

1979 EDITION

Revised December 1978

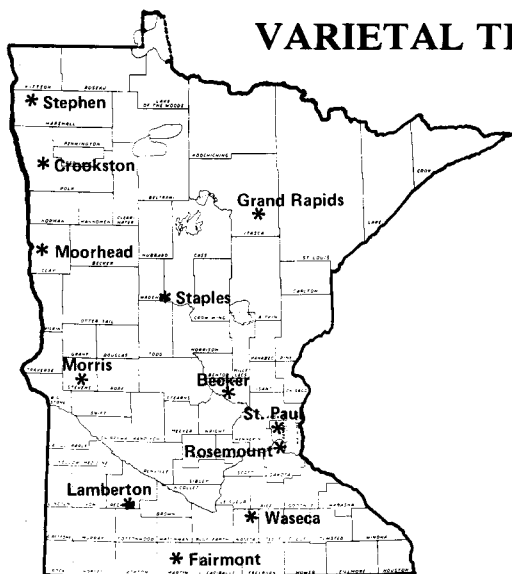
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VARIETAL TRIALS

OF
FARM
CROPS

VARIETAL TRIALS OF FARM CROPS



*1978 varietal trials were conducted at these locations.

Successful crop production depends to a considerable extent on selecting the best varieties for a particular farm.

To provide a basis for the selection of varieties, the Minnesota Agricultural Experiment Station compares varieties in trial plots. These trials are conducted on the Agricultural Experiment Stations at St. Paul, Rosemount, Waseca, Lambertson, Morris, Crookston, Grand Rapids, and Becker, and on farmers' fields.

Recommended varieties, important old varieties, and new varieties are grown in replicated plots at each location. These plots are handled so that the factors affecting yield and other characteristics are as nearly the same for all varieties at each location as is possible.

On the basis of these comparative trials, the list of varieties recommended for use in Minnesota is revised each year by the Experiment Station Crop Variety Review Committee.

For crops where recommendations are made, varietal descriptions are arranged in order of "recommended varieties," "varieties not adequately tested," and "other varieties," and in alphabetical order within each group.

Recommended varieties have performed better than other varieties in important characteristics in comparative tests. A variety usually is not eligible for recommendation until it has been tested in Minnesota for at least 3 years. New varieties from other public experiment stations and private plant breeders but not sufficiently evaluated here are listed as "not adequately tested." Information now available regarding these varieties is presented but no conclusions are drawn regarding their suitability under Minnesota conditions.

Varieties listed in the "other varieties" category are usually inferior in one or more characteristics, as demonstrated in comparative tests.

The LSD (Least Significant Difference) figures listed under the yield columns in the tables are statistical measures of variability within the trials. This statistic is used to determine whether the difference between two yields is due to genetic difference in

the varieties or to other causes such as soil variability. If the yield difference between two varieties equals or exceeds the LSD, one can conclude that the higher yielding variety was superior in yield. If the difference is less than the LSD, the yield difference was probably due to environmental rather than varietal differences. The 5 percent significance level used in this report is based on odds of 19 to 1 that yields differing by the amount of the LSD were truly different.

Data for varieties not included in all trials averaged within a table have been adjusted so that averages of varieties tested for different numbers of years can be compared directly. But use of the LSD for these comparisons is not valid.

These trials are designed for variety and not crop (species) comparisons, because the various crops were grown on different fields or with different management. The data should only be used to compare varieties within a table.

Relative maturities of varieties are indicated in the tables as date mature, heading, or blooming; days to mature, heading, or blooming; or moisture percentage at harvest.

Yields of some forage crops are given in pounds or tons of dry matter per acre. To convert to hay yield at 15 percent moisture (85 percent dry matter), divide the figure given by 0.85. To convert to haylage yield at 55 percent moisture (45 percent dry matter), divide by 0.45.

The use of certified seed of recommended varieties is suggested. Varieties eligible for certification by the Minnesota Crop Improvement Association include varieties recommended by the Minnesota Agricultural Experiment Station, certain new varieties not adequately tested in Minnesota, and certain nonrecommended varieties. Certification does not imply recommendation.

Registered and certified seed of most varieties described in this report can be purchased from seed dealers or from growers listed in the Minnesota Registered and Certified Seed Directory for 1979 Planting. This annual publication can be obtained without charge from the Minnesota Crop Improvement Association, 1900 Hendon Avenue, St. Paul, Minnesota 55108, or from county extension agents' offices.

Authors of the following sections are: barley, D.C. Rasmusson; oats, D.D. Stuthman; durum, hard red spring, and winter wheat, R.H. Busch; rye, millet, annual canarygrass, grain sorghum, buckwheat, field pea, field bean, and sunflower, R.G. Robinson; corn, J. L. Geadelmann and R.H. Peterson; flax, V.E. Comstock; soybean, J.W. Lambert; alfalfa, birdsfoot trefoil, and red clover, D.K. Barnes and F.I. Frosheiser; and bromegrass, orchardgrass, reed canarygrass, tall fescue, and timothy, A.W. Hovin. Extension agronomist L.L. Hardman also participated in preparing this publication.

Information on the reaction of varieties to specific pathogens was largely obtained by the following members of the Department of Plant Pathology: F.I. Frosheiser, alfalfa; B.W. Kennedy, soybean; D.V. McVey, wheat; A.P. Roelfs, barley, oat, and wheat; P.G. Rothman, oat; R.D. Wilcoxson, barley, wheat, and oat.

Field work of the varietal trials at Waseca, Lambertson, Morris, Crookston, and Grand Rapids was supervised by W.E. Lueschen, J.H. Ford, D.D. Warnes, J.V. Wiersma, and D.L. Rabas, respectively.

ALFALFA

Many alfalfa varieties are available from both private and public plant breeders. Certified seed should be used because it provides the best assurance of varietal purity and performance. For this reason only varieties eligible for certification are listed in this report.

WINTERHARDINESS AND YIELD — Severe Minnesota winters make winterhardiness a primary consideration in variety selection. Greater winterhardiness is usually needed in southern and western Minnesota and in the Red River Valley than in other parts of the state.

The varieties listed in tables 1 and 2 are ranked according to winterhardness index which is an indication of rate of growth and degree of winterhardness. *Very winterhardy varieties* are slow to recover after cutting. These varieties will survive nearly all winters. Except for the variety Ramsey they usually are not high yielding because they recover slowly for the second crop and produce only a small third crop because of early dormancy. *Winterhardy varieties* are adapted to all areas of the state. Forage yields vary among varieties in this group, primarily because of disease and insect resistance. Three or four years of production can be expected from most winterhardy varieties, but a few can be productive for five or more years. *Moderately winterhardy varieties* usually reach 1/10 bloom several days earlier than more winterhardy varieties. They are also characterized by rapid recovery after harvest.

Nonwinterhardy varieties should not be grown in Minnesota except for plowdown in the seedling year. Varieties in this group are not listed in the tables but include African, Amador, Ardiente, AS-13R, AS-49R, Bonanza, Caliente, Caliverde, Caliverde 65, CUF 101, Delta, El-Unico, Florida 66, Hairy Peruvian, Hayden, Joaquin II, Mesa Sirsa, Mesilla, Moapa, Moapa 69, Salton, Sonora, Sonora 70, 183, WL 504, WL 508, WL 600, UC Cargo, Unico, 183, 572, and 581.

BACTERIAL WILT RESISTANCE—This disease is prevalent in most areas of the state. Wilt-susceptible varieties are poor risks and should not be grown, because they generally show losses in stand by the end of the second year after seeding. In some cases where infection is severe, stand losses are often observed by the end of the first year after seeding. Stand reductions after winter often are due to a combination of wilt damage and winter injury.

PHYTOPHTHORA ROOT ROT—This disease is important on poorly drained soils. It can cause stand losses of seedlings and can contribute to lower productivity in older stands if the soil remains wet for a week or more. The first Phytophthora resistant variety, Agate, was released in 1973 by Minnesota Agricultural Experiment Station and USDA. More recently Apollo, Phytor, WL 318, and 545 have been released.

Two high yielding, wilt-resistant, and moderately winterhardy alfalfa varieties are ready for a second cutting July 20 at Grand Rapids.



Table 1. Average yields of alfalfa varieties expressed as percentage of Vernal for all tests in Minnesota, 1959-1978

Variety	Yield (percent of Vernal)					Average over years	
	Year after seeding					1-2	3-9
	1st	2nd	3rd	4th	5th-9th		
VERY WINTERHARDY							
Norseman	96	93	89	—	—	95	89
Ladak	87	88	78	89	—	88	82
Travois	88	88	88	87	—	88	88
Ramsey	100	101	103	114	111	101	109
WINTERHARDY							
Baker	97	103	113	106	124	101	114
Vernal, tons 15% DM hay/acre	4.8	4.6	4.5	4.4	4.2	4.7	4.2
Titan	101	101	104	103	104	101	104
Conquest	97	105	107	107	112	99	109
123	101	104	101	102	110	102	102
WL 215	101	102	109	101	115	101	108
Agate	99	98	104	97	105	99	102
Iroquois	109	104	105	110	105	107	106
Ladak 65	99	104	101	99	102	102	100
Nugget	102	101	97	100	100	102	99
520	104	106	109	111	114	105	111
521	100	100	100	96	96	100	97
524	106	109	114	113	—	108	114
545	93	—	—	—	—	93	—
SX-10	94	95	99	102	107	95	102
Valor	99	103	100	107	118	101	105
Weevlchek	107	107	109	103	98	107	105
Anchor	104	108	117	109	117	106	113
Polar 1	106	102	102	99	118	104	106
Ranger	97	98	97	99	93	97	97
MODERATELY WINTERHARDY							
Pacer	103	103	110	112	115	103	112
Citation	106	103	113	102	112	105	109
Marathon	109	106	106	98	93	108	99
WL 307	101	104	104	102	105	102	104
Apollo	101	98	90	111	—	100	100
Tempo	100	106	92	103	86	103	93
A59	101	104	108	110	101	102	104
WL 310	100	101	101	—	—	101	101
530	101	102	90	96	95	102	94
WL 309	105	104	102	103	110	105	105
WL 311	100	104	104	—	—	102	104
Honeoye	102	102	108	107	—	102	108
Saranac AR	106	102	112	106	—	104	109
WL 318	100	98	107	—	—	99	107
G 777	101	100	97	104	98	100	100
Saranac	101	100	103	105	101	101	103
Thor	103	104	100	104	105	104	103
Vista	105	105	98	102	105	105	102
A57	103	102	94	105	108	103	102
Atlas	99	104	—	—	—	101	—
Warrior	97	103	99	101	82	100	95
131	103	104	104	98	102	103	101
531	101	—	—	—	—	101	—
Olympic	96	92	99	—	—	95	99
WL 219	101	101	—	—	—	101	—
Vanguard	102	95	98	—	—	101	98

Table 2. Winterhardness index and disease resistance of alfalfa varieties eligible for certification

Variety	Developer or owner ¹	Winter hardiness (index) ²	RESISTANT PLANTS ³	
			Bacterial wilt (percent)	Phytophthora root rot (percent)
----- highest value best -----				
VERY WINTERHARDY				
Norseman	Barzen of Minneapolis	7.9	30	4
Ladak	USDA (foreign introduction) ^e	7.5	8	2
Travois	S. Dakota Agr. Exp. Sta. ^p	7.4	37	1
Ramsey	Minnesota Agr. Exp. Sta. & USDA	6.7	37	9
WINTERHARDY				
Baker	Nebraska Agr. Exp. Sta. & USDA ^p	6.5	50	3
Vernal	Wisconsin Agr. Exp. Sta. & USDA ^{eghikpq}	6.5	42	2
Titan	Rudy Patrick Co. ^e	6.4	60	2
Conquest	Pioneer Hi-Bred International Inc. ^l	6.3	21	4
123	DeKalb Ag Research Inc. ^b	6.3	41	3
WL 215	Waterman-Loomis Co. ^h	6.3	36	4
Agate	Minnesota Agr. Exp. Sta. & USDA ^{ehkpa}	6.0	65	43
Iroquois	Cornell University ^a	6.0	61	1
Ladak 65	Montana Agr. Exp. Sta.	6.0	36	2
Nugget	P-A-G ^j	5.9	46	<1
520	Pioneer Hi-Bred International Inc. ^m	5.9	40	1
521	Pioneer Hi-Bred International Inc. ^m	5.9	19	1
524	Pioneer Hi-Bred International Inc. ^m	5.9	24	7
545	Pioneer Hi-Bred International Inc. ^m	5.8	35	25
SX-10	Sexauer Co. ^p	5.7	5	3
Phytor	Northrup, King & Co. ⁱ	5.5	34	24
Valor	Land O'Lakes ^g	5.5	36	2
Weevlchek	Farmers Forage Res. Coop.	5.5	57	2
Anchor	Rudy Patrick Co. ^e	5.4	36	3
Polar 1	Pride Seed Co. ⁿ	5.4	49	8
Ranger	Nebraska Agr. Exp. Sta. & USDA ^{eghk}	5.4	18	2
WL 220	Waterman-Loomis Co.	5.4	49	12
MODERATELY WINTERHARDY				
Pacer	Land O'Lakes ^g	5.3	33	8
Citation	North American Plant Breeders ^h	5.2	45	2
Marathon	Cargill ^a	5.2	36	2
WL 307	Waterman-Loomis Co.	5.2	26	<1
Apollo	North American Plant Breeders ^e	5.1	36	40
Tempo	Farmers Forage Res. Coop.	5.1	26	2
A59	E.F. Mangelsdorf & Bros. Inc. ^o	5.0	16	4
WL 310	Waterman-Loomis Co.	5.0	42	3
530	Pioneer Hi-Bred International Inc. ^m	5.0	38	2
WL 309	Waterman-Loomis Co. ^{hk}	4.7	25	3
WL 311	Waterman-Loomis Co.	4.7	36	2
Honeye	Cornell University	4.6	16	<1
Saranac AR	Cornell University	4.6	29	8
WL 318	Waterman-Loomis Co. ^{hk}	4.6	32	20
G777	Funk Seed Int. ^d	4.5	25	4
Saranac	Cornell University ^{qa}	4.5	49	2
Thor	Northrup, King & Co. ⁱ	4.5	69	1
Vista	Cal/West Seeds	4.5	34	<1
A-57	Embro Seed Co. Inc. ^o	4.4	12	6
Atlas	North American Plant Breeders	4.3	39	3
Warrior	Northrup, King & Co. ⁱ	4.3	20	<1
131	Cal/West Seeds ^b	4.3	10	1
531	Pioneer Hi-Bred International Inc. ^m	4.3	23	3
Olympic	North American Plant Breeders ^c	4.2	39	3
WL 219	Waterman-Loomis Co.	4.2	27	9
Vanguard	North American Plant Breeders ^e	4.1	28	3

¹1979 seed suppliers: a. Cargill Seeds, b. DeKalb, c. Farmland Industries, d. Funk Seeds International, e. Interstate Seed and Grain Co., g. Land O'Lakes, Inc., h. Midland Cooperatives, Inc., i. Northrup, King & Co., j. P-A-G Seeds, k. Peterson Biddick, l. Peterson Forage Seed Div., m. Pioneer Hi-Bred International, Inc., n. Pride Company, Inc., o. Ramy Seed Co., p. The Sexauer Company, q. Twin City Seed Co.

²Based on fall growth after cutting 1st week of September: 1 = tallest (least winterhardy), 9 = shortest.

³Plants with little or no injury are classified as resistant.



Seed producer H. Bloomquist and commercial agronomist R. Hebert inspect a foundation-seed field of annual canarygrass in Kittson County.

ANNUAL CANARYGRASS

Annual canarygrass is grown as a cash grain crop and used for feeding caged and wild birds. Kittson County is the North American production and processing center for the crop.

RECOMMENDED VARIETIES

Alden — Highest yielding variety and 11 percent above best common seed lot. Averaged 1300 pounds/acre in Stephen,

Crookston, and Rosemount trials. 64 days from planting to heading and 106 days to maturity. 34 inches tall. Test weight 47 pounds/bushel and seed weight .7 grams/100 seed. Fair to poor lodging resistance. Large heads with good shattering resistance. Developed cooperatively by Minnesota Agricultural Experiment Station and Minn-Dak Growers Association from PI 251390 from Iran. Released in 1973.

BARLEY

RECOMMENDED VARIETIES

Bonanza — Medium yield. Later maturing than other recommended varieties. Six-row, semi-smooth awn, long rachilla hairs, blue aleurone. Classified as a malting variety by Malting Barley Improvement Association (MBIA). Resistant to stem rust and loose smut. Susceptible to spot blotch. Recommended for northwest counties only. Yielded especially well at Stephen. Developed by Agriculture Canada, Brandon, from a cross involving Vantage, Jet, Vantmore, Parkland, and Conquest. Licensed in 1970.

Manker — High yield. Medium early, good lodging resistance. Kernel plumpness intermediate to high. Six-row, rough-awn, short rachilla hairs, colorless aleurone. Classified as a malting variety by MBIA. Resistant to stem rust and spot blotch, susceptible to loose and covered smut. Developed by Minnesota Agricultural Experiment Station from cross involving Cree, M2, Vantage, Kindred, and Jotun. Released in 1974.

Morex — High yield. Medium maturity and lodging resistance. Kernel plumpness intermediate to high. Six-row, semi-

smooth awn, short rachilla hairs, colorless aleurone. Awns may drop off as crop approaches maturity. Threshes easily. Classified as a malting variety by MBIA. Resistant to stem rust and loose smut. Moderately resistant to spot blotch. Susceptible to bacterial blight. Developed by Minnesota Agricultural Experiment Station from cross of Cree and Bonanza. Released in 1978.

VARIETIES NOT ADEQUATELY TESTED

Glenn — Yield similar to recommended varieties. Good lodging resistance. Six-row, rough-awn, long rachilla hairs, colorless aleurone. Has not been classified as a malting variety by MBIA. Resistant to stem rust, loose and covered smut and spot blotch. Developed by North Dakota Agricultural Experiment Station from crosses involving Br 5755-3, ND B138, and Trophy. Released in 1977.

Park — Yield similar to recommended varieties. Good lodging resistance. Six-row, rough-awn, short rachilla hairs, colorless aleurone. Classified as a malting variety by MBIA. Resistant to stem rust and spot blotch and tolerant to net blotch and

Septoria leaf blotch. Developed by North Dakota Agricultural Experiment Station from crosses involving Dickson, Traill, CI 4738, UM 570, and ND B133. Released in 1977.

OTHER VARIETIES

Beacon — Medium yield, early, good lodging resistance. Six-row, rough-awn, short rachilla hairs, colorless aleurone. Classified as a malting variety by MBIA. Resistant to stem rust, spot blotch, and loose smut. Developed by North Dakota Agricultural Experiment Station from a cross between Conquest and Dickson. Released in 1973.

Conquest — Medium yield, good lodging resistance. Six-row, smooth-awn, long rachilla hairs, blue aleurone. Classified as a malting variety by MBIA. Resistant to loose smut. Developed by Agriculture Canada, Brandon, from crosses involving Vantage, Jet, Vantmore, Br. 4634-4456, UM 570, and Parkland. Released in 1965.

Cree — High yield, medium maturity and lodging. Kernel plumpness low. Six-row, rough-awn, short rachilla hairs, colorless aleurone. Classified as a nonmalting variety by MBIA. Resistant to loose smut, moderately resistant to leaf spot dis-

eases. Developed at Minnesota Agricultural Experiment Station from crosses involving Traill, Br. 5750-2 and Dickson. Released in 1972.

Dickson — Medium-high yield. Medium lodging resistance. Kernel plumpness low. Six-row, rough-awn, short rachilla hairs, colorless aleurone. Classified as a malting variety by MBIA. Susceptible to loose smut, resistant to spot blotch. Developed by North Dakota Agricultural Experiment Station from crosses involving Traill, Kindred, and CI 7117-77. Released in 1964.

Larker — Medium yield. Six-row, semi-smooth awn, long rachilla hairs, colorless aleurone. Excellent kernel plumpness. Classified as a malting variety by MBIA. Susceptible to loose smut and spot blotch. Yield loss from spot blotch may reach 25 bushels per acre. Developed by North Dakota Agricultural Experiment Station from a cross of Traill and a selection from UM 570. Released in 1961.

Nordic — Medium-high yield. Medium lodging resistance. Six-row, rough-awn, short rachilla hairs, colorless aleurone. Classified as a nonmalting variety by MBIA. Resistant to spot blotch and Septoria leaf blotch. Developed by North Dakota Agricultural Experiment Station from crosses of Dickson, CI 4738, Traill, and UM 570. Released in 1971.

Table 3. Yield of barley varieties in bushels per acre, 1973-1978

Variety	Morris 8 ¹	Crookston 9	Stephen 6	St. Paul 7	Lamberton 5	Mean 35
Bonanza	59	72	68	63	67	66
Larker	57	71	63	61	71	64
Manker	60	73	63	67	70	67
Morex	63	76	67	65	77	70
LSD 5%	5	5	5	6	7	2

¹Number of trials.

Table 4. Characteristics of barley varieties (15 trials: 1975, 1977 and 1978)

Variety	Heading (June)	Height (inches)	Lodging (percent)	Protein (percent) ¹	Plump kernels (percent)	Reactions to Disease			
						Bacterial blight ²	Stem rust ³	Loose smut ³	Spot blotch ³
Bonanza	25	35	37	14.0	61	2.2	R	R	S
Larker	23	32	45	13.7	72	2.2	R	S	S
Manker	23	32	23	13.4	69	1.8	R	S	R
Morex	23	33	30	13.4	71	3.3	R	R	MR

¹14 percent moisture. ²Scale of 1 to 5, 1 best. ³R=resistant, MR=moderately resistant, and S=susceptible.

BIRDSFOOT TREFOIL

Birdsfoot trefoil is primarily a pasture legume but also can be harvested for hay. It is suitable on sandy soils of medium to low fertility, but is tolerant to a wide range in soil fertility, acidity, and drainage. It is persistent when grown with bluegrass, but is also suitable with timothy. This highly palatable forage will not cause bloat.

Table 5. Average yields of birdsfoot trefoil varieties expressed as percentage of Empire for all tests in Minnesota 1967-77

Variety	Developer	Yield (percent of Empire)			
		Year after seeding			Average
		1	2	3	
Empire	New York Agr. Exp. Sta. (tons 15% DM hay/acre)	3.1	3.2	3.0	3.1
Leo	Macdonald College, Canada	119	109	112	113
Carroll	Iowa Agr. Exp. Sta.	116	112	106	111
Dawn	Missouri Agr. Exp. Sta.	107	108	107	107
Viking	New York Agr. Exp. Sta.	109	105	95	103
NK (N6-128)	Northrup, King & Co.	100	100	99	100
Maitland	Univ. of Guelph, Canada	116	101	77	98
Winnar	Soil Conservation Serv.	100	86	88	91
Tana	Montana Agr. Exp. Sta.	92	95	74	87
Mansfield	Vermont Agr. Exp. Sta.	27	51	59	59

BROMEGRASS

Bromegrass is generally grown for hay in mixture with alfalfa or is used as pasture in mixture with other grasses and legumes. Present varieties can be classed as southern, intermediate, and northern types. Varieties of the southern type may not be higher yielding, but they are generally less susceptible to leaf diseases and earlier in maturity than northern types. Nearly all tested

varieties are of the southern type and are satisfactory in winter-hardiness. Some stand losses may occur when brome grass is managed under a three-cut system.

The varieties have been evaluated in pure stands. Therefore, performance may be different when a variety is grown in mixtures with other grasses and legumes.

Table 6. Dry matter yields of bromegrass varieties expressed as percentage of Fox at five locations, and average for 1966-1978

Variety	Developer or owner ¹	Crookston	Grand Rapids	Lamberton	Morris	Rosemount	Average
No. of trial years		2	5	1	2	7	
<i>Fox toniacre</i>	Minnesota Agr. Exp. Sta. ^c	3.1	4.7	3.6	3.6	3.8	3.9
Barton	Land O'Lakes-Felco	—	86 ²	—	102 ²	110	105
Baylor	Rudy Patrick Co. ^b	106	94	104	100	105	101
Beacon	F.S. Services, Inc.	—	96 ²	—	93 ²	110	107
Blair	Midland Coop. Inc.	105	93	103	112	104	102
Bromage	Americana Seed Co.	—	98 ²	—	96 ²	103	101
Lincoln	Nebraska Agr. Exp. Sta. ^b	97	91	98	98	96	95
Regro	South Dak. Agr. Exp. Sta. ^a	—	99 ²	—	—	105 ²	102
Sac	Wisconsin Agr. Exp. Sta. ^b	102	93	99	95	106	100
Saratoga	New York Agr. Exp. Sta. ^a	103	102	105	105	101	102
Tempo	Agr. Canada, Ottawa ^a	—	99 ²	—	—	96 ³	97
LSD 5%		15	9	12	11	6	

¹Seed supplies: a. not available or very limited, b. available from several sources, c. Cenex.

²One year. ³Two years.

BUCKWHEAT

Buckwheat is cross-pollinated and very little certified seed is available. Consequently variety designations may not be valid except for the few available certified seedlots. Since 1972, only

Mancan, Pennquad, Tempest, and Tokyo have been certified in the United States. Trials at Elk River and Becker were conducted on infertile sandy soil; drought accounts for the low yields.

W. L. Cook, buckwheat exporter, in a field of the recommended variety, Mancan. Much of Minnesota's buckwheat crop is exported to Japan, and the flour is blended with wheat flour to make noodles.



RECOMMENDED VARIETIES

Mancan — High yield. Large seed. Low test weight but good market acceptability. Selected by Agriculture Canada, Morden, from common buckwheat. Licensed in 1974.

VARIETIES NOT ADEQUATELY TESTED

Giant American — High yield. Large seed. Very low test weight.

OTHER VARIETIES

Common — Seedlots tested under this name ranged from low to high yield. Small or medium seed of high test weight.

Pennquad — Low yield. Very large seed. Low test weight. Good lodging resistance. Tetraploid so fields should probably be isolated from other varieties. Released by Pennsylvania Agricultural Experiment Station in 1966.

Tempest — Low yield. Small seed. High test weight. Poor lodging resistance. Continues bloom later than other varieties. Selected by Agriculture Canada from a Russian seedlot. Licensed in 1971.

Tokyo — Medium yield. Small to medium seed. High test weight. Originated by Agriculture Canada from a Japanese introduction. Released in 1955.

Table 7. Characteristics of buckwheat varieties at Elk River in 1974-75 and at Becker in 1976-78

Variety	Seed yield/acre (pounds)	Test weight/bushel (pounds)	Weight/100 seeds (grams)	Height (inches)	Lodging (score) ¹	Planting to bloom (days)
Mancan	975	42.8	3.1	43	4.3	33
Giant American	985	40.5	3.4	43	4.0	34
LSD 5%	73					

¹1 = erect, 9 = flat.

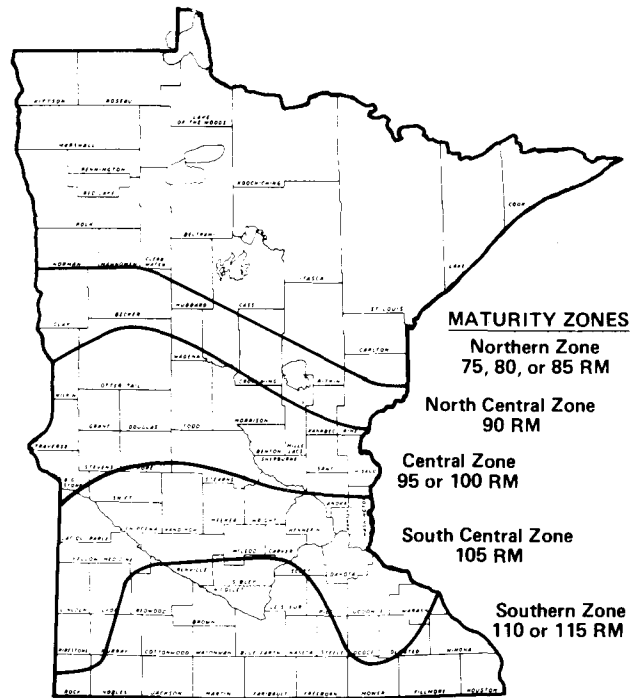
Early maturing, bush navy bean in the foreground contrasts with late maturing, viny UI-114 pinto bean in the background.



CORN

Many corn hybrids are produced by private plant breeders. Information on the performance of these closed-pedigree or private hybrids is usually available from the individuals or companies selling them. The Minnesota Agricultural Experiment Station does not conduct performance trials of private hybrids, but does develop and test open-pedigree or public hybrids. Those public hybrids developed by the Minnesota Agricultural Experiment Station are called Minhybrids. Minhybrids are produced and offered for sale by private growers.

The relative maturity ratings (RM) listed in table 8 correspond to zones of adaptation shown in the accompanying map. Yield and stalk breakage data reported in the table are from replicated, hand-harvested, single row plots. The plant population was approximately 21,000 plants per acre.



MATURITY ZONES

Northern Zone
75, 80, or 85 RM

North Central Zone
90 RM

Central Zone
95 or 100 RM

South Central Zone
105 RM

Southern Zone
110 or 115 RM

Table 8. Performance of corn hybrids, 1975, 77-78 average

Hybrid	Type of cross	Relative maturity	Yield per acre ¹ (bushels)				Broken stalks ² (percent)							
			Crook-ston	Staples	Morris	Rose-mount	Lamber-ton	Waseca	Crook-ston	Staples	Morris	Rose-mount	Lamber-ton	Waseca
Minhybrid 8301	3-way	80	97	114	86 ³	124 ³			6	6	10 ³	8 ³		
Minhybrid 8201	single	80	99	120	80 ³	128 ³			2	6	3 ³	7 ³		
Minhybrid 7301	3-way	90		120	114	143				2	8	5		
Minhybrid 6304	3-way	95			118	141					4	8		
Minhybrid 6301	3-way	95			120	144	116	160			4	5	4	3
Min. 309	3-way	100			119	154	125	158			6	10	4	3
Minhybrid 5301	3-way	105			127 ³	167 ³	130	170			4 ³	6 ³	3	2
Minhybrid 5201	single	105			130 ³	168 ³	129	169			2 ³	14 ³	2	1
Minhybrid 4301	3-way	110					118	161					2	1
Minhybrid 4201	single	110					126	169					3	1
LSD 5%			13	16	12	12	9	17						

¹15.5% moisture basis.

²Below ear.

³1977-1978.

DRY EDIBLE BEAN OR FIELD BEAN

Field bean is combine-harvested as mature dry bean. It is used for human food and reaches the grocer's shelf in either canned or dry form.

There are more than 15 market classes of dry, edible bean, but only eight have been grown commercially in Minnesota. Minnesota's 1977 production amounted to 44 percent navy and 56 percent pinto. Varietal recommendations are confined to varieties within the navy, small white, pinto, dark red kidney, black turtle soup, and great northern classes. Other classes such as pink are grown successfully, but important differences among varieties within their classes have not yet been identified in our trials. The only varieties described in the Other Variety group are those of most current interest and availability that were not tested in 1978.

RECOMMENDED VARIETIES

Aurora small white — Medium yield and maturity. Erect, viny bush. Very small, white seed. Resistant to rust and mosaic V-1, V-15. Tolerant of halo blight. Susceptible to common blight.

Developed by New York Agricultural Experiment Station from a cross of Black Turtle Soup and Cornell 49-242. Released in 1973.

Emerson great northern — High yield. Medium-late maturity. Large, prostrate vine. Large white seed. Tolerant to bacterial wilt and moderately tolerant to bacterial blight. Susceptible to white mold and rust. Developed by Nebraska Agricultural Experiment Station from a cross of GN 1140 and PI 165078. Released in 1971.

Montcalm dark red kidney — Medium yield. Late. Large, erect bush. Very large dark red seed. Resistant to mosaic and tolerant to halo blight. Susceptible to white mold, anthracnose, and common and fuscous blights. Named and released by Michigan Agricultural Experiment Station in 1974.

Seafarer navy — Medium yield. Early. Erect bush. Small white seed. Resistant to anthracnose and mosaic V-1, V-1A, V-15. Tolerant of halo blight. Susceptible to white mold and common and fuscous blights. Developed by Michigan Agricultural Experiment Station from crosses involving X-ray bush mutants, Emerson 847, Michelite, Trag 279-1, and Florida Belle. Released in 1967.

Snow-Bunting navy — Medium yield. Early. Medium-size bush. Small white seed. Reported resistant to common mosaic and root rot. Susceptible to white mold and common and fuscous blights. Developed by Clarence Muehlfeld (Bridgeport, Mich.) from crosses involving Gratiot, Sanilac, Snow-Flake, and experimental navy strains. Released in 1974.

Snow-Flake navy — Medium yield. Early. Small erect bush. Small white seed. Reported resistant to common mosaic and fuscous blight. Susceptible to white mold and common blight. Developed by Clarence Muehlfeld (Bridgeport, Mich.) from crosses involving red kidney, Michelite, and experimental navy strains. Released in 1974.

T39 black turtle soup — Medium yield and maturity. Erect, viny bush. Small, black seed. Resistant to rust. Reported resistant to white mold. Susceptible to anthracnose. Selected from black turtle soup by California Agricultural Experiment Station.

UI-114 pinto — High yield. Late maturity. Large prostrate vine. Tan and brown mottled seed. Resistant to mosaic V-1,

V-1A. Tolerant of halo blight. Susceptible to white mold, rust, and common and fuscous blights. Developed by Idaho Agricultural Experiment Station from a cross of UI-111 pinto and J378 great northern. Released in 1965.

Up-Land navy — Medium yield. Medium maturity. Medium-size bush. Small white seed. Reported resistant to common mosaic and root rot. Susceptible to white mold and common and fuscous blights. Developed by Clarence Muehlfeld (Bridgeport, Mich.) from a cross of Snow-Flake and a navy bean mutation. Released in 1974.

OTHER VARIETIES

Sanilac navy — Medium yield. Medium-late maturity. Developed by Michigan Agricultural Experiment Station from crosses involving a bush mutant (X-ray induced) of Michelite and an anthracnose-resistant line. Released in 1956.

Table 9. Characteristics of field bean varieties

Class and variety	Seed yield/acre (pounds)					Average — 5 locations		
	Becker ¹ 1976-78	Lamberton 1974-78	Morris 1974-75, 77-78	Crookston 1974-78	Rosemount 1974-75	Yield/acre (pounds)	Weight/100 seeds (grams)	Planting to maturity (days)
Pinto								
UI-114	2222	1603	1924	1694	2022	1893	38.3	104
Columbia ²	1659	1667	1616	1236	—	1570	36.2	93
UI-111	1824	1428	1747	1717 ³	1529	1649	36.8	99
Wyo 166 ²	2063	1749	1780	1571	—	1817	37.8	99
Navy								
Seafarer	1290	1325	1016	795	1383	1162	18.7	93
Snow-Bunting	1273	1412	1046	1268	1521	1304	19.3	91
Snow-Flake	1111	1237	968	1078	1267	1132	19.6	91
Up-Land	1330	1412	1182	1296	1359	1316	18.3	96
Bunsi ⁴	1413	1608	1367	1752	—	1561	18.4	96
Fleetwood	1827 ²	1178 ²	1525 ²	1590 ⁴	—	1556	18.0	104
Tuscola	1398	1307 ⁵	1324 ⁵	1328 ²	—	1365	18.4	105
Small White								
Aurora	1796	1465	1427	1563 ²	1574	1565	14.9	101
Great Northern								
Emerson	2173	1781	1822	2190 ⁴	2163	2026	44.9	97
Star	1959	1784 ⁵	1845 ⁵	2358 ⁴	—	2012	36.5	101
Valley	2062	1720	1984	1440 ⁴	1991	1839	33.9	114
Pink								
Viva	1768	1764	1689	1730 ⁴	1807	1752	26.2	103
Dark Red Kidney								
Montcalm	1587	1080	1215	1042 ⁶	1423	1269	46.9	104
Light Red Kidney								
Sacramento ⁴	1489	1376	524	1456	—	1237	51.7	88
Black Turtle Soup								
Black Turtle T39	1832	1702 ⁵	1355 ⁵	1413 ²	—	1601	19.0	99
Cranberry								
Michigan Improved								
Cranberry	1894 ⁷	1103 ⁷	952	543 ⁴	1592	1217	43.6	106
UI-50	1328 ²	870 ²	719 ²	573 ⁴	—	898	47.4	96
Small Red								
UI-37 ⁴	1096	1298	1434	—	—	1277	33.0	86
Miscellaneous								
Adzuki	2389	896 ²	1150 ²	0 ²	1520	1191	14.0	121
LSD 5%	269	157	206	148	252	95		

¹Irrigated. ²Not tested in 1974-76. ³Not tested in 1974. ⁴Not tested in 1974-77.

⁵Not tested in 1974-75. ⁶Not tested in 1976-77. ⁷Not tested in 1976.

DRY EDIBLE PEA AND FIELD PEA

Dry edible pea is sold to processors for use in soup and pigeon feed or fed on the farm to sheep, hogs, or cattle. When used for a forage or feed grain crop, it usually is sown in a mixture with oat.

Varieties with cream-colored seed are most commonly grown. Buyers in Minnesota have not encouraged production of green varieties because of bleaching at harvest time.

RECOMMENDED VARIETIES

Century — High yield. Medium to early. Long vined. Large, cream-colored seed. Good cooking quality. Originated by Agriculture Canada, Ottawa, from crosses involving Chancellor, Early Raymond, and Stirling. Licensed in 1960.

Student T.P. Kupris holds a Century pea vine upright to compare with the short-vined Paloma variety in his left hand.



VARIETIES NOT ADEQUATELY TESTED

CEB 102 — High yield. Early. Very short. Very large, green seed. Developed by Cebeco-Handelsraad of The Netherlands.

Fenn — High yield. Very late. Long vined. Small, dark mottled seed. Not marketable as an edible pea but satisfactory for feed. Selected from Austrian Winter by the Idaho Agricultural Experiment Station. Released in 1971.

Finale — Very high yield. Early. Very short. Very large, green seed. Developed by Cebeco-Handelsraad of The Netherlands.

Garfield — Medium yield. Medium to early. Medium vine length. Medium size, green seed. Selected from PI 244104 at Washington Agricultural Experiment Station. Released in 1976.

Paloma — Very high yield. Early. Very short. Large, cream-colored seed. Developed by Cebeco-Handelsraad of The Netherlands.

Tara — High yield. Medium to early. Medium vine length. Medium size, cream-colored seed. Satisfactory cooking quality. Resistant to powdery mildew. Originated by Agriculture Canada, Morden, from crosses involving Century, Chancellor, and PI 162567. Licensed in 1978.

Tracer — Low yield. Early. Medium vine length. Small, green seed. Selected from Alaska "New Line" at Washington Agricultural Experiment station. Released in 1976.

OTHER VARIETIES

Campbell Scotch — Low yield. Very early. Medium vine length. Medium size, green seed. More resistant to seed bleaching than other green varieties. Selected from crosses involving Alaska, Delwiche Early Scotch, and Thomas Laxton. Released by the Campbell Institute for Agricultural Research of Davis, CA and Camden, NJ in 1971.

Maple — Medium to low yield. Late. Long vined. Large, olive-colored seed with brown mottle and indistinct hilum. An excellent variety for pigeon feed use. Grown under contract when buyers offer a higher price than for recommended varieties.

Trapper — Medium to high yield. Medium to early. Medium vine length. Small, cream-colored seed. Good cooking quality. Originated by Agriculture Canada, Morden, from a cross of Chancellor x Weibull's 700. Licensed in 1970.

Triumph — High yield. Late. Medium vine length. Very large, green seed. Good cooking quality. Selected from PI 206852 by Agriculture Canada, Morden. Licensed in 1973.

Table 10. Characteristics of pea varieties at Becker, 1976-78

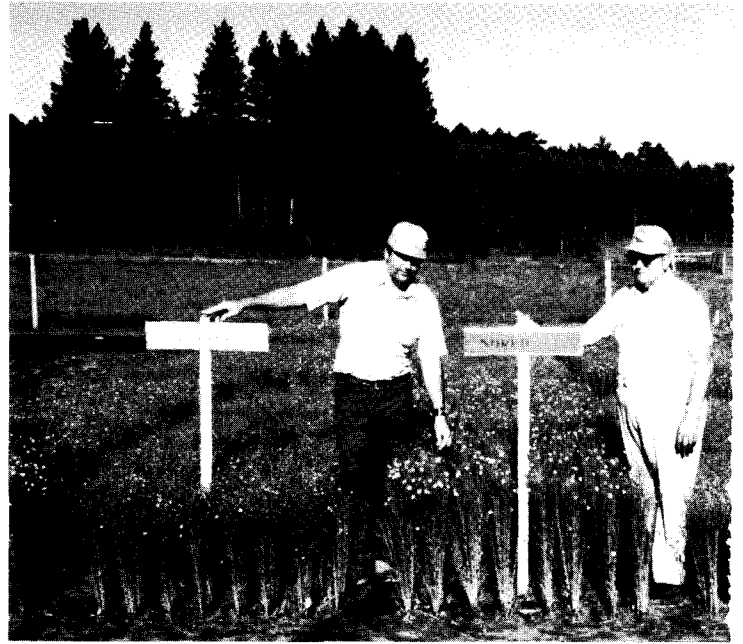
Variety	Seed yield/acre (pounds)			Weight/100 seeds (grams)	Seed protein (percent) ¹	First bloom (date)	Mature (date)	Vine length (inches)
	Dryland	Irrigated	Average					
Century	1331	1834	1583	21.4	26.2	6-6	7-16	34
Campbell Scotch	723	1326	1025	18.8	26.4	5-21	6-27	20
Finale	1405	2690	2048	27.8	26.0	5-31	7-9	11
Paloma	1523	2690	2107	25.7	25.1	6-1	7-8	12
CEB 102 ²	1388	2767	2078	28.4	25.4	6-1	7-9	11
Fenn ²	832	2612	1722	11.3	27.0	6-12	7-27	37
Garfield ³	1140	1807	1474	18.5	27.7	6-2	7-10	31
Maple ²	424	737	581	19.6	28.3	6-15	7-27	46
Tara ²	1201	1870	1536	18.1	26.5	6-5	7-14	29
Tracer ³	863	1487	1175	13.2	24.0	5-26	7-7	27
Trapper ²	1022	1928	1475	12.3	26.3	6-3	7-14	28
LSD 5%	188	246	155					

¹Oven-dry.

²1977-78.

³1978.

Agronomist D. L. Rabas and former Superintendent (deceased) W. Matalamaki of the North Central Experiment Station at Grand Rapids inspect flax varieties on July 20, 1978.



FLAX

RECOMMENDED VARIETIES

Culbert — Very high yield. Early, brown seed, blue flowers. High oil percent and very high iodine value. Resistant to rust, very resistant to wilt, moderately susceptible to pasmo. Released in 1975 by Minnesota Agricultural Experiment Station from a cross of Windom and Bison 70.

Dufferin — High yield when sown early, *not recommended for late sowing*. Very late, brown seed, blue flowers, variable plant height. High oil percent. Resistant to rust and wilt. Licensed in 1975 by Agriculture Canada, Ottawa from a cross of Redwood 65 and FP 441.

Linott — Very high yield. Early, brown seed, blue flowers. High oil percent and iodine value. Resistant to rust (has a trace of susceptible plants), moderately susceptible to wilt and pasmo. Licensed in 1967 by Agriculture Canada, Ottawa, from crosses involving 770B, Argentine C, Arrow, and CI 974.

Norstar — High yield. Medium-late, resistant to lodging, brown seed, blue flowers. High oil percent, medium to low iodine value. Moderately susceptible to rust (exhibits some field tolerance to current races), resistant to wilt, moderately resistant to pasmo. Released in 1969 by Minnesota Agricultural Experiment Station from a cross of Redwood and Crystal.

OTHER VARIETIES

B-5128 — Medium yield but low in yield when sown late. Late, brown seed, blue flowers. Medium oil percent, low iodine value. Susceptible to rust, moderately susceptible to both wilt and pasmo. Contains a mixture of types including a small percentage of yellow-seeded plants and rust-resistant plants. Released in 1943 by North Dakota Agricultural Experiment Station from a cross of Golden and Rio.

Nored — High yield, especially when sown early. Late, brown seed, blue flowers, resistant to lodging. More tolerant of herbicides MCPA and Dalapon than other commercial varieties. High oil percent, medium iodine value. Moderately susceptible to rust (exhibits some field tolerance to current races), resistant to wilt and pasmo. Released in 1968 by Minnesota Agricultural Experiment Station from an irradiated population of a cross of B-5128 and Redson.

Table 11. Yields of flax varieties in bushels per acre, 1975-78

Variety	Early-sown						Late-sown			
	Grand Rapids	Lamberton	Morris	Crookston	Stephen	Average	Lamberton	Morris	Crookston	Average
	1976-78	1975-78	1975, 77-78	1975-78	1976-78	1975-78	1975, 77-78	1975, 77-78	1975	1975, 77-78
Culbert	30	26	29	25	30	28	28	24	12	24
Dufferin	28	25	32	27	31	29	17	21	17	19
Linott	26	25	28	26	30	27	28	24	17	25
Norstar	28	23	30	27	27	27	21	24	15	21
Nored	26	22	29	26	28	26	18	22	19	20
LSD 5%	2	2	2	2	2	1	3	3	5	2

Table 12. Characteristics of flax varieties, 1975-78

Variety	Days from sowing to		Height (inches)	Weight/1000		Lodging (score) ¹	Chlorosis (score) ¹	Wilt (score) ¹	Rust ²	Oil (percent) ³
	First bloom	Full bloom		seeds (grams)						
Culbert	43	50	22	5.5	2.0	4.0	1.1	R	41.7	
Dufferin	49	57	25	5.0	2.6	1.3	2.8	R	41.6	
Linott	42	49	22	4.8	2.5	3.0	6.7	R	41.0	
Norstar	47	54	25	4.8	2.2	1.6	3.6	MS	40.5	
Nored	47	55	26	5.5	2.0	2.6	3.1	S	40.5	

¹1 = best, 9 = poorest. ²R = resistant, MS = moderately resistant, S = susceptible. ³Oven-dry.

GRAIN SORGHUM

Many hybrids are available. Most are too late for Minnesota. Even the earliest hybrids generally require drying after combine-harvest. The hybrids shown in the table may be of acceptable maturity for southern Minnesota, and the earliest hybrids usually are satisfactory for some parts of central Minnesota. Late hybrids usually yield less than early hybrids in years with low temperatures in August or early September.

Trials were planted between May 21 and June 3 at the rate of 150,000 seeds per acre in rows 30 inches apart. Sorghum was harvested when it was dry enough to combine but not dry enough to store without artificial drying. Consequently, these trials do not measure lodging that might occur during natural drying in the field. All hybrids were harvested the same day for relative moisture comparisons. Hybrids in the table are ranked from earliest to latest based on head moisture in September.

Table 13. Characteristics of grain sorghum hybrids at Lamberton, 1977-78

Hybrid and originator	Grain yield/acre (pounds) ¹		Head moisture (percent)		Test weight/ bushel (pounds)	Weight/ 100 seeds (grams)	Planting to heading (days)	Height (inches)
	1977-78	1978	September 19	October 9				
1, Minnesota	4066	4229	24.7	24.9	56.7	2.4	53	56
RS 455, Minnesota	5588	5510	25.6	24.4	57.0	2.7	57	56
P-158GB ² , Pride	—	5033	25.7	23.3	56.5	2.5	60	44
52, Northrup, King	4315	4233	26.2	23.2	56.2	1.9	54	40
R-920, Acco	5399	5531	28.0	23.9	57.2	2.3	60	50
894, Pioneer	5280	5692	28.1	24.0	57.8	2.3	61	42
354 ² , P-A-G	—	5669	28.2	23.0	58.2	2.4	66	46
129, Northrup, King	6111	6428	28.9	23.2	59.8	2.8	62	51
121A ² , Northrup, King	—	6586	30.5	24.1	57.7	2.4	65	46
M51, Trojan	6036	6507	30.6	23.3	59.1	2.6	62	46
8901, Pioneer	5320	5670	30.8	23.7	55.3	2.2	62	46
101, Jacques	6023	6634	30.9	25.4	58.8	2.7	63	47
180, Northrup, King	6027	6401	31.0	23.7	59.2	2.4	65	51
1580, Northrup, King	5755	5864	31.4	24.2	58.7	2.6	64	47
A25a, DeKalb	5668	6024	31.4	24.6	56.6	2.6	61	39
P-508GB ² , Pride	—	6414	31.8	25.2	60.5	2.8	64	48
M54, Trojan	6021	6299	32.0	25.5	59.7	2.5	66	53
4432 ² , P-A-G	—	6348	33.5	29.0	57.3	2.6	73	52
B-38+, DeKalb	6089	6365	34.3	26.0	59.7	2.6	66	46
R-980, Acco	5517	5564	34.4	28.5	60.9	2.4	68	46
202, Jacques	5470	5078	34.9	27.6	59.9	2.3	69	51
A-28+, DeKalb	5666	5828	36.8	26.3	58.1	2.4	63	46
B-35, DeKalb	6026	5710	39.1	31.9	58.3	2.4	71	53
LSD 5%	405	557	3.1	2.3				

¹Oven-dry. ²1978.

MILLET

Three types of millet are adapted in Minnesota: proso, foxtail, and barnyard (Japanese). Proso varieties are grown for grain for bird or livestock feed. Foxtail varieties and Japanese are grown for silage or hay.

RECOMMENDED VARIETIES

FORAGE

Empire — Foxtail. Late. Tall. Poor lodging resistance. Very small, plump yellow seed of medium test weight. Originated by Agriculture Canada.

GRAIN

Cerise — Red proso. Very early. Medium height. Fair lodging resistance. Medium size, orange seed of high test weight. Composite selection from PI 170603 by Nebraska Agricultural Experiment Station. Released in 1974.

Dawn — White proso. Very early. Short. Fair lodging resistance. Large, white seed of medium test weight. Bulk selection from IPm 1108 (PI 260053) by Nebraska Agricultural Experiment Station. Released in 1976.

Minco — White proso. Late. Medium height. Fair lodging resistance. Medium size, white seed of medium test weight. Selected from white proso by Minnesota Agricultural Experiment Station. Released in 1976.

Turghai — Red proso. Very early. Medium height. Good lodging resistance. Medium size, orange seed of high test weight. Introduced from Russia by USDA in 1903.

VARIETIES NOT ADEQUATELY TESTED

Cope — White proso. Very late. Very tall. Fair lodging resistance. Large, white seed of medium test weight. Selected from white proso by Colorado Agricultural Experiment Station. Released in 1978.

OTHER VARIETIES

Barnyard or Japanese — Forage. Late. Very tall. Very good lodging resistance. Medium size, gray seed of low test weight. High yielding forage millet but very coarse.

German, German R, and German No. 8 — Foxtail. Very late. Tall. Good lodging resistance. Very small, yellow seed of low test weight. High forage yield but too late for good seed production.

Manta — Foxtail. Early. Short. Poor lodging resistance. Small, orange seed. Low forage yield. Selection from Manchurian

by South Dakota Agricultural Experiment Station. Released in 1958.

Panhandle — White proso. Early. Medium height. Poor lodging resistance. Large, white seed of medium test weight. Lower yield than Snobird. Selected from white proso by Nebraska Agricultural Experiment Station. Released in 1967.

Snobird — White proso. Early. Medium height. Poor lodging resistance. Large, white seed of medium test weight. Selected from white proso by Minnesota Agricultural Experiment Station. Released in 1973.

Table 14. Characteristics of foxtail millet varieties at Rosemount, 1974-76

Variety	Forage ¹		Seed			Planting to heading (days)	Lodging (score) ²	Height (inches)
	Yield/acre (pounds)	Protein (percent)	Yield/acre (pounds)	Test weight/bushel (pounds)	Weight/100 (grams)			
Empire	9261	7.4	1603	50.5	.19	64	2.9	42
Butte	8264	7.8	1023	43.3	.30	67	1.5	38
White Wonder	8689	7.2	1127	46.5	.24	69	2.0	43
LSD 5%	658		289					

¹Oven-dry.

²1 = erect, 9 = flat.

Table 15. Grain yields of proso millet varieties in pounds per acre

Variety	Rosemount 1974-78	Elk River-Becker 1974-78	Grand Rapids 1976-78	Morris 1977-78	Lamberton 1976-77	Average (5 locations)
Dawn	3379	1779	1558	2354	2543	2323
Minco	3660	1916	1247	2876	1966	2333
Cerise	3122	1906	1427	2807	1974	2247
Turghai	3004	1797	1315	2963	1989	2214
Cope ¹	3141	1738	—	—	—	2154
LSD 5%	250	160	149	277	284	103

¹1978.

Table 16. Characteristics of proso millet varieties, 1974-78

Variety	Planting to heading (days)	Planting to maturity (days)	Lodging (score) ¹	Height (inches)	Weight/100 seeds (grams)	Test weight/bushel (pounds)
Dawn	49	81	3.1	30	.66	52.4
Minco	52	92	3.0	36	.62	52.9
Cerise	49	80	2.7	37	.58	56.4
Turghai	48	81	1.9	37	.56	56.1
Cope ²	58	95	2.5	42	.66	53.1

¹1 = erect, 9 = flat.

²1978.



These proso millet plots on dryland sandy soil at Becker are protected from bird feeding with 1-inch plastic mesh.

OAT

The losses from oat smut in susceptible varieties increased greatly in recent years. Since the disease is primarily seed carried, seed of susceptible varieties should be treated with a chemical to control oat smut.

RECOMMENDED VARIETIES

Lodi — Late, high yield, tall, fair lodging resistance, medium test weight, medium groat percentage and protein content, white seed. Susceptible to crown rust and smut. Selected at Wisconsin Agricultural Experiment Station from a cross involving several lines. Released in 1963.

Lyon — Medium-late maturity, high yield, tall good lodging resistance, high test weight and groat percentage, medium protein content, white seed. Some resistance to crown rust, resistant to smut. Selected at the Minnesota Agricultural Experiment Station from a cross between Lodi and Portage. Released in 1977.

Noble — Early-medium maturity, high yield, medium height, good lodging resistance, high test weight, medium groat percentage, and protein content, yellow seed. Susceptible to crown rust, resistant to smut. Selected at Purdue Agricultural Experiment Station from a cross involving many lines. Released in 1973. Seed sale regulated by U.S. Variety Protection Act.

VARIETIES NOT ADEQUATELY TESTED

Otana — Late, average yield, tall, poor lodging resistance, medium test weight, low groat percentage and protein content, white seed. Susceptible to crown rust and smut. Better performance in northern than in southern Minnesota. Selected at Idaho and Montana Agricultural Experiment Stations from a cross of CI 5345 and Zanster. Released in 1977.

OTHER VARIETIES

Chief — Early-medium maturity, high yield, medium height, good lodging resistance, high test weight and groat percentage, medium protein content, yellow seed. Susceptible to crown rust and smut. Selected at South Dakota Agricultural Experiment Station from a cross between Clintland 64 and Garland. Released in 1972.

Dal — Late, medium yield and height, fair lodging resistance, high test weight, medium groat percentage, high protein content, ivory seed. Resistant to crown rust and smut. Selected at Wisconsin Agricultural Experiment Station from a cross involving Trispermia, Belar and Beedee. Released in 1972. Seed sale regulated by U.S. Variety Protection Act.

Froker — Late, high yield, medium height, fair lodging resistance, high test weight and groat percentage, medium protein content, yellow seed. Susceptible to crown rust and smut. Selected at Wisconsin Agricultural Experiment Station from a cross involving sister lines of Beedee and Garland, and a foreign introduction. Released in 1970.

Garland — Early-medium maturity, medium yield, short, poor lodging resistance, high test weight and groat percentage,

yellow seed. Susceptible to crown rust, resistant to smut. Selected at Wisconsin Agricultural Experiment Station from a cross involving several lines. Released in 1962.

Hudson — Late, high yield, medium height, poor lodging resistance, low test weight, medium groat percentage, low protein content, white seed. Resistant to crown rust, susceptible to smut. Selected by Agriculture Canada, Winnipeg, from a cross involving several lines. Licensed in 1974.

Iowa Early Multiline Blend (E73, E74, and E76) — Early, low yield, medium height, good lodging resistance, high test weight and groat percentage, medium protein content, yellow seed. Heterogeneous crown rust reaction, susceptible to smut. The recurrent parent is CI 7970. Developed at Iowa Agricultural Experiment Station and originally released in 1968.

Iowa Midseason Multiline Blend (M73) — Early-medium maturity, medium yield and height, fair lodging resistance, high test weight and groat percentage, medium protein content, yellow seed. Heterogeneous reaction to crown rust, susceptible to smut. The recurrent parent is CI 7555, a Clintland type. Developed at Iowa Agricultural Experiment Station and originally released in 1968.

Lang — Early, high yield, short, good lodging resistance, high test weight, medium groat percentage, low protein content, yellow seed. Susceptible to crown rust and smut. Selected at Illinois Agricultural Experiment Station from a cross of Tyler and Orbit. Released in 1976.

Otee — Early-medium maturity, high yield, medium height, good lodging resistance, high test weight, medium groat percentage, high protein content, white seed. Susceptible to crown rust and smut, tolerant to red leaf. Selected at Illinois Agricultural Experiment Station from a cross involving several lines. Released in 1973.

Rodney — Late, medium yield, tall, poor lodging resistance, medium test weight, white seed. Some resistance to crown rust, susceptible to smut. Selected by Agriculture Canada, Winnipeg, from a cross involving several lines. Licensed in 1952.

Spear — Early-medium maturity, high yield, medium height, good lodging resistance; medium test weight, groat percentage, and protein content; white seed. Susceptible to crown rust and smut. Selected at South Dakota Agricultural Experiment Station from a cross between Neal and Clintland 64. Released in 1974.

Stout — Early-medium maturity, high yield, short, good lodging resistance, high test weight and groat percentage, medium protein content, white seed. Some resistance to crown rust, susceptible to smut. Selected at Purdue Agricultural Experiment Station from a cross involving many lines. Released in 1973. Seed sale regulated by U.S. Variety Protection Act.

Wright — Late, medium yield and height, poor lodging resistance, high test weight, medium groat percentage and protein content, tan seed. Resistant to crown rust, susceptible to smut. Selected at Wisconsin Agricultural Experiment Station from a Beedee backcross. Released in 1975. Seed sale regulated by U.S. Variety Protection Act.

Table 17. Yield of oat varieties in bushels per acre 1976-78

Variety	Rosemount	Waseca	Lamberton	Crookston	Grand Rapids	Average	Stephen ¹	Morris ²
Lang	87	107	94	106	76	94	117	72
Stout	90	107	89	93	70	90	98 ²	83
Noble	86	100	95	104	79	93	107	66
Chief	90	106	84	85	68	87	92	72
Lyon	89	96	99	107	69	92	103	75
Otana ²	58	85	74	128	78	85	148	61
Lodi	92	89	85	113	73	90	105	82
LSD 5%	7	9	8	7	8	3.6	9	10

¹1977-78.

²1978.



R. L. Thompson, Assistant Director of the Experiment Station, discusses oat varieties with agronomist D. L. Rabas.

Table 18. Characteristics of oat varieties, 1976-78

Variety	Heading (June)	Height (inches)	Lodging (score) ¹	Test weight/bushel (pounds)	Groats (percent)	Protein percent ²		Protein/ acre (pounds)	Reactions to disease ³	
						groat	seed		Crown rust	Smut
Lang	14	32	1.6	38	73	17.0	12.5	372	S	MS
Stout	15	30	1.4	38	75	17.8	13.1	377	MS	S
Noble	15	33	1.6	39	73	18.3	13.3	390	S	R
Chief	16	35	1.7	38	76	19.1	14.2	378	S	S
Lyon	19	40	1.9	38	74	19.0	14.0	412	MS	R
Otana ⁴	20	39	3.2	35	70	17.2	11.9	319	S	MS
Lodi	21	41	2.0	37	72	18.5	13.3	392	S	S

¹1=erect, 5=flat. ²8 percent moisture. ³R=resistant, MS=moderately susceptible, and S = susceptible. ⁴1978.

ORCHARDGRASS

Orchardgrass is used with other grasses in mixtures with legumes because it establishes rapidly and recovers quickly after grazing or harvest. Its chief limitation is lack of winterhardiness, but in areas with reliable snow cover it may persist and remain productive. Orchardgrass should be grown in mixtures with adapted grasses having similar heading characteristics. Heading differences were greater among varieties grown at Rosemount than at Grand Rapids. Early heading varieties and common types tested are generally less satisfactory than those with medium to late heading in mixtures.

The varieties have been evaluated in pure stands. Therefore, performance may be different when a variety is grown in mixtures with other grasses and legumes.

Orchardgrass is affected more by leaf diseases than other forage grasses. Rust will particularly reduce quality and may affect yield and winterhardness of pure orchardgrass stands. Diseases are less serious when orchardgrass is grazed or harvested frequently and when grown in mixtures with other grasses and legumes.

Table 19. Characteristics of orchardgrass varieties with dry matter yields expressed as percentage of Hallmark at three locations, 1971-1978

Variety	Developer or owner ¹	Yield (percent of Hallmark)				Winter injury ²		Rust reaction ³
		Grand Rapids	Morris	Rosemount	Average	Grand Rapids	Rosemount	
No. of trial years		8	3	6				
Early								
Boone	Kentucky Agr. Exp. Sta.	85	—	96	90	—	4.8	MS
Chinook	Agr. Canada, Lethbridge ^a	83	81	85	83	—	4.5	—
Medium								
Able	Farmers Forage Res. Coop. ^c	90	—	94	92	1.0	—	MS
Crown	North American Plant Breeders ^a	—	—	98 ⁴	98	—	—	—
Dart	Land O'Lakes-Felco	103	—	96	100	1.3	—	S
Dayton	Midland Coop. Inc.	93	—	100	96	—	—	S
Frode	Swedish Seed Assoc. ^d	94	89	92	92	—	—	—
Grassage	Americana Seed Co.	100	—	101	100	1.3	—	S
Hallmark								
<i>ton/acre</i>	Farmers Forage Res. Coop. ^e	3.7	3.0	3.9	3.6	1.5	4.8	S
Ina	Ontario Agr. Coll., Guelph ^a	90	—	89	89	—	3.3	MS
Juno	Agr. Canada, Ottawa ^a	100	—	99	100	1.0	—	S
Napier	Rudy Patrick Co. ^b	99	—	98	98	1.5	3.8	MS
Comet	Northrup, King & Co. ^a	98	—	96	97	1.7	2.3	S
Ox-1	North American Plant Breeders ^a	100	—	102 ⁵	100	1.7	—	MS
Sterling	Iowa Agr. Exp. Sta. ^e	98	103	95	97	1.5	4.9	S
Late								
Kay	Agr. Canada, Ottawa ^a	92	—	88	90	3.7	—	S
Majestic	Maple Leaf Mills, Inc. ^a	—	—	91	91	—	—	S
LSD 5%		9	9	9				

¹Seed supplies: a. not available or very limited, b. available from several sources, c. Cenex, d. Northrup, King & Co., e. Land O'Lakes-Felco.

²1 = most damaged, 9 = least damaged, 1977. ³MS = moderately susceptible, S = susceptible.

⁴One year. ⁵Two years.

RED CLOVER

Red clover can be seeded in pure stands or with timothy for hay or silage. It is more easily established in pasture renovation than either alfalfa or trefoil. Historically, winterhardy varieties have not persisted beyond two crop years because of susceptibility to crown rot and other disease. Some of the new varieties may persist for 3 years. Red clover should not be seeded with alfalfa

for hay because red clover seedlings are more aggressive than alfalfa seedlings and may prevent alfalfa from becoming established. Red clover is better adapted to acid soils than alfalfa, but where alfalfa can be grown successfully it will yield more than red clover.

Table 20. Average yields of red clover varieties expressed as percentage of Lakeland for all tests in Minnesota 1966-1978

Variety	Developer or owner ¹	Yield (percent of Lakeland)				Stand 3 years after seeding (percent)
		Year after seeding			Average 1st 2 years	
		1	2	3		
Lakeland	Wisconsin Agr. Exp. Sta. & USDA ^{abcefhij} (tons 15% DM hay/acre)	3.6	3.5	1.8	3.5	55
Arlington	Wisconsin Agr. Exp. Sta. & USDA ^{bceffij}	122	105	100	115	85
Flores	Northrup, King & Co. ^d	130	100	—	117	—
Prosper I	Pride Co. Inc. ^g	116	105	—	112	—
Dollard	Macdonald College, Canada	104	96	97	100	23
Kenstar	Kentucky Agr. Exp. Sta. & USDA	101	100	88	97	63
Redman	Farmers Forage Res. Coop.	96	100	89	97	70
Redland	Illinois Agr. Exp. Sta. ^a	96	92	81	95	55
Kenland	Kentucky Agr. Exp. Sta. & USDA	98	90	68	94	38
Pennscott	Pennsylvania Agr. Exp. Sta.	96	78	0	89	28
Florie	Northrup, King & Co.	85	111	—	95	—
Tensar	Louisiana Agr. Exp. Sta.	56	62	0	59	23

¹1979 seed suppliers: a. Interstate Seed and Grain Co., b. Land O'Lakes, Inc., c. Midland Cooperatives, Inc., d. Northrup, King, and Co., e. Peterson Biddick, f. Peterson Forage Seed Div., g. Pride Company Inc., h. Remy Seed Co., i. The Sexauer Company, j. Twin City Seed Co.

REED CANARYGRASS

Reed canarygrass is adapted throughout Minnesota for use as hay, pasture, or silage. It is one of the best grass species for use on poorly drained soil, in swampy areas, and in areas subject to spring flooding. The species is also well adapted to upland soils. The seedling vigor is not as good as that of other commonly used forage grasses. Reed canarygrass is less palatable than most species seeded for hay and pasture, but cattle will produce well on the grass if it is used before it becomes mature. Satisfac-

tory pasture utilization occurs if the grass is grazed when it is between 6 and 24 inches tall. Harvesting hay between heading and early bloom is preferred, because the quality declines with advanced maturity. The varieties tested are winterhardy and persistent.

The varieties have been evaluated in pure stands. Therefore, performance may be different when a variety is grown in mixtures with other grasses and legumes.

Table 21. Dry matter yields of reed canarygrass varieties expressed as percentage of Rise at four locations and average for 1972-78

Variety	Developer or owner ¹	Lamberton	Grand Rapids	Morris	Rosemount	Average
No. of trial years		2	5	2	8	
<i>Rise tonlacre</i>	Rudy Patrick Co. ^b	2.9	4.5	3.2	4.5	4.2
Castor	Agr. Canada, Beaverlodge ^a	91	94 ²	96	94 ²	94
Flare	Land O'Lakes-Felco	—	100 ²	—	99 ³	99
Frontier	Agr. Canada, Ottawa ^{c, d}	96	103	101	98	100
Vantage	Iowa Agr. Exp. Sta. ^e	96	101	102	102	101
LSD 5%		10	4	5	3	

¹Seed supplies: a. not available or very limited, b. available from several sources, c. Midland Coop. Inc., d. Pioneer Hi-Bred Int., Peterson Forage Seed Div., e. seed sale regulated by U.S. Variety Protection Act. ²Two years. ³Three years.

This research plot harvester driven by D. R. Swanson delivers chopped forage into the mesh bag held by agronomy graduate student, P. R. Carter. The chopped forage is weighed for yield and analyzed for quality.



SOYBEAN

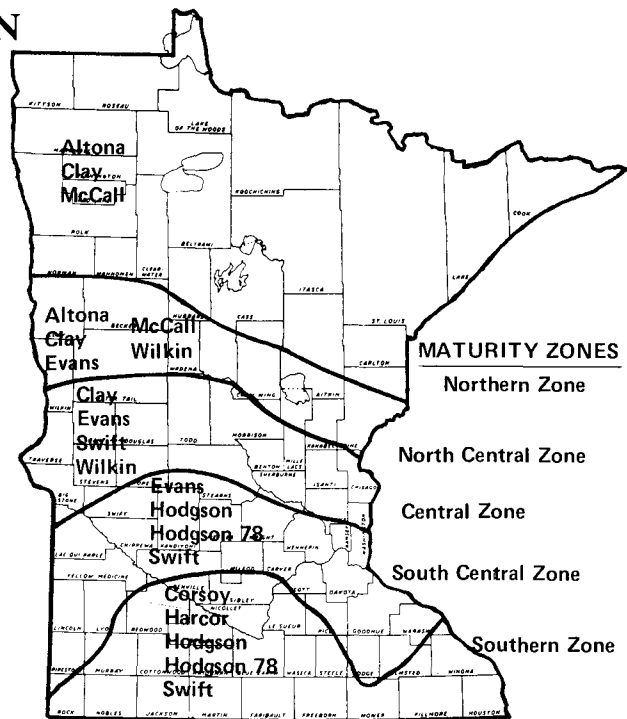
Information on soybean is presented in two sections. The first section deals with varieties that have been developed and released by publicly supported institutions and that are considered for recommendation by the Minnesota Agricultural Experiment Station. The second section deals with privately developed varieties, although several public varieties are included for comparison. These private varieties are not considered for recommendation because only those submitted voluntarily by their owners were tested, and the experiment station does not have adequate long-time data (3 years or more) on many of them.

PUBLICLY DEVELOPED VARIETIES

Yield data reported in table 22 are averages of two or more years. The data for all locations except Grand Rapids are from replicated combine-harvested plots. Data from Grand Rapids are from replicated multiple-row nursery plots. Row spacings at Crookston, Grand Rapids, and Moorhead varied from 22 to 28 inches in various years. At all other locations the spacing was 30 inches. Seeding rate was about 10 viable seeds per foot of row in 30-inch rows and slightly less in narrower row spacings. The majority of the tests were planted from May 5 to May 30. However, at Lamberton and Waseca, certain tests were planted in late April, and others were planted in mid-June.

Varieties are placed in three maturity groupings. Certain transitional varieties appear in more than one grouping. Comparison, other than in mid-June plantings, should be made within groupings. Varying plot locations are usually involved between groupings.

Data on maturity, lodging resistance, plant height, seed size, and seed quality in table 23 are from locations suited to particular maturity groups. Phytophthora reactions were determined by



University of Minnesota's Department of Plant Pathology. Chlorosis scores were obtained from plantings at Crookston and on a high-lime soil near Lamberton. Protein and oil determinations were made on a Neotec GQA 41 Grain Analyzer.

Because of maturity, soybean varieties have a narrow range of adaptation. The accompanying map relates Minnesota production areas to varietal recommendations in the text.

Table 22. Yields of publicly developed soybean varieties in bushels per acre

Variety	Crookston 1973-78	Grand Rapids 1974-78	Moorhead 1974-78	Morris 1977-78	Becker ¹ 1977-78	St. Paul 1977-78	Lamberton			Waseca			Fairmont 1977-78	
							Early planting 1976-78	Mid-May planting 1977-78	Mid-June planting 1977-78	Early planting 1976-78	Mid-May planting 1977-78	Mid-June planting 1977-78		
Early-maturing group														
Fiskeby V		23												
Ada	21	24	20											
Altona	22	25	21											
McCall	24	28	23							34			39	
Clay	25	26	25											
Wilkin	25	28	23											
LSD 5%	2	3	2							2			3	
Medium-maturing group														
Clay			24	27	37	33				33			37	
Wilkin					39									
Evans			26	30	50	39		43	36		49	42	43	
Grande				28	51	36		43			40		40	
Harlon				29	53	36		45			50		47	
Swift				31	52	40		45	36		49	40	46	
Anoka					47									
Steele				28	48	35		42	36		48	39	48	
Hodgson				31	58	39		48	39		54	43	50	
Hodgson 7.8				31	54	40		50			53		49	
LSD 5%				3	4	3		3	2		2	3	4	
Late-maturing group														
Hodgson							40	48			49	53		51
Hodgson 7.8														50

Table 22. continued

Variety	Crookston 1973-78	Grand Rapids 1974-78	Moorhead 1974-78	Morris 1977-78	Becker ¹ 1977-78	St. Paul 1977-78	Lamberton			Waseca			Fairmont 1977-78
							Early planting 1976-78	Mid-May planting 1977-78	Mid-June planting 1977-78	Early planting 1976-78	Mid-May planting 1977-78	Mid-June planting 1977-78	
Coles							38	47		46	54		53
Corsoy							40	46	36	48	56	44	50
Vickery								47			56		50
Harcor							43	47		49	55		51
Wells							37	46	34	47	52	42	50
Amsoy 71													48
LSD 5%							2	3	2	2	2	3	5

¹Irrigated.

RECOMMENDED VARIETIES

Altona — Northern and north central zones. Resistant to phytophthora. Developed at University of Manitoba from a cross of PI 194654 and Flambeau. Released in 1966.

Clay — North central, central, and northern zones. Outstanding in yield and oil content in its maturity class. Rather highly susceptible to phytophthora. Developed at Minnesota Agricultural Experiment Station from a cross of Renville and Capital. Released in 1968.

Corsoy — Southern zone. Outstanding in yield among the later-maturing varieties. Medium resistance to lodging. Occupied a large part of the soybean acreage in southern Minnesota in recent years. Developed at Iowa Agricultural Experiment Station from a cross of Harosoy and Capital. Released in 1967.

Evans — North central, central, and south central zones. Has performed well in southern zone also. Resistant to phytophthora. Developed at Minnesota Agricultural Experiment Station from a cross of Merit and Harosoy. Released in 1974. Seed sale regulated by U.S. Variety Protection Act.

Harcor — Southern zone. Similar to Corsoy in yield but slightly later and lodges more. Resistant to phytophthora. Should be used only in southern half of southern zone, and on heavy soils where phytophthora is a hazard. Developed at Agriculture Canada, Harrow, Ontario from crosses involving Corsoy and Harsoy 63. Licensed in 1975.

Hodgson — South central and southern zones. Outstanding in yield in its maturity class. Good resistance to lodging. Tolerant to high-lime soils. High oil content. Susceptible to phytophthora. Developed at Minnesota Agricultural Experiment Station from crosses involving Corsoy, Lincoln, Richland, and PI 180501. Released in 1974. Seed sale regulated by U.S. Variety Protection Act.

Hodgson 78 — South central and southern zones. Similar to Hodgson, except resistant to phytophthora. Developed at Minnesota Agricultural Experiment Station by a backcrossing procedure involving Hodgson as recurrent parent and Merit as the non-recurrent, phytophthora-resistant parent. Released in 1978. Seed sale regulated by U.S. Variety Protection Act.

McCall — Northern and North Central zones. High yield, tall and good lodging resistance in its maturity class. Developed at Minnesota Agricultural Experiment Station from crosses involving Acme, Chippewa, and Hark. Released in 1978.

Swift — South central, central, and southern zones. Very good tolerance to high-lime soils. Fair resistance to lodging. Susceptible to phytophthora. Developed at Minnesota Agricultural Experiment Station from crosses involving Lincoln, Richland, Capital, and Korean. Released in 1972.

Wilkin — Central and north central zones. Excellent resistance to lodging. Resistant to phytophthora. Good tolerance to

high-lime soils. Developed at Minnesota Agricultural Experiment Station from a cross of Merit x Harosoy. Released in 1972.

VARIETIES NOT ADEQUATELY TESTED

Vickery — Similar to Corsoy except that it is resistant to phytophthora. Developed jointly by the Iowa and Ohio Agricultural Experiment Stations by backcrossing in which Corsoy was the recurrent parent and Mack was the nonrecurrent source of phytophthora resistance. Released in 1978.

OTHER VARIETIES

Ada — Similar to Altona in maturity. Resistant to phytophthora. Developed at Minnesota Agricultural Experiment Station from a cross of Merit and Norman. Released in 1972.

Amsoy — Several days later than Corsoy and has yielded less. Susceptible to phytophthora. Selected at Iowa Agricultural Experiment Station from a cross of Adams and Harosoy. Released in 1965.

Amsoy 71 — Similar to Amsoy, but resistant to phytophthora. Developed by backcrossing at Indiana Agricultural Experiment Station. Released in 1971. Seed sale regulated by U.S. Variety Protection Act.

Anoka — Similar to Chippewa 64 in maturity. Yields more but lodges more than Chippewa 64. High oil content. Large seed. Susceptible to phytophthora rot and very susceptible to chlorosis on high-lime soils. Developed at Minnesota Agricultural Experiment Station from crosses involving Lincoln, Richland, and Korean. Released in 1970.

Chippewa and Chippewa 64 — Chippewa was selected at the U.S. Regional Soybean Laboratory from crosses involving Lincoln and Richland. The phytophthora-resistant Chippewa 64 was developed by backcrosses in which Chippewa was the recurrent parent and Blackhawk was the resistant, non-recurrent parent. Chippewa and Chippewa 64 were very important in Minnesota soybean production for two decades. Recently they have been superseded by higher yielding varieties. Chippewa was released in 1955, Chippewa 64 in 1964.

Coles — Taller, lodges more, and several days later than Hodgson. Susceptible to phytophthora. Developed at Iowa Agricultural Experiment Station from crosses involving Hark, Provar, Magna, and Disoy. Released in 1976.

Fiskeby V — An extremely early maturity variety which was developed by the Holmberg Seed Company of Norrkoping, Sweden. Tolerant of relatively low summer temperatures.

Grande — A large seeded variety which is similar in maturity and yield to Swift. *Of special interest to some of the food industries because of its large seed size and colorless hilum. A market for this variety should probably be negotiated before it is grown.* Susceptible to phytophthora. Relatively low in both oil and protein. Developed at the Minnesota Agricultural Experiment Station from a cross of Anoka and Magna. Released in 1976.

Hark — Slightly earlier than Corsoy and more resistant to lodging. Yields less than Corsoy. Susceptible to phytophthora. Very susceptible to chlorosis on high-lime soils. Developed at Iowa Agricultural Experiment Station from a cross of Hawkeye and Harosoy. Released in 1966.

Harlon — Similar to Evans in yield but several days later and lodges more. Resistant to phytophthora. Developed at Agriculture Canada, Harrow, Ontario from a cross of Blackhawk and Harosoy 63. Licensed in 1975.

Merit — Similar to Evans in maturity, height, and resistance to lodging but yields less. Resistant to phytophthora. Developed by Agriculture Canada from a cross of Blackhawk and Capital. Released in 1959.

Norman — Similar to Ada in maturity, yield, height and lodging. Susceptible to phytophthora. Developed at Minnesota Agricultural Experiment Station from a cross of Acme and Hardome. Released in 1969.

Steele — Similar to Hodgson in maturity but yields less. Resistant to phytophthora. Developed at Minnesota Agricultural Experiment Station from a cross of Blackhawk and Harosoy. Released in 1972.

Wells — Similar in maturity to Corsoy. Yields less than Corsoy, but has greater resistance to lodging. Resistant to phytophthora. Developed at Indiana Agricultural Experiment Station from crosses involving Harosoy, Lincoln, Ogden, and Blackhawk. Released in 1972. Seed sale regulated by U.S. Variety Protection Act.

Table 23. Characteristics of publicly developed soybean varieties

Variety	Mature (September)	Lodging (score) ¹	Height (inches)	Weight/100 seeds (grams)	Seed quality (score) ¹	Protein (percent) ²	Oil (percent) ²	Phytophthora (reaction) ³	Chlorosis (score) ¹	Flower (color) ⁴	Pubescence (color) ⁴	Hilum (color) ⁴
Early-maturing group (average of Crookston and Grand Rapids, 1974-78)												
Fiskeby V	1	1.0	20	15.0	2.2	—	—	S	2.5	P	T	Br
Ada	13	1.9	30	15.6	2.9	41.2	18.1	R	1.4	W	G	Y
Altona	14	1.7	28	17.3	2.9	40.9	17.6	R	2.1	P	T	Bl
McCall	15	1.3	29	14.1	2.6	38.9	19.5	S	1.5	P	G	Y
Clay	19	1.6	27	15.4	2.7	40.5	19.9	S	1.3	P	G	Y
Wilkin	20	1.2	29	13.6	2.6	40.0	18.8	R	1.3	W	G	Y
Medium-maturing group (average of Morris and St. Paul, 1977-78)												
Clay	5	1.6	26	16.8	2.8	40.0	20.8	S	1.0	P	G	Y
Wilkin	6	1.2	28	14.8	2.7	39.6	19.6	R	1.0	W	G	Y
Evans	11	1.6	34	15.6	2.4	39.9	20.0	R	1.2	W	G	Y
Grande	18	2.6	31	20.9	2.9	39.4	16.7	S	1.6	P	T	Y
Harlon	21	2.3	37	16.1	2.2	40.5	18.6	R	1.6	W	G	Y
Swift	19	3.4	36	15.9	2.1	38.8	18.5	S	1.0	W	T	Bl
Steele	24	2.4	36	17.3	2.5	41.8	17.2	R	2.2	P	G	Y
Hodgson	23	2.5	38	16.5	2.2	40.8	18.4	S	1.2	P	G	Bf
Hodgson 78	23	2.8	38	16.0	1.9	40.4	18.1	R	1.2	P	G	Bf
Late-maturing group (average of Lamberton and Waseca, 1977-78)												
Hodgson	18	2.2	38	16.5	2.0	38.9	20.0	S	1.5	P	G	Bf
Hodgson 78	19	2.3	39	17.5	2.0	38.8	20.2	R	1.2	P	G	Bf
Coles	26	3.1	46	19.5	2.2	41.4	18.0	S	2.0	P	G	Y
Corsoy	27	3.2	45	16.9	2.2	40.0	19.0	S	2.2	P	G	Y
Vickery	27	3.3	44	16.6	2.2	40.5	18.6	R	2.8	P	G	Y
Harcor	28	3.3	46	15.8	2.3	40.4	18.2	R	1.5	P	G	Y
Wells	27	2.2	43	17.7	2.3	41.0	19.4	R	2.0	P	G	lb

¹1 = excellent, 5 = very poor. ²Moisture-free; no 1978 data. ³R = resistant, S = susceptible. ⁴Flower color: P = purple, W = white; pubescence color: G = gray, T = tawny; hilum color: Bf = buff, Bl = black, Br = brown, lb = imperfect black, Y = yellow.

PRIVATELY DEVELOPED VARIETIES

A group of varieties considered "early" by the companies submitting them was planted in replicated tests at Becker, Morris, and Rosemount in 1976, 1977, and 1978. A later group was planted at Fairmont, Lamberton, and Waseca in the same years. The Morris and Lamberton tests were not harvested in 1976 because of drought. Irrigation water was applied to the Rosemount test in 1976 and to the Becker test all years.

All tests in all years were planted in four-row plots, 12 feet long with 30-inch spacings between rows. There were three replications at all locations except Becker, where there were four. Eight feet of each of the two interior rows were harvested for yield. Planting dates varied among years, but all trials were planted between May 5 and May 25. Seeding rate in all tests was about 10 viable seeds per foot of row.

Yields of the early group of varieties for 1978 and for 1977-78 periods are given in table 24. Yields of the late group for 1978 and longer periods are given in table 26. The varieties are arranged in two sections with the publicly developed varieties first and the privately developed varieties second. Each section is arranged alphabetically.

Other characteristics for 1978 are given in tables 25 and 27 for the early and late groups, respectively. For several of the characteristics, an average is shown for all locations within a group. The phytophthora reactions are from laboratory tests made by the Department of Plant Pathology.

The companies entering varieties in the 1978 Minnesota tests were: ACCO Seed Co., P.O. Box 9, Belmond, IA 50421; Asgrow Seed Co., 9001 Hickman Rd., Box 1059 — Clive Branch, Des Moines, IA 50053; Dairyland Research International, Inc., RR1, Clinton, WI 53525; Dale Ewing Farm Seeds, Box 322, Jewell, IA 50130; Farmland Industries, Inc., Box 7305, Kansas City, MO

64116: Hofler Seed Co., Box 426, Nora Springs, IA 50458; Jacques Seed Co., Prescott, WI 54021; Kruger Seed Co., R.R. 4, Cedar Falls, IA 50613; Land O'Lakes, Inc., Answer Farm, Webster City, IA 50595; Latham Seed Farm, Alexander, IA 50420; North American Plant Breeders, R.R. 2, Highway 30 East, Ames, IA 50010; Northrup King and Co., Box 49, Wash-

ington, IA 52353; Peterson Soybean Seed Division — Pioneer Hi-Bred International, Inc., 3261 West Airline Highway, Waterloo, IA 50701; Pfizer Genetics, R.R. 1, Box 99, Beaman, IA 50609; Pride Company, Inc., Glen Haven, WI 53810; Schettler Seed Farm, Inc., R.R. 2, Carroll, IA 51401; Soybean Research Foundation, Inc., Box 72, Mason City, IL 62664.

Table 24. Yields of private soybean varieties in bushels per acre, early group, 1978 and 1977-78

Company	Brand and/or variety	Becker ¹		Morris		Rosemount		Average	
		1978	1977-78	1978	1977-78	1978	1977-78	1978	1977-78
	Evans	53	49	48	41	47	44	49	45
	Harlon	47	47	43	39	44	43	45	43
	Hodgson	51	54	48	42	53	49	51	48
	Hodgson 78	53	52	47	41	52	47	51	47
	Swift	49	51	43	39	49	42	47	44
ACCO Seed Co.	Ex. 101	47	48	46	40	49	45	47	44
Asgrow Seed Co.	A1564	50	50	48	41	47	44	48	45
Dairyland Res. Int'l., Inc.	A102	48		45		47		47	
Dairyland Res. Int'l., Inc.	A111	53	52	48	41	47	41	49	45
Dairyland Res. Int'l., Inc.	A141	48		49		46		48	
Dale Ewing Farm Seeds	Nu-Soy 295	51		47		50		49	
Jacques Seed Co.	J94A	44	47	46	39	45	42	45	43
Kruger Seed Co.	DeSoy 222A	54		46		50		50	
N.A. Plant Breeders	Agripro AP10	50	50	40	38	49	46	46	45
Northrup King Co.	Multivar 31	50	51	44	39	47	43	47	44
Pioneer Hi-Bred Int'l., Inc.	Peterson 0877	57	53	44	39	50	49	50	47
Pioneer Hi-Bred Int'l., Inc.	Peterson 1677	52	54	51	41	52	47	52	47
Pioneer Hi-Bred Int'l., Inc.	Peterson118-11	48	52	42	35	50	46	47	44
Pride Co., Inc.	B186	53		48		51		51	
Soybean Res. Foundation	Ex. 69-707-25	53		47		51		50	
LSD 5%		6	4	6	4	4	4	3	2

¹Irrigated.

Table 25. Characteristics of private soybean varieties, early group, average Becker, Morris, and Rosemount, 1978

Company	Brand and/or variety	Mature (September)	Lodging (score) ¹	Height (inches)	Weight/100 seeds (grams)	Phytophthora (reaction) ²	Flower (color) ³	Pubescence (color) ³	Hilum (color) ³
	Evans	15	1.5	35	16.4	R	W	G	Y
	Harlon	20	2.6	37	16.9	R	W	G	Y
	Hodgson	25	2.3	38	16.9	S	P	G	Bf
	Hodgson 78	26	2.8	40	17.4	R	P	G	Bf
	Swift	19	2.9	37	17.8	S	W	T	Bl
ACCO Seed Co.	Acco 101	25	2.8	39	16.8	R	P	G	lb
Asgrow Seed Co.	A1564	26	3.1	40	18.9	R	P	G	Y
Dairyland Res. Int'l., Inc.	A102	22	1.9	39	16.6	S	P	T	Bl
Dairyland Res. Int'l., Inc.	A111	28	2.4	41	17.4	H	P	G	Bf
Dairyland Res. Int'l., Inc.	A141	27	3.1	42	19.4	H	P	T	Br
Dale Ewing Farm Seeds	Nu-Soy 295	25	2.8	39	17.5	H	P	G	M
Jacques Seed Co.	J94A	20	2.7	37	16.3	S	W	T	T
Kruger Seed Co.	De Soy 222A	25	2.8	39	17.5	H	P	G	M
N.A. Plant Breeders	Agripro AP10	27	2.5	38	18.2	R	P	G	Y
Northrup King Co.	Multivar 31	17	2.4	38	17.5	H	M	M	M
Pioneer Hi-Bred Int'l., Inc.	Peterson 0877	17	2.3	36	18.3	H	P	G	M
Pioneer Hi-Bred Int'l., Inc.	Peterson 1677	27	2.4	39	15.6	S	P	G	Y
Pioneer Hi-Bred Int'l., Inc.	Peterson 118-11	26	2.6	37	17.6	H	P	T	Br
Pride Co., Inc.	B186	26	3.1	39	18.1	H	P	T	Br
Soybean Res. Foundation	Ex 69-707-25	19	1.8	36	15.0	S	P	G	Y

¹ 1 = excellent, 5 = very poor. ² H = heterogeneous, R = resistant, S = susceptible. ³ Flower color: P = purple, W = white, M = mixed; pubescence color: G = gray, T = tawny; hilum color: Bf = buff, Bl = black, Br = brown, lb = imperfect black, T = tan, Y = yellow, M = mixed.



The Minnesota Soybean Research and Promotion Council provided money to purchase this two-row combine for research plots. Minnesota farmers contribute 1 cent per bushel to this fund when they sell soybean.

Table 26. Yields of private soybean varieties in bushels per acre, late group, 1978 and period averages

Company	Brand and/or variety	Fairmont			Lamberton ¹			Waseca			Average
		1978	1977-78	1975-78	1978	1977-78	1975-78	1978	1977-78	1975-78	1978
	Corsoy	54	46	47	56	48	44	56	56	52	55
	Vickery	58	47		61	51		59	55		59
	Harcor	53	44	46	54	48	45	57	54	50	55
	Coles	57			58			60			58
	Hodgson 78	49	45		60	50		52	52		54
	Wells	49	44	47	46	42	42	56	55	51	50
ACCO Seed Co.	Acco 101	47	42		54	46		51	49		51
ACCO Seed Co.	Acco 201	52	44		53	48		52	53		52
Asgrow Seed Co.	A1564	54	46		54	46		50	45		53
Asgrow Seed Co.	A2440	52	44	48	57	50	48	53	53	52	54
Asgrow Seed Co.	A2575	53	46		52	48		52	54		52
Asgrow Seed Co.	A2656	58	51		54	50		57	56		56
Dairyland Res. Int'l., Inc.	A141	49	45		53	47		56	52		53
Dairyland Res. Int'l., Inc.	A149	47			54			52			51
Dairyland Res. Int'l., Inc.	A151	52			56			53			54
Dale Ewing Farm Seeds	Nu-Soy 295	55	46		56	49		53	52		55
Dale Ewing Farm Seeds	Nu-Soy 327	52			54			52			53
Dale Ewing Farm Seeds	Exp. 395	53	45		54	54		53	52		53
Dale Ewing Farm Seeds	Nu-Soy 409	52	45		55	46		56	53		54
Dale Ewing Farm Seeds	Exp. 530	51			51			53			52
Farmland Industries, Inc.	Coop 85	47	39		55	46		51	47		51
Farmland Industries, Inc.	Coop 95	54			56			51			54

Table 26. continued

Company	Brand and/or variety	Fairmont			Lamberton ¹			Waseca		Average 1978	
		1978	1977-78	1975-78	1978	1977-78	1975-78	1978	1977-78		1975-78
Hofler Seed Co.	Norsoy	54			60			54			56
Jacques Seed Co.	J98	53	45	47	58	51	46	56	57	52	56
Jacques Seed Co.	J102A	57	46		62	51		58	53		59
Jacques Seed Co.	J103	54			58			59			57
Kruger Seed Co.	DeSoy 222A	51	42	46	57	48	44	55	55	51	54
Kruger Seed Co.	DeSoy 333R	51			57			58			55
Kruger Seed Co.	DeSoy 444	57			54			54			55
Kruger Seed Co.	DeSoy 555R	52	45		54	51		58	55		55
Kruger Seed Co.	DeSoy Exp. 375	59			51			55			55
Land O'Lakes, Inc.	Go 44	54	46	47	57	47	45	56	55	52	56
Land O'Lakes, Inc.	LL 4402	47	40		50	45		50	50		49
Latham Seed Farm	Latham 300	58			61			59			59
Latham Seed Farm	Latham 550	53			53			55			54
N.A. Plant Breeders	Agripro AP10	54	46		55	48		51	50		53
N.A. Plant Breeders	Agripro 14	52	43	48	52	47	45	56	53	51	53
N.A. Plant Breeders	Agripro 18	55	44		55	48		52	52		54
N.A. Plant Breeders	NAPB Exp. 136	54			56			45			52
N.A. Plant Breeders	HP 20-20	58			62			56			59
Northrup King Co.	S1346	58			56			52			55
Northrup King Co.	S1492	59			54			55			56
Pioneer Hi-Bred Int'l., Inc.	Peterson 1677	58	48		59	52		58	58		58
Pioneer Hi-Bred Int'l., Inc.	Peterson 118-11	53	44	46	57	47	44	51	50	47	54
Pioneer Hi-Bred Int'l., Inc.	Peterson 2477	56	50		57	49		57	55		57
Pioneer Hi-Bred Int'l., Inc.	Peterson 3100	52	45	46	54	47	43	55	57	51	54
Pfizer Genetics, Inc.	CX 155	51	45		61	61		57	56		56
Pfizer Genetics, Inc.	CX 175	55	48		57	50		60	57		57
Pfizer Genetics, Inc.	CB 151	55			63			53			57
Pfizer Genetics, Inc.	CB 200	54			62			54			57
Pfizer Genetics, Inc.	CB 244	47			51			49			49
Pride Co., Inc.	B186	52	44	46	54	47	43	51	49	47	52
Pride Co., Inc.	B216	50			54			56			53
Schettler Seed Co.	Ex 51501	53			55			52			53
Schettler Seed Co.	Ex 52630	54			56			58			56
Soybean Res. Foundation	SRF 150P	54	41		51	47		55	53		53
Soybean Res. Foundation	SRF 200	50	44	44	44	42	40	53	53	49	49
Soybean Res. Foundation	Ex 59-707-25	47			56			45			49
LSD 5%		8	5	4	7	5	4	7	5	4	4

¹No data at Lamberton in 1976.

Table 27. Characteristics of private soybean varieties, late group, average Fairmont, Lamberton and Waseca, 1978

Company	Brand and/or variety	Mature (September)	Lodging (score) ¹	Height (inches)	Weight/100 seeds (grams)	Phytophthora (reaction) ²	Flower (color) ³	Pubescence (color) ³	Hilum (color) ³
	Corsoy	21	2.7	41	17.2	S	P	G	Y
	Vickery	22	2.8	42	17.9	R	P	G	Y
	Harcor	22	2.8	40	17.0	R	P	G	Y
	Coles	21	3.1	42	19.7	S	P	G	Y
	Hodgson 78	16	2.1	38	17.1	R	P	G	Bf
	Wells	22	1.9	43	18.3	R	P	G	lb
ACCO Seed Co.	Acco 101	13	2.2	39	16.1	R	P	G	lb
ACCO Seed Co.	Acco 201	20	2.2	39	17.2	H	M	M	M

Table 27. continued

Company	Brand and/or variety	Mature (September)	Lodging (score) ¹	Height (inches)	Weight/100 seeds (grams)	Phytophthora (reaction) ²	Flower (color) ³	Pubescence (color) ³	Hilum (color) ³
Asgrow Seed Co.	A1564	15	2.5	42	17.0	R	P	G	Y
Asgrow Seed Co.	A2440	21	2.6	39	16.7	H	P	G	Y
Asgrow Seed Co.	A2575	24	2.1	42	16.9	R	P	G	Y
Asgrow Seed Co.	A2656	21	3.0	41	15.4	R	P	G	lb
Dairyland Res. Int'l., Inc.	A141	16	1.9	40	18.7	H	P	T	Br
Dairyland Res. Int'l., Inc.	A149	16	2.3	37	18.3	H	W	T	Bl
Dairyland Res. Int'l., Inc.	A151	17	1.9	40	15.0	H	P	G	Bf
Dale Ewing Farm Seeds	Nu-Soy 295	15	2.0	36	16.2	H	P	G	Bf
Dale Ewing Farm Seeds	Nu-Soy 327	21	2.5	39	16.8	H	P	G	Y
Dale Ewing Farm Seeds	Exp. 395	22	3.0	42	18.4	H	P	G	M
Dale Ewing Farm Seeds	Nu-Soy 409	23	2.7	39	15.9	H	P	G	Y
Dale Ewing Farm Seeds	Exp. 530	23	2.6	41	15.9	H	P	G	M
Farmland Industries Inc.	Coop 85	12	2.0	36	16.7	R	P	G	lb.
Farmland Industries Inc.	Coop 95	17	2.2	38	17.6	R	P	M	M
Hofler Seed Co.	Norsoy	23	2.6	40	16.6	H	P	G	Y
Jacques Seed Co.	J98	22	2.4	39	17.1	S	P	G	Y
Jacques Seed Co.	J102A	23	2.7	40	17.4	H	P	G	Y
Jacques Seed Co.	J103	23	2.5	40	16.7	H	P	G	Y
Kruger Seed Co.	DeSoy 222A	13	2.1	35	17.0	H	P	G	Bf
Kruger Seed Co.	DeSoy 333R	24	2.9	41	16.3	H	P	G	Y
Kruger Seed Co.	DeSoy 444	24	3.0	41	18.6	H	P	G	M
Kruger Seed Co.	DeSoy 555R	25	2.7	41	16.7	R	P	G	M
Kruger Seed Co.	DeSoy Exp. 375	23	2.7	40	18.9	H	P	G	Y
Land O'Lakes, Inc.	Go44	22	2.5	40	17.4	S	P	G	Y
Land O'Lakes, Inc.	LL4402	19	1.6	27	18.3	H	P	T	Bl
Latham Seed Farm	Latham 300	19	2.2	37	17.0	H	W	G	Y
Latham Seed Farm	Latham 550	23	2.6	39	17.0	H	P	G	M
N.A. Plant Breeders	Agripro AP10	13	2.1	36	16.0	R	P	G	Y
N.A. Plant Breeders	Agripro 14	18	2.2	38	18.2	H	M	M	M
N.A. Plant Breeders	Agripro 18	21	2.4	39	17.6	H	M	M	M
N.A. Plant Breeders	NAPB Exp. 136	18	2.1	38	16.7	R	W	G	Bf
N.A. Plant Breeders	HP 20-20	20	2.4	38	18.9	H	P	G	Y
Northrup King Co.	S1346	15	1.4	35	18.2	R	P	G	Y
Northrup King Co.	S1492	25	3.3	38	16.4	-	W	G	Bf
Pioneer Hi-Bred Int'l., Inc.	Peterson 1677	15	1.6	37	15.4	S	P	G	Y
Pioneer Hi-Bred Int'l., Inc.	Peterson 118-11	14	2.0	34	16.8	H	P	T	Br
Pioneer Hi-Bred Int'l., Inc.	Peterson 2477	24	2.6	42	17.5	H	P	G	Y
Pioneer Hi-Bred Int'l., Inc.	Peterson 3100	22	2.4	40	18.0	H	P	G	M
Pfizer Genetics, Inc.	CX 155	21	2.4	39	17.3	S	P	G	Y
Pfizer Genetics, Inc.	CX 175	23	2.4	40	17.3	H	P	G	Y
Pfizer Genetics, Inc.	CB 151	20	2.4	40	16.6	H	P	G	M
Pfizer Genetics, Inc.	CB 200	22	2.7	42	16.6	H	P	G	Y
Pfizer Genetics, Inc.	CB 244	24	2.7	40	17.7	R	P	G	M
Pride Co., Inc.	B186	13	2.2	37	16.9	H	P	T	Br
Pride Co., Inc.	B216	24	3.2	38	16.4	H	W	G	Y
Schettler Seed Co.	Ex 51501	12	1.6	34	16.1	R	W	G	Y
Schettler Seed Co.	Ex 52630	25	3.1	38	16.8	H	M	M	M
Soybean Res. Foundation	SRF 150P	21	2.8	41	15.6	R	P	G	Y
Soybean Res. Foundation	SRF 200	23	2.4	43	15.6	R	P	G	Y
Soybean Res. Foundation	Ex 69-707-25	10	1.4	33	14.2	S	P	G	Y

¹1 = excellent, 5 = very poor. ²H = heterogeneous, R = resistant, S = susceptible. ³Flower color: P = purple, W = white, M = mixed; pubescence color: G = gray, T = tawny, M = mixed; hilum color: Bf = buff, Bl = black, Br = brown, Gr = gray, lb = imperfect black, Y = yellow, M = mixed.

Big White sunflower variety averaged 10 feet tall in contrast to the 6-foot height of the other 65 varieties tested in 1978.



SUNFLOWER

The oilseed varieties in table 28 are grown for oil and protein-feed extraction. The nonoilseed varieties in table 29 are grown for use as nutmeats, salted whole seed, or birdfeed. Both types of sunflower were grown in the same trials, so varieties in both tables can be compared.

Peredovik and Sputnik are nonhybrid oilseed varieties, and RC 6 and Big White are nonhybrid nonoilseed varieties. All other varieties in the tables are hybrids produced by the cytoplasmic male-sterility and genetic fertility-restoration method. All of the USDA and most of the private hybrids are resistant to downy mildew fungi and resistant or moderately resistant to rust fungi.

All of the USDA oilseed and a majority of the private oilseed hybrids are resistant or moderately resistant to *Verticillium*, but most of the nonoilseed hybrids are susceptible to *Verticillium*. All varieties are susceptible to stem and head rots caused by *Sclerotinia*.

Row widths in these trials were 30 inches, and plant populations were about 20,000 plants per acre for all varieties.

Varieties of high self-compatibility are more likely to produce high yields than are varieties of low self-compatibility if there is a shortage of insect pollinators.

Table 28. Characteristics of oilseed sunflower varieties, 1976-78

Variety and originator	Seed yield/acre (pounds)					Averages — Crookston, Morris, Rosemount, Lambertton				
	Crookston 1976-78	Morris 1977-78	Lamberton 1978	Average ¹		Oil (percent) ²	Test weight/ bushel pounds	Weight/ 100 seeds (grams)	Planting to bloom (days)	Self compatibility (percent) ³
				6 trials	1978					
241, USDA	2547	2438	2717	2539	2601	46.5	34.6	5.2	72	77
891, USDA	1997	2209	2346	2126	2258	47.6	34.9	4.9	73	49
893, USDA	2259	2384	2482	2338	2522	47.9	35.1	4.8	71	71
894, USDA	2296	2182	2321	2262	2346	45.8	34.0	4.4	70	97
897, USDA ⁴	2469	2394	2115	2385	2378	47.1	34.0	4.6	70	56
898, USDA ⁴	2126	2320	2222	2207	2274	47.8	34.7	4.9	72	49
903, USDA	2374	2517	2598	2459	2484	45.5	34.1	5.4	70	56
908, USDA ⁵	1662	2474	2185	2020	2115	46.5	33.8	5.3	71	41
993, USDA ⁴	2157	2343	2533	2282	2396	47.4	34.8	4.8	72	63
994, USDA ⁴	2509	2195	2140	2343	2333	44.9	33.5	4.2	71	65
8903, USDA	2043	2510	2310	2243	2309	46.4	34.8	5.2	71	41
8907, USDA ⁴	2356	2527	2630	2459	2556	45.0	33.6	4.8	71	73
8944, USDA	2087	2438	2578	2286	2435	44.9	34.8	5.0	69	67
204, Cargill	2031	2331	2145	2150	2236	45.4	33.5	4.4	71	100
205, Cargill ⁴	2420	2358	1885	2310	2273	47.1	33.4	4.7	69	67
DO 704, Dahlgren ⁴	2538	2577	2512	2547	2594	45.5	32.4	5.2	70	58
DO 714, Dahlgren ⁵	2151	2305	2593	2276	2486	41.7	32.4	5.6	69	29
DO 844, Dahlgren ⁴	2617	2330	2510	2503	2537	44.0	33.4	5.0	6.8	67
Sun-Gro 372A, G.S.A. ⁵	2237	2533	2769	2424	2584	47.2	33.2	4.9	75	100
Sun-Gro 380A, G.S.A. ⁴	2134	2483	2416	2297	2396	49.2	36.1	4.7	75	84
7775, Interstate ⁴	2426	2590	3036	2582	2736	44.3	33.7	5.0	71	70
J401, Jacques ⁴	2388	2635	2688	2520	2622	43.9	32.5	5.9	68	78

Table 28. continued

Variety and originator	Seed yield/acre (pounds)					Averages — Crookston, Morris, Rosemount, Lamberton				
	Crookston	Morris	Lamberton	Average ¹		Oil	Test weight/ bushel	Weight/ 100 seeds	Planting to bloom	Self compatibility
	1976-78	1977-78	1978	6 trials	1978					
J501A, Jacques ⁴	2378	2406	2296	2374	2412	45.9	33.2	4.4	70	93
J701A, Jacques ⁴	1724	2229	2497	2021	2202	48.2	35.0	5.0	72	99
Hy-Sun 101, Farm Bureau ⁴	2466	2685	2706	2579	2671	42.5	31.9	5.7	69	100
Sunbred 212, NK	2046	2522	2609	2298	2366	46.6	35.2	5.7	70	73
Sunbred 254, NK	2269	2330	2588	2342	2479	45.3	33.1	4.2	71	67
Sunbred 265, NK ⁴	2244	2360	2678	2355	2479	46.9	33.8	5.3	71	66
Sun-Hi 108, P.O.I. ⁴	1868	2566	2212	2158	2267	46.6	33.8	5.5	69	19
Sun-Hi 301A, P.O.I. ⁵	2021	2470	1919	2154	2121	48.2	35.4	4.8	72	40
Sun-Hi 304, P.O.I.	2167	2089	2195	2146	2301	45.4	33.9	4.3	71	67
Sun-Hi 304A, P.O.I. ⁵	1966	2234	2135	2083	2164	46.8	34.6	4.3	72	75
Sun-Hi 325, P.O.I. ⁴	2179	2307	2653	2301	2431	45.8	35.4	5.0	70	61
Sun-Hi 345, P.O.I. ⁴	1605	2291	2334	1955	2128	48.0	35.1	5.3	72	44
Big Top 10, Rob-See ⁴	2084	2263	2235	2169	2246	45.7	33.7	4.3	71	58
Big Top 20, Rob-See ⁴	2284	2289	2709	2356	2479	44.7	33.4	4.7	71	84
Big Top 30, Rob-See ⁴	1762	2285	2479	2056	2227	46.6	34.7	5.0	72	47
Gold 2, RBA ⁴	1916	2219	2566	2125	2285	45.2	31.8	5.6	70	73
Gold Rush, RBA ⁴	1909	2487	2674	2229	2408	43.6	32.8	5.6	69	64
Mr. Gold, RBA ⁴	2253	2408	2499	2346	2438	41.9	31.8	5.6	69	37
Oilmaster X, RBA ⁴	2379	2540	2666	2480	2580	42.4	31.8	5.7	69	32
430, Sigco ⁴	1992	2345	2562	2205	2351	46.7	31.9	4.6	70	42
440, Sigco ⁴	2253	2487	2450	2364	2448	44.5	33.2	5.2	69	39
448, Sigco ⁴	2005	2203	2613	2172	2325	50.5	35.5	4.7	71	84
449, Sigco ⁴	2338	2453	2302	2370	2416	43.8	33.2	5.1	71	86
894A, Sigco ⁴	2303	2251	2318	2288	2342	46.3	34.2	4.3	70	89
Peredovik, U.S.S.R.	1731	2051	2059	1892	1984	44.6	30.3	6.3	72	9
Sputnik, U.S.S.R.	1964	2147	2553	2123	2216	48.4	32.0	6.1	72	15
LSD 5%	304	289	456	207	243					22

¹ Crookston, Morris, Lamberton. ² Oven-dry. ³ 100 times yield of self-pollinated plants (covered with bags) divided by yield of cross-pollinated plants (no bags) at Rosemount, 1976-78. The bags per se often reduce yield. Consequently, these percentages may be low and should be used for comparing varieties and not as absolute values. ⁴ 1 year. ⁵ 2 years.

Table 29. Characteristics of nonoilseed sunflower varieties, 1976-78

Variety and originator	Seed yield/acre (pounds)					Average-Crookston, Morris, Rosemount, Lamberton				
	Crookston	Morris	Lamberton	Average ¹		Large seed	Test weight/ bushel	Weight/ 100 seeds	Planting to bloom	Self compatibility
	1976-78	1977-78	1978	6 trials	1978					
853, USDA ⁴	1801	2308	2090	2018	2117	10	29.0	9.8	68	61
863, USDA ⁴	1692	2184	1881	1887	1876	7	28.4	9.0	71	81
883, USDA	1823	2201	2355	2038	2214	2	26.9	9.2	68	51
923, USDA	2087	2454	1489	2110	1885	17	25.5	9.6	71	100
924, USDA ⁴	2631	2410	2795	2585	2709	30	26.9	11.1	69	80
RC 6, Agway	1827	1868	1939	1859	1916	9	25.9	9.7	72	60
RH 371, Agway ⁵	1962	2207	2322	2104	2215	4	28.1	9.1	70	49
RH 372, Agway ⁵	1986	2120	2040	2040	2100	7	27.6	9.4	72	44
RH 381, Agway ⁵	1963	2148	2330	2086	2199	6	27.7	9.3	70	16
RH 391, Agway ⁵	2109	2313	2342	2216	2306	5	28.1	10.1	72	60
D-715, Dahlgren	2395	2304	2907	2450	2633	5	27.7	9.7	70	47
D-717, Dahlgren ⁴	2499	2547	2099	2448	2338	7	27.4	9.3	70	63
D-818, Dahlgren ⁵	2082	2337	2819	2290	2464	1	28.1	8.8	67	26
D-823, Dahlgren ⁵	1940	2441	2418	2187	2318	3	28.7	9.4	71	30
Big White, D'Arcy ⁵	304	902	2032	791	1131	3	27.8	8.6	90	-
940, Sigco ⁵	2211	2635	2657	2427	2553	8	27.3	9.1	69	72
945, Sigco ⁵	2222	2668	2752	2459	2599	15	27.4	9.8	67	53
LSD 5%	304	289	456	207	243					22

¹ Crookston, Morris, Lamberton. ² Held on a 20/64 round-hole screen. ³ 100 times yield of self-pollinated plants (covered with bags) divided by yield of cross-pollinated plants (no bags) at Rosemount, 1976-78. The bags per se often reduce yield. Consequently, these percentages may be low and should be used for comparing varieties and not as absolute values. ⁴ 2 years. ⁵ 1 year.

TALL FESCUE

Tall fescue is a relatively new forage grass in Minnesota. It may be tried in mixtures with other grasses and legumes. It establishes rapidly, withstands trampling, tolerates summer drought, and produces fall season pasture when other grasses become dormant. This bunchgrass is subject to winter injury, but may persist and remain productive in areas with reliable snow cover.

Several European varieties were winterkilled or severely injured at Rosemount following the 1976-77 winter, when compared with the more winterhardy varieties of U.S. origin. The varieties have been evaluated in pure stands. Therefore, performance may be different when a variety is grown in mixtures with other grasses and legumes. Under these conditions, diseases are less serious, particularly when grazed or harvested frequently.

Table 30. Dry matter yields of tall fescue varieties expressed as percentage of Ky-31 at two locations and average for 1973-78

Variety	Developer or owner ¹	Grand Rapids		Rosemount		Average	Winter injury ² Rosemount	
		No. of trials	years	3	3	1	7	1
<i>Ky-31 toniacre</i>	Ky. Agr. Exp. Sta. & USDA ^b			4.3	5.4	2.0	4.4	6.9
Aronde	J. Joorden, Vento-Blerick, Netherlands ^a			100	100	92	100	2.8
Clarine	I.N.R.A., Paris, France ^a			—	—	99	99	1.7
Festal	D.J. van der Have, Netherlands ^a			—	—	83	83	3.3
Kenhy	Ky. Agr. Exp. Sta. & USDA ^a			100	102	99	101	7.0
Ludelle	I.N.R.A., Paris, France ^a			—	—	81	81	3.3
Ludion	I.N.R.A., Paris, France ^a			—	—	95	95	3.5
Manade	Vilmorin-Andrieux, France ^a			—	77	91	81	3.3
MO-96	Mo. Agr. Exp. Sta. ^a			—	—	85	85	3.5
S-170	Nat'l. Seed Dev. Org., Cambridge, U.K. ^a			—	89	—	89	3.6
LSD 5%				6	4	12		

¹ Seed supplies: ^anot available or very limited, ^bavailable from several sources.

² 1 = most damaged, 9 = least damaged, 1977.

TIMOTHY

Timothy is adapted throughout Minnesota for use in hay and pasture mixtures. When timothy is the major component in hay, its stage of maturity affects yield and quality. Harvesting at early bloom stage is preferred to later harvesting. Because timothy varieties differ in maturity, care should be taken in choosing varieties that will fit the management of the crop. Only very early

varieties are adapted to a three-cut system with alfalfa. Varieties of medium and medium-late maturity should not be harvested more than twice during the growing season.

The varieties have been evaluated in pure stands. Therefore, performance may be different when a variety is grown in mixtures with other grasses and legumes.

Table 31. Dry matter yields of timothy varieties expressed as percentage of Itasca at three locations and average for 1965-78

Variety	Developer or owner ¹	Grand Rapids	Morris	Rosemount	Average
		No. of trial years	9	3	7
Very early					
Clair	Kentucky Agr. Exp. Sta.	101	101	102	101
Medium-early					
Basho	Agr. Canada, Ottawa ^a	89 ²	—	99 ³	95
Champlain	New York Agr. Exp. Sta. ^a	88	—	83 ²	87
Champ	Agr. Canada, Ottawa ^a	94	—	101 ²	96
Timfor	Northrup, King & Co.	96 ²	—	102	100
Toro	Institute le Colture Foraggere, Milano, Italy ^a	98 ²	—	98 ²	98
Medium					
Bounty	Agr. Canada, Ottawa ^a	—	—	92 ²	92
Climax	Agr. Canada, Ottawa ^b	92	100	97	95
<i>Itasca toniacre</i>	Minnesota Agr. Exp. Sta. ^b	3.9	3.7	3.2	3.6
Milton	Macdonald Coll., Quebec ^a	97 ²	—	97 ²	97
Pronto	Pride Seed Co.	97 ²	—	97	97
Medium-late					
Lorain	Ohio Agr. Exp. Sta. & USDA ^a	92 ²	91	99	96
Verdant	Wisconsin Agr. Exp. Sta. & USDA ^b	94	87	98 ³	94
LSD 5%		4	10	5	

¹ Seed supplies: ^anot available or very limited, ^bavailable from several sources.

² Three years.

³ Four years.



Planting four-row plots of small grain varieties on a cold day in April.

DURUM WHEAT

RECOMMENDED VARIETIES

Cando — Awned early semidwarf with good lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. High yield, medium test weight, and low seed weight. Satisfactory quality for semolina products. Selected from crosses involving Lakota, Willet 'sib' Norin 10/Brevor, Langdon, Leeds, and Wells. Released by the North Dakota Agricultural Experiment Station in 1975.

Crosby — Awned, early, medium height and lodging resistance. Resistant to leaf and stem rust. High yield and medium test weight with large seed. Satisfactory quality for semolina products. Selected from crosses involving Langdon, ST 464, and Leeds. Released by North Dakota Agricultural Experiment Station in 1973.

Rugby — Awned, early, medium height with good lodging resistance. Resistant to stem and leaf rust. High yield and medium test weight with large seed. Satisfactory quality for semolina products. Selected from crosses involving Heiti, Stewart, Carleton, Mindum, and Nugget. Released by North Dakota Agricultural Experiment Station in 1973.

Ward — Awned, early, medium height and lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. High yield, medium test weight, and seed weight. Satisfactory quality for semolina products. Selected from crosses involving Langdon, Leeds, and Wells. Released by North Dakota Agricultural Experiment Station in 1972.

VARIETIES NOT ADEQUATELY TESTED

Calvin — Awned, early to midseason, semidwarf with good lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. High yield, high test weight, and medium seed weight. Satisfactory quality for semolina products. Selected from crosses involving Leeds and 61130. Released by the North Dakota Agricultural Experiment Station in 1978.

Edmore — Awned, early, tall with medium lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. High yield, medium test weight and large seed. Satisfactory quality for semolina products. Selected from crosses involving 561, Cappelli, Leeds, 62220, and 61130. Released by the North Dakota Agricultural Experiment Station in 1978.

OTHER VARIETIES

Botno — Awned, early, medium height, and good lodging resistance. Resistant to stem rust, but moderately susceptible to leaf rust. Medium yield and high test weight with large seed. Satisfactory quality for semolina products. Selected from crosses involving Heiti, Stewart, Carleton, Mindum, and Nugget. Released by North Dakota Agricultural Experiment Station in 1973.

Coulter — Awned, early, medium height and lodging resistance. Resistant to stem rust but moderately resistant to leaf rust. High yield and low test weight. Lower quality than Cando. Licensed in Canada in 1976.

Leeds — Awned, early, medium height and lodging resistance. Moderately resistant to leaf rust, resistant to stem rust and loose smut. Medium yield and very high test weight with large seed. Satisfactory quality for semolina products. Selected from

crosses involving Br. 180 and Wells. Released by North Dakota Agricultural Experiment Station in 1966.

Mindum — Awned and amber-kerneled. Resistant to bunt, leaf rust, and loose smut; susceptible to scab and stem rust. Susceptible to lodging. Low yield and medium test weight. Excellent for semolina products. A durum type selected from a bread wheat field. Released by Minnesota Agricultural Experiment Station in 1917.

Rolette — Awned, early, medium height, and good lodging resistance. Resistant to stem rust, moderately susceptible to leaf

rust. High yield and high test weight. Satisfactory quality for semolina products. Selected from crosses involving Ld. 393, Langdon, Ld. 398, Ld. 357, and St. 464. Released by North Dakota Agricultural Experiment Station in 1971.

Wells — Awned, early, medium height and lodging resistance. Moderately resistant to leaf rust; resistant to stem rust, bunt, and loose smut. High yield, medium test weight and small seed size. Satisfactory quality for semolina products. Selected from crosses involving Sentry, Ld. 379, and Ld. 357. Released by North Dakota Agricultural Experiment Station in 1960.

Table 32. Characteristics of durum wheat varieties, 1976-78

Variety	Heading (June)	Height (inches)	Lodging (score) ¹	Rust reaction ²		Weight/ 1000 seeds (grams) ³	Test weight/ bushel (pounds)	Yield/acre (bushels)			
				Leaf	Stem			Morris	Crookston ⁴	Stephen	Average ⁵
Cando	27	29	1.6	MS	R	37	60.4	32	59	67	46
Crosby	25	38	3.0	R	R	40	61.0	39	53	60	46
Rugby	26	38	2.3	R	R	39	61.1	34	54	65	44
Ward	26	39	1.9	MS	R	40	61.1	34	53	65	44
Botno	24	37	2.5	MR	R	41	61.5	34	50	62	42
Calvin	26	27	1.6	MS	R	38	61.0	32	49	—	41
Coulter	26	37	3.0	S-MS	R	38	60.1	33	55	—	44
Edmore	25	37	3.0	MS	R	38	61.0	32	49	—	41
Mindum	28	45	4.9	S	S	39	61.0	31	43	60	37
Rolette	25	36	3.2	MS	R	41	61.8	33	51	62	42
LSD 5%								4	10	4	4

¹ 1 = erect, 9 = flat.

² Reaction to prevalent races: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible.

³ 1975-1977.

⁴ 1977-1978.

⁵ Stephen not included in average.

HARD RED SPRING WHEAT

RECOMMENDED VARIETIES

Angus — Awned, bronze chaff, medium maturity semidwarf with good lodging resistance. Resistant to stem and leaf rust. Tolerant of ergot but susceptible to loose smut and bacterial leaf blight. Medium yield and high test weight. Susceptible to shattering. Milling and baking characteristics are satisfactory. Protein content and bake absorption are lower than Chris, but better than Era. Selected from crosses involving Frontana, Thatcher, Mida, Kenya 117A, Kenya 58, Lee, Newthatch, Pembina, and Polk 'sib.' Released by Minnesota Agricultural Experiment Station and USDA, SEA-AR in 1978.

Era — Awned, midseason to late semidwarf with good lodging resistance. Resistant to stem and leaf rust. Tolerant of Septoria, bunt, loose smut, and ergot. Very high yield and high test weight. Milling characteristics are satisfactory. Protein content and bake absorption are low. Selected from crosses involving Frontana, Thatcher, Mida, Kenya 117A, Kenya 58, Lee, Newthatch, Pembina, and Polk "sib." Released by Minnesota Agricultural Experiment Station in 1970.

Kitt — Awned, midseason to late semidwarf with good lodging resistance. Resistant to stem rust and has broader spectrum of resistance to leaf rust than Chris and Era. Tolerant of black chaff, bacterial leaf blight, and ergot, but susceptible to loose smut. High yield and medium to low test weight. Susceptible to shattering. Milling and baking characteristics are satisfactory. Protein content and bake absorption are lower than Chris, but better than Era. Selected from crosses involving Frontana, Thatcher, Mida, Kenya 117A, Kenya 58, Lee, Newthatch, Pembina, and Polk "sib." Released by Minnesota Agricultural Experiment Station and ARS-USDA in 1975.

Olaf — Awned, semidwarf, medium maturity with good lodging resistance. Resistant to stem and leaf rust but susceptible to loose smut. Medium yield and test weight. Susceptible to shattering. Protein content and bake absorption are lower than Chris, but better than Era. Tendency to have long dough mixing requirements. Selected from crosses involving Conley, Justin and Waldron. Released by North Dakota Agricultural Experiment Station in 1973.

Wared — Awned, midseason to late semidwarf with good lodging resistance. Resistant to stem and leaf rust. Tolerant of Septoria, bunt, loose smut, and ergot. High yield and high test weight. Milling and baking characteristics are slightly higher than Era but are lower than Kitt. Selected from crosses involving Frontana, Thatcher, Mida, Kenya 117A, Kenya 58, Lee, Newthatch, Pembina, and Polk 'sib' at the Minnesota Agricultural Experiment Station. Released by the Washington Agricultural Experiment Station and ARS-USDA in 1974.

VARIETIES NOT ADEQUATELY TESTED

Eureka — Awned, medium height and maturity. Fair resistance to lodging. Resistant to stem rust and moderately resistant to leaf rust. Low yield and test weight. Selected from crosses involving Era, Corre camino, Ciano 67, and Sonora 64. Released by South Dakota Agricultural Experiment Station in 1978.

Solar — Awned, midseason to late semidwarf with good lodging resistance. Resistant to stem and leaf rust. High yield and test weight. Reported to be satisfactory in milling but low in protein and bake absorption. Selected from crosses involving Sonora 64 and Tezanos Pintos Precoz. Released by Northrup, King & Co. in 1977. Seed sale regulated by U. S. Variety Protection Act.

OTHER VARIETIES

Bounty 309 — Awned, medium to early semidwarf with good lodging resistance. Moderately susceptible to both leaf and stem rust. Medium yield and test weight. Medium to poor milling and baking characteristics. Developed by Cargill, Inc., and approved for certification in 1972. Seed sale regulated by U.S. Variety Protection Act.

Butte — Awned, early to midseason. Medium height and lodging resistance. Resistant to stem and leaf rust. Medium yield and very high test weight. Milling characteristics are satisfactory. Protein content and bake absorption are lower than Chris but better than Era. Selected from crosses involving NC480, Polk and Wisc 261. Released by North Dakota Agricultural Experiment Station in 1977.

Chris — Awnless, medium height and maturity. Fair resistance to lodging. Resistant to stem rust but ranges from resistant to moderately susceptible to leaf rust. Medium yield and test weight. Milling and baking characteristics are satisfactory. Selected from crosses involving Frontana, Kenya 58, Newthatch, and Thatcher. Released by Minnesota Agricultural Experiment Station and ARS-USDA in 1965.

Coteau — Awned, midseason to late, and medium height. Good lodging resistance. Resistant to stem and leaf rust. Medium yield and test weight. Very high protein. Milling and baking characteristics are satisfactory. Selected from crosses involving ND 496 sib, ND 487, and Fletcher. Released by North Dakota Agricultural Experiment Station in 1978.

Ellar — Awnless, early, medium height and lodging resistance. Resistant to stem rust and moderately resistant to leaf

rust. Medium yield and test weight. Flour yield and wheat protein are lower than Chris, but better than Era. Milling and baking characteristics are satisfactory. Selected from crosses involving Waldron, Kenya Farmer, Lee, Mida, and Cadet. Released by North Dakota Agricultural Experiment Station in 1974.

Glenlea — Awnless, medium height and maturity with good lodging resistance. Resistant to stem rust, but moderately susceptible to leaf rust. Medium yield and test weight with very large seed. Milling and baking characteristics are unsatisfactory. Developed by University of Manitoba. Licensed in 1972.

Protor — Awned, early semidwarf with good lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust; susceptible to ergot. High yield and medium test weight. Unsatisfactory milling and baking quality. Selected from the cross of Tobari by Ciano. Released by Northrup, King & Co. in 1972.

Waldron — Awnless, yellow chaff, early, and medium height. Good lodging resistance. Resistant to stem and leaf rust. Very susceptible to ergot. Susceptible to Septoria. Medium yield and test weight. Satisfactory milling and baking characteristics. Selected from crosses involving Lee, Mida, K338AA, and Justin. Released by North Dakota Agricultural Experiment Station in 1969.

World Seeds 1809 — Awnless, very early semidwarf with good lodging resistance. Resistant to stem and leaf rust but susceptible to loose smut. Medium yield and test weight. Milling and baking characteristics are satisfactory. Protein content and bake absorption are lower than Chris, but better than Era. Released by World Seeds Inc. in 1970. Seed sale regulated by U.S. Variety Protection Act.

Height differences between normal and semi-dwarf wheat varieties and agronomist J. V. Wiersma are evident in this picture.



Table 33. Characteristics of hard red spring wheat varieties, 1976-78

Variety	Heading (June)	Height (inches)	Lodging (score) ¹	Rust reaction ²		Weight/ 1000 seeds (grams)	Test weight/ bushel (pounds)	Wheat protein (percent) ³	Milling, baking quality	Yield/acre (bushels)					
				Leaf	Stem					Waseca	St. Paul	Morris	Crookston	Stephen ⁴	Average ⁵
Angus	24	31	2.3	R	R	33	59.9	14.8	med-high	—	42	29	45	67	43
Era	26	30	2.6	R-MR	R	30	60.1	13.6	low-med.	70	47	33	47	74	47
Kitt	25	31	2.7	R	R	32	57.7	14.9	med.-high	66	41	33	43	77	45
Olaf	24	33	2.2	R	R	34	59.9	15.2	medium	64	41	32	38	70	43
Wared	26	31	2.1	R-MR	R	30	60.1	14.4	medium	—	49	32	43	74	44
Butte	22	35	3.0	R	R	33	61.1	14.8	med.-high	—	48	33	46	66	46
Chris	25	38	4.6	R-MS	R	28	60.2	15.8	v. high	—	33	30	33	56	35
Coteau	25	37	3.0	R	R	33	59.8	16.3	med-high	—	39	33	42	—	43
Ellar	23	38	2.8	MR-MS	R	34	59.8	15.5	med-high	50	42	30	36	60	40
Eureka ⁶	25	37	4.0	MR	R	32	59.0	15.4	med-high	—	36	38	41	—	38
Glenlea	25	41	3.3	MS	MR	38	59.0	15.2	low-med.	—	37	32	39	69	41
Polk	24	38	4.0	R-MS	R	35	61.5	15.7	v. high	—	33	27	39	59	38
Prodax	23	31	2.6	S	R	32	57.4	14.2	low-med.	68	37	32	41	76	43
Protor	23	30	2.2	MS	R	31	60.1	14.9	low	63	47	33	46	73	47
Solar ⁷	26	30	2.6	R-MR	R	—	59.8	—	—	—	47	26	51	—	—
Waldron	23	37	2.5	MR-MS	R	34	59.2	15.8	high	53	39	29	41	63	41
World Seeds 1809	19	28	2.1	R-MR	R	30	59.7	14.9	medium	60	45	30	36	67	42
LSD 5%										5	5	5	4	11	3

¹ 1 = erect, 9 = flat. ² Reaction to prevalent races: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible. ³ 14 percent moisture, 1975-77. ⁴ 1976-77. ⁵ Waseca not included in average. ⁶ 1977-1978. ⁷ 1978.

WINTER WHEAT

Cultural practices have an effect on winter survival of all winter wheats. Planting into a firm seedbed with some stubble remaining to retain snow cover can reduce winterkill of less winterhardy varieties.

RECOMMENDED VARIETIES

Minter — Awned, tall, winterhardy, and medium lodging resistance. Moderately susceptible to leaf and stem rust. Medium yield and test weight. Satisfactory quality characteristics. Selected from a backcross of Hope and Minturki. Released by the Minnesota Agricultural Experiment Station and ARS-USDA in 1949.

Winoka — Awned, winterhardy, medium height, maturity, and lodging resistance. Susceptible to leaf rust and moderately resistant to stem rust. Severe leaf necrosis in certain years. Satisfactory milling and baking characteristics. Reselection from Winalta by South Dakota Agricultural Experiment Station in 1968.

VARIETIES NOT ADEQUATELY TESTED

Roughrider — Awned, tall, winterhardy, medium maturity and lodging resistance. Susceptible to leaf rust but resistant to stem rust. Limited data showed high yield and test weight. Released by the North Dakota Agricultural Experiment Station in 1975.

OTHER VARIETIES

Bronze — Awned, early, medium height and lodging resistance. Moderately winterhardy. Susceptible to leaf rust, but resistant to stem rust. High yield and medium test weight. Milling and baking characteristics satisfactory. Selected from Cycle

II, Series I of a recurrent selection scheme. Released by South Dakota Agricultural Experiment Station in 1972.

Centurk — Awned, early, medium height and lodging resistance. Winterhardiness is not satisfactory. Susceptible to leaf rust and moderately resistant to stem rust. Satisfactory quality. Selected from crosses involving Kenya 58, Newthatch, Hope, Turkey, Cheyenne, and Parker. Released by Nebraska Agricultural Experiment Station in 1971. Seed sale regulated by U.S. Variety Protection Act.

Eklund — Awnless, very tall, medium to late maturity with medium lodging resistance. Susceptible to leaf rust and stem rust. Low yield and test weight. Satisfactory quality. Selected as an individual plant from the variety Minter by Mr. Eklund in northern Minnesota. Seed was available in 1976. Seed sale regulated by U.S. Variety Protection Act.

Froid — Awned, winterhardy, medium height, maturity, and lodging resistance. Moderately resistant to stem rust, susceptible to leaf rust. High yield, but lower than average test weight. Satisfactory milling and baking characteristics. Selected from a population of unknown origin at Montana Agricultural Experiment Station in 1968.

Gent — Awned, early, medium height and lodging resistance. Winterhardiness lower than Minter and Winoka. Moderately resistant to leaf rust and resistant to stem rust. High yield and test weight. Satisfactory quality. Made by compositing nine selections from crosses of Agent and Scout. Developed at Hays, Kansas, but tested and released by South Dakota Agricultural Experiment Station in 1974.

Sundance — Awned, tall, winterhardy, medium lodging resistance. Susceptible to leaf and stem rust. Low yield and medium test weight. Satisfactory quality characteristics. Selected from a cross involving Cheyenne and Kharkof. Licensed by Agriculture Canada, Winnipeg, in 1971.

Table 34. Characteristics of winter wheat varieties, 1976-1978

Variety	Heading (June)	Height (inches)	Winter survival (percent)	Lodging (score) ¹	Rust reaction ²		Test weight/bushel (pounds)	Yield/acre (bushels)		
					Leaf	Stem		Waseca ³	St. Paul	Average
Minter	8	43	93	4.4	MS	MS	61.2	52	42	47
Winoka	6	41	88	4.2	S	MR	61.6	61	48	55
Centurk	4	38	54	3.3	S	MR	59.0	56	41	49
Eklund ⁴	8	45	94	4.2	S	S	58.4	38	33	36
Froid	6	43	90	4.4	S	MR-S	59.5	53	40	47
Gent	3	39	62	3.3	MR	R	60.3	47	41	44
Roughrider ⁴	5	42	92	3.5	S	R	61.1	55	50	53
Sundance	10	42	93	3.7	S	S	57.1	—	41	—
LSD 5%								3	5	3

¹1 = erect, 9 = flat ²Reaction to prevalent races: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible. ³1976-77. ⁴1977-78.

WINTER RYE

Spring rye varieties are not recommended because they yield much less than recommended winter ryes.

RECOMMENDED VARIETIES

Puma — Medium yield, good winterhardiness, medium late, medium height. Poor lodging resistance. Small seed of predominantly green color and medium test weight. Winterhardy selec-

tion from Dominant by University of Manitoba. Licensed in 1972.

Rymin — High yield, fair winterhardiness, medium late, medium height. Good lodging resistance. Large plump seed of predominantly greenish-gray color and high test weight. Originated by Minnesota Agricultural Experiment Station from a cross of Von Lochow and WR5. Released in 1973.

Agronomist A. Schneiter of the North Dakota Agricultural Experiment Station inspects lodged Cougar rye at his right and upright Puma at his left.



OTHER VARIETIES

Cougar — Medium yield, winterhardy (only fair hardiness in eastern Minnesota trials), late, medium height. Fair lodging resistance. Small seed of green and tan color, and medium test weight. Originated by University of Manitoba from an open-pollinated selection in a composite cross of European and Canadian varieties. Licensed in 1967.

Frontier — Medium yield, very winterhardy, medium maturity, tall. Poor lodging resistance. Small seed of predominantly blue-gray color and high test weight. Developed by Agriculture Canada, Swift Current, from a cross of Dakold 23 and Petkus. Licensed in 1965. *If winterhardiness is of primary*

concern, grow Frontier instead of the recommended varieties.

Maton — Low yield, poor winterhardness, early, tall. Good lodging resistance. Taller than other varieties in fall. Large seed of predominantly tan color and high test weight. Originated by the Samuel Roberts Noble Foundation Inc. of Ardmore, Oklahoma.

Von Lochow — Medium yield, fair to poor winterhardness, medium late, medium height. Good lodging resistance. Large seed of predominantly green color and high test weight. Obtained from F. Von Lochow-Petkus Ltd. of Germany in 1958. Released by Minnesota Agricultural Experiment Station in 1964

Table 35. Yields of winter rye varieties in bushels per acre

Variety	Rosemount 1973-78	Grand Rapids 1973-78	Morris 1973-76, 78	Crookston 1975-78	Average (4 locations)
Puma	50	42	42	44	44
Rymin	60	44	38	47	47
Maton ¹	52	18	0	0	17
LSD 5%	2	2	4	5	2

¹1978.

Table 36. Characteristics of winter rye varieties, 4 location averages

Variety	Winterkill (percent)	Heading (May)	Mature (July)	Lodging (score) ¹	Height (inches)	Weight/100 seeds (grams)	Test weight/bushel (pounds)
Puma	5	31	20	3.2	49	2.4	55.2
Rymin	9	31	20	2.3	48	2.7	55.7
Maton ²	62	25	17	2.0	51	2.7	56.5

¹1 = erect, 9 = flat.

²1978.

Glenn and Morex are new, high yielding barley varieties with improved disease tolerance. Morex is the most recently recommended malting variety for Minnesota.





Commercial agronomist, G.N. Fick, bends a downy mildew-resistant sunflower hybrid toward a Peredovik plant dwarfed by downy mildew disease. Replacement of the susceptible Peredovik by resistant hybrids has prevented large financial losses from downy mildew.

PLANTING RATE AND DATE

Rates are based on average seedbed and on use of good quality seed of high germination. Use high rate for large-seeded and low rate for small-seeded recommended varieties. Increase rate for seed of low germination.

Crop	Bushel weight* (pounds)	Rate/acre (pounds)	Date
Barley	48	72-96	Early spring
Corn	56	10-20	Late April or early May
Flax	56	42-56	April 15 to May 15
Forage Grasses (perennial) If mixed with legume, sow at time indicated for the legume.			
Bromegrass in mixtures	14	8-12	Early spring or summer
Orchardgrass in mixtures	14	1.5-3	Early spring or summer
Reed canarygrass alone	44-48	6-8	Early spring or summer
in mixtures		4-6	
Tall fescue alone	23-27	10-12	Early spring or summer
in mixtures		3-5	
Timothy in mixtures	45	2-6	Early spring or summer
Forage Legumes (perennial)			
Alfalfa alone	60	10-12	Early spring to August 10
with grasses		5-8	
Alsike clover in mixtures	60	2	Early spring to August 10
Birdsfoot trefoil	60	5-6	Early spring
Ladino clover in mixtures	60	½-1	Early spring to August 10
Red clover alone	60	9-11	Early spring to August 10
with grasses		4-8	
Oat	32	64-80	Early spring
Rye	56	56-70	September
Sorghum 18- to 40-inch rows	50 (sweet), 56 (grain)	5-10	May 20 to June 5 for grain
6- to 14-inch rows		7-15	
Soybean 6- to 7-inch rows	60	100 (4 seeds/ft.)	May 5-25
20-inch rows		65 (7 seeds /ft.)	
30-inch rows		55 (9 seeds/ft.)	
40-inch rows		50 (11 seeds/ft.)	
Sudangrass 18- to 40-inch rows	40	10-20	May 20 to June 10
6- to 14-inch rows		25-30	
With 1½ bushels of soybean		10	
Wheat Hard Red Spring	60	75-90	Early spring
Durum		90	Early spring
Winter		75-90	Aug. 20 to Sept. 20
Other Crops			
Annual canarygrass	50	40	Early spring
Buckwheat	48-50	40-48	June 15 to July 15
Field bean Black turtle soup	60	40-45	May 20 to June 15
Great northern		55-100	
Kidney		75-100	
Navy		40-45	
Pinto		60-80	
Small white		35-40	
Field pea	60	120-225	Early spring
With 1½ to 2 bushels of oat		45-90	
Fababean — medium size	60	180	Early spring
With 2 bushels of oat		60	
Millet	48-56	20-40	June 15 to July 15
Mustard and oilseed rape	50-58	10	May 1 to June 15
Rape for forage	50	4-6	Early spring with oat
Sunflower	24	3-8	May 1-25
Sweet clover	60	10-12	Early spring

*U.S. legal if established. If not established, weight given is that most widely accepted in the United States.