistically significantly higher in grain protein content.

Ten lines with the best combination of protein content and yield potential are as follows:

Entry	Yield q/ha	Protein %	Adjusted lysine %
31	51.6	19.1	2.78
29	46.9	20.0	2.81
32	48.6	19.1	2.81
34	56.4	16.2	2.96
36	46.7	19.4	2.89
39	51.0	17.5	2.86
9	47.2	18.3	2.86
30	44.7	19.3	2.70
35	46.5	18.5	2.87
4	52.7	16.3	2.89

These lines are all CIMMYT selections. The lines derived from Nap Hal and/or Atlas 66 did not have enough yield potential to compete in this particular test.

Adjusted lysine values ranged from 3.14% to 2.70%. The overall nursery mean was 2.94%. Six lines were significantly higher in average adjusted lysine value than the nursery mean. However, these lines were not impressive in yield performance and three of the six were too tall.

Stripe rust data for the 105 entries in this nursery are presented in Table 14 for each of the three locations. Stem rust readings also were recorded at three sites and are listed in Table 15. Table 16 contains leaf rust data from two sites as well as Septoria readings from one site.

Table 5. Grain yield values and rankings for the entries in the fifth high protein-high lysine winter wheat observation nursery for each site and listed by decreasing yield value when averaged over seven sites.

Entry	Bordenave, Argentina		Tres Arroyos, Argentina		Santiago, Chile		Böhnshausen, East Germany		Bethlehem, South Africa		Aleppo, Syria		Yuma, Arizona USA		7-Site yield average
	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha
87	15.3	65	22.0	5	71.2	16	112.2	2	47.2	1	37.0	3	43.1	76	49.7
112	22.0	22	23.2	3	73.7	13	102.2	3	30.2	69	25.9	48	64.7	1	48.9
80	22.0	22	22.5	4	85.0	3	93.3	10	39.2	18	34.0	13	45.7	62	48.8
Centurk	27.3	9	11.5	41	78.7	9	97.3	6	37.9	24	23.7	62	45.3	65	46.0
86	28.0	7	4.5	102	72.5	15	84.4	16	40.1	10	33.3	16	49.5	36	44.6
94	30.7	3	27.7	1	80.0	8	53.3	84	31.5	65	29.6	27	57.9	6	44.4
100	35.4	1	8.7	65	73.7	13	80.0	22	28.2	81	33.3	16	51.7	24	44.4
71	21.3	26	4.0	108	107.5	1	75.5	34	34.2	43	27.4	41	35.7	100	43.7
4	34.0	2	8.0	71	107.5	1	41.1	100	42.7	3	20.7	76	49.3	40	43.3
Centurk	20.0	30	13.0	29	47.5	41	100.0	4	38.6	21	32.6	19	50.8	26	43.2
Lancota	24.0	14	19.5	8	60.0	25	80.0	22	41.2	6	37.7	2	39.8	87	43.2
91	16.7	49	14.7	22	78.7	9	68.9	50	42.2	5	29.6	27	50.2	30	43.0
97	25.3	12	21.5	6	61.2	20	67.8	54	40.3	9	24.4	56	59.4	4	42.8
95	27.3	9	21.0	7	35.0	67	88.9	14	38.5	22	34.0	13	49.9	32	42.1
60	15.3	65	12.0	38	36.2	64	117.8	1	40.9	7	20.0	82	49.8	34	41.7
76	14.0	73	13.7	25	48.7	40	94.4	8	39.6	13	29.6	27	48.4	43	41.2
92	30.0	4	17.7	10	52.5	32	76.7	30	32.7	53	29.6	27	49.4	38	41.2
39	16.0	60	15.7	19	85.0	3	68.9	50	27.0	87	23.7	62	50.6	27	41.0
96	20.0	30	23.7	2	47.5	41	75.5	34	30.8	67	33.3	16	53.5	16	40.6
81	22.0	22	16.7	14	68.7	17	55.5	81	39.5	14	31.8	21	48.4	43	40.4
104	29.3	5	4.2	106	61.2	20	58.9	72	39.5	14	34.8	10	52.2	20	40.0
7	28.7	6	17.2	12	56.2	30	72.2	40	30.1	71	25.2	54	47.9	48	39.7
85	8.0	105	19.2	9	40.0	57	94.4	8	34.3	41	35.5	8	44.9	69	39.5
62	15.3	65	4.5	102	81.2	6	90.0	12	26.9	89	20.7	76	35.6	102	39.2
Lancota	22.7	20	11.5	41	58.7	27	72.2	40	39.9	12	29.6	27	38.7	92	39.1
108	23.3	16	3.7	111	52.5	32	65.5	58	35.8	37	37.0	3	55.6	11	39.1
44	15.3	65	12.5	31	40.0	57	80.0	22	39.1	19	31.8	21	53.0	17	38.8
50	28.0	7	4.0	108	78.7	9	74.4	36	30.2	69	18.5	88	37.1	97	38.7
41	16.0	60	10.5	43	82.5	5	56.7	76	31.8	61	27.4	41	44.6	71	38.5
74	20.0	30	17.2	12	62.5	19	68.9	50	28.5	80	28.1	38	44.3	73	38.5
66	22.7	20	11.7	40	61.2	20	80.0	22	29.3	75	22.2	70	40.9	85	38.3
75	16.7	49	11.5	41	36.2	64	80.0	22	39.5	14	37.0	3	47.1	54	38.3
77	16.0	60	9.0	59	42.5	54	95.5	7	36.4	32	31.8	21	34.5	104	38.0
6	26.7	11	17.7	10	51.2	35	65.1	61	31.9	60	29.6	27	42.5	79	37.8
48	14.0	73	8.5	67	81.2	6	67.5	56	28.8	77	16.3	96	47.7	50	37.7

Table 5. Grain yield values and rankings for the entries in the fifth high protein-high lysine winter wheat observation nursery for each site listed by decreasing yield value when averaged over seven sites. (Continued).

Entry	Bordenave, Argentina		Tres Arroyos, Argentina		Santiago, Chile		Böhnshausen, East Germany		Bethlehem, South Africa		Aleppo, Syria		Yuma, Arizona USA		7-Site yield average
	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha
110	22.0	22	4.7	98	43.7	49	71.1	44	38.8	20	36.3	7	46.6	58	37.6
78	17.3	46	7.7	75	33.7	71	100.0	4	45.4	2	30.3	25	27.5	112	37.4
54	21.3	26	4.0	108	52.5	32	90.0	12	36.4	32	15.5	98	39.6	89	37.0
109	21.3	26	5.2	92	50.0	37	53.3	84	36.5	31	40.0	1	52.7	19	37.0
84	7.3	106	16.0	18	37.5	62	93.3	10	37.1	28	28.9	34	38.3	93	36.9
88	16.7	49	9.0	59	35.0	67	86.7	15	40.6	8	29.6	27	40.9	85	36.9
40	12.7	82	9.7	56	51.2	35	76.7	30	28.2	81	24.4	56	53.6	14	36.7
61	14.7	70	13.2	28	40.0	57	81.1	20	37.4	26	19.2	83	50.0	31	36.5
37	25.3	12	12.2	36	61.2	20	42.7	99	33.6	46	31.1	24	48.3	45	36.4
82	9.3	103	13.7	25	33.7	71	84.4	16	40.0	11	37.0	3	34.8	103	36.2
12	20.0	30	8.0	71	53.7	31	51.1	88	33.6	46	25.9	48	60.0	3	36.1
Centurk	12.7	82	6.5	82	50.0	37	78.9	28	31.7	62	24.4	56	47.9	48	36.0
98	18.0	43	4.5	102	47.5	41	82.2	18	39.3	17	22.2	70	37.9	95	36.0
16	13.3	80	11.5	41	43.7	49	71.5	43	32.9	51	28.9	34	49.5	36	35.9
113	21.3	26	12.5	31	50.0	37	60.0	71	28.7	79	11.1	105	63.2	2	35.3
83	10.0	99	16.2	15	46.2	46	73.3	38	35.7	38	28.9	34	35.7	100	35.2
9	23.3	16	8.5	67	37.5	62	61.1	69	27.5	84	30.3	25	55.8	10	34.9
Lancota	23.3	16	6.0	84	36.2	64	68.9	50	42.3	4	26.6	45	39.6	89	34.7
89	17.3	46	4.7	98	38.7	61	74.4	36	37.3	27	25.9	48	44.1	74	34.6
67	23.3	16	9.0	59	61.2	20	44.0	98	36.1	36	25.9	48	41.1	84	34.4
45	16.7	49	11.5	41	35.0	67	62.2	66	38.0	23	22.9	67	53.6	14	34.3
72	16.7	49	12.2	36	60.0	25	61.1	69	29.2	76	18.5	88	42.6	78	34.3
79	14.0	73	5.5	88	47.5	41	82.2	18	24.2	100	23.7	62	42.8	77	34.3
73	20.0	30	13.5	27	63.7	18	50.0	93	32.9	51	14.8	101	44.7	70	34.2
55	14.0	73	4.7	98	78.7	9	56.7	76	32.1	58	19.2	83	33.2	106	34.1
93	15.3	65	13.0	29	42.5	54	57.8	75	36.2	35	23.7	62	49.4	38	34.9
21	11.3	97	10.5	49	32.5	74	55.5	81	35.6	39	34.0	13	57.8	7	33.9
90	16.7	49	15.2	20	20.0	101	71.1	44	32.7	53	34.8	10	47.0	57	33.9
42	14.7	70	15.2	20	31.2	80	76.7	30	28.8	77	24.4	56	45.9	61	33.8
43	12.0	91	14.2	23	32.5	74	71.1	44	36.7	29	24.4	56	45.2	66	33.7
19	13.3	80	5.0	95	22.5	96	78.7	29	33.8	45	32.6	19	47.1	54	33.3
20	6.7	109	4.5	102	27.5	84	79.1	27	29.7	73	25.9	48	59.4	4	33.3
111	20.0	30	9.7	56	25.0	91	62.2	66	32.4	56	34.8	10	49.0	41	33.3
23	12.7	82	10.5	49	40.0	57	58.9	72	33.3	48	26.6	45	50.4	28	33.2
107	12.7	82	11.5	41	35.0	67	71.1	44	34.9	40	21.5	74	45.7	62	33.2

Table 5. Grain yield values and rankings for the entries in the fifth high protein-high lysine winter wheat observation nursery for each site and listed by decreasing yield value when averaged over seven sites. (Continued).

Entry	Bordenave, Argentina		Tres Arroyos, Argentina		Santiago, Chile		Böhnshausen, East Germany		Bethlehem, South Africa		Aleppo, Syria		Yuma, Arizona USA		7-Site yield average
	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha
11	16.7	49	8.0	71	17.5	104	81.1	20	30.1	71	27.4	41	47.6	51	32.6
70	12.7	82	12.5	31	43.7	49	64.4	62	32.2	57	23.7	62	39.2	91	32.6
14	16.0	60	9.0	59	26.2	87	76.7	30	34.3	41	22.2	70	42.1	81	32.4
35	12.0	91	5.5	88	45.0	48	70.0	49	27.0	87	12.6	104	52.1	21	32.0
15	16.7	49	12.0	38	27.5	84	65.5	58	32.5	55	25.9	48	41.5	83	31.7
18	16.7	49	5.0	95	30.0	81	64.4	62	31.7	62	28.9	34	45.4	64	31.7
69	18.7	38	16.2	15	32.5	74	51.1	88	34.0	44	15.5	98	53.0	17	31.6
99	18.7	38	10.7	48	15.0	107	64.4	62	36.6	30	24.4	56	51.1	25	31.6
34	12.7	82	12.5	31	47.5	41	65.5	58	28.0	83	8.9	108	43.8	75	31.3
13	14.0	73	8.7	65	17.5	104	71.1	44	33.1	49	26.6	45	47.6	51	31.2
105	18.7	38	6.2	83	32.5	74	56.7	76	29.7	73	27.4	41	47.5	53	31.2
106	12.0	91	9.5	58	23.7	92	67.8	54	37.9	24	20.7	76	47.1	54	31.2
5	14.7	70	16.2	15	23.7	92	62.2	66	25.4	95	25.2	54	49.9	32	31.0
63	18.0	43	6.7	79	57.5	28	58.4	74	27.1	86	16.3	96	33.2	106	31.0
49	18.7	38	10.0	53	32.5	74	63.3	65	32.1	58	22.9	67	36.3	98	30.8
64	17.3	46	3.2	112	57.5	28	36.7	102	33.1	49	20.7	76	46.4	60	30.7
38	10.0	99	11.0	47	43.7	49	46.7	95	22.7	104	28.1	38	46.5	59	29.8
8	24.0	14	9.0	59	33.7	71	36.4	103	36.3	34	22.9	67	45.2	66	29.7
17	12.7	82	10.5	49	26.2	87	35.6	104	31.5	64	35.5	8	48.5	42	28.6
25	16.0	60	6.7	79	21.2	97	51.1	88	27.5	84	19.2	83	52.1	21	27.7
56	10.0	99	6.7	79	26.2	87	72.2	40	17.9	109	18.5	88	42.0	82	27.7
27	12.0	91	5.2	92	20.0	101	51.1	88	26.9	89	17.8	92	57.0	9	27.1
29	12.0	91	6.0	84	23.7	92	52.2	87	25.7	93	17.0	94	50.3	29	26.7
30	12.7	82	10.0	53	12.5	109	51.1	88	24.4	98	19.2	83	57.3	8	26.7
26	18.7	38	7.5	77	23.7	92	53.8	83	9.6	113	21.5	74	48.3	45	26.2
32	18.0	43	6.0	84	21.2	97	56.7	76	21.2	106	22.2	70	37.6	96	26.1
47	6.0	110	14.2	23	46.2	46	56.7	76	20.1	107	5.2	112	33.8	105	26.0
28	14.0	73	7.7	75	16.2	106	40.0	101	25.4	95	15.5	98	53.8	13	24.7
46	7.3	106	5.2	92	10.0	110	66.0	57	30.9	66	3.7	113	49.6	35	24.7
36	7.3	106	8.5	67	13.7	108	73.3	38	26.6	91	7.4	109	33.1	109	24.3
10	14.0	73	8.5	67	26.2	87	45.6	96	19.9	108	19.2	83	36.2	99	24.2
31	19.3	36	4.7	98	43.7	49	17.8	112	17.4	110	28.1	38	38.1	94	24.2
65	12.7	82	8.0	71	32.5	74	31.8	108	24.4	98	18.5	88	39.8	87	24.0
68	11.3	97	10.0	53	27.5	84	32.2	106	22.9	102	9.6	107	54.3	12	24.0
59	19.3	36	5.5	88	28.7	83	31.8	108	24.5	97	20.7	76	32.9	110	23.4

Table 5. Grain yield values and rankings for the entries in the fifth high protein-high lysine winter wheat observation nursery for each site and listed by decreasing yield value when averaged over seven sites. (Concluded).

Entry	Bordenave, Argentina		Tres Arroyos, Argentina		Santiago, Chile		Böhnshausen, East Germany		Bethlehem, South Africa		Aleppo, Syria		Yuma, Arizona USA		7-Site yield average
	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha
57	16.7	49	7.0	78	21.2	97	33.3	105	23.1	101	17.0	94	45.0	68	23.3
22	10.0	99	5.5	88	21.2	97	32.2	106	30.8	67	20.7	76	42.2	80	23.2
33	12.0	91	6.0	84	30.0	81	45.1	97	12.5	111	10.4	106	44.5	72	22.9
24	9.3	103	5.0	95	20.0	101	29.8	110	25.6	94	17.8	92	51.9	23	22.8
CI 13449	3.3	112	12.5	31	5.0	112	53.3	84	26.3	92	7.4	109	48.1	47	22.3
58	16.7	49	2.2	113	42.5	54	16.7	113	21.9	105	13.3	102	28.8	111	20.3
CI 13449	4.7	111	9.0	59	7.5	111	50.0	93	22.9	102	7.4	109	33.2	106	19.2
CI 13449	2.7	113	4.2	106	3.7	113	18.2	111	11.7	112	13.3	102	21.7	113	10.8
Mean	17.0		10.4		43.6		65.4		31.8		24.3		45.8		34.1
LSD (.05)	--		--		--		--		--		--		8.8		11.7
CV (%)	--		--		--		--		--		--		12.1		32.8
Analysis of check varieties															
Centurk	20.0		10.3		58.8		92.1		36.1		26.9		48.0		41.7
Lancota	23.3		12.3		51.7		73.7		41.1		31.3		39.4		39.0
CI 13449	3.6		8.6		5.4		40.5		20.3		9.4		34.3		17.4
Check mean	15.6		10.4		38.6		68.8		32.5		22.5		40.6		32.7
LSD (.05)	9.1		NS		23.6		17.0		9.5		10.1		NS		7.1
CV (%)	26.3		19.4		27.7		11.2		13.2		20.4		17.9		35.3

Table 6. Protein values and rankings for the entries in the fifth high protein-high lysine winter wheat observation nursery for each site and listed by decreasing protein value when averaged over seven sites.

Entry	Böhnshausen, East Germany		Suwon, Korea		Gore, New Zealand		Bethlehem, South Africa		Eskisehir, Turkey		Stillwater, Oklahoma, USA		Yuma, Arizona, USA		7-Site protein mean
	%	rank	%	rank	%	rank	%	rank	%	rank	%	rank	%	rank	%
31	20.4	2	20.4	2	20.7	3	20.8	1	21.1	1	--	-	22.0	1	20.9
58	20.5	1	21.2	1	21.8	1	19.2	6	15.3	97	19.8	1	21.1	3	19.8
32	18.2	5	18.7	3	16.9	15	19.7	4	20.6	2	19.8	1	21.5	2	19.3
37	18.0	7	17.7	9	19.4	4	20.4	3	19.2	10	19.7	4	19.2	10	19.1
65	17.3	16	18.2	4	18.2	5	20.5	2	20.0	5	19.6	5	20.1	5	19.1
33	18.5	4	16.3	27	16.1	22	18.3	10	19.5	8	19.4	6	21.1	3	18.5
49	17.8	8	18.1	6	17.7	7	17.1	33	19.9	7	18.7	11	20.1	5	18.5
57	16.5	33	16.2	34	21.7	2	17.5	23	19.2	10	18.4	19	17.8	22	18.2
41	17.7	9	16.9	13	15.4	40	19.7	4	18.8	17	18.6	15	17.6	29	17.8
47	18.2	5	16.5	19	16.0	26	17.7	15	18.9	15	18.0	26	19.5	9	17.8
50	16.7	30	--	-	15.9	28	16.3	48	19.5	8	18.5	17	20.0	7	17.8
17	17.5	12	17.4	11	17.1	13	17.5	23	18.0	29	18.7	11	17.8	22	17.7
55	16.6	32	16.3	27	15.6	33	19.0	7	18.7	18	18.5	17	18.9	13	17.7
43	16.4	35	17.9	8	14.3	75	16.6	41	20.5	3	18.8	10	18.8	14	17.6
8	17.4	14	16.3	27	15.5	36	17.2	31	20.1	4	18.3	21	17.4	36	17.5
4	18.8	3	16.7	17	15.4	40	15.8	57	18.4	21	19.8	1	17.2	40	17.4
10	17.5	16	16.9	13	15.7	32	17.3	26	18.1	25	18.9	7	17.5	31	17.4
14	17.4	14	15.9	42	16.1	22	17.7	15	18.2	23	18.9	7	17.9	21	17.4
35	15.5	50	18.1	6	14.9	51	17.7	15	18.1	25	18.6	15	19.2	10	17.4
23	15.3	56	18.2	4	15.4	40	18.5	9	17.5	43	18.7	11	17.6	29	17.3
34	15.7	45	16.1	36	14.5	65	17.7	15	18.5	20	18.7	11	19.8	8	17.3
62	15.6	47	17.7	9	14.8	54	17.2	31	19.0	14	18.0	26	18.4	15	17.2
6	17.3	16	15.9	42	15.2	47	16.6	41	20.0	5	18.1	23	16.8	57	17.1
15	17.1	22	16.7	17	15.4	40	17.0	37	17.9	31	18.1	23	17.8	22	17.1
16	17.3	16	15.4	62	17.2	11	17.3	26	17.3	50	17.7	34	17.2	40	17.1
24	15.9	41	16.4	22	17.4	8	17.7	15	17.6	40	17.7	34	16.9	52	17.1
11	17.0	26	16.1	36	14.4	70	17.7	15	17.9	31	18.9	7	17.2	40	17.0
12	17.3	16	15.5	60	17.4	8	15.9	53	18.1	25	18.0	26	16.5	71	17.0
29	17.1	22	14.8	84	17.9	6	17.5	23	17.5	43	16.9	52	17.5	31	17.0
64	13.4	100	15.3	67	17.2	11	18.8	8	19.1	12	16.9	52	18.2	17	17.0
21	17.3	16	15.0	75	16.1	22	17.1	33	17.1	58	18.4	19	17.5	31	16.9
42	16.7	30	15.7	52	15.8	30	18.2	11	17.5	43	17.8	30	16.6	66	16.9
66	15.2	60	15.0	75	14.3	75	18.0	14	19.1	12	17.9	29	19.0	12	16.9
105	16.9	28	17.2	12	16.5	18	15.0	75	18.6	19	15.9	78	18.2	17	16.9
13	15.7	45	16.4	22	14.8	54	17.3	26	18.2	23	18.3	21	16.9	52	16.8

Table 6. Protein values and rankings for the entries in the fifth high protein-high lysine winter wheat observation nursery for each site and listed by decreasing protein value when averaged over seven sites. (Continued).

Entry	Böhnshausen, East Germany		Suwon, Korea		Gore, New Zealand		Bethlehem, South Africa		Eskisehir, Turkey		Stillwater, Oklahoma, USA		Yuma, Arizona, USA		7-Site protein mean
	%	rank	%	rank	%	rank	%	rank	%	rank	%	rank	%	rank	%
22	16.5	33	16.1	36	15.2	47	16.9	40	17.3	50	17.8	30	17.7	25	16.8
25	17.0	26	16.5	19	15.3	45	18.2	11	15.9	87	17.3	39	17.2	40	16.8
28	15.2	60	16.2	34	16.6	16	17.1	33	18.3	22	17.0	48	17.4	36	16.8
26	15.3	56	16.0	40	15.6	33	18.1	13	17.1	58	16.9	52	18.0	20	16.7
45	15.6	47	16.8	15	14.6	64	17.0	37	18.0	29	17.0	48	17.7	25	16.7
71	15.1	64	16.1	36	16.0	26	16.4	45	17.7	37	17.3	39	18.4	15	16.7
Lancota	17.6	10	16.3	27	16.2	20	16.6	41	16.3	78	16.5	61	17.7	25	16.7
5	17.6	10	15.8	48	14.4	70	16.2	50	18.9	15	17.2	45	16.4	73	16.6
38	15.4	52	15.1	73	17.4	8	17.3	26	16.8	63	17.3	39	16.6	66	16.6
27	15.4	52	14.9	83	16.1	22	16.4	45	17.6	40	16.8	55	17.1	46	16.3
30	13.6	94	16.5	19	15.9	28	17.7	15	17.1	58	16.1	74	17.1	46	16.3
59	13.6	94	16.3	27	15.8	30	16.6	41	17.7	37	17.2	45	16.9	52	16.3
91	15.5	50	15.7	52	14.8	54	17.1	33	17.4	47	16.7	57	16.8	57	16.3
44	15.2	60	16.4	22	13.5	92	15.9	53	17.7	37	17.3	39	17.5	31	16.2
56	14.5	74	15.3	67	15.2	47	15.7	58	17.9	31	17.3	39	17.2	40	16.2
18	15.4	52	15.6	56	13.9	83	17.3	26	16.3	78	17.4	38	16.7	62	16.1
Lancota	16.1	38	15.0	75	15.5	36	14.8	78	17.8	35	16.2	72	17.4	36	16.1
75	15.6	47	16.3	27	15.3	45	16.4	45	17.1	58	16.5	61	15.6	94	16.1
86	17.5	12	15.1	73	14.4	70	15.6	61	17.6	40	15.8	80	16.8	57	16.1
88	16.0	39	15.8	48	15.4	40	15.9	33	17.0	64	16.4	65	16.4	73	16.1
104	15.8	44	16.4	22	17.0	14	15.1	71	14.6	110	16.4	65	17.1	46	16.1
Lancota	16.8	29	15.0	75	14.5	65	14.1	92	17.0	64	17.7	34	17.2	40	16.0
9	15.9	41	15.6	56	13.8	86	14.9	77	18.1	25	17.0	48	16.7	62	16.0
19	14.3	75	15.4	62	14.0	79	15.9	53	17.2	55	18.1	23	16.9	52	16.0
20	15.1	64	15.2	70	14.5	65	15.4	64	17.3	50	17.8	30	16.7	62	16.0
48	15.4	52	15.4	62	15.5	36	14.5	81	17.3	50	16.4	65	17.7	25	16.0
73	14.6	72	15.9	42	16.5	18	14.5	81	17.2	55	16.5	61	16.6	66	16.0
74	16.2	36	15.0	75	14.9	51	14.7	79	17.4	47	16.6	59	17.0	49	16.0
79	15.9	41	15.6	56	15.6	33	15.4	64	17.0	64	15.9	78	16.6	66	16.0
72	13.7	90	15.9	42	16.6	16	14.4	84	17.2	55	16.7	57	16.7	62	15.9
40	14.0	82	--	-	15.0	50	17.0	37	15.4	93	17.5	37	16.2	80	15.8
67	13.1	102	15.8	48	15.5	36	16.1	51	17.3	50	15.8	80	17.0	49	15.8
36	14.0	82	15.9	42	13.8	86	17.7	15	14.3	111	17.3	39	16.9	52	15.7
54	14.3	75	15.5	60	14.8	54	14.5	81	16.8	68	16.2	72	17.5	31	15.7
63	14.2	78	14.8	84	14.4	70	14.2	87	17.9	31	16.3	69	18.2	17	15.7

Table 6. Protein values and rankings for the entries in the fifth high protein-high lysine winter wheat observation nursery for each site and listed by decreasing protein value when averaged over seven sites. (Continued).

Entry	Böhnshausen, East Germany		Suwon, Korea		Gore, New Zealand		Bethlehem, South Africa		Eskisehir, Turkey		Stillwater, Oklahoma, USA		Yuma, Arizona, USA		7-Site protein mean
	%	rank	%	rank	%	rank	%	rank	%	rank	%	rank	%	rank	%
46	15.3	56	15.4	62	14.8	54	13.5	104	16.5	77	16.8	55	17.0	49	15.6
68	13.7	90	14.6	90	13.5	92	15.2	69	17.8	35	17.8	30	16.8	57	15.6
69	13.1	102	14.7	86	--	-	15.4	64	16.8	68	16.3	69	17.3	39	15.6
77	14.0	82	16.4	22	13.6	89	16.0	52	16.0	85	17.0	48	16.3	76	15.6
83	14.6	7[illegible]	16.3	27	13.9	83	16.3	48	15.8	90	16.0	77	16.3	76	15.6
110	17.1	22	13.8	105	14.7	61	14.1	92	17.5	43	15.6	84	16.1	83	15.6
7	14.8	68	15.0	75	13.2	97	15.2	69	16.8	68	17.2	45	16.1	83	15.5
39	15.3	56	15.0	75	14.7	61	15.4	64	15.2	99	16.6	59	16.4	73	15.5
78	13.9	86	16.0	40	14.0	79	15.7	58	16.1	83	16.1	74	16.1	83	15.4
89	13.9	86	15.7	52	14.5	65	15.6	61	16.6	75	15.6	84	16.1	83	15.4
95	14.0	82	15.6	56	16.2	20	14.2	87	16.9	67	14.8	98	15.8	91	15.4
108	17.1	22	14.0	98	14.9	51	14.2	87	16.7	74	15.4	89	15.3	100	15.4
109	16.2	36	13.9	101	14.5	65	14.0	94	17.1	58	15.8	80	16.2	80	15.4
61	14.3	75	15.8	48	13.9	83	13.8	98	16.3	78	16.4	65	16.8	57	15.3
60	13.3	101	16.8	15	12.7	102	14.0	94	16.8	68	16.5	61	16.5	71	15.2
70	12.7	105	14.5	91	--	-	14.4	84	17.1	58	15.8	80	16.6	66	15.2
100	16.0	39	14.1	97	14.8	54	13.3	105	16.1	83	14.7	100	15.9	90	15.0
76	14.8	68	14.3	94	13.3	95	14.4	84	15.4	93	16.3	69	16.1	83	14.9
82	15.2	60	15.2	70	13.6	89	15.3	68	15.4	93	14.3	107	15.3	100	14.9
87	14.7	70	15.7	52	13.0	101	15.7	58	15.0	102	15.4	89	15.0	105	14.9
98	14.9	66	15.9	42	13.6	89	13.7	102	15.4	93	14.6	101	16.3	76	14.9
90	14.7	70	13.7	106	13.4	94	15.5	63	16.3	78	14.8	98	15.1	104	14.8
92	14.2	78	14.5	91	14.7	61	15.0	75	15.6	92	13.8	110	15.5	99	14.8
96	13.6	94	15.3	67	12.6	104	15.1	71	15.9	87	15.4	89	16.0	89	14.8
85	14.1	81	15.4	62	13.3	95	15.1	71	14.7	105	14.4	105	15.6	94	14.7
107	13.6	94	14.7	86	14.3	75	13.8	98	14.7	105	15.6	84	16.3	76	14.7
112	14.9	66	13.4	109	14.8	54	12.8	106	16.2	82	15.3	92	15.6	94	14.7
81	13.9	86	15.0	75	14.4	70	13.9	97	15.9	87	14.2	109	14.8	108	14.6
97	14.2	78	14.7	86	13.1	98	13.8	98	15.8	90	14.5	104	16.2	80	14.6
84	13.6	94	14.5	91	12.7	102	15.1	71	14.7	105	14.6	101	15.6	94	14.4
93	13.8	89	14.2	96	13.1	98	14.6	80	15.1	100	15.0	95	15.0	105	14.4
105	13.7	90	14.3	94	13.7	88	14.2	87	14.7	105	15.0	95	15.3	100	14.4
111	12.5	108	12.8	110	14.3	75	12.2	111	17.4	47	15.0	95	15.6	94	14.3
94	12.7	105	--	-	13.1	98	14.0	94	16.8	68	13.8	110	14.5	110	14.1
Centurk	13.7	90	13.9	101	11.9	107	14.2	87	14.1	112	14.6	101	16.1	83	14.1

Table 6. Protein values and rankings for the entries in the fifth high protein-high lysine winter wheat observation nursery for each site and listed by decreasing protein value when averaged over seven sites. (Concluded).

Entry	Böhnshausen, East Germany		Suwon, Korea		Gore, New Zealand		Bethlehem, South Africa		Eskisehir, Turkey		Stillwater, Oklahoma, USA		Yuma, Arizona, USA		7-Site protein mean
	%	rank	%	rank	%	rank	%	rank	%	rank	%	rank	%	rank	%
113	13.6	94	13.7	106	14.0	79	12.3	109	15.0	102	15.3	92	15.0	105	14.1
Centurk	13.0	104	13.7	106	12.1	106	12.7	108	15.1	100	15.6	84	15.8	91	14.0
CI 13449	11.2	111	15.2	70	11.3	110	12.1	112	16.6	75	16.1	74	15.3	100	14.0
99	12.7	105	14.0	98	12.4	105	13.7	102	16.0	85	14.4	105	14.7	109	14.0
Centurk	12.1	110	13.9	101	11.6	108	13.8	98	15.0	102	14.3	107	15.7	93	13.8
80	12.5	108	13.9	101	14.0	79	12.8	106	13.4	113	13.7	112	14.3	112	13.5
CI 13449	10.9	113	14.7	86	10.4	111	11.7	113	15.3	97	15.6	84	14.4	111	13.3
CI 13449	11.0	112	14.0	98	11.6	108	12.3	109	14.7	105	15.1	94	14.0	113	13.2
Mean	15.3		15.7		15.0		15.9		17.1		16.8		17.0		16.1
LSD (.05)	--		--		--		--		--		--		--		1.0
CV (%)	--		--		--		--		--		--		--		6.1
Analysis of the check varieties															
Lancota	16.8		15.4		15.4		15.2		17.0		16.8		17.4		16.3
Centurk	12.9		13.8		11.9		13.6		14.7		14.8		15.9		13.9
CI 13449	11.0		14.6		11.1		12.0		15.5		15.6		14.6		13.5
Check mean	13.6		14.6		12.8		13.6		15.8		15.7		16.0		14.6
LSD (.05)	1.2		NS		1.2		1.2		0.8		1.3		1.1		0.6
CV (%)	3.4		4.5		4.2		4.0		2.3		3.6		3.0		7.0

Table 7. Summary of agronomic and grain quality data for the entries in the fifth high protein-high lysine winter wheat observation nursery grown in 1979.

Entry	Yield q/ha	Protein %	Protein rank	Lysine/protein %	Adjusted lysine/protein %	Plant height cm
Number of sites	7	7		7	7	7
87	49.7	14.9	88	2.88	3.03	91
112	48.9	14.7	95	3.03	3.17	83
30	48.8	13.5	111	3.02	3.11	65
Centurk	46.0	14.0	107	2.91	3.01	97
86	44.6	16.1	51	2.82	3.01	84
94	44.4	14.1	104	3.05	3.16	78
100	44.4	15.0	87	2.94	3.09	87
71	43.7	16.7	39	2.66	2.86	93
4	43.3	17.4	16	2.68	2.89	89
Centurk	43.2	14.1	104	2.94	3.04	100
Lancota	43.2	16.7	39	2.65	2.85	104
91	43.0	16.3	45	2.92	3.11	96
97	42.8	14.6	98	3.03	3.17	80
95	42.1	15.4	79	2.75	2.92	82
60	41.7	15.2	85	2.95	3.10	90
76	41.2	14.9	88	2.88	3.03	97
92	41.2	14.8	92	2.85	3.00	81
39	41.0	15.5	77	2.80	2.98	88
96	40.6	14.8	92	3.01	3.15	79
81	40.4	14.6	98	2.91	3.06	67
104	40.0	16.1	51	2.77	2.96	84
7	39.7	15.5	77	3.00	3.17	86
85	39.5	14.7	95	2.94	3.09	74
62	39.2	17.2	22	2.68	2.88	93
Lancota	39.1	16.0	57	2.66	2.84	100
108	39.1	15.4	79	2.90	3.07	94
44	38.8	16.2	49	2.78	2.97	82
50	38.7	17.8	9	2.61	2.81	92
41	38.5	17.8	9	2.71	2.92	91
74	38.5	16.0	57	2.78	2.98	75
66	38.3	16.9	31	2.68	2.87	81
75	38.3	16.1	51	2.92	3.12	77
77	38.0	15.6	71	2.87	3.04	84
6	37.8	17.1	23	2.78	2.98	81
48	37.7	16.0	57	2.70	2.88	83
110	37.6	15.6	71	2.87	3.04	90
78	37.4	15.4	79	2.88	3.05	90
54	37.0	15.7	68	2.83	3.01	81
109	37.0	15.4	79	2.81	2.98	97
84	36.9	14.4	100	2.97	3.10	71

Table 7. (continued)

Entry	Yield q/ha	Protein %	Protein rank	Lysine/protein %	Adjusted lysine/protein %	Plant height cm
88	36.9	16.1	51	2.73	2.93	85
40	36.7	15.9	65	2.88	3.06	87
61	36.5	15.3	84	2.97	3.13	91
37	36.4	19.1	4	2.75	2.96	88
82	36.2	14.9	88	2.87	3.03	68
12	36.1	17.0	27	2.72	2.92	88
Centurk	36.0	13.8	110	2.95	3.03	94
98	36.0	14.9	88	2.77	2.92	90
16	35.9	17.1	23	2.76	2.96	84
113	35.3	14.1	104	3.02	3.13	74
83	35.2	15.6	71	2.87	3.05	72
9	34.9	16.0	57	2.87	3.05	84
Lancota	34.7	16.1	51	2.68	2.87	95
89	34.6	15.4	79	2.96	3.14	85
67	34.4	15.8	66	2.77	2.95	85
45	34.3	16.7	39	2.80	3.00	79
72	34.3	15.9	65	2.81	3.00	88
79	34.3	16.0	57	2.78	2.97	76
73	34.2	16.0	57	2.92	3.10	86
55	34.1	17.7	12	2.63	2.84	91
93	34.0	14.4	100	2.96	3.10	83
21	33.9	16.9	31	2.76	2.96	71
90	33.9	14.8	92	2.86	3.01	82
42	33.8	16.9	31	2.74	2.94	85
43	33.7	17.6	14	2.73	2.93	83
19	33.3	16.0	57	2.81	2.99	75
20	33.3	16.0	57	2.81	3.00	70
111	33.3	14.3	103	2.95	3.05	84
23	33.2	17.3	20	2.76	2.96	70
107	33.2	14.7	95	2.93	3.08	88
11	32.6	17.0	27	2.77	2.97	81
70	32.6	15.2	85	2.91	3.07	87
14	32.4	17.4	16	2.70	2.91	81
35	32.0	17.4	16	2.68	2.89	81
15	31.7	17.1	23	2.74	2.95	79
18	31.7	16.1	51	2.76	2.95	81
69	31.6	15.6	71	2.88	3.05	83
99	31.6	14.0	107	3.00	3.11	80
34	31.3	17.3	20	2.72	2.92	95
13	31.2	16.8	35	2.77	2.97	80
105	31.2	16.9	31	2.74	2.95	79
106	31.2	14.4	100	2.96	3.10	85
5	31.0	16.6	43	2.78	2.98	84
63	31.0	15.7	68	2.89	3.06	78
49	30.8	18.5	6	2.61	2.82	85

Table 7. (continued)

Entry	Yield q/ha	Protein %	Protein rank	Lysine/protein %	Adjusted lysine/protein %	Plant height cm
64	30.7	17.0	27	2.80	2.99	79
38	29.8	16.6	43	2.73	2.93	92
8	29.7	17.5	15	2.66	2.87	87
17	28.6	17.7	12	2.82	3.04	74
25	27.7	16.8	35	2.81	3.01	75
56	27.7	16.2	49	2.86	3.05	79
27	27.1	16.3	45	2.85	3.04	72
29	26.7	17.0	27	2.78	2.98	73
30	26.7	16.3	45	2.74	2.94	76
26	26.2	16.7	39	2.79	2.99	71
32	26.1	19.3	3	2.64	2.85	90
47	26.0	17.8	9	2.66	2.87	89
28	24.7	16.8	35	2.73	2.93	74
46	24.7	15.6	71	2.82	2.99	87
36	24.3	15.7	68	2.84	3.01	78
10	24.2	17.4	16	2.74	2.96	77
31	24.2	20.9	1	2.47	2.66	87
65	24.0	19.1	4	2.60	2.81	71
68	24.0	15.6	71	2.93	3.10	80
59	23.4	16.3	45	2.83	3.02	91
57	23.3	18.2	8	2.61	2.82	91
22	23.2	16.8	35	2.80	3.00	74
33	22.9	18.5	6	2.62	2.83	94
24	22.8	17.1	23	2.79	3.01	71
CI 13449	22.3	13.2	113	3.13	3.17	79
58	20.3	19.8	2	2.67	2.87	93
CI 13449	19.2	13.3	112	3.09	3.12	81
CI 13449	10.8	14.0	107	3.14	3.21	76
Mean	34.1	16.1		2.82	2.99	83
LSD (.05)	11.7	1.0		0.15	0.14	10
CV (%)	32.8	6.1		5.2	4.6	8.5
Analysis of the check varieties						
Centurk	41.7	13.9		2.93	3.03	97
Lancota	39.0	16.3		2.66	2.85	100
CI 13449	17.4	13.5		3.12	3.17	78
Check mean	32.7	14.6		2.90	3.02	92
LSD (.05)	7.1	0.6		0.07	0.13	5
CV (%)	35.3	7.0		3.9	4.0	6.1

Table 8. Stripe rust readings for the entries in the fifth high protein-high lysine winter wheat observation nursery recorded at the indicated sites in 1979.

Entry	Tres Arroyos, Argentina	Santiago, Chile		Aleppo, Syria		Three-site severity	
	Sev %	Sev %	Resp	Sev %	Resp	Average %	High score %
1	5	10	MS	0		5	10
2	t	t	R	0		< 1	t
3	0	40	S	t	MR	14	40
4	0	10	MR	0		3	10
5	5	20	MR	5	MR	10	20
6	1	20	MR	5	MR	9	20
7	10	20	MR	24	MR	18	24
8	5	10	MR	25	MR	13	25
9	5	20	MR	5	MR	10	20
10	15	80	S	20	MS	38	80
11	40	80	S	60	S	60	80
12	10	50	S	20	MS	27	50
13	50	50	S	50	S	50	50
14	5	50	S	15	MS	23	50
15	5	50	S	50	S	35	50
16	15	20	MS	60	S	32	60
17	5	20	MS	20	S	15	20
18	20	20	MS	60	S	33	60
19	40	50	S	60	S	50	60
20	40	50	S	70	S	53	70
21	10	50	S	40	MS	33	50
22	20	50	S	70	S	47	70
23	10	10	MR	30	MR	17	30
24	80	80	S	60	S	73	80
25	40	50	S	90	S	60	90
26	60	50	S	70	S	60	70
27	85	90	S	75	S	83	90
28	95	90	S	80	S	88	95
29	75	90	S	70	S	78	90
30	50	20	S	70	S	47	70
31	20	t	S	10	MR	10	20
32	20	90	S	40	MS	50	90
33	60	20	MS	75	S	52	75
34	60	20	MS	90	S	57	90
35	50	20	MS	90	S	53	90
36	30	20	MS	70	S	40	70
37	20	0		0		7	20
38*	0	0		0		0	0
39*	10	0		0		3	10
40	5	50	S	20	S	25	50

Table 8. (continued)

Entry	Tres Arroyos, Argentina	Santiago, Chile		Aleppo, Syria		Three-site severity	
	Sev %	Sev %	Resp	Sev %	Resp	Average %	High score %
41*	1	0		0		< 1	1
42	1	10	MS	15	MS	9	15
43*	0	0		0		0	0
44	0	20	MR	0		7	20
45	0	20	MR	t	MR	7	20
46	90	90	S	90	S	90	90
47	5	t	R	85	S	30	85
48	1	t	R	5	MS	2	5
49	20	t	S	5	MS	9	20
50	10	t	R	t	MS	4	10
51	1	10	MS	t	MS	4	10
52	5	t	R	0		2	5
53	1	50	S	20	MR	24	50
54	30	0		t	MS	10	30
55	0	50	S	0		17	50
56	10	90	S	t	MS	34	90
57	40	0		40	MS	27	40
58	0	30	S	t	MR	10	30
59	15	t	R	t	MR	6	15
60	0	0		20	MS	7	20
61	0	t	R	30	MS	10	30
62	0	t	R	25	S	9	25
63	5	t	R	0		2	5
64*	0	t	R	0		< 1	t
65*	5	t	R	0		2	5
66	0	10	MS	5	MS	5	10
67*	0	t	R	0		< 1	t
68	50	50	S	80	S	60	80
69	5	20	MS	30	S	18	30
70	5	t	R	50	MR	19	50
71	1	t	R	50	MR	17	50
72	15	t	R	0		5	15
73	10	t	R	40	S	<17	40
74*	0	t	R	0		1	t
75	15	30	S	10	MS	18	30
76	15	30	S	50	S	32	50
77	5	20	MR	15	MR	13	20
78	1	20	MR	15	MS	12	20
79	10	t	R	15	MR	9	15
80	10	t	R	5	MR	5	10

Table 8. (continued)

Entry	Tres Arroyos, Argentina Sev %	Santiago, Chile Sev %	Santiago, Chile Resp	Aleppo, Syria Sev %	Aleppo, Syria Resp	Three-site severity Average %	Three-site severity High score %
81	0	t	R	10	MS	4	10
82	5	50	S	t	MR	19	50
83	1	50	S	20	MS	24	50
84	0	20	S	t	MR	7	20
85*	0	t	R	5	MS	2	5
86*	0	t	R	5	MS	2	5
87*	0	0		5	MS	2	5
88	1	50	S	t	MS	17	50
89	20	80	S	t	MS	34	80
90	15	50	S	t	MS	22	50
91	0	t	R	10	MS	4	10
92	5	10	MS	15	S	10	15
93	40	50	S	15	S	35	50
94	1	20	MS	10	MS	10	20
95	10	50	S	15	MS	25	50
96	0	t	R	10	MS	4	10
97	0	5	MS	t	MR	2	5
98*	1	t	R	t	MS	1	1
99	60	90	S	0		50	90
100	15	30	S	0		15	30
101	1	20	MS	0		7	20
102	1	t	R	0		< 1	1
103	0	t	R	10	MR	4	10
104	1	20	S	0		7	20
105	0	30	S	0		10	30
106	40	30	S	85	S	52	85
107	60	50	S	90	S	67	90
108	0	t	R	10	MS	4	10
109*	0	0		5	MS	2	5
110*	0	0		5	MS	2	5
111	80	50	S	5	MR	45	80
112	1	20	MR	0		7	20
113	60	30	S	60	S	50	60
Mean	16.6	25.3		23.9		22.0	37.0

Table 9. Stem rust readings for the entries in the fifth high protein-high lysine winter wheat observation nursery recorded at the indicated sites in 1979.

Entry	Bordenave, Argentina		Tres Arroyos, Argentina	Santiago, Chile		Bethlehem, South Africa		Four-site severity	
	Sev. %	Resp.	Sev. %	Sev. %	Resp.	Sev. %	Resp.	Mean	High score
1	30	S	0	5	S	5	S	10	30
2	10	MS	0	t	S	40	S	13	40
3	30	S	30	10	S	70	S	35	70
4	t	R	1	t	S	10	S	3	10
5	20	MS-S	30	5	S	10	S	16	30
6	30	S	40	10	S	10	S	23	40
7	10	MS	10	15	S	5	S	10	15
8	10	MS	5	5	S	2	S	6	10
9	20	MS	10	5	S	10	S	11	20
10	5	MS	5	0		40	S	13	40
11	5	MS-MR	1	t	MR	30	S	9	30
12	5	MS	0	0		30	S	9	30
13	5	MS-MR	1	5	S	20	S	8	20
14	10	MS-MR	5	t	S	5	S	5	10
15	10	MS	0	5	S	5	S	5	10
16	5	MS-MR	1	5	S	5	MS	4	5
17	10	MS	1	10	S	20	S	10	20
18	20	MS	0	15	S	10	MR-S	11	20
19	10	MS	1	5	S	40	MR-S	14	40
20	5	MS	5	10	S	40	MR-S	15	40
21	5	MS	1	15	S	5	S	7	15
22	10	S	0	5	S	0		4	10
23	10	MS-S	0	10	S	10	S	8	10
24	10	MS	1	10	S	50	S	18	50
25	20	MS-S	1	40	S	30	S	23	40
26	5	MS	0	5	S	10	S	5	10
27	5	MS-MR	0	t	S	20	S	7	20
28	10	MS	1	t	S	10	MS-R	6	10
29	5	MS-S	1	15	S	10	S	8	15
30	5	MS	5	t	S	5	MS-S	4	5
31	0		5	10	S	10	S	6	10
32	5	MS	1	20	S	10	S-MR	9	20
33	20	MS	5	40	S	40	S	21	40
34	30	MS-S	10	60	S	50	S	38	60
35	20	MS	20	60	S	50	S	38	60

Table 9. Stem rust readings for the entries in the fifth high protein-high lysine winter wheat observation nursery recorded at the indicated sites in 1979. (Continued).

Entry	Bordenave, Argentina		Tres Arroyos, Argentina	Santiago, Chile		Bethlehem, South Africa		Four-site severity	
	Sev. %	Resp.	Sev. %	Sev. %	Resp.	Sev. %	Resp.	Mean	High score
36	5	MS	0	10	S	10	S	6	10
37	20	MS	1	10	S	5	S	9	20
38	20	MS	1	5	S	40	S	17	40
39	5	MS-S	1	t	S	50	S	14	50
40	t	R	1	5	S	20	R-S	7	20
41	10	S	1	t	S	0		3	10
42	10	MS	1	0		30	S	10	30
43	t	R	1	t	S	10	S	3	10
44	20	MS-S	1	t	S	10	S	8	20
45*	t	R	0	0		5	S	2	5
46	10	MS	0	t	S	50	S	15	50
47*	t	R	0	0		0		< 1	t
48	0		0	5	S	t	MR	2	5
49	10	S-MS	20	15	S	t	MR-S	12	20
50	0		5	t	S	10	S	4	10
51	30	S	1	t	S	20	S	13	30
52	20	S	0	t	S	70	S-R	23	70
53	40	S	20	30	S	60	S	38	60
54	30	S	5	15	S	0		13	30
55*	t	R	0	0		t	R	< 1	t
56	30	S	20	10	S	10	S	18	30
57	20	S	5	10	S	10	S	11	20
58	40	S	5	40	S	10	MS-S	24	40
59	30	S	1	10	S	10	R-S	13	30
60	20	S-MS	10	20	S	40	S	23	40
61	10	S-MS	5	15	S	40	S	18	40
62	20	S-MS	1	5	S	10	R-S	9	20
63	t	R	10	5	S	0		4	10
64*	t	R	0	0		0		< 1	t
65	5	MS-MR	0	0		0		1	5
66	5	MR	0	10	S	0		4	10
67	5	MR-MS	0	t	S	0		2	5
68	30	MS-S	10	5	S	50	S	24	50
69	20	MS	10	30	S	5	S	16	30
70	30	S-MS	10	30	S	20	S	23	30

Table 9. Stem rust readings for the entries in the fifth high protein-high lysine winter wheat observation nursery recorded at the indicated sites in 1979. (Continued).

Entry	Bordenave, Argentina		Tres Arroyos, Argentina	Santiago, Chile		Bethlehem, South Africa		Four-site severity	
	Sev. %	Resp.	Sev. %	Sev. %	Resp.	Sev. %	Resp.	Mean	High score
71	10	MS	5	20	S	5	S	10	20
72	10	MS	40	60	S	20	S	33	60
73	30	S-MS	40	80	S	30	MR-S	45	80
74	0		40	30	S	5	S	19	40
75	20	MS-S	50	t	S	0		18	50
76	10	MS	30	t	S	10	R-S	13	30
77	t	R	0	t	S	5	MS-R	2	5
78	30	S-MS	1	0		70	S	25	70
79	20	MS-S	0	0		90	S	28	90
80	10	MS	10	10	S	0		8	10
81	10	MS	1	15	S	5	S	8	15
82	30	S	1	5	S	10	S	12	30
83	20	S	1	10	S	50	S	20	50
84*	t	MR	1	0		t	S	< 1	1
85	20	MS-S	1	10	S	0		8	20
86	20	S-MS	1	15	S	10	MR-S	12	20
87	5	MS	1	5	S	10	S	5	10
88	5	MS-MR	1	0		0		2	5
89	30	S	10	10	S	0		13	30
90	30	S	5	10	MS	80	S	31	80
91	5	MS	10	t	S	60	S	19	60
92	0		20	t	S	0		5	20
93	30	S	20	30	S	0		20	30
94	t	R	0	t	MS	5	S	2	5
95	20	MS	10	40	S	t	S	18	40
96	20	MS	10	40	S	5	S	19	40
97	40	S	20	20	S	0		20	40
98	30	S	5	5	S	60	S	25	60
99	30	S-MS	20	t	S	10	MR-S	15	30
100	10	S	20	5	S	0		9	20
101	30	S-MS	1	t	S	5	S	9	30
102	10	MS-S	1	t	S	10	MS-S	6	10
103	40	S	30	40	S	10	S	30	40
104	5	S	10	20	S	0		9	20
105	5	MR	5	t	S	10	S	5	10

Table 9. Stem rust readings for the entries in the fifth high protein-high lysine winter wheat observation nursery recorded at the indicated sites in 1979. (Concluded).

Entry	Bordenave, Argentina		Tres Arroyos, Argentina	Santiago, Chile		Bethlehem, South Africa		Four-site severity	
	Sev. %	Resp.	Sev. %	Sev. %	Resp.	Sev. %	Resp.	Mean	High score
106	10	MR-MS	5	5	S	5	S	6	10
107	5	MS-MR	1	10	MR	0		4	10
108	5	MS	1	20	S	20	S	12	20
109	10	MS	1	20	S	10	S	10	20
110	5	MS-MR	1	5	S	10	S	5	10
111	10	MS	1	10	S	10	S	8	10
112	10	MS	1	20	S	5	S	9	20
113	5	MS	5	10	S	10	S	8	10
Mean	13.8		6.9	11.4		17.4		12.5	26.9

Table 10. Other disease data for the entries in the fifth high protein-high lysine winter wheat observation nursery recorded at the indicated sites in 1979.

Entry	Leaf rust: Tres Arroyos, Argentina Sev %	Leaf rust: Bethlehem, South Africa Sev %	Leaf rust: Bethlehem, South Africa Resp	Leaf rust: Two-site Average %	Septoria sp.: Tres Arroyos, Argentina Sev %	Mildew: Bohnshausen, East Germany
1	0	10	MR-S	5	30	R
2	0	10	R	5	30	R
3	60	99	S	80	20	
4	30	90	S	60	40	
5	30	20	R-MR	25	30	
6	30	20	R-S	25	20	
7	40	20	R-MR	30	30	
8	60	10	MR	35	20	
9	40	10	MR	25	30	
10	20	30	R-S	25	30	
11	10	30	S-MR	20	20	
12	40	80	S	60	30	
13	1	30	S	16	20	
14	5	30	R-S	12	20	
15	5	40	MS-R	23	20	R
16	10	50	R-MR	30	20	
17	20	50	R-MR	35	20	R
18	50	70	R-MR	60	10	
19	20	70	MR	45	10	
20	40	90	MS	65	10	
21	10	50	R-S	30	20	R
22	60	50	R-S	55	20	R
23	10	30	R-S	20	20	R
24	5	99	S	52	10	
25	10	90	S-MR	50	20	
26	10	80	S-MR	45	20	
27	10	90	S	50	20	
28	1	99	S	50	10	
29	20	99	S	60	10	
30	20	90	S	55	10	
31	50	60	S	55	20	
32	40	70	S	55	20	
33	1	99	S	50	20	
34	5	99	S	52	20	
35	5	99	S	52	20	
36	30	20	R-S	25	40	
37	40	60	S	50	20	
38	25	99	S	62	25	
39	25	99	S	62	20	
40	20	99	S	60	25	

Table 10. (continued)

Entry	Leaf rust: Tres Arroyos, Argentina Sev %	Leaf rust: Bethlehem, South Africa Sev %	Leaf rust: Bethlehem, South Africa Resp	Leaf rust: Two-site Average %	Septoria sp.: Tres Arroyos, Argentina Sev %	Mildew: Bohnshausen, East Germany
41	10	20	S	15	25	
42	60	30	S	45	20	
43	80	50	R-MR	65	25	R
44	80	50	R-MR	65	25	R
45	60	10	MR	35	25	R
46	5	99	S	52	20	R
47	30	50	S	40	25	R
48	30	40	S-MR	35	20	
49	30	99	S	65	20	
50	10	20	S-MS	15	20	
51	5	10	R-MR	8	25	
52	30	10	R	20	30	
53	60	99	S	80	10	
54	10	40	S	25	20	R
55	1	30	S-MR	16	20	
56	70	70	S	70	10	
57	5	30	MR	18	30	
58	50	99	S	75	15	
59	30	60	S	45	15	
60	30	99	VS	65	20	R
61	40	99	S	70	20	R
62	10	90	S	50	20	
63	10	60	S	35	20	
64	0	0		0	15	
65	5	0		3	15	
66	10	90	S	50	20	
67	10	50	S	30	10	
68	10	90	S	50	20	
69	30	50	S	40	20	
70	50	99	S	75	20	
71	20	20	MR	20	20	
72	40	90	S	65	15	
73	40	99	S	70	20	
74	20	70	S	45	10	
75	20	40	S	30	20	
76	40	99	S	70	30	
77	0	30	S-MR	15	25	
78	1	80	S	41	25	
79	0	30	S-MR	15	20	
80	30	99	S	65	20	

Table 10. (continued)

Entry	Leaf rust: Tres Arroyos, Argentina Sev %	Leaf rust: Bethlehem, South Africa Sev %	Leaf rust: Bethlehem, South Africa Resp	Leaf rust: Two-site Average %	Septoria sp.: Tres Arroyos, Argentina Sev %	Mildew: Bohnshausen, East Germany
81	5	80	S	43	15	
82	30	99	S	65	20	
83	5	40	S	23	25	
84	1	20	R	11	20	
85	5	30	MS-R	18	25	
86	1	50	R-S	26	15	
87	5	20	R-S	13	10	R
88	5	99	S	52	20	
89	20	99	S	60	20	
90	5	20	R-MS	13	20	
91	0	40	S-MR	20	20	
92	30	5	S	18	20	
93	5	99	S	52	20	
94	1	99	S	50	15	
95	10	99	S	55	20	
96	10	80	S	45	25	
97	1	60	S	31	20	
98	0	20	S-MS	10	25	
99	5	70	R-MS	38	20	
100	1	70	R-S	36	20	R
101	0	20	R-S	10	25	
102	0	20	R	10	15	R
103	40	99	S	70	20	
104	10	30	S	20	25	
105	5	99	S	52	20	R
106	5	99	S	52	20	
107	10	99	S	55	20	
108	5	99	S	52	15	
109	20	30	S	25	15	
110	10	80	S	45	15	
111	0	50	MR-S	25	15	
112	5	30	S	18	20	
113	40	99	S	70	25	
Mean	20.1	60.1		40.2	20.4	

Table 11. Grain yield values and rankings for the entries in the fifth high protein-high lysine spring wheat observation nursery for each site listed by decreasing yield values when averaged over five sites.

Entry	Tres Arroyos, Argentina		La Platina, Chile		Santiago, Chile		Bethlehem, South Africa		Yuma, Arizona		5-site yield average
	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha
Super X	7.2	48	54.3	29	157.5	1	9.1	95	72.3	1	60.1
Super X	11.0	32	75.1	7	127.5	3	17.5	61	64.3	2	59.1
Super X	13.7	20	51.8	35	140.0	2	17.6	60	59.6	4	56.5
34	6.5	53	86.8	1	106.2	4	25.4	19	57.1	7	56.4
4	3.7	86	85.2	2	97.5	10	23.6	32	53.6	15	52.7
31	4.7	75	80.2	3	96.2	11	25.4	19	51.2	21	51.6
39	4.2	79	68.5	12	95.0	12	27.6	12	59.5	5	51.0
32	4.2	79	80.2	3	88.7	15	23.7	31	46.1	42	48.6
42	8.5	43	55.1	28	92.5	14	29.7	7	56.6	8	48.5
9	3.2	94	61.8	17	106.2	4	17.5	61	47.3	33	47.2
29	5.0	73	75.1	7	85.0	19	25.0	24	44.2	52	46.9
36	6.7	50	74.3	9	75.0	30	28.0	9	49.5	26	46.7
35	6.2	57	59.3	19	86.2	17	27.3	13	53.6	15	46.5
15	6.2	57	69.3	11	81.2	23	6.9	103	60.7	3	44.9
30	4.7	75	57.6	21	76.2	28	31.2	4	53.7	14	44.7
26	2.7	101	67.6	14	76.2	28	24.2	29	49.1	29	44.0
56	8.2	44	46.8	44	102.5	6	21.9	40	40.8	68	44.0
11	4.5	78	76.0	5	68.7	37	17.5	61	52.0	19	43.8
55	20.5	5	39.2	61	101.2	7	19.5	48	37.6	80	43.6
Era	21.5	3	40.9	56	101.2	7	22.9	35	29.1	99	43.1
10	4.7	75	43.4	49	101.2	7	20.2	44	42.7	57	42.5
27	3.2	94	74.3	9	66.2	47	23.5	33	45.2	48	42.5
28	6.0	60	68.5	12	63.7	55	26.5	16	46.5	38	42.2
50	17.0	12	61.8	17	73.7	33	19.1	52	39.2	73	42.2
12	3.0	98	76.0	5	65.0	50	18.4	55	45.9	44	41.6
7	3.0	98	66.0	15	66.2	47	17.7	59	54.8	12	41.5
16	5.5	67	41.7	53	80.0	25	24.5	27	55.2	11	41.4
77	11.7	28	52.6	34	70.0	35	33.7	3	38.8	77	41.4
14	3.7	86	54.3	29	80.0	25	8.8	96	58.1	6	41.0
47	2.0	105	54.3	29	86.2	17	16.1	70	46.4	41	41.0
44	8.2	44	47.6	42	63.7	55	25.3	22	56.0	9	40.2
23	4.2	79	35.9	64	88.7	15	25.6	18	45.3	46	40.0
24	3.0	98	54.3	29	75.0	30	24.2	29	43.7	54	40.0
101	15.5	15	51.8	35	66.2	47	15.4	72	47.1	35	39.2
20	3.5	91	40.9	56	65.0	50	35.5	1	50.3	22	39.0
Era	17.7	10	25.9	85	93.5	13	8.8	96	48.5	30	38.9
85	5.0	73	58.4	20	78.7	27	17.2	64	34.9	94	38.9
54	13.2	25	54.3	29	46.2	78	34.0	2	43.1	56	38.2
63	10.0	36	37.6	63	85.0	19	18.2	57	39.2	73	38.0
80	14.7	19	50.1	39	68.7	37	17.0	65	38.7	78	37.9

Table 11. (continued)

Entry	Tres Arroyos, Argentina		La Platina, Chile		Santiago, Chile		Bethlehem, South Africa		Yuma, Arizona		5-year yield average
	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha
43	6.5	53	31.7	75	65.0	50	27.3	13	55.5	10	37.2
8	3.5	91	55.9	26	57.5	63	21.7	41	47.0	36	37.1
84	4.0	83	56.8	25	68.7	37	18.4	55	37.4	81	37.1
17	5.5	67	28.4	80	68.7	37	30.5	5	51.9	20	37.0
19	2.7	101	40.9	56	62.5	57	25.4	19	52.6	18	36.8
74	6.5	53	57.6	21	58.7	61	24.3	28	36.0	89	36.6
62	6.2	57	42.6	51	70.0	35	22.0	39	40.8	68	36.3
75	8.7	40	40.9	56	65.0	50	24.6	26	39.0	76	35.7
18	6.5	53	24.2	88	67.5	42	30.1	6	49.4	27	35.5
64	23.2	2	45.1	46	57.5	63	8.0	99	42.6	58	35.3
93	21.5	3	55.9	26	45.0	81	7.5	102	46.5	38	35.3
95	7.0	49	33.4	67	62.5	57	27.1	15	46.7	37	35.3
41	6.0	60	64.3	16	55.0	68	10.4	89	38.3	79	34.8
22	3.2	94	57.6	21	33.7	95	28.5	8	50.1	23	34.6
96	11.7	28	32.6	73	81.2	23	11.4	87	36.1	88	34.6
13	3.5	91	57.6	21	50.0	73	19.9	46	41.6	64	34.5
83	2.2	104	45.1	46	67.5	42	22.6	37	35.0	93	34.5
Local	10.5	35	40.9	56	71.5	34	24.9	25	23.0	104	34.1
40	3.2	94	47.6	42	67.5	42	4.7	105	46.5	38	33.9
100	12.5	26	23.4	90	68.7	37	19.7	47	45.1	49	33.9
60	9.7	37	44.3	48	53.7	70	20.0	45	39.5	72	33.5
68	4.0	83	50.1	39	58.7	61	14.4	78	40.0	71	33.5
5	6.0	60	32.6	73	85.0	19	16.7	68	54.2	13	33.4
Local	4.2	79	50.9	38	75.0	30	9.2	94	26.1	102	33.1
Local	6.7	50	43.4	49	82.5	22	11.6	85	21.4	105	33.1
45	4.0	83	18.4	96	67.5	42	19.2	50	53.3	17	32.5
66	18.0	8	41.7	53	38.7	85	19.2	50	44.1	53	32.4
79	11.0	32	30.9	76	57.5	63	19.0	53	42.5	59	32.2
25	2.5	103	48.4	41	38.7	85	25.3	22	45.4	45	32.1
89	17.0	12	28.4	80	57.5	63	8.6	98	47.6	32	31.8
59	6.7	50	45.9	45	47.5	77	16.8	67	41.7	63	31.7
76	11.5	31	30.1	78	65.0	50	10.1	92	40.9	67	31.5
57	6.0	60	41.7	53	40.0	84	28.0	9	39.2	73	31.0
102	19.7	6	38.4	62	38.7	85	14.0	81	40.7	70	30.3
61	7.5	47	33.4	67	57.5	63	16.4	69	36.2	87	30.2
Era	23.7	1	22.5	91	55.0	68	12.3	84	36.7	85	30.1
91	16.2	14	35.1	66	42.5	83	7.7	101	49.2	28	30.1
67	17.2	11	27.6	82	48.7	74	14.3	79	42.0	62	30.0
72	5.5	67	24.2	88	67.5	42	19.3	49	33.7	95	30.0
21	3.7	86	20.9	94	52.0	72	27.8	11	44.9	50	29.9

Table 11. (continued)

Entry	Tres Arroyos, Argentina q/ha	rank	La Platina, Chile q/ha	rank	Santiago, Chile q/ha	rank	Bethlehem, South Africa q/ha	rank	Yuma, Arizona q/ha	rank	5-site yield average q/ha
37	3.7	86	33.4	67	38.7	85	22.7	36	48.1	31	29.3
73	8.7	40	42.6	51	37.5	89	14.1	80	41.1	66	28.8
90	19.2	7	13.4	99	48.7	74	15.3	74	47.2	34	28.8
58	9.2	39	26.7	84	45.0	81	21.4	42	37.2	83	27.9
99	9.7	37	20.9	94	60.0	60	6.5	104	41.3	65	27.7
94	15.5	15	33.4	67	28.7	98	18.0	58	42.2	61	27.6
6	5.7	65	51.8	35	53.7	70	17.0	65	29.4	98	27.2
88	15.2	17	33.4	67	27.5	100	9.9	93	50.1	23	27.2
98	13.7	20	27.6	82	36.2	91	15.4	72	42.5	59	27.1
38	3.0	98	25.9	85	46.2	78	10.4	89	45.3	46	26.2
46	13.5	23	5.8	104	36.2	91	25.8	17	49.8	25	26.2
49	18.0	8	35.9	64	23.7	102	13.7	82	37.4	81	25.8
78	11.0	32	15.0	97	48.7	74	10.8	88	43.2	55	25.8
71	5.5	67	14.2	98	62.5	57	15.2	75	29.1	99	25.3
33	3.7	86	33.4	67	36.2	91	23.2	34	28.2	101	25.0
81	13.5	23	25.0	87	31.2	96	20.6	43	32.7	96	24.6
65	8.7	40	30.1	78	35.0	94	7.8	100	36.7	85	23.7
48	12.5	26	22.5	91	23.7	102	15.0	77	44.4	51	23.6
97	13.7	20	30.9	76	16.2	105	18.9	54	35.6	92	23.1
92	15.2	17	22.5	91	31.2	96	15.1	76	23.8	103	21.6
87	11.7	28	8.3	103	37.5	89	11.6	85	35.9	90	21.0
69	3.0	98	13.4	99	46.2	78	10.3	91	31.8	97	20.9
82	5.5	67	10.0	102	27.5	100	22.4	38	37.2	83	20.5
70	7.7	46	13.4	99	28.7	98	16.0	71	35.9	90	20.3
86	5.5	67	4.2	105	20.0	104	13.3	83	45.9	43	17.8
Mean	8.7		43.2		64.3		19.0		43.9		35.7
L.S.D.(.05)	-		-		-		-		9.9		17.1
C.V. (%)	-		-		-		-		14.1		38.6
Analysis of check varieties											
Super X	10.7		60.4		141.7		14.7		65.4		58.6
Era	21.0		29.8		83.3		14.7		38.1		37.4
Check mean	15.8		45.1		112.5		14.7		51.8		48.0
L.S.D. (.05)	0.5		5.1		NS		NS		11.1		15.8
C.V. (%)	1.3		5.0		18.7		25.7		9.4		40.9

Table 12. Protein values and rankings of the entries in the fifth high protein-high lysine spring wheat observation nursery for each site and listed by decreasing protein values when averaged over five sites.

Entry	New Delhi,[a] India %	rank	Gore, New Zealand %	rank	Madrid, Spain %	rank	Bethlehem, South Africa %	rank	Davis, California, U.S.A. %	rank	Yuma, Arizona, U.S.A. %	rank	5-site Protein mean %
29	15.4	59	22.2	5	22.7	1	18.5	10	17.2	44	19.2	20	20.0
62	17.8	26	19.3	24	22.1	5	17.1	34	19.0	8	20.8	3	19.7
26	14.6	86	21.3	8	21.4	13	19.5	4	16.3	78	18.8	29	19.5
36	16.3	36	19.3	24	21.9	6	19.4	6	17.2	44	19.3	19	19.4
28	14.7	82	21.4	6	21.7	8	18.3	12	16.8	60	18.5	35	19.3
30	14.8	80	21.0	12	21.9	6	17.9	14	17.2	44	18.4	39	19.3
80	20.5	9	17.7	46	22.5	2	17.3	27	19.1	7	19.7	12	19.3
31	14.9	77	20.2	19	21.6	9	17.8	18	17.0	52	18.8	29	19.1
32	15.5	57	20.4	18	21.6	9	18.8	7	16.4	74	18.5	35	19.1
54	17.4	28	16.7	59	20.9	24	17.9	14	19.6	3	20.4	4	19.1
25	15.3	62	19.7	21	21.0	19	19.6	3	16.5	69	18.4	39	19.0
27	13.7	97	21.2	10	21.4	13	18.7	9	15.9	84	17.6	55	19.0
58	15.6	54	18.5	37	19.8	59	15.6	68	19.2	5	21.9	1	19.0
61	16.3	36	19.6	22	20.5	35	16.8	39	18.7	13	19.4	17	19.0
70	19.9	12	17.8	44	20.9	24	18.0	13	18.4	20	19.9	7	19.0
17	18.9	18	23.4	1	20.3	42	13.9	98	18.6	15	18.5	35	18.9
23	15.3	62	20.7	16	18.5	90	19.5	4	17.5	34	18.2	41	18.9
63	15.3	62	19.3	24	20.6	31	17.3	27	17.6	31	19.8	9	18.9
81	17.4	28	18.8	33	21.0	19	16.3	53	18.6	15	19.8	9	18.9
55	17.9	24	17.8	44	20.6	31	17.3	27	18.8	11	19.5	15	18.8
59	15.8	47	19.1	28	20.6	31	15.5	72	18.1	23	20.9	2	18.8
18	17.9	24	23.1	2	20.5	35	14.4	92	17.6	31	18.1	43	18.7
24	15.6	54	19.0	31	19.1	76	20.2	1	16.4	74	18.6	32	18.7
60	16.1	43	20.6	17	20.0	54	16.1	57	17.1	49	19.8	9	18.7
79	22.4	3	17.2	50	20.0	54	18.8	7	18.7	13	18.7	31	18.7
84	15.9	46	16.6	60	20.8	27	17.8	18	19.2	5	19.2	20	18.7
85	16.4	34	16.9	54	20.4	41	17.8	18	18.9	9	19.4	17	18.7
87	25.6	1	19.1	28	22.2	4	16.0	59	18.2	22	18.1	43	18.7
11	14.9	77	21.4	6	21.1	18	16.3	53	17.3	39	17.0	75	18.6
50	18.3	19	18.0	41	20.5	35	17.4	25	17.8	26	19.1	22	18.6
57	14.8	80	21.3	8	20.3	42	14.7	88	17.5	34	19.0	24	18.6
10	15.7	50	20.8	14	20.9	24	16.2	56	17.5	34	17.2	67	18.5
19	17.3	30	22.7	4	20.3	42	14.9	84	17.0	52	17.8	51	18.5
20	16.3	36	22.9	3	19.4	70	14.7	88	17.2	44	18.1	43	18.5
33	16.0	44	19.2	27	20.2	47	17.9	14	17.4	38	17.6	55	18.5
35	15.5	57	17.5	48	21.0	19	17.3	27	18.6	15	18.0	47	18.5
74	16.3	36	18.1	38	20.5	35	16.5	46	18.6	15	19.0	24	18.5
83	15.6	54	16.6	60	22.3	3	14.2	94	19.7	2	19.9	7	18.5
96	16.2	41	15.6	74	21.2	15	16.5	46	18.9	9	19.7	12	18.4
9	15.7	50	21.0	12	20.5	35	16.4	50	16.9	57	16.7	85	18.3

Table 12. (continued)

Entry	New Delhi,[a] India %	rank	Gore, New Zealand %	rank	Madrid, Spain %	rank	Bethlehem, South Africa %	rank	Davis, California, U.S.A. %	rank	Yuma, Arizona, U.S.A. %	rank	5-site Protein mean %
22	14.7	82	18.6	36	19.1	76	19.9	2	17.1	49	16.8	80	18.3
82	18.5	21	15.9	70	20.3	42	16.7	41	17.8	26	20.1	6	18.2
90	20.8	8	17.9	42	21.2	15	15.7	66	18.6	15	17.7	53	18.2
92	24.4	2	14.5	89	18.9	81	16.6	44	23.1	1	17.8	51	18.2
7	15.7	50	20.8	14	20.0	54	16.3	53	16.8	60	16.4	93	18.1
8	15.3	62	21.2	10	20.1	51	16.1	57	16.7	64	16.4	93	18.1
12	14.3	92	20.1	20	20.1	51	15.9	64	17.0	52	17.2	67	18.1
49	21.1	7	17.3	49	20.2	47	18.4	11	17.1	49	17.3	63	18.1
65	18.2	23	16.3	66	20.7	29	17.2	33	18.8	11	17.3	63	18.1
77	.	.	16.1	68	21.5	11	16.0	59	19.5	4	17.6	55	18.1
16	16.3	36	17.6	47	20.5	35	17.5	23	16.4	74	17.9	48	18.0
78	19.5	14	15.4	78	20.2	47	17.7	21	17.8	26	19.0	24	18.0
71	16.0	44	15.6	74	21.0	19	15.3	75	17.3	39	20.4	4	17.9
76	19.0	17	16.5	64	19.9	57	16.7	41	18.0	24	18.5	35	17.9
5	15.0	71	17.9	42	20.6	31	16.5	46	16.3	78	17.5	59	17.8
14	14.6	86	17.0	52	21.0	19	17.9	14	15.9	84	17.2	67	17.8
37	14.1	94	19.5	23	19.4	70	16.7	41	16.5	69	16.9	77	17.8
73	15.8	47	16.8	57	19.8	59	17.3	27	18.0	24	17.1	71	17.8
6	15.4	59	18.8	33	20.7	29	17.0	35	16.8	60	15.4	99	17.7
75	15.8	47	16.3	66	19.9	57	16.4	50	17.8	26	17.9	48	17.7
93	17.8	26	17.0	52	20.2	47	16.6	44	17.6	31	17.3	63	17.7
15	15.2	67	16.6	60	20.8	27	17.5	23	15.6	91	17.2	67	17.5
39	15.0	71	18.7	35	19.2	74	17.3	27	15.7	88	16.8	80	17.5
66	.	.	15.6	74	20.1	51	15.9	64	17.2	44	18.6	32	17.5
94	22.0	4	15.1	80	19.5	64	16.9	37	18.4	20	17.4	61	17.5
13	14.5	89	18.9	32	20.3	42	15.4	74	15.8	86	16.5	91	17.4
41	15.0	71	18.1	38	18.8	83	16.8	39	16.4	74	17.1	71	17.4
48	19.3	16	16.0	69	19.0	79	17.0	35	16.7	64	18.2	41	17.4
40	14.1	94	17.1	51	19.4	70	16.9	37	16.3	78	16.6	90	17.3
45	16.2	41	16.8	57	19.8	59	16.0	59	16.7	64	17.4	61	17.3
64	21.2	5	19.1	28	18.0	94	15.0	82	16.9	57	17.7	53	17.3
68	16.6	33	15.7	73	19.1	76	16.0	59	17.3	39	18.6	32	17.3
86	18.8	19	14.2	92	21.5	11	15.2	78	16.1	82	19.0	24	17.2
95	17.3	30	16.6	60	19.8	59	15.3	75	17.3	39	16.9	77	17.2
44	16.4	34	14.7	86	21.2	15	15.7	66	17.0	52	16.8	80	17.1
69	17.1	32	16.9	54	17.0	99	16.5	46	16.8	60	18.1	43	17.1
98	15.0	71	18.1	38	19.4	70	14.2	94	16.5	69	17.1	71	17.1
99	.	.	16.9	54	19.0	79	14.9	84	16.9	57	17.3	63	17.0
38	14.7	82	16.5	64	18.8	83	17.7	21	15.3	95	15.9	97	16.8
88	21.2	5	15.6	74	18.8	83	15.2	78	17.8	26	16.8	80	16.8

Table 12. (continued)

Entry	New Delhi,[a/] India %	rank	Gore, New Zealand %	rank	Madrid, Spain %	rank	Bethlehem, South Africa %	rank	Davis, California, U.S.A. %	rank	Yuma, Arizona, U.S.A. %	rank	5-site Protein mean %
89	20.5	9	15.9	70	18.3	92	15.5	72	17.3	39	16.7	85	16.7
91	20.3	11	15.9	70	19.5	64	15.2	78	16.3	78	16.7	85	16.7
97	15.7	50	14.5	89	19.5	64	15.6	68	16.7	64	16.0	96	16.5
47	15.3	62	14.9	84	18.9	81	13.8	100	16.5	69	17.9	48	16.4
56	14.4	91	15.3	79	17.5	97	13.6	101	16.6	68	19.0	24	16.4
102	15.0	71	15.1	80	19.5	64	14.8	86	15.5	94	17.1	71	16.4
4	15.2	67	14.8	85	18.4	91	16.4	50	15.7	88	16.2	95	16.3
42	14.2	93	13.3	97	19.5	64	15.6	68	16.5	69	16.8	80	16.3
43	15.1	69	15.1	80	19.7	63	15.2	78	15.8	86	15.8	98	16.3
101	14.9	77	15.1	80	19.5	64	14.2	94	15.6	91	17.0	75	16.3
Local	14.6	86	13.8	95	19.2	74	15.0	82	14.0	101	19.5	15	16.3
21	15.1	69	14.7	86	16.1	102	17.4	25	16.0	83	16.7	85	16.2
34	14.7	82	14.6	88	17.9	95	16.0	59	15.7	88	16.7	85	16.2
67	.	.	12.8	100	18.6	89	14.8	86	17.5	34	17.5	59	16.2
Local	14.5	89	13.0	99	18.7	86	15.6	68	14.2	100	19.1	22	16.1
72	15.4	59	14.5	89	18.3	92	13.9	98	15.6	91	17.6	55	16.0
Local	15.0	71	11.5	105	17.9	95	15.3	75	13.9	102	19.6	14	15.6
46	.	.	12.1	103	18.7	86	12.5	104	17.0	52	16.5	91	15.4
100	14.1	94	14.2	92	18.7	86	11.7	105	15.0	97	16.9	77	15.3
Era	19.5	14	13.9	94	17.5	97	14.5	91	15.1	96	14.7	102	15.1
Era	19.8	13	13.1	98	15.9	105	14.7	88	15.0	97	14.9	101	14.7
Era	18.3	22	13.4	96	16.0	103	13.6	101	15.0	97	15.4	99	14.7
Super X	13.7	97	12.4	102	16.4	100	14.4	92	13.2	103	14.2	103	14.1
Super X	12.7	100	11.8	104	16.3	101	14.0	97	12.6	105	14.0	104	13.7
Super X	13.5	99	12.7	101	16.0	103	13.0	103	12.8	104	14.0	104	13.7
Mean	16.6		17.3		19.8		16.3		17.0		17.8		17.7
LSD(.05)	-		-		-		-		-		-		1.8
CV (%)	-		-		-		-		-		-		8.2
					Analysis of the check varieties								
Super X	13.3		12.3		16.2		13.8		12.9		14.1		13.8
Era	19.2		13.5		16.5		14.3		15.0		15.0		15.6
Check mean	16.3		12.9		16.4		14.0		14.0		14.5		14.7
LSD(.05)	0.4		NS		NS		NS		0.5		NS		1.0
CV (%)	1.2		2.5		4.8		4.8		1.6		2.0		9.9

[a/] India was not included in the overall averages.

Table 13. Summary of agronomic and grain quality data for the entries in the fifth high protein-high lysine spring wheat observation nursery grown in 1979.

Entry	Yield	Protein		Lysine/protein	Adjusted lysine/protein	Plant height
	q/ha	%	rank	%	%	cm
Number of sites	5	5		5	5	4
Super X	60.1	14.1	103	2.88	2.99	86
Super X	59.1	13.7	104	2.91	2.99	87
Super X	56.5	13.7	104	2.83	2.91	93
34	56.4	16.2	92	2.77	2.96	94
4	52.7	16.3	87	2.70	2.89	82
31	51.6	19.1	8	2.57	2.78	84
39	51.0	17.5	62	2.65	2.86	88
32	48.6	19.1		2.61	2.81	82
42	48.5	16.3		2.65	2.83	86
9	47.2	18.3	40	2.66	2.86	78
29	46.9	20.0	1	2.61	2.81	79
36	46.7	19.4	4	2.68	2.89	98
35	46.5	18.5	32	2.67	2.87	100
15	44.9	17.5	62	2.62	2.83	77
30	44.7	19.3	5	2.49	2.70	81
26	44.0	19.5	3	2.57	2.77	73
56	44.0	16.4	84	2.89	3.07	108
11	43.8	18.6	29	2.67	2.87	80
55	43.6	18.8	20	2.78	3.00	100
Era	43.1	15.1	100	2.77	2.93	98
10	42.5	18.5	32	2.55	2.75	73
27	42.5	19.0	11	2.58	2.78	81
28	42.2	19.3	5	2.53	2.73	82
50	42.2	18.6	29	2.74	2.96	91
12	41.6	18.1	45	2.66	2.86	85
7	41.5	18.1	45	2.72	2.92	83
16	41.4	18.0	51	2.66	2.87	74
77	41.4	18.1	45	2.79	2.99	93
14	41.0	17.8	55	2.64	2.84	81
47	41.0	16.4	84	2.91	3.09	99
44	40.2	17.1	75	2.76	2.95	87
23	40.0	18.9	16	2.71	2.92	76
24	40.0	18.7	22	2.75	2.96	78
101	39.2	16.3	87	2.81	2.99	85
20	39.0	18.5	32	2.71	2.91	88
Era	38.9	14.7	101	2.94	3.09	94
85	38.9	18.7	22	2.82	3.03	96
54	38.2	19.1	8	2.77	2.98	102
63	38.0	18.9	16	2.66	2.87	101
80	37.9	19.3	5	2.82	3.03	96

Table 13. (continued)

Entry	Yield	Protein		Lysine/protein	Adjusted lysine/protein	Plant height
	q/ha	%	rank	%	%	cm
Number of sites	5	5		5	5	4
43	37.2	16.3	87	2.69	2.88	88
8	37.1	18.1	45	2.63	2.84	80
84	37.1	18.7	22	2.80	3.00	101
17	37.0	18.9	16	2.62	2.81	87
19	36.8	18.5	32	2.61	2.80	90
74	36.6	18.5	32	2.84	3.05	97
62	36.3	19.7	2	2.62	2.82	97
75	35.7	17.7	59	2.75	2.96	90
18	35.5	18.7	22	2.61	2.79	84
64	35.3	17.3	69	2.90	3.10	109
93	35.3	17.7	59	2.79	3.00	94
95	35.3	17.2	73	2.81	3.01	96
41	34.8	17.4	66	2.70	2.91	79
22	34.6	18.3	40	2.75	3.00	83
96	34.6	18.4	39	2.75	2.95	98
13	34.5	17.4	66	2.74	2.94	75
83	34.5	18.5	32	2.77	2.96	96
Local	34.1	16.3	87	2.70	2.86	85
40	33.9	17.3	69	2.73	2.94	74
100	33.9	15.3	99	3.00	3.13	113
60	33.5	18.7	22	2.71	2.91	91
68	33.5	17.3	69	2.75	2.96	88
5	33.4	17.8	55	2.70	2.90	86
Local	33.1	16.1	95	2.77	2.92	84
Local	33.1	15.6	97	2.87	3.00	87
45	32.5	17.3	69	2.69	2.89	84
66	32.4	17.5	62	2.77	2.97	85
79	32.2	18.7	22	2.77	2.98	86
25	32.1	19.0	11	2.72	2.93	76
89	31.8	16.7	81	2.72	2.93	88
59	31.7	18.8	20	2.74	2.95	86
76	31.5	17.9	53	2.72	2.93	105
57	31.0	18.6	29	2.70	2.89	95
102	30.3	16.4	84	2.79	2.98	86
61	30.2	19.0	11	2.77	2.98	91
Era	30.1	14.7	101	2.84	2.98	95
91	30.1	16.7	81	2.86	3.06	88
67	30.0	16.2	92	2.88	3.05	89
72	30.0	16.0	96	2.83	3.01	98
21	29.9	16.2	92	2.76	2.96	83

Table 13. (continued)

Entry	Yield	Protein		Lysine/portein	Adjusted lysine/protein	Plant height
	q/ha	%	rank	%	%	cm
37	29.3	17.8	55	2.71	2.92	77
73	28.8	17.8	55	2.79	3.00	88
90	28.8	18.2	42	2.75	2.96	94
58	27.9	19.0	11	2.67	2.87	98
99	27.7	17.0	78	2.83	3.04	98
94	27.6	17.5	62	2.81	3.01	87
6	27.2	17.7	59	2.63	2.83	55
88	27.2	16.8	79	2.82	3.01	88
98	27.1	17.1	75	2.84	3.04	92
38	26.2	16.8	79	2.69	2.89	71
46	26.2	15.4	98	2.91	3.03	98
49	25.8	18.1	45	2.74	2.95	74
78	25.8	18.0	51	2.73	2.94	90
71	25.3	17.9	53	2.65	2.85	96
33	25.0	18.5	32	2.72	2.93	59
81	24.6	18.9	16	2.70	2.90	103
65	23.7	18.1	45	2.92	3.13	76
48	23.6	17.4	66	2.82	3.03	71
97	23.1	16.5	83	2.94	3.13	72
92	21.6	18.2	42	2.76	2.95	57
87	21.0	18.7	22	2.93	3.14	81
69	20.9	17.1	75	2.78	2.99	86
82	20.5	18.2	42	2.76	2.96	96
70	20.3	19.0	11	2.64	2.85	88
86	17.8	17.2	73	2.82	3.00	92
Mean	35.7	17.7		2.74	2.94	87
LSD (.05)	17.1	1.8		0.16	0.15	10
CV (%)	38.6	8.2		4.7	4.1	7.9

Table 14. Stripe rust readings for the entries in the fifth high protein-high lysine spring wheat observation nursery reported from the indicated sites in 1979.

Entry	Santiago, Chile		La Platina, Chile		Tres Arroyos, Argentina	Three-site severity	
	Sev %	Resp	Sev %	Resp	Sev %	Average	High Score
1	t	R [a/]	t	R [b/]	5	2	5
2	0		0		1 [c/]	< 1	1
3	t	R	t	R	1	1	1
4	20	MS	0		0	7	20
5	0		80	S	1	27	80
6	t	R	t	R	1	1	1
7	5	MR	10	MS	1	5	10
8	5	MR	20	MS	1	9	20
9	5	MR	40	S	1	15	40
10	10	MR	30	S	5	15	30
11	t	R	20	MS	5	9	20
12	t	R	t	R	1	1	1
13	t	R	t	R	1	1	1
14	30	MR	90	S	1	40	90
15	30	S	90	S	5	42	90
16	50	S	90	S	5	48	90
17	30	MR	90	S	0	40	90
18	30	S	90	S	0	40	90
19	30	S	90	S	0	40	90
20	t	R	t	R	0	< 1	t
21	t	R	5	MR	0	2	5
22	0		0		1	< 1	1
23	t	R	50	S	0	17	50
24	0		t	R	0	< 1	t
25	t	R	t	R	0	< 1	t
26	t	R	40	S	0	14	40
27	t	R	t	R	0	< 1	t
28	0		30	MS	0	10	30
29	t	R	40	MS	1	14	40
30	t	R	20	MR	5	9	20
31	0		10	MR	1	4	10
32	0		t	R	5	2	5
33	0		0		1	< 1	1
34	0		t	R	0	< 1	t
35	0		t	R	10	4	10
36	0		t	R	10	4	10
37	t	R	20	MR	20	14	20
38	t	R	40	MR	10	17	40
39	t	R	40	MS	10	17	40
40	t	R	t	R	20	7	20

Table 14. (continued)

Entry	Santiago, Chile		La Platina, Chile		Tres Arroyos, Argentina	Three-site severity	
	Sev %	Resp	Sev %	Resp	Sev %	Average	High Score
41	0		t	R	30	10	30
42	t	R	10	R	20	10	20
43	10	MR	40	MR	20	23	40
44	10	MR	40	MR	20	23	40
45	5	MR	70	S	20	32	70
46	10	MR	40	S	0	17	40
47	50	S	90	S	10	50	90
48	30	S	90	S	10	43	90
49	10	S	t	R	0	4	10
50	t	R	t	R	30	11	30
51	t	R[a/]	t	R[b/]	10[c/]	4	10
52	0		0		5	2	5
53	t	R	t	R	20	7	20
54	t	R	t	R	40	14	40
55	t	R	10	R	50	20	50
56	t	R	40	S	50	30	50
57	10	S	40	S	10	20	40
58	t	R	90	S	5	32	90
59	80	S	90	S	5	58	90
60	20	S	90	S	30	47	90
61	30	MR	90	S	30	50	90
62	30	MR	t	R	40	24	40
63	30	MR	90	S	30	50	90
64	50	S	0		40	30	50
65	t	R	90	S	40	44	90
66	5	MR	20	MR	40	22	40
67	t	R	0		40	14	40
68	50	S	90	S	60	67	90
69	80	S	90	S	60	77	90
70	t	R	10	MR	60	24	60
71	50	S	90	S	20	53	90
72	20	S	90	S	60	57	90
73	t	R	0		10	4	10
74	5	MR	t	R	20	9	20
75	10	S	10	R	10	10	10
76	5	MR	70	S	1	25	70
77	t	R	10	R	20	10	20
78	80	S	100	S	60	80	100
79	t	R	t	R	5	2	5
80	t	R	t	R	30	11	30
81	30	S	90	S	5	42	90
82	80	S	90	S	1	57	90
83	t	R	40	S	20	20	40
84	t	R	40	S	5	15	40
85	t	R	t	R	5	2	5

Table 14. (continued)

Entry	Santiago, Chile		La Platina, Chile		Tres Arroyos, Argentina	Three-site severity	
	Sev %	Resp	Sev %	Resp	Sev %	Average	High Score
86	80	S	100	S	20	67	100
87	t	R	50	S	30	27	50
88	t	R	5	MR	30	12	30
89	t	R	5	MR	10	5	10
90	t	R	30	S	30	20	30
91	t	R	5	MR	50	19	50
92	t	R	5	R	20	9	20
93	t	R	10	MR	10	7	10
94	t	R	30	S	20	17	30
95	20	S	40	S	5	22	40
96	20	S	100	S	50	57	100
97	t	R	40	S	20	20	40
98	50	S	100	S	1	50	100
99	30	S	90	S	20	47	90
100	30	S	90	S	40	53	90
101	t	R	5	R	40	15	40
102	t	R	10	R	40	17	40
103	t	R [a/]	5	R [b/]	1 [c/]	2	5
104	0		0			< 1	1
105	t	R	5	R	1	2	5
Mean	12.9		35.6		16.3	21.6	42.4

a/ Unidentified local cultivar.

b/ Sonka INIA.

c/ Buck Nandu.

Table 15. Stem rust readings for the entries in the fifth high protein-high lysine spring wheat observation nursery reported from the indicated sites in 1979.

Entry	Santiago, Chile		La Platina, Chile		Bethlehem, South Africa		Three-site severity	
	Sev %	Resp	Sev %	Resp	Sev %	Resp	Average	High Score
1	0		20	MR-MS	0		7	20
2	40	S [a/]	20	MR-MS [b/]	0	[c/]	20	40
3	0		t	MR	0		< 1	t
4	0		20	S	0		7	20
5	t	R	10	MR-MS	0		4	10
6	t	R	20	MS-S	0		7	20
7	t	R	40	MS-S	0		14	40
8	5	MR-S	50	MS-S	10	S	22	50
9	t	R	30	MS-S	0		10	30
10	t	S	20	MS-S	10	S	10	20
11	t	S	50	S	0		17	50
12	5	S	60	S	t	S	11	60
13	t	MS	5	MR	5	S	4	5
14	t	MS	20	MS-S	2	S	8	20
15	0		30	MS-S	0		10	30
16	0		30	MS-S	0		10	30
17	0		10	MR	20	S	10	20
18	t	R	5	MS-S	20	S	9	20
19	0		t	MR	20	S	7	20
20	0		0		10	S	3	10
21	0		t	MR	0		< 1	t
22	0		50	MS-S	0		17	50
23	0		10	S	0		3	10
24	0		5	MS-S	0		2	5
25	0		5	MS-S	5	S	3	5
26	0		5	MR-MS	2	S	2	5
27	0		5	MS-S	5	S	3	5
28	0		5	MS-S	10	S	5	10
29	0		20	MS-S	5	S	8	20
30	0		20	MS-S	2	S	7	20
31	0		30	MR-MS	2	S	11	30
32	0		20	MS-S	5	S	8	20
33	0		t	MR	0		< 1	t
34	0		5	MS-S	0		2	5
35	0		70	S	0		23	70
36	0		60	S	20	S	27	60
37	0		60	S	0		20	60
38	0		60	S	10	S	23	60
39	t	S	70	S	2	S	24	70
40	0		60	S	0		20	60

Table 15. (continued)

Entry	Santiago, Chile		La Platina, Chile		Bethlehem, South Africa		Three-site severity	
	Sev %	Resp	Sev %	Resp	Sev %	Resp	Average	High Score
41	0		60	S	0		20	60
42	20	S	80	S	0		33	80
43	40	S	90	S	2	S	37	90
44	30	S	90	S	0		40	90
45	10	S	90	S	0		33	90
46	10	S	90	S	40	S	47	90
47	10	S	90	S	20	S	40	90
48	5	S	80	S	30	S	38	80
49	0		70	S	2	S	24	70
50	t	S	70	S	0		24	70
51	0	[a]	20	MS-S[b]	10	S [c]	10	20
52	20	S	40	MS-S	0		20	40
53	0		5	MS-S	0		2	5
54	10	S	80	S	t	S	30	80
55	15	S	80	S	0		32	80
56	30	S	90	S	40	S	53	90
57	30	S	90	S	t	S	40	90
58	t	R	70	S	5	S	25	70
59	t	R	80	S	5	S	29	80
60	40	S	80	S	30	S	50	80
61	40	S	80	S	5	S	42	80
62	10	S	80	S	5	S	32	80
63	5	S	70	S	40	S	38	70
64	t	R	70	S	5	S	25	70
65	30	S	50	S	20	S	33	50
66	t	S	60	S	10	S	24	60
67	t	S	70	S	10	S	27	70
68	20	S	80	S	0		33	80
69	15	S	80	S	10	S	35	80
70	5	S	80	S	0		28	80
71	40	S	80	S	0		40	80
72	30	S	80	S	0		37	80
73	0		70	S	5	S	25	70
74	20	S	80	S	5	S	35	80
75	5	S	80	S	10	S	32	80
76	t	S	70	S	10	S	27	70
77	5	S	80	S	10	S	32	80
78	5	S	80	S	t	S	29	80
79	0		90	S	0		30	90
80	20	S	90	S	0		37	90

Table 15. (continued)

Entry	Santiago, Chile		La Platina, Chile		Bethlehem, South Africa		Three-site severity	
	Sev %	Resp	Sev %	Resp	Sev %	Resp	Average	High Score
81	40	S	90	S	40	S	57	90
82	30	S	90	S	20	S	47	90
83	30	S	90	S	0		40	90
84	5	S	90	S	5	S	33	90
85	5	S	90	S	0		32	90
86	t	S	90	S	20	S	37	90
87	0		80	S	10	S	30	80
88	t	S	90	S	5	S	32	90
89	5	S	90	S	10	S	35	90
90	5	S	90	S	10	S	35	90
91	5	S	90	S	5	S	33	90
92	0		80	S	5	S	28	80
93	5	S	90	S	2	S	32	90
94	10	S	80	S	2	S	31	80
95	10	S	70	S	5	S	28	70
96	20	S	90	S	t	S	37	90
97	0		80	S	5	S	28	80
98	15	S	80	S	0		32	80
99	20	S	80	S	10	S	37	80
100	20	S	70	S	0		30	70
101	10	S	80	S	0		30	80
102	5	S	90	S	50	S	48	90
103	0		5	MS-S[b]	5	S [c]	3	5
104	30	S[a]	5	MS-S[b]	0		12	30
105	0		5	MR-MS	0		2	5
Mean	7.7		56.6		6.9		23.7	57.1

a/ Unidentified local cultivar.

b/ Sonka INIA.

c/ Gouritz

Table 16. Leaf rust and Septoria readings for the entries in the fifth high protein-high lysine spring wheat observation nursery reported from the indicated sites in 1979.

Entry	Leaf rust				Septoria sp.
	Tres Arroyos, Argentina	Bethlehem, South Africa		Two-site severity mean	Tres Arroyos, Argentina
	Sev %	Sev %	Resp	%	Sev %
1	1	30	MS	16	20
2	5	10	S	8	20
3	0	0		0	5
4	0	10	S	5	10
5	0	0		0	10
6	10	0		5	20
7	5	0		3	20
8	20	30	S	25	10
9	20	30	S	25	10
10	30	30	S	30	10
11	10	20	S	15	10
12	10	10	MR	10	10
13	20	50	S	35	10
14	20	20	S	20	10
15	10	10	S	10	10
16	10	10	S	10	20
17	1	5	MS	3	20
18	0	5	S	3	20
19	1	20	S	11	20
20	0	10	S	5	20
21	0	0		0	10
22	1	10	MR	6	10
23	1	30	S	16	20
24	1	10	S	6	20
25	0	20	S	10	20
26	1	5	MR	3	20
27	0	10	MS	5	10
28	0	20	S	10	20
29	1	15	S	8	20
30	1	10	S	6	20
31	1	20	S	11	10
32	1	10	MS-S	6	20
33	1	2	S	2	20
34	1	7	S	4	10
35	0	20	MR	10	10
36	1	30	S	16	20
37	5	30	S	18	10
38	1	20	MS	11	20
39	20	10	MS	15	20
40	5	10	MS	8	10

Table 16. (continued)

Entry	Leaf rust: Tres Arroyos, Argentina Sev %	Leaf rust: Bethlehem, South Africa Sev %	Leaf rust: Bethlehem, South Africa Resp	Leaf rust: Two-site severity mean %	Septoria sp.: Tres Arroyos, Argentina Sev %
41	5	30	S	18	20
42	30	30	MR	30	10
43	20	30	S	25	10
44	20	20	S	20	10
45	20	40	S	30	10
46	80	90	S	85	10
47	40	99	S	70	10
48	70	10	S	40	10
49	5	0		3	10
50	20	20	R-S	20	10
51	1	30	MR	16	20
52	0	20	MS	10	20
53	5	5	S	5	10
54	20	40	MR-S	30	20
55	10	80	S	45	20
56	10	99	S	55	20
57	50	99	S	75	20
58	50	99	S	75	20
59	50	99	S	75	20
60	30	99	S	65	10
61	30	99	S	65	10
62	30	90	S	60	10
63	30	90	S	60	10
64	1	30	MR-S	16	10
65	20	5	MR	13	20
66	1	50	R	26	10
67	0	20	R-S	10	10
68	5	99	S	52	10
69	5	5	MR	5	10
70	5	15	MR-S	10	10
71	50	90	S	70	10
72	5	99	S	52	10
73	30	10	R	20	20
74	20	40	R-S	30	10
75	30	5	MS	18	20
76	5	10	MR-S	8	20
77	5	99	S	52	10
78	20	50	MR	35	10
79	1	5	MR	3	20
80	1	5	MR	3	10

Table 16. (continued)

Entry	Leaf rust: Tres Arroyos, Argentina Sev %	Leaf rust: Bethlehem, South Africa Sev %	Leaf rust: Bethlehem, South Africa Resp	Leaf rust: Two-site severity mean %	Septoria sp.: Tres Arroyos, Argentina Sev %
81	5	70	MR-S	38	10
82	50	40	MR	45	10
83	30	99	S	65	10
84	50	20	MS	35	10
85	50	40	S	45	10
86	50	99	S	75	10
87	10	60	R	35	10
88	20	70	R-S	45	10
89	0	30	R	15	5
90	1	50	R	26	10
91	1	70	R-S	36	10
92	5	30	R	18	10
93	0	5	MR	3	10
94	1	15	R-MR	8	10
95	60	60	R-S	60	10
96	10	99	S	55	10
97	5	30	S	18	20
98	70	90	S	80	10
99	50	99	S	75	10
100	10	99	S	55	10
101	10	70	S	40	10
102	10	20	S	15	10
103	1	40	S	21	20
104	0	10	MR	5	20
105	5	10	R	8	5
Mean	15.1	37.5		26.5	13.3