PN-AAR-382 37004

FIFTEENTH INTERNATIONAL WINTER WHEAT PERFORMANCE NURSERY, 1983

Preliminary Report

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May 1, 1984

Not for Publication

Supported by:

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

FIFTEENTH INTERNATIONAL WINTER WHEAT PERFORMANCE NURSERY (IWWPN)

1983

Preliminary Report

This report is intended to provide nursery cooperators and others the opportunity to evaluate data from cultivars in the Fifteenth International Winter Wheat Performance Nursery prior to publication of the final report. It will be useful for field observations and comparisons with current nursery plantings since 15 of the varieties also have been retained in the Sixteenth IWWPN grown in 1984. Included are data on yield and other agronomic traits summarized from 45 cooperating stations in 24 countries.

The authors wish to express their appreciation to nursery cooperators for their excellent nursery management and cooperation in providing nursery data. Their efforts are invaluable to the success of the nursery.

Detailed information from all cooperators concerning each trait on which data were collected and production conditions at each nursery site will be available in the final report at a later date when protein analyses are completed and data from the Southern Hemisphere become available. Specific information concerning nursery management and other environmental factors also will be included in that report.

THE NURSERY

The International Winter Wheat Performance Nursery Program was organized in 1969 by the Nebraska Agricultural Experiment Station in cooperation with the Agricultural Research Service, U. S. Department of Agriculture, under a contract with the Agency for International Development, U. S. Department of State.

Evaluation of the performance of important new winter wheat varieties grown in many environments is a prime objective of the nursery. We hope that the nursery will lead to identification of superior winter wheat genotypes for use in breeding wheats with higher productivity and better nutritional quality than are now available. Adaptation limits of varieties based upon their nursery performance can be valuable information for wheat breeders and other researchers.

Wheat varieties evaluated in the IWWPN have come from many different wheat regions of the world. A total of 190 wheat varieties and two varieties of triticale originating from 29 countries have been tested from 1969 through 1983.

We encourage submission of candidate varieties for the nursery by cooperators. Seed of new varieties in the amount of 1000 grams should be sent to Dr. V. A. Johnson at the University of Nebraska before October 15 each year for quarantine increase at Yuma, Arizona. It requires two years after candidate varieties are received at Nebraska before they can be included in the IWWPN since the seed is normally packaged for mailing before the Arizona harvest is completed. Cultivars grown in the Fifteenth IWWPN are listed in Table 1. The nursery contained a promising triticale variety as well as two commercial hybrid wheats. The commercial hybrids were included to gather information on their

adaptability and competitiveness on a worldwide scale. This information should be useful to all wheat breeders since much publicity has accompanied the development and sale of hybrid wheats in certain areas.

The Fifteenth IWWPN was distributed to 67 locations in 36 countries. There were 59 locations in the Northern Hemisphere and eight in the Southern. A list of cooperators for the Fifteenth IWWPN is provided in Table 2.

DATA RECEIVED

Data from all locations returning completed field books to Lincoln, Nebraska, by January 31, 1984, are included in this report. Data from field books received after January 31 will be included in the final report at a later date.

Statistical analyses were completed for the most common traits from each location and over locations for selected traits. Individual cooperators will receive computer print-outs with the data analyses for their respective sites. Included in the print-outs are a table of mean values, correlation coefficients, and analyses of variance. Disease data have not been analyzed for this report.

Yield data from each nursery site are reported in Table 3 of this report. Combined analyses over locations are shown for nine traits in Table 5. Correlation coefficients among the traits are presented in Table 8. Tables 9 - 17 contain mean values, statistics, and ranges by trait for the 30 cultivars across test sites.

Lasko (LT 176-73), the triticale from Poland, produced the highest average grain yield in 1983. Its yield of 57.5 q/ha was 30.7% higher than the yield of Bezostaya 1. The most productive wheats in the 1983 nursery were F29-76 and Lovrin 32 at 52.5 and 52.4 q/ha, respectively.

F29-76 also had the highest yield in the 1982 nursery at 53.2 q/ha. Bezostaya 1 was down from 46.7 q/ha in 1982 to 44.0 q/ha in 1983. Averaged over 42 sites, the grand mean of the 30 entries was 46.5 q/ha. This compares with 40.5 q/ha over 33 sites in 1982 and 43.9 q/ha over 35 sites in 1981.

Twenty-one cultivars had overall yields higher than Bezostaya 1, eight of these being statistically significantly higher yielding on the average. Lasko (LT 176-73) was the most productive entry at 14 of the 42 sites and ranked within the top 5 at 24 of the sites. On a regional basis (Table 4), Lasko was the top performer in the Great Plains, USA; Pacific-Northwest, USA; Northeastern USA and Southeastern Canada; Central Europe; and the Far East. Only the analysis for Eastern Europe showed a different cultivar as being most productive. Katya A-1 from Bulgaria was the most productive cultivar in that analysis, although it was not statistically significantly higher yielding than Lasko.

To compare relative yield responses among the locations, correlation coefficients were computed and are reported. Table 6 contains the "r" values among the sites in North America. The correlation coefficients among the European sites are listed in Table 7. Positive and statistically significant "r" values among sites would indicate similar rankings of the cultivar yields, although actual yields would vary considerably among the different production environments. Correlation coefficients among nine agronomic characters computed over 44 sites are given in Table 8. Among the correlations with yield, only the comparison with 1000-kernel weight exceeded .50.

Test weight values ranged from 79.9 kg/hl for F29-76 to 70.5 kg/hl for Quilamapu 25-77. Lasko also had a light test weight at 70.7 kg/hl.

Averaged over 16 sites, the grand mean was 76.5 kg/hl compared with 75.8 kg/hl over 6 sites in 1982.

Cargill Experimental Hybrid 4117 (Bounty Hybrid 100) had the highest average 1000-kernel weight of 44.5 grams; this over 21 sites. Ogosta and Feng Kang 15 shared the next highest seed weight value of 43.3 grams. The lowest seed weights were 33.0 and 31.7 grams for WWP 4258 and Brule, respectively.

Lasko was over 14 cm taller than the next tallest cultivar Arina (105 cm) and 43 cm taller than the shortest cultivar, Orovcanka, at 75.8 cm. The nursery average was 91.8 cm compared with 81.9 cm in 1982. Along with taller plant height, lodging was more evident in 1983 than in 1982. Chasico INTA and Brule experienced lodging at average levels of 65.7 and 54.1%, respectively. In addition, Horoshiri-komugi, Bounty Hybrid 200, and Lucero INIA suffered significant amounts of lodging. The least lodging occurred in plots of WWP 4258 (1.3%) and Vratza (8.9%).

Feng Kang 15 was the earliest cultivar in the nursery. Flowering dates ranged from 141 to 154 days from January 1. Arina was the latest maturing cultivar in 1983. Flowering and/or heading data were reported from 29 sites, while ripening data were collected at 18 sites. The "r" value between flowering and ripening was .91**.

Winter survival values ranged from 96.3% (Horoshiri-komugi) to 30.6% (Super X). The overall 1983 nursery mean of 84.1% was an improvement over the 71.0% average in 1982. Seventeen of the cultivars averaged at least 90% survival over the 17 sites. Frost damage was recorded at 6 sites. Lucero INIA, Orovcanka, and Super X were damaged most frequently, having respective averages of 4.5, 4.7, and 4.7 on the 0-9 scale.

The results of protein analyses, general nursery information, and disease data will be included in the final report. Harvesting of the Fifteenth IWWPN in the Southern Hemisphere is being completed and those data will appear in the final report.

Note to Cooperators

Please check carefully on the accompanying computer print-outs the data for your experiment to verify or correct it. If any errors have occurred, report them to us. This will allow us to correct them for the final report.

We welcome information on address changes or new job assignments, as we try to keep our address lists as current as possible. Updating the cultivar list is also desirable. If your experimental lines have been given official names, we would like to be informed so that the names might appear in the final report.

Table 1. Cultivars grown in the Fifteenth International Winter Wheat Performance Nursery, 1983.

Cultivar	Origin	Pedigree
Vratza	Bulgaria	NS313/Bezostaya 1/2/184-541 (Bezostaya 1/Elia)
Daws	USA, WA	Norin 10/Brevor/3/CI 12250/2/Rio/Rex/4/Odin/5/ CI 13431/6/Elgin 19/Elmar/2/Norin 10/Brevor /3/PI 178383
Chasico INTA	Argentina	Buck Manantial/3/Sonora 64A/6*Selkirk//3*Andes
Brule	USA, NE	(Pnc/3*Cnn//Sk/2*Cnn)/(Seu Seun 27/CI 12500/2/ Pn/Cnn/3/Cnn/Pnc/TK/Cnn)//Gage
Grana	Poland	Etoile de Choisy/Wysokolitewka Sztywnosloma/2/ Dankowska Biala
Sutjeska	Yugoslavia	Sava/Aurora
Bezostaya 1	USSR	Lutescens 17/Skorospelka 2
MV 22-77	Hungary	Mironovskaya 808/2*Bezostaya 1/3/Bezostaya 1/ Produttore//Bezostaya 1
Lovrin 32	Romania	Ranniaia 12/Nadadores 63//Lovrin 12
Vala	Czechoslovakia	Moisson/Mironovskaya 808
Stephens	USA, OR	Nord Desprez/4/Norin 10/Brevor/3/CI 12250/2/Rio/Rex
Orovcanka	Yugoslavia	Bezostaya 1/L-38
Lucero INIA	Chile	Ofn(Yt 54-Nor 10/B//LR-Mfo) x Vil 53-Vg 9139
F29-76	Romania	Aurora/Riley 67
Martonvasari 7	Hungary	Bezostaya 1/Opal
Horoshiri-komugi	Japan	Minturki/Hitsumi komugi//Honkei 275/Purcam
CA 8055	China	Jing Shuang 2/Lovrin 13//Jing Shuang 3
Ogosta	Bulgaria	234/S-13//Bezostaya 1
TAW 12399-75	East Germany	Atlas 66/Kavkaz//Alcedo
Arina	Switzerland	Moisson/Zenith
Super X	Mexico (CIMMYT)	Penjamo 62 "S"-Gabo 55 II 8156
Lasko (LT 176-73)	Poland	Triticale 57 (Hungary)//Bezostaya 1/Dankowska Polnocna//6TA 206 (Jenkins)
Bounty Hybrid 200	USA (Cargill)	Unavailable
Bounty Hybrid 100	USA (Cargill)	Unavailable
NS 15-89A	Yugoslavia	Aurora/NS 845
Katya A-1	Bulgaria	Fortunato/No. 301 (Bulgaria)/Bezostaya 1
Quilamapu 25-77	Chile	(MD-Nor 10/B x PQQ) x Sup. F_2 (Kw-F_2 Kans. I111/ Neb) Trumb 3.-H/Hussar
WWP 4258	Austria	(Record x Mexico 40) x Record x (Bezostaya 1 x Accord)
Feng Kang 15	China	You Mang Hong 7/Lovrin 10
Saliente	Italy	Bezostaya 1/Marimp 3

Table 2. Nursery sites and cooperators, 1983.

Country	Station	Cooperator(s)
Afghanistan	Kunduz	Abdul Ahad
Algeria	Algiers	Directeur de Recherche, IDGC
Argentina	Balcarce	Ing. Agr. Ernesto F. Godoy and Ing. Roberto Bedogni
"	Bordenave	Ing. Agr. Ernesto F. Godoy and Ing. Santiago Garbini
"	Marcos Juarez	Ing. Agr. Ernesto F. Godoy
Austria	Vienna	Drs. R. Hron and H. Foessleitner
Bulgaria	Tolbukhin	Dr. I. Govedarov
Canada	Alberta, Lethbridge	Dr. J. Thomas
"	Prince Edward Island	Dr. H. G. Nass
Chile	Chillan	Dr. Ignacio Ramirez A. and Lilian Aguayo Ch.
"	Temuco	Drs. Ignacio Ramirez A. and Juan Acevedo
China	Beijing	Prof. Yang, Tso-Min
"	Beijing	Dr. Heng-Li Wang
"	Wugong	Prof. Zhao, Hong-Zhang
Czechoslovakia	Male Ripnany	Ings. D. Michalik, A. Hlavicka, S. Odler, and Maria Terabkova
"	Sedlec	Ings. J. Schmidt and Maroslav Maly
East Germany	Böhnshausen	Dr. A. Meinel
England	Cambridge	Dr. F. G. H. Lupton and R. H. Oliver
Finland	Jokioinen	Dr. Rolf Manner
France	Orgerus	Drs. J. P. Hardouin and Pierre Benoist
Hungary	Martonvasar	Dr. Laszlo Balla
"	Szeged	Drs. I. Szaniel and Z. Barabas
Iraq	Sulaimaniya	Drs. A. I. Alaka and M. M. Said
Italy	Milano	Dr. Basilio Borghi
"	Rieti	Drs. G. Zitelli and E. Biancolatte
Japan	Morioka Iwate	Drs. T. Gotoh and Y. Taniguchi
Jordan	Amman	Zulkifl Ghosheh
Korea	Suwon	Dr. Chang Hwan Cho
Mexico	Toluca	CIMMYT Bread Wheat Staff
Netherlands	Wageningen	Dr. A. C. Zeven and Ing. H. Bouter
Norway	Vollebekk	Drs. Kare Ringlund and Anne K. Uhlen
Pakistan	Islamabad	Deputy Director of Research, A.R.C.
Peru	Lima	Dr. Marino Romero
Poland	Przeclaw	Dr. E. Bilski
"	Warsaw	Dr. S. Starzycki

Table 2. Continued.

Country	Station	Cooperator(s)
Romania	Fundulea	Drs. G. H. Ittu and N. N. Saulescu
South Africa*	Bethlehem	Dr. R. Britz
Spain	Alcala de Henares	Dr. M. Brañas
"	Zaragoza	Ing. J. Comenge
Sweden	Svalof	Dr. Bo Kristiansson
Switzerland	Zurich	Drs. F. Weilenmann, H. Winzeler, P. Fried, and W. Saurer
Syria	Aleppo	ICARDA Bread Wheat Staff
Turkey	Ankara	Dr. M. Kiziltan, K. Yakar, G. Mizrak, N. Zencirci, and I. Tutluer
"	Erzurum	Drs. F. Tosun and C. Koycu
"	Eskisehir	Drs. B. Suzen and M. K. Haksel
USA	Davis, CA	Dr. C. O. Qualset and H. E. Vogt
"	Akron, CO	Drs. J. Quick, G. H. Ellis, and R. Normann
"	Fort Collins, CO	Drs. J. Quick, G. H. Ellis, J. Shanahan, and R. Normann
"	Brookston, IN	Dr. K. E. Miskin
"	Hutchinson, KS	Drs. R. G. Sears and G. M. Paulsen
"	Billings, MT	Mr. J. Lenneman and S. Scherer
"	Lincoln, NE	Dr. V. A. Johnson, S. L. Kuhr, and C. J. Peterson
"	Sidney, NE	Dr. J. W. Schmidt
"	Ithaca, NY	Dr. M. E. Sorrells
"	Rowan Co., NC	Dr. C. F. Murphy
"	Stillwater, OK	Dr. E. L. Smith and H. T. Nguyen
"	Corvallis, OR	Dr. W. E. Kronstad and Cereal Staff
"	Lancaster Co., PA	Drs. M. L. Risius, H. G. Marshall, and J. Frank
"	Pullman, WA	Drs. C. J. Peterson, Jr. and R. E. Allan
USSR	Krasnodar	Dr. Y. M. Puchkov
"	Mironovski	Dr. V. N. Remeslo
"	Odessa	Dr. L. K. Sechnjak
West Germany	Monsheim	Dr. K. Brunckhorst and F. Bonne
"	Weihenstephan	Dr. G. Fischbeck
Yugoslavia	Novi Sad	Dr. S. Borojevic
"	Zagreb	Mr. Rade Mlinar

* Two sets of seed were distributed for different planting dates.

Table 3. Summary of average yield in quintals per hectare and rankings for the 30 cultivars grown in the Fifteenth International Winter Wheat Performance Nursery in 1983.

Cultivars	Vienna, Austria		Prince Edward Island, Canada		Beijing, China		Beijing,[a] China		Sedlec, Czechoslovakia		Bohnshausen, East Germany		Jokioinen,[a] Finland	
	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank
LT 176-73 (Lasko)	69.7	9	78.8	1	21.1	11	29.0	11	95.7	2	66.5	5	0.0	14
F29-76	66.8	13	65.5	2	25.9	6	33.7	10	91.9	5	48.6	24	10.3	9
Lovrin 32	78.3	1	35.4	20	28.2	4	27.4	14	96.5	1	64.1	6	0.0	14
Vala (HE 270-115)	76.9	2	59.4	3	21.7	10	34.7	7	91.8	6	64.0	7	41.3	3
Martonvasari 7	70.6	7	38.4	17	22.1	9	22.3	20	91.6	7	60.1	12	5.9	11
Vratza	61.3	20	47.2	8	20.2	14	26.9	16	89.4	9	72.0	1	0.0	14
MV 22-77	72.5	5	48.0	7	18.3	16	33.8	9	90.7	8	58.9	16	34.1	4
CA 8055	57.5	27	45.5	9	40.9	1	49.4	2	85.0	13	69.8	2	0.0	14
Katya A-1	75.0	3	21.6	26	25.0	7	28.2	13	95.4	3	61.1	11	0.0	14
TAW 12399-75	62.1	19	49.9	6	14.9	21	22.5	19	88.2	10	68.7	3	3.4	12
NS 15-89A	67.1	12	42.1	12	28.3	3	25.6	17	80.2	17	52.3	21	0.0	14
Grana	63.8	17	56.6	4	11.3	28	28.6	12	78.8	18	59.2	14	93.9	1
Exp. Hyb. 3214	61.2	21	37.5	19	20.8	12	36.7	6	72.1	26	46.0	27	31.2	6
Sutjeska (NS 18-30)	75.0	3	45.4	10	17.0	18	24.3	18	81.9	15	55.2	18	0.0	14
Stephens	64.5	16	37.6	18	13.2	23	12.7	26	86.7	11	68.1	4	0.0	14
Exp. Hyb. 4117	58.8	23	28.5	24	27.7	5	47.7	3	75.1	23	48.9	22	0.0	14
Quilamapu 25-77	70.3	8	40.8	13	13.2	23	17.5	24	75.5	22	58.9	16	8.0	10
Ogosta	65.8	15	33.0	22	13.7	22	21.3	21	85.7	12	59.8	13	0.0	14
Saliente	57.9	24	32.4	23	22.8	8	27.3	15	77.8	20	61.6	10	0.0	14
Brule (NE 75414)	66.5	14	39.1	15	12.9	25	39.9	4	70.3	27	44.8	28	33.2	5
Arina	67.2	11	52.8	5	10.0	29	14.6	25	76.6	21	53.2	19	2.1	13
Bezostaya 1	60.8	22	39.5	14	17.8	17	34.1	8	77.9	19	38.7	29	21.2	8
Horoshiri-komugi	57.5	27	43.0	11	20.4	13	37.4	5	74.3	24	47.8	25	52.9	2
Daws	57.8	25	33.4	21	15.2	20	18.5	23	63.7	28	52.9	20	26.6	7
Orovcanka	57.7	26	0.0	27	16.5	19	8.7	27	93.7	4	62.8	9	0.0	14
WWP 4258	69.7	9	28.2	25	12.2	26	19.5	22	80.9	16	59.1	15	0.0	14
Feng Kang 15	44.2	30	38.6	16	40.7	2	54.6	1	74.0	25	28.6	30	0.0	14
Chasico INTA	63.2	18	0.0	27	12.0	27	.	.	60.7	29	46.6	26	0.0	14
Lucero INIA	54.5	29	0.0	27	18.4	15	.	.	55.7	30	48.8	23	0.0	14
Super X	70.8	6	0.0	27	0.0	30	.	.	82.9	14	63.4	8	0.0	14
Means	64.8		37.3		19.4		28.8		81.4		56.3		12.1	
LSD of the cultivar means (.05)	7.2		6.7		6.7		6.4		6.4		8.0		17.8	
Coefficient of variation (%)	7.9		12.7		24.6		15.7		5.6		10.1		104.0	

a/ These sites were not used in the overall means and analyses.

Table 3. Summary of average yield in quintals per hectare and rankings for the 30 cultivars grown in the Fifteenth International Winter Wheat Performance Nursery in 1983.

Cultivars	Orgerus, France		Martonvasar, Hungary		Szeged, Hungary		Sulaimaniya, Iraq		Milano, Italy		Rieti, Italy		Morioka, Iwate, Japan	
	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank
LT 176-73 (Lasko)	68.1	3	93.8	7	70.8	1	12.0	28	72.5	1	64.4	18	86.9	1
F29-76	58.0	20	95.4	6	63.5	6	18.2	12	65.5	5	70.6	14	62.6	6
Lovrin 32	70.6	2	97.8	3	67.3	3	19.2	8	62.3	8	72.5	10	64.1	5
Vala (HE 270-115)	55.2	22	96.3	4	60.7	14	16.2	18	60.6	10	67.6	15	60.5	14
Martonvasari 7	63.1	9	90.5	10	57.4	17	20.0	5	65.8	4	79.0	1	62.3	7
Vratza	64.8	6	93.0	8	69.0	2	20.8	3	59.0	13	73.0	7	54.6	18
MV 22-77	60.1	14	91.7	9	52.2	25	18.0	14	50.3	24	58.3	27	61.8	9
CA 8055	57.1	21	95.8	5	63.4	7	20.7	4	63.3	7	66.5	16	61.7	10
Katya A-1	71.0	1	105.2	1	46.4	30	14.9	22	69.0	2	75.1	6	48.3	21
TAW 12399-75	65.9	5	99.3	2	57.3	18	15.7	21	60.6	10	61.7	23	58.0	16
NS 15-89A	62.8	11	87.5	12	60.9	12	20.0	5	54.9	18	77.8	2	65.8	3
Grana	59.9	15	71.2	28	58.1	16	14.0	25	54.5	20	60.0	24	64.5	4
Exp. Hyb. 3214	49.0	27	78.1	21	66.2	4	19.1	9	66.1	3	72.9	9	69.9	2
Sutjeska (NS 18-30)	52.6	24	87.3	13	54.2	22	17.7	15	54.6	19	63.0	21	60.6	13
Stephens	64.7	7	73.0	27	62.5	8	14.1	24	55.1	17	66.1	17	52.3	20
Exp. Hyb. 4117	44.3	28	83.5	15	64.6	5	22.1	1	64.3	6	72.4	11	54.9	17
Quilamapu 25-77	68.1	3	73.8	26	61.8	10	12.7	27	61.4	9	76.7	3	61.3	11
Ogosta	62.1	12	88.5	11	61.4	11	15.8	20	59.9	12	71.9	12	46.7	22
Saliente	63.5	8	76.7	23	54.1	23	14.6	23	58.3	15	75.2	5	61.2	12
Brule (NE 75414)	54.5	23	74.1	24	62.3	9	18.4	11	55.6	16	63.7	19	37.1	26
Arina	51.7	25	80.5	18	59.0	15	16.3	17	50.8	23	56.0	29	61.9	8
Bezostaya 1	59.2	18	78.7	20	52.1	26	16.4	16	58.6	14	61.9	22	54.2	19
Horoshiri-komugi	59.9	15	79.4	19	52.8	24	16.2	18	50.3	24	57.7	28	59.6	15
Daws	59.4	17	60.5	29	47.6	29	11.6	29	46.9	28	63.6	20	31.9	28
Orovcanka	62.9	10	82.6	17	56.0	19	21.3	2	49.5	27	71.2	13	44.5	24
WWP 4258	61.5	13	82.8	16	48.7	28	9.8	30	42.9	30	49.9	30	38.5	25
Feng Kang 15	19.3	30	85.5	14	51.1	27	19.7	7	50.0	26	59.4	26	45.6	23
Chasico INTA	44.1	29	73.9	25	54.5	20	13.5	26	51.5	21	59.8	25	28.2	29
Lucero INIA	50.2	26	57.8	30	54.4	21	18.9	10	51.0	22	75.3	4	33.4	27
Super X	58.4	19	77.6	22	60.8	13	18.2	12	44.9	29	73.0	7	1.8	30
Means	58.1		83.7		58.4		16.9		57.0		67.1		53.2	
LSD of the cultivar means (.05)	7.0		7.6		11.0		4.1		8.6		12.6		11.7	
Coefficient of variation (%)	8.5		6.4		13.4		17.2		10.7		13.3		15.6	

Table 3. Summary of average yield in quintals per hectare and rankings for the 30 cultivars grown in the Fifteenth International Winter Wheat Performance Nursery in 1983.

Cultivars	Suwon, Korea		Toluca, Mexico		Wageningen, The Netherlands		Vollebekk, Norway		Przeclaw, Poland		Warsaw, Poland		Fundulea, Romania	
	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank
LT 176-73 (Lasko)	45.8	12	33.4	5	30.0	18	72.9	1	36.2	1	94.3	1	57.4	21
F29-76	52.0	3	23.6	12	27.5	24	65.4	2	30.3	7	57.4	26	67.4	6
Lovrin 32	56.2	1	13.7	20	29.2	21	51.7	14	32.7	4	71.5	9	61.5	13
Vala (HE 270-115)	46.6	9	27.3	8	36.1	7	64.6	3	30.1	8	82.6	3	68.4	5
Martonvasari 7	45.8	12	18.9	14	32.9	13	55.4	12	32.8	3	62.0	20	59.9	18
Vratza	48.1	7	7.3	30	33.8	12	48.5	17	30.7	6	72.2	8	73.3	3
MV 22-77	52.6	2	16.7	15	27.5	24	51.7	14	30.1	8	70.8	10	61.5	13
CA 8055	35.7	20	9.6	25	38.0	3	56.5	10	33.1	2	66.3	15	73.2	4
Katya A-1	50.6	4	12.6	22	40.1	1	58.7	7	23.1	21	68.0	13	76.7	1
TAW 12399-75	49.7	6	31.6	6	35.1	10	46.1	19	27.3	14	66.4	14	50.8	27
NS 15-89A	46.1	11	9.4	26	27.3	26	62.2	5	19.0	27	65.3	17	64.4	9
Grana	32.9	26	29.9	7	37.6	4	56.2	11	27.4	12	78.0	5	57.7	20
Exp. Hyb. 3214	47.0	8	26.4	10	37.0	6	50.9	16	24.6	18	49.4	30	66.7	7
Sutjeska (NS 18-30)	31.5	27	13.1	21	29.2	21	62.5	4	28.1	11	76.7	7	64.4	9
Stephens	37.6	18	26.6	9	33.9	11	59.9	6	24.0	20	62.3	19	60.6	17
Exp. Hyb. 4117	49.8	5	23.5	13	14.6	30	37.8	25	27.2	15	55.8	28	73.5	2
Quilamapu 25-77	26.2	29	35.0	4	32.8	14	58.5	8	20.7	26	89.1	2	50.3	28
Ogosta	34.9	22	8.7	27	25.5	28	52.4	13	27.4	12	66.2	16	59.7	19
Saliente	46.5	10	12.4	23	39.5	2	42.2	21	24.1	19	68.8	11	64.0	11
Brule (NE 75414)	42.7	16	36.5	2	26.0	27	37.2	26	21.6	23	63.3	18	63.5	12
Arina	34.0	23	25.6	11	28.8	23	58.0	9	32.2	5	59.5	24	57.2	22
Bezostaya 1	36.5	19	14.9	18	29.3	19	40.2	23	21.8	22	59.7	23	61.3	15
Horoshiri-komugi	45.6	14	14.7	19	30.5	17	41.9	22	25.1	17	59.4	25	54.7	25
Daws	33.2	25	53.5	1	29.3	19	46.4	18	21.5	24	77.5	6	45.9	29
Orovcanka	38.2	17	7.4	29	32.4	15	31.0	27	28.8	10	61.7	21	66.4	8
WWP 4258	29.1	28	35.2	3	37.5	5	42.5	20	16.0	29	82.5	4	37.8	30
Feng Kang 15	43.2	15	7.6	28	24.4	29	38.9	24	25.2	16	49.9	29	61.3	15
Chasico INTA	33.4	24	16.6	16	30.8	16	25.1	28	11.6	30	56.8	27	52.4	26
Lucero INIA	35.1	21	11.9	24	35.2	9	8.8	29	17.9	28	60.3	22	56.5	23
Super X	0.0	30	15.7	17	36.1	7	1.0	30	21.0	25	68.1	12	56.2	24
Means	40.2		20.6		31.6		47.5		25.7		67.4		60.9	
LSD of the cultivar means (.05)	10.6		7.9		6.7		14.0		2.2		5.1		3.9	
Coefficient of variation (%)	18.7		27.2		15.1		20.9		6.0		5.4		4.5	

Table 3. Summary of average yield in quintals per hectare and rankings for the 30 cultivars grown in the Fifteenth International Winter Wheat Performance Nursery in 1983.

Cultivars	Madrid, Spain		Zaragoza, Spain		Svalof, Sweden		Zurich, Switzerland		Aleppo, Syria		Eskisehir, Turkey		Davis, a/ California, USA	
	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank
LT 176-73 (Lasko)	9.5	26	31.8	27	92.9	1	54.7	3	45.2	22	36.3	7	51.0	2
F29-76	21.0	6	46.2	11	67.5	6	40.5	22	49.8	11	35.5	8	38.0	20
Lovrin 32	10.4	24	45.9	12	64.9	11	54.8	2	53.7	5	37.2	6	45.5	10
Vala (HE 270-115)	17.0	14	44.4	15	70.5	5	49.0	10	43.4	25	33.9	14	46.4	9
Martonvasari 7	19.3	9	48.1	6	62.8	17	52.7	6	53.0	7	38.6	3	49.5	6
Vratza	20.5	7	48.1	6	63.0	16	53.5	4	55.4	2	31.0	17	45.4	11
MV 22-77	14.8	18	48.1	6	66.6	7	49.6	9	52.4	9	35.2	11	31.0	25
CA 8055	22.7	2	45.5	13	53.4	26	37.0	25	52.9	8	34.2	12	34.9	22
Katya A-1	21.5	4	49.9	3	61.5	19	47.9	12	53.7	5	37.4	4	42.7	14
TAW 12399-75	11.6	22	37.7	25	76.1	3	41.4	21	44.5	23	30.7	19	39.9	17
NS 15-89A	22.5	3	46.6	10	63.4	13	50.2	8	47.0	19	32.6	16	38.7	19
Grana	9.7	25	40.3	22	78.8	2	58.0	1	47.4	17	20.2	30	31.8	24
Exp. Hyb. 3214	21.3	5	56.2	1	65.4	9	20.4	30	55.1	3	43.8	2	20.2	28
Sutjeska (NS 18-30)	11.4	23	44.0	17	72.8	4	39.1	24	44.4	24	25.1	27	39.7	18
Stephens	15.0	17	43.7	18	61.4	20	50.7	7	40.7	30	28.9	24	50.4	5
Exp. Hyb. 4117	17.3	13	53.6	2	61.4	20	48.9	11	54.2	4	48.1	1	50.8	3
Quilamapu 25-77	5.2	30	38.8	24	47.9	27	45.8	13	49.8	11	28.4	25	48.8	8
Ogosta	16.5	16	44.4	15	62.6	18	44.7	16	56.6	1	30.7	19	43.5	13
Saliente	19.0	10	41.4	21	61.0	22	52.9	5	49.6	13	24.2	28	50.8	3
Brule (NE 75414)	19.9	8	40.0	23	63.1	15	35.9	26	50.4	10	37.3	5	42.3	15
Arina	8.9	27	31.8	27	66.5	8	44.0	17	42.1	28	35.3	10	35.7	21
Bezostaya 1	14.4	19	43.3	19	63.4	13	43.7	18	47.1	18	29.9	23	29.8	26
Horoshiri-komugi	12.6	21	30.3	29	55.6	24	43.7	18	43.1	26	26.4	26	34.3	23
Daws	7.9	28	42.9	20	60.7	23	39.6	23	45.9	21	30.6	22	44.0	12
Orovcanka	22.8	1	49.9	3	42.9	29	45.7	14	48.0	15	30.9	18	42.0	16
WWP 4258	5.4	29	13.7	30	65.2	10	35.5	27	49.2	14	20.3	29	.	.
Feng Kang 15	17.5	12	33.7	26	45.7	28	21.4	29	47.5	16	30.7	19	.	.
Chasico INTA	19.0	10	47.4	9	63.7	12	42.3	20	42.7	27	33.0	15	49.2	7
Lucero INIA	13.1	20	48.8	5	54.4	25	45.3	15	41.5	29	34.1	13	51.5	1
Super X	16.6	15	45.5	13	21.8	30	23.5	28	46.4	20	35.5	8	27.0	27
Means	15.5		42.7		61.9		43.8		48.4		32.5		41.2	
LSD of the cultivar means (.05)	4.7		5.8		12.0		6.2		6.8		6.5		6.7	
Coefficient of variation (%)	21.5		9.6		13.8		10.1		10.0		14.2		11.5	

a/ This site not included in the overall means and analyses.

Table 3. Summary of average yield in quintals per hectare and rankings for the 30 cultivars grown in the Fifteenth International Winter Wheat Performance Nursery in 1983.

Cultivars	Akron, Colorado, USA		Fort Collins, Colorado, USA		Brookston, Indiana, USA		Lincoln, Nebraska, USA		Ithaca, New York, USA		Rowan County, North Carolina, USA		Stillwater, Oklahoma, USA	
	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank
LT 176-73 (Lasko)	28.9	2	72.5	3	46.7	24	53.3	1	70.9	1	42.9	1	31.3	2
F29-76	24.6	7	68.3	7	65.3	4	47.4	7	55.4	2	31.7	5	28.5	6
Lovrin 32	27.1	3	71.3	5	67.3	1	48.0	5	32.0	17	37.6	2	22.7	13
Vala (HE 270-115)	17.4	20	58.7	20	58.8	11	39.2	16	44.4	6	21.5	19	19.1	20
Martonvasari 7	25.8	6	69.0	6	58.0	12	38.2	17	35.8	14	31.4	6	19.6	19
Vratza	20.8	16	59.2	17	63.1	6	46.9	8	43.7	8	16.5	24	29.7	3
MV 22-77	24.1	9	62.1	12	64.8	5	43.8	11	43.7	8	36.1	3	24.4	10
CA 8055	22.9	11	62.6	10	65.5	3	50.6	3	32.0	17	15.1	25	29.4	5
Katya A-1	15.1	24	61.9	13	66.0	2	48.6	4	10.9	26	8.4	27	26.2	9
TAW 12399-75	21.4	13	59.2	17	59.5	9	40.3	14	50.9	3	20.6	20	16.0	25
NS 15-89A	21.0	15	62.4	11	59.0	10	47.9	6	31.3	19	9.0	26	27.6	8
Grana	17.6	19	54.7	23	51.9	19	30.1	24	50.6	4	23.0	16	20.9	17
Exp. Hyb. 3214	29.0	1	79.6	1	49.0	22	46.2	10	36.8	12	29.9	8	23.9	11
Sutjeska (NS 18-30)	7.8	30	46.2	26	56.1	15	40.3	14	49.9	5	21.7	18	19.9	18
Stephens	21.1	14	61.6	14	52.2	18	35.9	22	34.9	15	25.6	13	11.0	29
Exp. Hyb. 4117	26.7	4	72.4	4	57.1	14	46.7	9	25.7	23	17.6	21	28.1	7
Quilamapu 25-77	24.0	10	61.5	15	49.9	21	36.5	20	40.3	10	27.6	10	15.6	26
Ogosta	16.2	22	53.4	24	60.9	8	36.4	21	29.3	21	26.3	12	22.5	14
Saliente	13.7	26	60.8	16	48.7	23	38.2	17	27.5	22	26.8	11	22.1	15
Brule (NE 75414)	26.4	5	77.2	2	55.8	16	41.7	13	37.9	11	35.0	4	29.7	3
Arina	24.2	8	66.5	8	51.2	20	28.4	26	44.0	7	24.4	15	16.1	24
Bezostaya 1	12.5	27	51.0	25	53.7	17	41.8	12	30.3	20	28.6	9	22.1	15
Horoshiri-komugi	19.5	18	58.3	21	58.0	12	36.9	19	34.8	16	30.2	7	18.4	21
Daws	14.2	25	54.9	22	44.1	25	18.1	28	23.8	25	22.3	17	10.5	30
Orovcanka	17.0	21	58.9	19	23.7	28	29.2	25	0.0	27	2.0	30	16.3	23
WWP 4258	10.7	28	43.5	27	43.9	26	26.4	27	36.6	13	17.3	23	13.6	27
Feng Kang 15	22.2	12	41.3	28	61.0	7	52.8	2	24.2	24	17.6	21	32.9	1
Chasico INTA	19.7	17	66.3	9	31.0	27	31.3	23	0.0	27	25.6	13	18.3	22
Lucero INIA	15.7	23	39.4	29	0.0	29	0.0	29	0.0	27	7.0	28	12.7	28
Super X	10.4	29	19.1	30	0.0	29	0.0	29	0.0	27	3.8	29	22.8	12
Means	19.9		59.1		50.7		37.4		32.6		22.8		21.7	
LSD of the cultivar means (.05)	6.5		8.4		7.0		6.2		6.8		4.8		4.1	
Coefficient of variation (%)	23.3		10.1		9.8		11.7		12.7		15.0		13.3	

Table 3. Summary of average yield in quintals per hectare and rankings for the 30 cultivars grown in the Fifteenth International Winter Wheat Performance Nursery in 1983.

Cultivars	Corvallis, Oregon, USA		Lancaster Co., Pennsylvania, USA		Pullman, Washington, USA		Krasnodar, USSR		Mironovski, USSR		Odessa, USSR		Monsheim, West Germany	
	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank
LT 176-73 (Lasko)	71.5	6	63.4	4	82.3	1	51.3	14	70.9	1	17.5	14	69.9	17
F29-76	55.1	22	57.9	8	64.1	12	56.2	4	52.9	2	19.3	7	73.5	10
Lovrin 32	55.7	21	49.2	17	67.2	8	52.9	7	40.3	11	17.0	17	75.9	7
Vala (HE 270-115)	73.5	4	58.1	7	71.3	4	50.6	16	49.6	3	18.6	10	70.5	14
Martonvasari 7	75.5	2	54.0	11	72.7	3	52.0	12	35.4	17	17.9	13	78.7	2
Vratza	53.5	23	70.5	1	76.1	2	55.4	5	36.3	16	20.1	4	72.5	12
MV 22-77	65.0	11	56.2	9	66.5	9	51.2	15	44.0	7	19.0	9	76.3	5
CA 8055	48.9	27	63.5	3	58.3	19	59.4	3	42.5	9	21.0	1	70.7	13
Katya A-1	51.1	24	67.2	2	51.4	25	52.9	7	9.9	27	21.0	1	70.5	14
TAW 12399-75	70.9	7	58.8	6	62.5	14	49.1	18	36.7	15	15.7	25	76.1	6
NS 15-89A	58.6	17	54.1	10	59.0	17	55.4	5	26.2	22	16.1	21	63.6	23
Grana	66.6	10	48.8	18	65.2	10	45.7	23	44.7	6	18.0	12	73.7	9
Exp. Hyb. 3214	17.7	30	43.3	21	60.4	16	59.7	1	37.8	14	20.2	3	73.9	8
Sutjeska (NS 18-30)	66.7	9	61.2	5	56.0	22	51.4	13	47.0	5	17.5	14	72.6	11
Stephens	79.4	1	41.8	22	70.6	5	46.0	22	27.4	21	16.1	21	80.9	1
Exp. Hyb. 4117	58.1	18	46.4	19	58.6	18	59.7	1	33.7	19	19.6	5	55.0	28
Quilamapu 25-77	64.5	12	40.3	24	63.2	13	41.9	28	39.8	12	14.9	27	70.0	16
Ogosta	59.5	15	50.2	14	68.8	6	44.8	24	33.8	18	19.2	8	69.7	18
Saliente	59.2	16	53.5	12	60.5	15	42.0	27	41.1	10	16.1	21	76.4	4
Brule (NE 75414)	50.0	26	44.5	20	58.3	19	52.1	11	49.4	4	19.4	6	63.2	24
Arina	57.8	19	51.5	13	68.2	7	46.5	21	38.8	13	15.5	26	67.9	20
Bezostaya 1	60.2	14	41.7	23	53.2	24	52.6	10	33.4	20	16.8	18	62.0	25
Horoshiri-komugi	63.0	13	35.0	25	55.8	23	48.2	19	44.0	7	14.9	27	53.9	29
Daws	72.3	5	31.5	26	64.9	11	43.7	25	17.6	26	15.8	24	66.1	21
Orovcanka	51.0	25	27.6	27	49.5	27	48.0	20	6.7	29	16.2	20	69.2	19
WWP 4258	56.5	20	49.7	15	56.9	21	36.7	29	21.5	24	13.4	29	77.2	3
Feng Kang 15	47.2	28	49.6	16	42.3	29	52.8	9	23.7	23	17.1	16	30.6	30
Chasico INTA	69.1	8	26.3	28	50.8	26	49.4	17	19.1	25	16.3	19	59.8	26
Lucero INIA	73.8	3	11.3	29	48.2	28	42.9	26	7.9	28	12.2	30	64.5	22
Super X	24.8	29	0.0	30	29.7	30	36.5	30	0.0	30	18.4	11	58.3	27
Means	59.2		46.9		60.4		49.6		33.7		17.4		68.1	
LSD of the cultivar means (.05)	7.6		6.2		7.2		3.5		5.6		1.4		6.2	
Coefficient of variation (%)	9.2		8.1		8.5		5.0		11.8		5.9		6.5	

Table 3. Summary of average yield in quintals per hectare and rankings for the 30 cultivars grown in the Fifteenth International Winter Wheat Performance Nursery in 1983.

Cultivars	Weihenstephan, West Germany		Novi Sad, Yugoslavia		Zagreb, Yugoslavia		Cultivar means over 42 sites
	q/ha	rank	q/ha	rank	q/ha	rank	
LT 176-73 (Lasko)	89.4	1	62.3	28	52.8	2	57.5
F29-76	65.2	15	77.2	5	46.1	8	52.5
Lovrin 32	75.8	3	70.3	19	46.2	7	52.4
Vala (HE 270-115)	69.1	9	70.6	17	44.6	9	51.9
Martonvasari 7	63.7	18	74.7	9	47.7	5	51.3
Vratza	58.4	23	80.8	3	38.0	27	51.1
MV 22-77	66.5	11	75.0	8	43.9	13	50.5
CA 8055	64.1	16	85.1	1	39.0	23	50.4
Katya A-1	75.8	3	83.3	2	43.8	15	49.5
TAW 12399-75	64.0	17	71.1	16	50.9	3	49.4
NS 15-89A	66.2	13	76.4	6	43.2	17	48.5
Grana	70.5	7	64.8	25	47.5	6	48.1
Exp. Hyb. 3214	58.9	22	72.0	15	44.5	11	47.9
Sutjeska (NS 18-30)	69.9	8	68.7	21	43.9	13	47.6
Stephens	66.4	12	66.6	22	54.1	1	47.6
Exp. Hyb. 4117	59.2	21	80.1	4	38.5	26	47.6
Quilamapu 25-77	81.5	2	63.2	27	44.3	12	47.3
Ogosta	71.2	6	73.1	13	36.3	28	46.9
Saliente	57.8	24	74.0	11	44.6	9	46.9
Brule (NE 75414)	51.6	27	70.5	18	42.9	18	46.3
Arina	60.4	19	69.4	20	43.3	16	46.0
Bezostaya 1	52.3	26	72.1	14	38.7	24	44.0
Horoshiri-komugi	59.8	20	66.1	23	39.7	21	43.9
Daws	56.5	25	55.2	29	40.5	20	41.4
Orovcanka	68.4	10	75.2	7	32.5	29	41.0
WWP 4258	72.4	5	44.3	30	38.6	25	40.8
Feng Kang 15	46.2	28	74.5	10	31.4	30	39.8
Cnasico INTA	42.1	30	66.1	23	50.0	4	39.0
Lucero INIA	45.6	29	63.5	26	41.9	19	35.3
Super X	65.5	14	73.8	12	39.7	21	32.3
Means	63.8		70.7		43.0		46.5
LSD of the cultivar means (.05)	2.8		7.4		5.8		3.8
Coefficient of variation (%)	3.1		7.4		9.6		11.2

Table 4. Summary of yield data for the 30 cultivars grown in the Fifteenth International Winter Wheat Performance Nursery analyzed over selected sites in six geographic regions.

Cultivars	Great Plains USA		Pacific-Northwest USA		Northeast USA and Canada		Central Europe		Eastern Europe		Far East	
	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank	q/ha	rank
Number of sites	4		2		3		7		7		2	
LT 176-73 (Lasko)	46.5	1	76.9	1	71.8	1	67.8	1	61.4	5	66.4	1
F29-76	42.2	6	59.6	18	60.1	2	57.9	17	59.9	6	57.3	4
Lovrin 32	42.3	5	61.4	13	38.5	16	66.7	2	59.6	7	60.1	2
Vala (HE 270-115)	33.6	19	72.4	4	54.5	3	62.2	9	61.7	4	53.5	10
Martonvasari 7	38.1	11	74.1	3	42.3	12	63.3	6	57.8	12	54.0	7
Vratza	39.1	9	64.8	9	53.1	4	63.5	5	61.8	3	51.3	13
MV 22-77	38.6	10	65.7	8	49.2	9	61.4	12	59.0	8	57.2	5
CA 8055	41.4	7	53.6	25	46.8	10	60.2	15	62.8	2	48.7	15
Katya A-1	38.0	12	51.3	26	32.2	25	66.0	3	64.4	1	49.4	14
TAW 12399-75	34.2	15	66.7	6	52.9	5	62.8	7	57.6	13	53.9	8
NS 15-89A	39.7	8	58.8	20	42.5	11	57.5	18	58.3	11	55.9	6
Grana	30.8	24	65.9	7	52.5	6	62.5	8	54.7	18	48.7	15
Exp. Hyb. 3214	44.7	2	39.1	29	39.0	15	51.0	25	55.8	14	58.5	3
Stephens	32.4	21	75.0	2	38.0	18	64.5	4	54.1	21	45.0	20
Sutjeska (NS 18-30)	28.6	26	61.3	14	51.5	7	57.2	19	58.6	10	46.1	18
Exp. Hyb. 4117	43.5	4	58.3	21	33.0	24	49.4	27	58.7	9	52.4	12
Quilamapu 25-77	34.4	14	63.9	11	40.5	13	61.8	11	53.9	22	43.7	22
Saliente	33.7	18	59.9	17	37.2	21	61.3	13	55.2	16	53.9	8
Ogosta	32.1	22	64.2	10	37.1	23	59.8	16	55.4	15	40.8	24
Brule (NE 75414)	43.8	3	54.2	24	40.4	14	49.5	26	55.1	17	39.9	25
Arina	33.8	17	63.0	12	49.8	8	54.7	21	53.1	24	48.0	17
Bezostaya 1	31.9	23	56.7	22	37.4	20	51.9	24	54.3	20	45.4	19
Horoshiri-komugi	33.3	20	59.4	19	38.2	17	52.9	22	51.8	27	52.6	11
Daws	24.4	27	68.6	5	29.9	26	52.5	23	48.4	28	32.6	28
Orovcanka	30.3	25	50.3	27	8.3	27	62.2	9	54.7	18	41.3	23
WWP 4258	23.5	28	56.7	22	37.2	21	60.6	14	48.0	29	33.8	27
Feng Kang 15	37.3	13	44.8	28	37.6	19	34.9	30	53.2	23	44.4	21
Chasico INTA	33.9	16	60.0	16	7.9	28	46.6	29	52.1	26	30.8	29
Lucero INIA	17.0	29	61.0	15	3.4	29	49.3	28	47.9	30	34.3	26
Super X	13.1	30	27.2	30	0.0	30	55.4	20	52.9	25	0.9	30
Mean	34.5		59.8		38.8		57.6		56.1		46.7	
LSD of the cultivar means (.05)	10.1		17.9		11.4		7.0		7.7		17.6	
Coefficient of variation (%)	13.3		8.8		11.1		7.9		6.8		16.7	

Table 5. Summary of agronomic data for the 30 cultivars grown in the Fifteenth International Winter Wheat Performance Nursery in 1983.

Cultivars	Grain yield		Test weight		1000-kernel weight		Plant height		Lodging	
	q/ha	% of Bezostaya 1	kg/hl	rank	g	rank	cm	rank	%	rank
Number of sites	42		16		21		31		13	
LT 176-73 (Lasko)	57.5	130.7	70.7	29	34.1	27	119.2	30	28.8	16
F29-76	52.5	119.3	79.9	1	37.3	19	91.5	15	24.6	12
Lovrin 32	52.4	119.1	78.6	6	43.0	5	89.3	12	29.0	17
Vala (HE 270-115)	51.9	118.0	75.1	23	37.7	17	88.5	10	22.9	10
Martonvasari 7	51.3	116.6	76.9	16	39.5	10	95.5	20	31.9	20
Vratza	51.1	116.1	77.1	15	41.2	6	77.2	3	8.9	2
MV 22-77	50.5	114.8	77.9	10	38.5	16	84.8	6	24.2	11
CA 8055	50.4	114.5	78.2	9	39.5	10	88.6	11	25.7	14
Katya A-1	49.5	112.5	78.8	5	36.5	22	93.8	18	21.3	8
TAW 12399-75	49.4	112.3	77.6	12	39.0	13	98.9	26	17.8	6
NS 15-89A	48.5	110.2	79.9	1	41.2	6	94.2	19	14.7	4
Grana	48.1	109.3	76.1	21	39.3	12	96.9	24	38.6	22
Exp. Hyb. 3214	47.9	108.9	75.1	23	37.6	18	97.7	25	52.6	27
Stephens	47.6	108.2	72.3	27	38.8	14	85.1	7	28.6	15
Sutjeska (NS 18-30)	47.6	108.2	76.3	20	43.2	4	86.8	9	9.6	3
Exp. Hyb. 4117	47.6	108.2	77.8	11	44.5	1	96.2	22	42.1	25
Quilamapu 25-77	47.3	107.5	70.5	30	37.1	20	93.3	17	39.4	23
Saliente	46.9	106.6	78.6	6	34.7	23	91.1	14	21.3	8
Ogosta	46.9	106.6	76.0	22	43.3	2	79.7	4	29.0	17
Brule (NE 75414)	46.3	105.2	76.8	17	31.7	30	100.8	27	54.1	29
Arina	46.0	104.5	78.4	8	36.7	21	104.9	29	39.8	24
Bezostaya 1	44.0	100.0	79.5	4	40.5	9	96.2	22	37.9	21
Horoshiri-komugi	43.9	99.8	77.6	12	38.6	15	92.2	16	54.0	28
Daws	41.4	94.1	73.6	25	33.5	28	85.9	8	18.8	7
Orovcanka	41.0	93.2	76.6	18	40.8	8	75.8	1	16.1	5
WWP 4258	40.8	92.7	72.9	26	33.0	29	76.2	2	1.3	1
Feng Kang 15	39.8	90.5	77.4	14	43.3	2	95.8	21	24.8	13
Chasico INTA	39.0	88.6	79.6	3	34.5	26	101.1	28	65.7	30
Lucero INIA	35.3	80.2	72.3	27	34.6	25	90.0	13	49.3	26
Super X	32.3	73.4	76.5	19	34.7	23	84.5	5	31.7	19
Mean	46.5	105.7	76.5		38.3		91.8		30.1	
LSD of the cultivar means (.05)	3.8		1.6		1.7		2.6		14.6	
Coefficient of variation (%)	11.2		1.9		4.7		4.6		45.4	

Table 5. Summary of agronomic data for the 30 cultivars grown in the Fifteenth International Winter Wheat Performance Nursery in 1983. (concluded)

Cultivars	Days to flowering		Days to ripening		Winter survival		Frost damage	
	from Jan. 1	rank	from Jan. 1	rank	%	rank	0-9	rank
Number of sites	29		18		17		6	
LT 176-73 (Lasko)	147.6	17	188.0	28	90.6	10	0.4	1
F 29-76	147.5	16	183.1	10	91.5	7	0.9	10
Lovrin 32	147.2	15	185.8	23	88.6	19	1.2	14
Vala (HE 270-115)	147.6	17	183.3	12	94.4	6	0.8	8
Martonvasari 7	148.2	22	184.7	18	90.1	17	1.4	17
Vratza	143.0	4	179.5	4	90.2	16	2.0	21
MV 22-77	147.8	19	183.9	14	94.9	4	1.1	11
CA 8055	141.5	2	178.9	2	90.3	13	1.2	14
Katya A-1	143.3	6	179.1	3	77.8	25	2.0	21
TAW 12399-75	149.5	24	186.1	24	90.3	13	0.6	4
NS 15-89A	145.6	8	182.3	8	82.1	24	3.0	27
Grana	152.3	27	188.2	29	96.0	2	0.7	5
Exp. Hyb. 3214	144.3	7	182.4	9	94.6	5	0.5	2
Stephens	150.2	25	186.4	25	90.4	12	1.1	11
Sutjeska (NS 18-30)	148.7	23	184.1	15	86.0	21	2.0	21
Exp. Hyb. 4117	143.0	4	182.1	7	90.5	11	1.3	16
Quilamapu 25-77	152.9	29	186.9	26	91.2	9	1.1	11
Saliente	145.6	8	181.4	6	84.0	22	2.7	26
Ogosta	145.7	10	183.2	11	83.1	23	2.2	25
Brule (NE 75414)	148.0	20	184.8	19	95.0	3	0.5	2
Arina	153.7	30	188.7	30	91.5	7	1.5	18
Bezostaya 1	147.1	14	184.3	16	89.4	18	0.8	8
Horoshiri-komugi	148.1	21	184.5	17	96.3	1	0.7	5
Daws	152.7	28	187.6	27	90.3	13	0.7	5
Orovcanka	142.7	3	181.3	5	66.1	27	4.7	29
WWP 4258	150.3	26	185.1	21	70.0	26	2.1	24
Feng Kang 15	141.0	1	178.1	1	87.3	20	1.5	18
Chasico INTA	145.9	12	185.3	22	62.6	28	1.8	20
Lucero INIA	145.7	10	183.8	13	45.3	29	4.5	28
Super X	146.0	13	184.9	20	30.6	30	4.7	29
Mean	147.1		183.9		84.1		1.7	
LSD of the cultivar means (.05)	1.4		1.7		10.3		1.5	
Coefficient of variation (%)	1.1		1.4		8.4		37.2	

Table 6. Comparison of yield response of the 30 cultivars in the Fifteenth International Winter Wheat Performance Nursery among sites in North America as measured by simple correlation coefficients.

	Toluca, Mexico	Davis, California	Akron, Colorado	Fort Collins, Colorado	Brookston, Indiana	Lincoln, Nebraska	Ithaca, New York	Rowan County, North Carolina	Stillwater, Oklahoma	Corvallis, Oregon	Lancaster County, Pennsylvania	Pullman, Washington
Prince Edward Island, Canada	.31	-.09	.41*	.41*	.69**	.61**	.96**	.61**	.34	.24	.73**	.71**
Toluca, Mexico		.07	.15	.22	.00	-.16	.38*	.35	-.36*	.24	-.04	.33
Davis, California			.08	.18	-.03	.02	-.07	.05	-.17	.65**	.10	.34
Akron, Colorado				.77**	.38*	.53**	.38*	.52**	.40*	-.06	.28	.47**
Fort Collins, Colorado					.55**	.64**	.40*	.58**	.25	.09	.48**	.62**
Brookston, Indiana						.86**	.62**	.48**	.41*	.13	.86**	.55**
Lincoln, Nebraska							.54**	.44*	.65**	-.04	.82**	.44*
Ithaca, New York								.65**	.23	.25	.70**	.73**
Rowan County, North Carolina									.14	.25	.33	.62**
Stillwater, Oklahoma										-.44*	.45*	.01
Corvallis, Oregon											.17	.49**
Lancaster County, Pennsylvania												.63**

*,** Significant at the .05 and .01 probability levels, respectively.

Table 7. Comparison of yield responses among European sites for the entries in the Fifteenth International Winter Wheat Performance Nursery as measured by correlation coefficients.

	Sedlec, Czechoslovakia	Böhnshausen, East Germany	Jokioinen, Finland	Orgerus, France	Martonvasar, Hungary	Szeged, Hungary	Sulaimaniya, Iraq	Milano, Italy	Rieti, Italy	Wageningen, Netherlands	Vollebekk, Norway
Vienna, Austria	.53**	.45*	.01	.57**	.43*	.18	-.21	.25	.11	.15	.40*
Sedlec, Czechoslovakia		.61**	-.14	.54**	.83**	.30	.14	.45*	.17	.13	.52**
Böhnshausen, East Germany			-.15	.73**	.38*	.34	-.12	.23	.23	.48**	.27
Jokioinen, Finland				.00	-.24	-.10	-.17	-.11	-.32	.12	.13
Orgerus, France					.26	.17	-.29	.29	.29	.40*	.33
Martonvasar, Hungary						.23	.25	.55**	.10	.01	.51**
Szeged, Hungary							.33	.53**	.37*	-.17	.26
Sulaimaniya, Iraq								.15	.43*	-.33	-.19
Milano, Italy									.49**	.00	.57**
Rieti, Italy										.08	-.02
Wageningen, The Netherlands											-.02

*,** Significant at the .05 and .01 probability levels, respectively.

Table 7. Comparison of yield responses among European sites for the entries in the Fifteenth International Winter Wheat Performance Nursery as measured by correlation coefficients.

	Przeclaw, Poland	Warsaw, Poland	Fundulea, Romania	Madrid, Spain	Zaragoza, Spain	Svalof, Sweden	Zurich, Switzerland	Aleppo, Syria	Eskisehir, Turkey	Krasnodar, USSR
Vienna, Austria	.20	.53**	.02	-.20	.02	.29	.32	.11	.09	-.07
Sedlec, Czechoslovakia	.69**	.31	.37*	.17	.04	.21	.36	.34	.07	.22
Böhnshausen, East Germany	.41*	.56**	.09	-.06	.04	.14	.48**	.13	-.13	.17
Jokioinen, Finland	.04	.11	-.09	-.18	-.06	.25	.11	-.09	-.24	.00
Orgerus, France	.20	.55**	-.05	-.16	-.01	.22	.58**	.17	-.17	.20
Martonvasar, Hungary	.58**	.11	.47**	.30	.05	.27	.16	.42*	.24	.49**
Szeged, Hungary	.48**	.10	.35	.17	.25	.19	.17	.26	.42*	.39*
Sulaimaniya, Iraq	.34	-.57**	.69**	.66**	.60**	.33	-.11	.36*	.54**	.61**
Milano, Italy	.51**	.08	.55**	.27	.37*	.46*	.31	.44*	.49**	.61**
Rieti, Italy	.08	-.07	.49**	.47**	.68**	.28	.20	.41*	.42*	.19
Wageningen, The Netherlands	.11	.28	-.09	.01	-.09	.05	.01	-.11	-.39*	.35

*,** Significant at the .05 and .01 probability levels, respectively.

Table 7. Comparison of yield responses among European sites for the entries in the Fifteenth International Winter Wheat Performance Nursery as measured by correlation coefficients.

	Mironovski, USSR	Odessa, USSR	Monsheim, West Germany	Weihenstephan, West Germany	Novi Sad, Yugoslavia	Zagreb, Yugoslavia
Vienna, Austria	.25	.20	.57**	.65**	-.07	.46*
Sedlec, Czechoslovakia	.29	.43*	.45*	.71**	.37*	.15
Böhnshausen, East Germany	.10	.15	.71**	.62**	.08	.34
Jokioinen, Finland	.32	.10	.02	-.02	-.19	.10
Orgerus, France	.14	.00	.75**	.68**	-.06	.39*
Martonvasar, Hungary	.33	.54**	.20	.47**	.52**	.07
Szeged, Hungary	.49**	.37*	.21	.30	.28	.27
Sulaimaniya, Iraq	-.08	.41*	-.24	-.29	.75**	-.40*
Milano, Italy	.52**	.54**	.29	.40*	.46*	.39*
Rieti, Italy	-.18	.25	.16	.14	.50**	.02
Wageningen, The Netherlands	-.18	-.08	.48**	.18	-.13	.24

*,** Significant at the .05 and .01 probability levels, respectively.

Table 7. Comparison of yield responses among European sites for the entries in the Fifteenth International Winter Wheat Performance Nursery as measured by correlation coefficients.

	Przeclaw, Poland	Warsaw, Poland	Fundulea, Romania	Madrid, Spain	Zaragoza, Spain	Svalof, Sweden	Zurich, Switzerland	Aleppo, Syria	Eskisehir, Turkey	Krasnodar, USSR
Vollebekk, Norway	.55**	.38*	.23	-.09	-.10	.67**	.40*	.16	-.05	.40*
Przeclaw, Poland		.16	.44*	.06	.10	.34	.32	.28	.25	.42*
Warsaw, Poland			-.31	-.57**	-.38*	.34	.41*	-.07	-.39*	-.38*
Fundulea, Romania				.75**	.66**	-.01	.14	.44*	.49**	.72**
Madrid, Spain					.63**	-.25	-.13	.36*	.43*	.57**
Zaragoza, Spain						-.17	.09	.35	.59**	.50**
Svalof, Sweden							.49**	-.05	-.05	.30
Zurich, Switzerland								.01	-.14	.02
Aleppo, Syria									.36*	.40*
Eskisehir, Turkey										.59**

*,** Significant at the .05 and .01 probability levels, respectively.

Table 7. Comparison of yield responses among European sites for the entries in the Fifteenth International Winter Wheat Performance Nursery as measured by correlation coefficients.

	Mironovski, USSR	Odessa, USSR	Monsheim, West Germany	Weihenstephan, West Germany	Novi Sad, Yugoslavia	Zagreb, Yugoslavia
Vollebekk, Norway	.69**	.29	.42*	.59**	.08	.39*
Przeclaw, Poland	.59**	.45*	.27	.45*	.40*	.08
Warsaw, Poland	.32	-.13	.41*	.72**	-.45*	.27
Fundulea, Romania	.14	.75**	-.02	-.01	.88**	-.15
Madrid, Spain	-.16	.59**	-.12	-.32	.78**	-.21
Zaragoza, Spain	-.19	.52**	.10	-.19	.66**	.03
Svalof, Sweden	.70**	.07	.43*	.29	-.20	.58**
Zurich, Switzerland	.31	-.08	.47**	.37*	.05	.40*
Aleppo, Syria	.10	.65**	.17	.20	.46*	-.31
Eskisehir, Turkey	.02	.49**	-.13	-.10	.50**	.05

*,** Significant at the .05 and .01 probability levels, respectively.

Table 7. Comparison of yield responses among European sites for the entries in the Fifteenth International Winter Wheat Performance Nursery as measured by correlation coefficients.

	Mironovski, USSR	Odessa, USSR	Monsheim, West Germany	Weihenstephan, West Germany	Novi Sad, Yugoslavia	Zagreb, Yugoslavia
Krasnodar, USSR	.39*	.64**	-.10	-.11	.65**	.01
Mironovski, USSR		.27	.25	.34	.03	.40*
Odessa, USSR			.06	.14	.71**	-.06
Monsheim, West Germany				.50**	-.11	.55**
Weihenstephan, West Germany					-.10	.28
Novi Sad, Yugoslavia						-.18

*,** Significant at the .05 and .01 probability levels, respectively.

Table 8. Correlation coefficients of agronomic traits for the cultivars grown in the Fifteenth International Winter Wheat Performance Nursery in 1983.

N = Number of paired comparisons	Test weight	1000-kernel weight	Plant height	Lodging	Flowering	Ripening	Winter survival	Frost damage
Grain yield	.47**	.52**	.36**	.06**	.10**	.35**	.44**	.01
N	2373	2865	4535	2384	4320	2381	2694	780
Test weight		.61**	.22**	-.23**	.03	-.17**	-.03	.05
N		1727	2283	1442	2073	1252	1238	417
1000-kernel weight			.08**	-.26**	.27**	.31**	-.06*	.07
N			2775	1793	2651	1973	1577	600
Plant height				.08**	.17**	.30**	.22**	-.16**
N				2380	4106	2381	2501	780
Lodging					-.15**	-.07**	.10**	-.14**
N					2290	1574	1546	480
Flowering						.91**	-.16**	-.04
N						2379	2462	780
Ripening							-.11**	-.19**
N							1571	630
Winter survival								-.30**
N								270

*, ** Significant at the .05 and .01 probability levels, respectively.

Table 9. Grain yield means and statistics averaged over 42 sites of the Fifteenth International Winter Wheat Performance Nursery grown in 1983.

Cultivars	Entry	N	Mean q/ha	Standard Deviation	Variance	Corrected Sum of Squares	Low	High	Coefficient of Variation
LT 176-73 (Lasko)	22	166	57.5	24.03	577.40	95273.5	6.7	102.0	41.81
F29-76	14	166	52.5	19.88	395.20	65199.9	16.6	97.8	37.89
Lovrin 32	9	166	52.4	21.84	477.10	78728.3	7.0	103.8	41.67
Vala (HE 270-115)	10	166	51.9	21.60	466.50	76969.9	12.3	99.0	41.60
Martonvasari 7	15	166	51.3	20.78	431.80	71251.0	13.3	94.4	40.48
Vratza	1	166	51.1	21.38	457.20	75440.0	5.0	97.4	41.81
MV 22-77	8	166	50.5	19.94	397.80	65636.1	10.7	98.0	39.49
CA 8055	17	166	50.4	20.33	413.40	68215.8	6.2	101.2	40.33
Katya A-1	26	166	49.5	24.88	618.90	102120.1	5.1	121.8	50.25
TAW 12399-75	19	166	49.4	21.58	465.50	77279.7	5.6	108.2	43.66
NS 15-89A	25	166	48.5	21.11	445.60	73524.6	8.2	97.4	43.55
Grana	5	166	48.1	20.35	414.00	68304.0	6.4	83.5	42.31
Exp. Hyb. 3214	23	166	47.9	19.43	377.40	62274.1	10.3	84.0	40.60
Sutjeska (NS 18-30)	6	166	47.6	21.47	461.00	76061.9	1.7	94.4	45.09
Stephens	11	166	47.6	21.14	447.00	73754.6	5.6	94.9	44.41
Exp. Hyb. 4117	24	166	47.6	19.43	377.40	62276.3	10.3	95.2	40.81
Quilamapu 25-77	27	166	47.3	21.68	469.80	77524.9	4.0	95.5	45.84
Ogosta	18	166	46.9	21.32	454.70	75027.1	6.4	94.6	45.46
Saliente	30	166	46.9	19.79	391.50	64594.6	5.2	82.8	42.23
Brule (NE 75414)	4	166	46.3	17.33	300.40	49561.2	8.3	82.3	37.42
Arina	20	166	46.0	19.35	374.60	61807.0	6.9	88.0	42.04
Bezostaya 1	7	166	44.0	18.57	344.80	56883.9	7.2	81.6	42.19
Horoshiri-komugi	16	166	43.9	17.48	305.60	50426.9	9.9	84.8	39.82
Daws	2	166	41.4	19.20	368.60	60826.9	6.3	81.3	46.38
Orovcanka	12	165	41.0	23.67	560.30	91884.0	0.0	96.3	57.71
WWP 4258	28	166	40.8	21.98	483.00	79701.2	3.1	93.0	53.90
Feng Kang 15	29	166	39.8	18.03	325.10	53642.2	6.0	90.8	45.28
Chasico INTA	3	166	39.0	20.43	417.40	68868.7	0.0	82.6	52.42
Lucero INIA	13	166	35.3	22.32	498.20	82210.3	0.0	84.8	63.22
Super X	21	166	32.3	26.79	717.60	118406.4	0.0	85.6	82.84

Table 10. Test weight means and statistics averaged over 16 sites of the Fifteenth International Winter Wheat Performance Nursery grown in 1983.

Cultivars	Entry	N	Mean kg/hl	Standard Deviation	Variance	Corrected Sum of Squares	Low	High	Coefficient of Variation
F29-76	14	61	79.9	8.46	71.60	4298.2	49.1	85.3	10.59
NS 15-89A	25	61	79.9	7.65	58.50	3511.2	52.8	85.1	9.58
Chasico INTA	3	61	79.6	5.49	30.10	1806.6	61.8	86.0	6.90
Bezostaya 1	7	61	79.5	8.90	79.10	4747.9	47.0	86.0	11.19
Katya A-1	26	61	78.8	8.04	64.60	3878.1	50.1	85.1	10.21
Lovrin 32	9	61	78.6	7.85	61.60	3696.2	49.9	85.1	9.99
Saliente	30	61	78.6	6.22	38.60	2319.0	57.0	85.1	7.91
Arina	20	61	78.4	6.37	40.60	2438.0	57.7	85.0	8.13
CA 8055	17	61	78.2	8.32	69.10	4148.4	48.8	86.0	10.63
MV 22-77	8	61	77.9	8.52	72.60	4356.1	47.5	85.1	10.94
Exp. Hyb. 4117	24	61	77.8	9.01	81.30	4875.9	45.1	85.1	11.59
Horoshiri-komugi	16	61	77.6	8.56	73.30	4396.1	47.5	85.1	11.03
TAW 12399-75	19	61	77.6	8.20	67.20	4096.8	48.5	85.1	10.56
Feng Kang 15	29	61	77.4	6.25	39.00	2342.6	57.6	84.3	8.07
Vratza	1	61	77.1	8.01	64.10	3848.9	50.0	84.3	10.39
Martonvasari 7	15	61	76.9	8.29	68.80	4126.8	47.4	83.4	10.78
Brule (NE 75414)	4	61	76.8	9.18	84.20	5052.9	42.9	83.5	11.95
Orovcanka	12	60	76.6	8.85	78.40	4625.6	45.2	85.1	11.56
Super X	21	57	76.5	10.28	105.60	5915.0	42.7	85.5	13.43
Sutjeska (NS 18-30)	6	61	76.3	7.70	59.30	3558.1	49.8	84.0	10.09
Grana	5	61	76.1	6.88	47.40	2843.3	51.9	82.0	9.05
Ogosta	18	61	76.0	8.88	78.90	4731.7	45.5	85.1	11.69
Vala (HE 270-115)	10	61	75.1	7.24	52.50	3147.3	51.2	82.9	9.65
Exp. Hyb. 3214	23	61	75.1	8.83	78.00	4680.5	44.8	84.2	11.76
Daws	2	61	73.6	7.76	60.30	3617.2	47.5	82.0	10.55
WWP 4258	28	61	72.9	7.49	56.10	3365.1	47.7	83.2	10.27
Stephens	11	61	72.3	10.14	102.90	6171.7	37.3	86.2	14.02
Lucero INIA	13	61	72.3	9.99	99.90	5993.5	36.2	83.0	13.83
LT 176-73 (Lasko)	22	61	70.7	5.99	35.90	2154.2	53.1	78.0	8.47
Quilamapu 25-77	27	61	70.5	7.25	52.60	3155.9	47.7	82.6	10.28

Table 11. 1000-kernel weight means and statistics averaged over 21 sites of the Fifteenth International Winter Wheat Performance Nursery grown in 1983.

Cultivars	Entry	N	Mean grams	Standard Deviation	Variance	Corrected Sum of Squares	Low	High	Coefficient of Variation
Exp. Hyb. 4117	24	81	44.5	6.92	47.80	3826.8	26.8	57.3	15.55
Ogosta	18	81	43.3	7.86	61.80	4942.4	22.8	55.7	18.15
Feng Kang 15	29	81	43.3	5.35	28.70	2292.6	31.1	53.0	12.36
Sutjeska (NS 18-30)	6	81	43.2	7.00	49.00	3923.2	27.9	57.0	16.21
Lovrin 32	9	81	43.0	8.75	76.50	6122.9	19.3	57.6	20.34
Vratza	1	81	41.2	7.11	50.50	4040.2	21.2	57.3	17.23
NS 15-89A	25	81	41.2	6.22	38.70	3099.6	24.4	51.1	15.12
Orovcanka	12	80	40.8	7.39	54.60	4316.6	24.8	57.6	18.14
Bezostaya 1	7	81	40.5	6.01	36.20	2892.6	26.1	48.0	14.84
Martonvasari 7	15	81	39.5	6.38	40.70	3259.1	21.1	47.7	16.16
CA 8055	17	81	39.5	6.21	38.50	3082.4	23.8	53.7	15.72
Grana	5	81	39.3	6.82	46.50	3723.4	20.8	47.3	17.35
TAW 12399-75	19	81	39.0	6.85	47.00	3803.3	22.5	48.7	17.59
Stephens	11	81	38.8	9.20	84.60	6769.3	20.0	57.0	23.70
Horoshiri-komugi	16	81	38.6	6.25	39.00	3120.8	21.3	47.2	16.17
MV 22-77	8	81	38.5	6.59	43.40	3470.0	20.8	49.0	17.10
Vala (HE 270-115)	10	81	37.7	6.65	44.30	3540.0	21.9	47.3	17.65
Exp. Hyb. 3214	23	81	37.6	7.52	56.60	4526.5	21.0	48.7	19.99
F25-76	14	81	37.3	5.84	34.10	2726.9	23.8	46.7	15.65
Quilamapu 25-77	27	81	37.1	9.40	88.40	7071.5	15.5	53.0	25.34
Arina	20	81	36.7	6.44	41.40	3313.1	16.1	46.8	17.54
Katya A-1	26	81	36.5	5.51	30.30	2425.4	22.3	44.3	15.07
Super X	21	69	34.7	6.98	48.70	3311.3	20.4	45.5	20.14
Saliente	30	81	34.7	5.83	34.00	2720.6	20.6	43.7	16.78
Lucero INIA	13	81	34.6	7.13	50.80	4062.9	17.7	46.3	20.62
Chasico INTA	3	81	34.5	5.64	31.80	2540.3	18.8	43.3	16.33
LT 176-73 (Lasko)	22	81	34.1	6.78	46.00	3678.2	16.5	44.7	19.87
Daws	2	81	33.5	6.98	48.70	3893.9	18.0	45.8	20.86
WWP 4258	28	81	33.0	7.11	50.60	4049.0	17.9	44.0	21.57
Brule (NE 75414)	4	81	31.7	5.58	31.10	2491.9	15.9	42.0	17.61

Table 12. Winter survival means and statistics averaged over 17 sites of the Fifteenth International Winter Wheat Performance Nursery grown in 1983.

Cultivars	Entry	N	Mean %	Standard Deviation	Variance	Corrected Sum of Squares	Low	High	Coefficient of Variation
Horoshiri-komugi	16	65	96.3	9.22	84.90	5435.0	35.0	100.0	9.57
Grana	5	65	96.0	7.94	63.00	4031.0	50.0	100.0	8.27
Brule (NE 75414)	4	65	95.0	12.63	159.50	10208.0	8.0	100.0	13.29
MV 22-77	8	65	94.9	12.12	147.00	9407.4	25.0	100.0	12.77
Exp. Hyb. 3214	23	65	94.6	12.07	145.70	9323.8	38.0	100.0	12.76
Vala (HE 270-115)	10	65	94.4	14.43	208.30	13328.9	20.0	100.0	15.29
F29-76	14	65	91.5	20.78	431.70	27626.2	9.0	100.0	22.72
Arina	20	65	91.5	23.07	532.30	34066.2	0.0	100.0	25.21
Quilamapu 25-77	27	65	91.2	23.15	535.80	34288.1	0.0	100.0	25.37
LT 176-73 (Lasko)	22	65	90.6	24.29	589.90	37755.4	0.0	100.0	26.80
Exp. Hyb. 4117	24	65	90.5	24.08	580.10	37124.2	0.0	100.0	26.62
Stephens	11	65	90.4	24.07	579.60	37093.1	0.0	100.0	26.64
Daws	2	65	90.3	20.14	405.50	25949.4	0.0	100.0	22.30
CA 8055	17	65	90.3	23.78	565.60	36201.0	0.0	100.0	26.34
TAW 12399-75	19	65	90.3	23.03	530.20	33932.6	0.0	100.0	25.49
Vratza	1	65	90.2	24.13	582.40	37274.5	0.0	100.0	26.77
Martonvasari 7	15	65	90.1	21.67	469.70	30062.6	0.0	100.0	24.06
Bezostaya 1	7	65	89.4	19.71	388.40	24857.9	0.0	100.0	22.04
Lovrin 32	9	65	88.6	23.72	562.50	36002.9	0.0	100.0	26.76
Feng Kang 15	29	65	87.3	24.57	603.90	38650.6	0.0	100.0	28.16
Sutjeska (NS 18-30)	6	65	86.0	26.31	692.50	44317.0	0.0	100.0	30.59
Saliente	30	65	84.0	28.22	796.40	50966.9	0.0	100.0	33.61
Ogosta	18	65	83.1	26.08	680.30	43541.8	0.0	100.0	31.37
NS 15-89A	25	65	82.1	27.22	741.10	47430.2	0.0	100.0	33.16
Katya A-1	26	65	77.8	33.21	1102.6	70566.1	0.0	100.0	42.71
WWP 4258	28	65	70.0	30.69	941.70	60265.9	0.0	100.0	43.82
Orovcanka	12	64	66.1	40.51	1641.1	103389.4	0.0	100.0	61.29
Chasico INTA	3	63	62.6	40.31	1625.1	100757.3	0.0	100.0	64.41
Lucero INIA	13	64	45.3	39.54	1563.4	98494.9	0.0	100.0	87.32
Super X	21	63	30.6	36.88	1360.3	84337.6	0.0	100.0	120.70

Table 13. Plant height means and statistics averaged over 31 sites of the Fifteenth International Winter Wheat Performance Nursery grown in 1983.

Cultivars	Entry	N	Mean cm	Standard Deviation	Variance	Corrected Sum of Squares	Low	High	Coefficient of Variation
Orovcanka	12	123	75.8	9.17	84.00	10247.9	52.0	95.0	12.09
WWP 4258	28	124	76.2	10.18	103.60	12742.5	55.0	97.0	13.36
Vratza	1	124	77.2	8.38	70.30	8645.4	58.0	100.0	10.86
Ogosta	18	124	79.7	8.09	65.40	8043.7	65.0	101.0	10.14
Super X	21	109	84.5	12.39	153.60	16589.2	56.0	110.0	14.67
MV 22-77	8	124	84.8	8.93	79.70	9800.8	68.0	115.0	10.52
Stephens	11	124	85.1	9.62	92.50	11372.8	63.0	104.0	11.30
Daws	2	124	85.9	11.40	129.90	15975.5	58.0	116.0	13.26
Sutjeska (NS 18-30)	6	124	86.8	9.76	95.20	11710.2	69.0	122.0	11.25
Vala (HE 270-115)	10	124	88.5	11.74	137.90	16958.9	65.0	117.0	13.27
CA 8055	17	124	88.6	11.15	124.30	15290.7	65.0	114.0	12.58
Lovrin 32	9	124	89.3	9.62	92.50	11381.8	70.0	120.0	10.77
Lucero INIA	13	124	90.0	11.44	131.00	16110.9	57.0	117.0	12.72
Saliente	30	124	91.1	10.18	103.60	12744.4	70.0	117.0	11.17
F29-76	14	124	91.5	9.98	99.70	12257.0	64.0	115.0	10.91
Horoshiri-komugi	16	124	92.2	8.87	78.70	9676.1	75.0	116.0	9.62
Quilamapu 25-77	27	124	93.3	10.58	111.90	13768.0	70.0	119.0	11.34
Katya A-1	26	124	93.8	10.48	109.90	13518.7	68.0	112.0	11.17
NS 15-89A	25	124	94.2	10.77	115.90	14256.7	72.0	122.0	11.43
Martonvasari 7	15	124	95.5	10.44	109.00	13412.9	72.0	123.0	10.93
Feng Kang 15	29	124	95.8	10.91	119.00	14638.7	75.0	117.0	11.39
Bezostaya 1	7	124	96.2	10.80	116.70	14359.1	70.0	130.0	11.23
Exp. Hyb. 4117	24	124	96.2	10.58	111.90	13766.2	70.0	127.0	10.99
Grana	5	124	96.9	11.19	125.10	15389.5	72.0	124.0	11.54
Exp. Hyb. 3214	23	124	97.7	11.77	138.50	17037.1	76.0	129.0	12.04
TAW 12399-75	19	124	98.9	10.27	105.60	13088.8	68.0	124.0	10.39
Brule (NE 75414)	4	124	100.8	9.48	89.90	11055.4	75.0	122.0	9.40
Chasico INTA	3	124	101.1	11.08	122.70	15090.3	70.0	129.0	10.96
Arina	20	124	104.9	10.75	115.70	14226.7	70.0	132.0	10.26
LT 176-73 (Lasko)	22	124	119.2	12.67	160.40	19734.1	80.0	145.0	10.63

Table 14. Lodging means and statistics averaged over 13 sites of the Fifteenth International Winter Wheat Performance Nursery grown in 1983.

Cultivars	Entry	N	Mean %	Standard Deviation	Variance	Corrected Sum of Squares	Low	High	Coefficient of Variation
WWP 4258	28	52	1.3	3.20	10.20	521.4	0.0	12.0	240.98
Vratza	1	52	8.9	19.96	398.40	20316.8	0.0	80.0	223.20
Sutjeska (NS 18-30)	6	52	9.6	16.05	257.70	13142.5	0.0	60.0	167.29
NS 15-89A	25	52	14.7	27.38	749.80	38239.8	0.0	95.0	186.86
Orovcanka	12	52	16.1	23.88	570.10	29073.7	0.0	90.0	148.51
TAW 12399-75	19	52	17.8	24.99	624.70	31857.8	0.0	90.0	140.81
Daws	2	52	18.8	26.75	715.50	36491.8	0.0	100.0	142.66
Katya A-1	26	52	21.3	28.04	786.10	40090.7	0.0	90.0	131.70
Saliente	30	52	21.3	32.42	1051	53601.1	0.0	100.0	152.15
Vala (HE 270-115)	10	52	22.9	29.85	891.30	45455.3	0.0	100.0	130.46
MV 22-77	8	52	24.2	29.69	881.30	44945.4	0.0	95.0	122.81
F29-76	14	52	24.6	34.17	1167.9	59560.5	0.0	100.0	138.94
Feng Kang 15	29	52	24.8	30.31	918.70	46853.8	0.0	100.0	122.46
CA 8055	17	52	25.7	31.66	1002.2	51114.7	0.0	95.0	123.13
Stephens	11	52	28.6	32.93	1084.5	55310.1	0.0	100.0	115.01
LT 176-73 (Lasko)	22	52	28.8	31.14	969.80	49458.1	0.0	100.0	108.10
Lovrin 32	9	52	29.0	30.79	948.10	48351.9	0.0	100.0	106.32
Ogosta	18	52	29.0	33.07	1093.8	55783.9	0.0	100.0	113.89
Super X	21	49	31.7	38.36	1471.2	70618.8	0.0	100.0	121.10
Martonvasari 7	15	52	31.9	32.48	1055.1	53808.1	0.0	100.0	101.93
Bezostaya 1	7	52	37.9	34.68	1203	61355.3	0.0	100.0	91.55
Grana	5	52	38.6	32.57	1061.1	54114.5	0.0	100.0	84.40
Quilamapu 25-77	27	52	39.4	36.04	1298.6	66226.7	0.0	100.0	91.41
Arina	20	52	39.8	36.74	1349.9	68844.1	0.0	100.0	92.30
Exp. Hyb. 4117	24	52	42.1	34.93	1219.9	62216.5	0.0	100.0	82.97
Lucero INIA	13	52	49.3	38.48	1480.4	75501.8	0.0	100.0	77.97
Exp. Hyb. 3214	23	52	52.6	37.16	1380.5	70406.3	0.0	100.0	70.62
Horoshiri-komugi	16	52	54.0	34.90	1218.1	62123.9	0.0	100.0	64.68
Brule (NE 75414)	4	52	54.1	38.10	1451.7	74036.5	0.0	100.0	70.43
Chasicc INTA	3	52	65.7	36.50	1332.5	67956.7	0.0	100.0	55.55

Table 15. Date of flowering means and statistics averaged over 29 sites of the Fifteenth International Winter Wheat Performance Nursery grown in 1983.

Cultivars	Entry	N	Mean Days*	Standard Deviation	Variance	Corrected Sum of Squares	Low	High	Coefficient of Variation
Feng Kang 15	29	116	141.0	14.10	198.90	22876.0	118.0	170.0	10.00
CA 8055	17	116	141.5	14.28	203.90	23445.0	117.0	170.0	10.09
Orovcanka	12	116	142.7	14.13	199.70	22969.2	120.0	170.0	9.90
Vratza	1	116	143.0	14.17	200.70	23080.0	118.0	175.0	9.91
Exp. Hyb. 4117	24	116	143.0	13.76	189.40	21783.9	120.0	170.0	9.62
Katya A-1	26	116	143.3	14.07	198.00	22770.2	122.0	179.0	9.82
Exp. Hyb. 3214	23	116	144.3	14.22	202.20	23257.9	118.0	170.0	9.85
NS 15-89A	25	116	145.6	13.69	187.30	21542.4	124.0	175.0	9.40
Saliente	30	116	145.6	13.27	176.10	20252.8	127.0	173.0	9.11
Lucero INIA	13	116	145.7	14.72	216.60	24906.2	120.0	175.0	10.10
Ogosta	18	116	145.7	13.23	175.10	20139.2	126.0	175.0	9.08
Chasico INTA	3	116	145.9	12.78	163.40	18785.8	122.0	175.0	8.76
Super X	21	101	146.0	16.00	255.90	25590.0	120.0	198.0	10.96
Bezostaya 1	7	116	147.1	13.84	191.60	22034.3	124.0	187.0	9.41
Lovrin 32	9	116	147.2	12.08	145.90	16773.6	126.0	180.0	8.20
F29-76	14	116	147.5	13.68	187.20	21532.9	128.0	185.0	9.28
Vala (HE 270-115)	10	115	147.6	14.12	199.50	22939.3	126.0	190.0	9.57
LT 176-73 (Lasko)	22	116	147.6	12.22	149.30	17170.8	129.0	185.0	8.28
MV 22-77	8	116	147.8	12.95	167.60	19278.4	128.0	185.0	8.76
Brule (NE 75414)	4	116	148.0	12.03	144.70	16636.0	131.0	173.0	8.13
Horoshiri-komugi	16	116	148.1	12.89	166.10	19106.8	130.0	177.0	8.70
Martonvasari 7	15	116	148.2	11.79	139.00	15979.9	132.0	180.0	7.96
Sutjeska (NS 18-30)	6	116	148.7	13.65	186.30	21428.0	126.0	180.0	9.18
TAW 12399-75	19	116	149.5	13.85	191.70	22050.9	126.0	185.0	9.26
Stephens	11	116	150.2	11.22	125.90	14478.7	132.0	173.0	7.47
WWP 4258	28	116	150.3	14.01	196.20	22563.2	129.0	195.0	9.32
Grana	5	116	152.3	15.07	227.20	26128.0	132.0	204.0	9.90
Daws	2	116	152.7	13.91	193.40	22235.6	132.0	202.0	9.11
Quilamapu 25-77	27	116	152.9	12.93	167.20	19226.0	132.0	195.0	8.46
Arina	20	116	153.7	12.40	153.80	17692.7	136.0	195.0	8.07

* From January 1.

Table 16. Date of ripening means and statistics averaged over 18 sites of the Fifteenth International Winter Wheat Performance Nursery grown in 1983.

Cultivars	Entry	N	Mean Days*	Standard Deviation	Variance	Corrected Sum of Squares	Low	High	Coefficient of Variation
Feng Kang 15	29	72	178.1	14.70	216.10	15342.7	157.0	201.0	8.26
CA 8055	17	72	178.9	14.45	208.80	14825.8	158.0	201.0	8.08
Katya A-1	26	72	179.1	13.92	193.70	13753.5	161.0	204.0	7.77
Vratza	1	72	179.5	14.77	218.10	15487.9	147.0	204.0	8.23
Orovcanka	12	72	181.3	14.25	203.20	14424.0	159.0	207.0	7.86
Saliente	30	72	181.4	14.44	208.40	14797.3	162.0	203.0	7.96
Exp. Hyb. 4117	24	72	182.1	15.02	225.70	16021.9	158.0	204.0	8.25
NS 15-89A	25	72	182.3	14.62	213.80	15182.0	161.0	205.0	8.02
Exp. Hyb. 3214	23	72	182.4	14.91	222.20	15775.7	162.0	204.0	8.17
F29-76	14	72	183.1	13.43	180.30	12800.7	163.0	204.0	7.33
Ogosta	18	72	183.2	13.46	181.10	12855.3	164.0	204.0	7.35
Vala (HE 270-115)	10	72	183.3	14.46	209.00	14839.7	160.0	205.0	7.89
Lucerc INIA	13	72	183.8	13.69	187.40	13303.3	160.0	206.0	7.45
MV 22-77	8	72	183.9	13.45	181.00	12852.6	163.0	206.0	7.32
Sutjeska (NS 18-30)	6	72	184.1	13.81	190.80	13548.7	164.0	207.0	7.50
Bezostaya 1	7	72	184.3	14.02	196.50	13951.7	162.0	208.0	7.61
Horoshiri-komugi	16	72	184.5	13.25	175.40	12455.9	164.0	205.0	7.18
Martonvasari 7	15	72	184.7	13.06	170.50	12102.4	164.0	204.0	7.07
Brule (NE 75414)	4	72	184.8	13.45	181.00	12848.7	164.0	207.0	7.28
Super X	21	60	184.9	14.89	221.80	13086.9	162.0	212.0	8.05
WWP 4258	28	72	185.1	18.36	337.20	23940.3	84.0	207.0	9.92
Chasico INTA	3	72	185.3	15.04	226.30	16066.0	137.0	212.0	8.12
Lovrin 32	9	72	185.8	13.63	185.70	13186.0	164.0	208.0	7.33
TAW 12399-75	19	72	186.1	15.05	226.40	16071.5	139.0	208.0	8.09
Stephens	11	72	186.4	13.62	185.50	13170.9	162.0	207.0	7.31
Quilamapu 25-77	27	72	186.9	12.70	161.20	11445.8	168.0	207.0	6.79
Daws	2	72	187.6	13.58	184.30	13085.3	169.0	210.0	7.24
LT 176-73 (Lasko)	22	72	188.0	13.82	191.00	13564.0	169.0	209.0	7.35
Grana	5	72	188.2	14.48	209.80	14895.3	163.0	211.0	7.70
Arina	20	72	188.7	13.54	183.40	13018.4	169.0	210.0	7.18

* From January 1.

Table 17. Frost damage means and statistics averaged over six sites of the Fifteenth International Winter Wheat Performance Nursery grown in 1983.

Cultivars	Entry	N	Mean 0-9	Standard Deviation	Variance	Corrected Sum of Squares	Low	High	Coefficient of Variation
Orovcanka	12	24	4.7	2.84	8.00	185.0	0.0	9.0	60.23
Super X	21	24	4.7	2.69	7.30	167.0	0.0	9.0	57.22
Lucero INIA	13	24	4.5	2.59	6.70	154.0	0.0	7.0	58.03
NS 15-89A	25	24	3.0	1.81	3.30	75.0	1.0	7.0	59.35
Saliente	30	24	2.7	1.69	2.80	65.3	0.0	6.0	63.20
Ogosta	18	24	2.2	1.38	1.90	44.0	0.0	5.0	62.60
WWP 4258	28	24	2.1	2.47	6.10	140.6	0.0	7.0	116.36
Vratza	1	24	2.0	1.64	2.70	62.0	0.0	6.0	82.09
Sutjeska (NS 18-30)	6	24	2.0	1.27	1.60	37.0	0.0	4.0	62.09
Katya A-1	26	24	2.0	1.43	2.00	47.0	0.0	6.0	69.99
Chasico INTA	3	24	1.8	1.55	2.40	55.3	0.0	4.0	84.60
Arina	20	24	1.5	1.69	2.90	66.0	0.0	4.0	109.85
Feng Kang 15	29	24	1.5	1.06	1.10	26.0	0.0	3.0	72.85
Martonvasari 7	15	24	1.4	1.06	1.10	25.6	0.0	3.0	76.77
Exp. Hyb. 4117	24	24	1.3	1.27	1.60	37.0	0.0	4.0	98.14
Lovrin 32	9	24	1.2	1.24	1.50	35.3	0.0	4.0	106.24
CA 8055	17	24	1.2	1.25	1.60	36.0	0.0	4.0	103.48
MV 22-77	8	24	1.1	1.84	3.40	77.8	0.0	5.0	169.81
Stephens	11	24	1.1	1.21	1.50	33.8	0.0	4.0	111.96
Quilamapu 25-77	27	24	1.1	0.97	0.90	21.8	0.0	3.0	89.94
F29-76	14	24	0.9	1.02	1.00	23.8	0.0	3.0	111.05
Bezostaya 1	7	24	0.8	1.06	1.10	26.0	0.0	3.0	134.19
Vala (HE 270-115)	10	24	0.8	1.15	1.30	30.5	0.0	3.0	153.54
Daws	2	24	0.7	1.05	1.10	25.3	0.0	4.0	157.42
Grana	5	24	0.7	0.75	0.60	13.0	0.0	2.0	105.97
Horoshiri-komugi	16	24	0.7	1.00	1.00	23.0	0.0	3.0	141.05
TAW 12399-75	19	24	0.6	0.77	0.60	13.6	0.0	2.0	123.15
Brule (NE 75414)	4	24	0.5	0.78	0.60	14.0	0.0	2.0	169.97
Exp. Hyb. 3214	23	24	0.5	0.66	0.40	10.0	0.0	2.0	121.48
LT 176-73 (Lasko)	22	24	0.4	0.65	0.40	9.8	0.0	2.0	156.93