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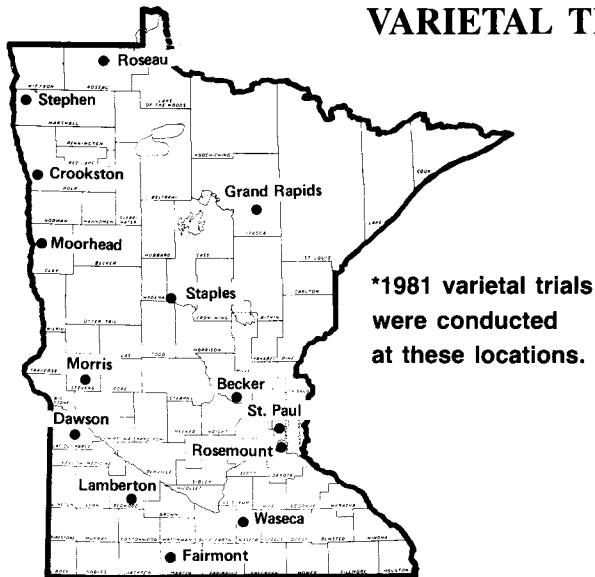
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WARD BEECHER

TOPICAL CROPS

VARIETAL TRIALS OF FARM CROPS



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, Lamberton, 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 not designed for crop (species) comparisons, because the various crops are 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 1982 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 crop sections are: R.G. Robinson (adzuki bean, annual canarygrass, buckwheat, field bean, field pea, grain sorghum, millet, sunflower, and rye); D.K. Barnes and F.I. Frosheiser (alfalfa, birdsfoot trefoil, and red clover); D.C. Rasmuson (barley); D.K. Barnes (brome grass, orchardgrass, reed canarygrass, tall fescue, and timothy); J.L. Geadelmann and R.H. Peterson (corn); V.E. Comstock (flax); D.D. Stuthman (oat); J.W. Lambert (soybean); R.H. Busch (wheat—durum, hard red spring, and winter); R.E. Stucker (wild rice). 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); A.P. Roelfs (barley and wheat); R.D. Wilcoxson (barley and oat); J.S. Baumer (wheat); P.G. Rothman (oat); B.W. Kennedy and D. H. MacDonal (soybean); D.V. McVey and J.B. Rowell (wheat).

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

ADZUKI BEAN

Adzuki bean is combine-harvested as mature, dry bean. Consumption in the United States is small, but the potential export market is large. A processed mixture of adzuki bean, sugar, and water is used for many confections in Japan.

Takara, Kasho, and Minoka are the most commonly grown varieties in Minnesota, but the other varieties in table 1 have been introduced. *Fusarium* yellows disease destroyed some fields in 1980 and severely damaged experiment station trials in 1980 and

Table 1. Yields of adzuki bean varieties in pounds per acre, 1980-81

Variety	Rosemount	Becker	Morris	Lamberton	Waseca	Average
Minoka	1170	787	656	570	1106	858
Kasho	1149	914	621	806	1290	956
Takara	1136	1003	731	495	791	831
Takara SNB	1194	991	791	648	1249	975
Express	1038	947	605	593	1125	862
Hayate SNB	1060	950	463	512	866	770
Hokaido Hashimoto	1126	876	671	793	1143	922
Dainagon	641	522	551	495	558	553
LSD 5%	261	143	220	172	433	119

1981. The uncertainty of whether or not such severe losses will occur again may curtail rapid expansion of adzuki bean production.

VARIETIES NOT ADEQUATELY TESTED

Kasho—Medium yield. Late. Medium height. Medium size, red seed. Imported from Japan by D'Arcy Foods, Minneapolis, in 1977.

Minoka—Medium yield. Medium-late maturity. Medium height. Large, red seed. Selected by the Minnesota Agricultural Experiment Station from an introduction from Taiwan. Released in 1980.

Takara—Medium yield. Early. Medium height. Medium size, red seed. Imported from Japan by the Red River Edible Bean Growers Association in 1977-78.

Table 2. Characteristics of adzuki bean varieties

Variety	Planting to maturity (days)	Lodging (score) ¹	Height (inches)	Weight/100 seeds (grams)	Fusarium (injury) ²
Minoka	109	3.6	18	12.5	2.4
Kasho	111	3.9	19	9.4	2.6
Takara	106	3.5	16	8.7	2.5
Takara SNB	110	3.7	19	8.8	2.1
Express	109	4.0	19	8.5	2.9
Hayate SNB	105	3.7	15	8.5	2.5
Hokaido Hashimoto	111	4.1	21	10.4	2.5
Dainagon	110	4.4	15	11.5	3.7

¹1 = erect, 9 = flat. ²0 = none, 5 = killed.

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, that will be sold in Minnesota in 1982, 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 3 and 4 are ranked according to winterhardiness index which is an indication of rate of growth and degree of winterhardiness. *Very winterhardy varieties* are slow to recover after cutting. These varieties will survive nearly all winters. 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 Amador, Ardiente, AS-13R, AS-49R, Caliente, Caliverde 65, CUF 101, El-Unico, Florida 66, Hayden, Joaquin II, Maxidor, Mesa Sirsa, Mesilla, Moapa 69, Sonora 70, 183, WL 504, WL 508, WL 514, WL 600, UC Cargo, UC Salton, Validor, 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 a number of new varieties have been released with Phytophthora resistance.

FUSARIUM WILT—The fungus that causes Fusarium wilt is present in most soils. In Minnesota it is usually not a serious problem by itself, but it contributes to stand decline in combination with other disease organisms. Resistance to Fusarium wilt in addition to resistance to bacterial wilt and Phytophthora root rot contribute to longer lived stands.

VERTICILLIUM WILT—This is a new, potentially destructive



The contrast between winterhardy and nonwinterhardy alfalfa varieties is evident in this variety trial. Agronomist D. K. Barnes.

disease in Minnesota. It was identified in several fields during 1981. In Europe and the Pacific Northwest where it has been prevalent, stands are reduced after 2 or 3 years. All present varieties used in Minnesota are susceptible. Several new varieties with apparent resistance are being released. Sufficient data are not available to recommend Verticillium resistant varieties in Minnesota.

Table 3. Average yields of alfalfa varieties expressed as percentage of Vernal for all tests in Minnesota, 1959-81

Variety	Number tests	Yield (percent of Vernal)						
		Year after seeding					Average over years	
		1st	2nd	3rd	4th	5th-9th	1-2	3-9
VERY WINTERHARDY								
Norseman	12	96	93	91	86	80	95	88
Ladak	3	87	88	78	89	—	88	82
Teton	3	89	93	86	93	—	91	90
Travois	3	88	88	88	87	—	88	88
WINTERHARDY								
Vernal, tons/acre, 15% M	70	4.8	4.6	4.5	4.4	4.2	4.7	4.2
Baker	9	97	100	107	106	124	98	109
Dawson	4	100	104	104	100	98	102	101
Titan	10	101	101	104	103	104	101	104
123	6	101	104	101	102	110	102	102
WL 215	6	101	102	101	101	115	101	104
Agate	26	97	98	100	97	99	98	99
Algonquin	3	99	104	101	98	86	101	97
Iroquois	12	107	104	105	110	105	107	106
Ladak 65	4	99	104	101	99	102	102	100
130	2	103	107	117	—	—	105	—
Nugget	7	102	100	100	100	100	101	100
520	13	104	105	107	111	114	105	110
524	6	107	104	110	107	—	105	108
Blazer	6	108	104	116	104	99	106	109
545	5	101	102	108	90	—	101	102
SX-10	6	94	95	96	102	107	95	102
Phytor	5	103	106	120	—	—	104	—
Valor	8	100	103	102	107	118	101	107
Weevlchek	6	106	107	109	103	98	107	105
120	4	113	109	118	103	—	111	110
Anchor	10	103	107	114	109	116	105	114
Gladiator	3	104	107	102	109	—	105	105

Table 3 (continued). Average yields of alfalfa varieties expressed as percentage of Vernal for all tests in Minnesota, 1959-81

Variety	Number tests	Yield (percent of Vernal)						
		Year after seeding					Average over years	
		1st	2nd	3rd	4th	5th-9th	1-2	3-9
Ranger	26	97	98	97	99	93	97	97
WL 220	4	101	102	116	—	—	101	—
532	2	112	—	—	—	—	—	—
MODERATELY WINTERHARDY								
Pacer	9	102	104	109	107	106	103	108
Arc	4	102	101	98	—	—	102	—
Citation	8	105	103	112	102	110	104	109
Marathon	5	109	104	106	98	93	106	99
Apollo	9	102	101	90	103	91	101	99
Tempo	8	100	106	92	103	86	103	93
A-59	10	102	104	108	110	101	103	104
Classic	4	102	99	108	—	—	100	—
G7730	2	101	102	120	—	—	101	—
Magnum	3	107	107	125	—	—	107	—
WL 309	5	106	103	103	102	110	104	104
Answer	4	106	99	105	104	—	102	105
Honeoye	5	102	101	106	107	—	101	106
Primal	4	104	104	121	105	—	104	115
Saranac AR	10	106	101	108	105	90	104	104
WL 318	6	100	96	101	104	88	98	102
G777	4	100	100	97	104	98	100	100
Peak	7	105	109	114	114	108	107	112
Saranac	39	101	100	103	105	101	101	103
Thor	9	103	104	100	104	105	104	103
Trident	5	105	105	109	105	—	105	107
SX-418	3	103	106	111	102	—	104	106
G-2815	1	94	105	109	—	—	100	—
A-57	5	100	103	98	105	108	101	104
Aquarius	2	97	99	—	—	—	98	—
131	3	106	104	104	98	102	105	101
WL 312	3	104	100	—	—	—	102	—
A-24	1	109	101	—	—	—	105	—
WL 219	7	103	104	104	97	—	103	100
Hi-Phy	4	107	106	—	—	—	106	—
Epic	3	101	119	136	—	—	105	—

Table 4. 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)	Fusarium wilt (percent)
VERY WINTERHARDY					
Norseman	Barzen of Minneapolis ^{ac}	7.9	30	3	27
Prowler	Northrup King Co. ^p	7.9	72	—	18
Ladak	USDA (foreign introduction) ^{cv}	7.5	8	2	—
Spredor II	Northrup King Co. ^k	7.5	58	—	24
Teton	S. Dakota Agr. Exp. Sta. ^x	7.4	15	7	26
Travois	S. Dakota Agr. Exp. Sta. ^{cy}	7.4	37	1	15
WINTERHARDY					
Vernal	Wisconsin Agr. Exp. Sta. & USDA ^{achijkmqorstuvxy}	6.5	42	5	32
Baker	USDA & Nebraska Agr. Exp. Sta. ^{chly}	6.5	50	2	37

Table 4 (continued). 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)	Fusarium wilt (percent)
Dawson	USDA & Nebraska Agr. Exp. Sta. ^y	6.5	15	1	35
Titan	Rudy Patrick Co. ^f	6.4	60	2	31
123	DeKalb Ag Research Inc. ^d	6.3	41	3	40
WL 215	W.L. Research Inc. ^{aj}	6.3	36	4	34
Agate	USDA & Minnesota Agr. Exp. Sta. ^{chijooqrstuxy}	6.0	65	43	54
Algonquin	Agriculture Canada ^f	6.0	51	3	40
Iroquois	Cornell University ^{cijooqstuy}	6.0	61	1	22
Ladak 65	Montana Agr. Exp. Sta. ^{acy}	6.0	36	2	15
130	DeKalb Ag Research Inc. ^d	6.0	66	29	73
Nugget	P-A-G Seeds ^l	5.9	46	1	29
520	Pioneer Hi-Bred International Inc. ⁿ	5.9	40	4	29
524	Pioneer Hi-Bred International Inc. ⁿ	5.9	24	8	44
Blazer	Land O'Lakes ⁱ	5.9	53	26	26
545	Pioneer Hi-Bred International Inc. ⁿ	5.8	35	30	30
SX-10	Sexauer Co. ^f	5.7	5	2	46
Phytor	Northrup King Co. ^k	5.5	34	30	39
Valor	Land O'Lakes ⁱ	5.5	36	2	30
Weevichek	Farmers Forage Res. Coop. ^c	5.5	57	2	30
120	DeKalb Ag Research Inc. ^d	5.5	57	39	20
Anchor	Rudy Patrick Co. ^{fv}	5.4	36	5	17
Gladiator	Northrup King Co. ^k	5.4	57	1	37
Ranger	USDA & Nebraska Agr. Exp. Sta. ^{chijomoruxy}	5.4	18	4	25
WL 220	W.L. Research Inc. ^j	5.4	49	12	64
532	Pioneer Hi-Bred International Inc. ⁿ	5.4	63	7	37
MODERATELY WINTERHARDY					
Pacer	Land O'Lakes ⁱ	5.3	33	8	20
Polar II	Pride Seed Co. ^p	5.3	57	—	34
Arc	USDA & N. Carolina Agr. Exp. Sta. ^y	5.2	7	3	34
Citation	North American Plant Breeders ^j	5.2	45	3	30
Marathon	Cargill ^b	5.2	36	2	13
Apollo	North American Plant Breeders ^{tv}	5.1	36	36	40
Tempo	Farmers Forage Res. Coop. ^c	5.1	26	8	31
A-59	E. F. Mangelsdorf & Bros. Inc. ^q	5.0	16	4	34
Classic	Farmers Forage Res. Coop. ^c	5.0	39	7	—
G7730	Funk Seed Int. ^g	4.7	55	62	62
Magnum	Dairyland Seed Co. Inc. ^w	4.7	51	5	32
WL 309	W.L. Research Inc. ^{aj}	4.7	25	4	50
Answer	Midland Cooperatives, Inc. ^j	4.6	50	66	58
Honeoye	Cornell University ^s	4.6	16	1	19
Primal	Pride Seed Co. ^p	4.6	62	9	33
Saranac AR	Cornell University	4.6	29	8	44
WL 318	W.L. Research Inc. ^{aj}	4.6	32	21	52
G 777	Funk Seed Int. ^g	4.5	25	4	12
Peak	Land O'Lakes ^o	4.5	52	16	28
Saranac	Cornell University ^{ioqty}	4.5	49	3	34
Thor	Northrup King Co. ^k	4.5	69	1	30
Trident	P-A-G Seeds ^l	4.5	37	71	55
SX-418	Sexauer Co. ^f	4.5	33	5	—
G 2815	Funk Seed Int. ^g	4.4	51	16	56
A-57	Embro Seed Co. Inc. ^q	4.4	12	7	—
Aquarius	Lincoln Seed & Feed Co. ^y	4.3	75	2	47
131	Cal/West Seeds ^d	4.3	10	8	—
WL 312	W.L. Research Inc. ^{aj}	4.3	38	25	54
A-24	Ramy Seed Co. ^q	4.2	5	2	—
WL 219	W.L. Research Inc. ^c	4.2	27	9	45
Hi-Phy	Farmers Forage Res. Coop. ^c	4.1	64	27	57
Epic	Larry Peterson, Ltd. ^e	3.9	58	34	45

¹1982 seed suppliers: a. Barzen of Minneapolis, b. Cargill Seeds, c. Cenex, d. DeKalb, e. Larry Peterson, Ltd., f. Field Seed Farms, g. Funk Seeds International, Inc., h. Interstate Seed and Grain Co., i. Land O'Lakes, Inc., j. Midland Cooperatives, Inc., k. Northrup King Co., l. P-A-G Seeds, m. Payco Seeds, n. Pioneer Hi-Bred International, Inc., o. Premium Seed Co., p. Pride Seed Co., Inc., q. Ramy Seed Co., r. The Sexauer Co., s. Twin City Seed Co., t. Werner Seeds, Inc., u. Peterson-Biddick Co., v. Ziller Seed Farms, Inc., w. Dairyland Seed Co., Inc., x. Arrowhead, Inc., y. Lincoln Seed and Feed 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.

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—Medium yield, medium maturity and height. Poor lodging resistance. Medium size seed of medium test weight. May

outyield Keet in favorable environments for canarygrass. Developed cooperatively by Minnesota Agricultural Experiment Station and Minn-Dak Growers Association from PI 251390 from Iran. Released in 1973.

Keet—High yield, early, medium height. Fair lodging resistance. Medium size seed of high test weight. Selected from PI 250741 by Minnesota Agricultural Experiment Station. Released in 1979.

Table 5. Yields of annual canarygrass varieties in pounds per acre

Variety	Rosemount 1972-81	Crookston 1976-81	Stephen 1975-81	Average 3 locations
Alden	1069	1397	1315	1260
Keet	1206	1418	1431	1352
LSD 5%	60	127	118	61

Table 6. Characteristics of annual canarygrass varieties

Variety	Planting to heading (days)	Planting to maturity (days)	Lodging (score) ¹	Height (inches)	Weight/ 100 seeds (grams)	Test weight/ bushel (pounds)
Alden	63	106	4.4	35	.74	47.3
Keet	59	103	3.2	34	.74	48.4

¹1 = erect, 9 = flat.

BARLEY

RECOMMENDED VARIETIES

Glenn—High yield. Early maturity. Good lodging resistance. Six-row, rough-awn, long rachilla hairs, colorless aleurone. Classified as a malting variety by Malting Barley Improvement Association (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.

Morex—High yield. Early maturity. Medium 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. Developed by Minnesota Agricultural Experiment Station from cross of Cree and Bonanza. Released in 1978.

VARIETIES NOT ADEQUATELY TESTED

Bumper—High yield. Later in maturity than Morex or Glenn. Medium lodging resistance. Six-row, rough-awn, long rachilla hairs, colorless aleurone. Malting quality status undetermined. Lower extract percent than Morex. Resistant to stem rust and spot blotch. Developed by North American Plant Breeders. Selected from a bulk population which involved Larker as a parent. Released in 1980.

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.

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 MBIA. Resistant to stem rust and loose smut. Susceptible to spot blotch. Developed by Agriculture Canada, Brandon, from a cross involving Vantage, Jet, Vantmore, Parkland, and Conquest. Licensed in 1970.

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 diseases. 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 Triall and a selection from UM 570. Released in 1961.

Manker—High yield. Medium maturity, 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, susceptible to loose and covered smut. Developed by Minnesota Agricultural Experiment Station from cross involving Cree, M2, Vantage, Kindred, and Jotun. Released in 1974.

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.

Valley—Medium yield. Later in maturity than Morex or

Glenn. Lodging resistance not equal to Morex. Six-row, smooth-awn, long rachilla hairs, colorless aleurone. Malting quality status undetermined. Lower extract percent than Morex. Resistant to stem

rust and spot blotch. Developed by North American Plant Breeders. Selected from a bulk population which involved Larker as a parent. Released in 1980.

Table 7. Yield of barley varieties in bushels per acre, 1978-81

	Crookston 5 ¹	Morris 5	Stephen 2	St. Paul 2	Lamberton 1	Average 15
Larker	58	70	73	62	75	65
Manker	72	73	80	71	89	75
Morex	70	70	91	69	81	73
Glenn	71	69	72	74	95	72
Bumper	67	69	81	68	92	71
Valley	60	69	77	69	81	68
LSD 5%	11	8	22	21	12	6

¹Number of trials.

Table 8. Characteristics of barley varieties

	Heading (June)	Height (inches)	Lodging (percent)	Plump kernels (percent)	Protein (percent) ¹	Malt Extract (percent) ¹	Reaction to disease ²		
							stem rust	loose smut	spot blotch
Larker	15	33	45	71	13.6	76.7	R	S	S
Manker	14	32	18	70	—	—	R	S	R
Morex	14	34	24	65	12.8	78.8	R	R	MR
Glenn	13	32	15	70	12.6	77.1	R	R	R
Bumper	18	33	25	73	12.8	76.0	R	S	R
Valley	18	34	36	64	12.8	76.2	R	S	R

¹Regional data from 1979 and 1980 (12 trials). Protein based on dry matter. ²R=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 9. Average yields of birdsfoot trefoil varieties expressed as percentage of Empire for all tests in Minnesota, 1967-81

Variety	Developer ¹	Yield (percent of Empire)			
		Year after seeding			
		1	2	3	Average
Empire	New York Agr. Exp. Sta. tons/acre, 15% M ^{acdefghijkl}	3.7	3.2	3.0	3.1
Leo	Macdonald College Canada ^j	116	107	112	112
Carroll	Iowa Agr. Exp. Sta. ^g	114	107	106	109
Dawn	Missouri Agr. Exp. Sta. ^b	108	108	107	108
Viking	New York Agr. Exp. Sta. ^d	102	102	95	100
Maitland	Univ. of Guelph, Canada ^d	111	101	77	96

¹1982 seed suppliers: a. Cenex, b. Field Seed Farms, c. Interstate Seed and Grain Co., d. Midland Cooperatives, Inc., e. Peterson-Biddick Co., f. Land O'Lakes, Inc., g. Premium Seed Co., h. The Sexauer Co., i. Twin City Seed Co., j. Werner Farm Seeds, Inc., k. Ramy Seed Co., l. Lincoln Seed and Feed Co.

BROMEGRASS

Brome grass 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 winterhardiness. 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 10. Dry matter yields of bromegrass varieties expressed as percentage of Fox at five locations, and average for 1966-1981

Variety	Developer or owner ¹	Crookston	Grand Rapids	Lamberton	Morris	Rosemount	Average
No. of trial years		2	5	1	2	10	
<i>Fox ton/acre</i>	Minnesota Agr. Exp. Sta. ^d	3.1	4.7	3.6	3.6	3.9	4.0
Barton	Land O'Lakes Inc. ^f	—	86	—	102	109	105
Baylor	Rudy Patrick Co. ^{eik}	106	94	104	100	105	101
Beacon	F.S. Services, Inc.	—	96	—	93	110	106
Blair	Midland Coop. Inc. ^h	105	93	103	112	104	102
Bromex	Northrup King Co. ^g	—	—	—	—	106	103
Lincoln	Nebraska Agr. Exp. Sta. ^b	97	91	98	98	96	95
Rebound	South Dak. Agr. Exp. Sta. ^{cg}	—	99	—	—	104	102
Sac	Wisconsin Agr. Exp. Sta. ^h	102	93	99	95	106	100
Saratoga	New York Agr. Exp. Sta. ^a	103	102	105	105	102	103
Tempo	Agr. Canada, Ottawa ^a	—	99	—	—	96	97
LSD 5%		15	9	12	11	5	2

¹1982 seed supplies and sources: a. not available or very limited, b. available from most sources, c. Arrowhead, Inc., d. Cenex Coop. Inc., e. Field Seed Farms, f. Land O'Lakes, Inc., g. Lincoln Seed and Feed Co., h. Midland Coop. Inc., i. Northrup King Co., j. PAG Seeds, k. Ziller Seed Farms.

BUCKWHEAT

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.

Manor—High yield. Large seed. Low test weight but good market acceptability. Selected by Agriculture Canada, Morden. Licensed in 1980. Production of certified seed limited to Canada.

OTHER VARIETIES

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

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

Siva-Domaca—Low yield. Small seed. High test weight. Short and early. Poor lodging resistance. Originated in Yugoslavia.

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

Table 11. Characteristics of buckwheat varieties

Variety	Seed yield/acre (pounds)				Test weight/ bushel (pounds)	Weight/ 100 seeds (grams)	Height (inches)	Lodging (score) ¹	Planting to bloom (days)
	Becker 1979-81	Rosemount 1980-81	Grand Rapids 1980-81	Crookston 1981					
Mancan	1506	1014	130	790	44.4	2.9	48	4.1	30
Manor	1569	1027	123	897	45.4	2.8	48	4.5	30
Giant American	1441	1007	92	716	42.5	3.1	48	4.3	30
Tokyo ²	1505	669	135	808	48.1	2.4	45	5.1	26
Siva-Domaca ²	1299	360	68	469	48.7	2.2	33	6.2	25
LSD 5%	146	139	50	394					

¹1 = erect, 9 = flat. ²1981.

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 12 correspond to zones of adaptation shown in the accompanying map. Yield and stalk breakage data reported in the table are from small replicated plots. The plant population was approximately 24,000 plants per acre.



Agronomist J. L. Geadelmann is evaluating corn hybrids for efficient use of nitrogen fertilizer. He is standing between plots of low and high levels of nitrogen.

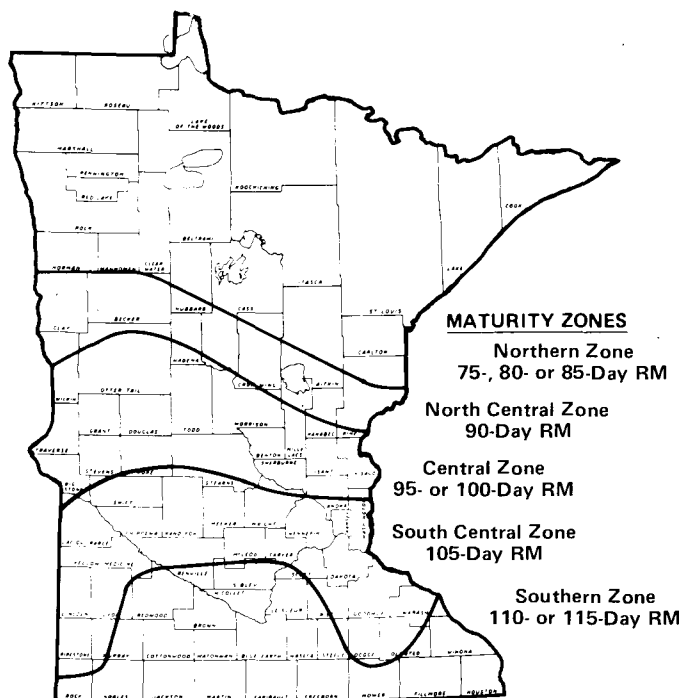


Table 12. Performance of corn hybrids, 1978-1980

Hybrid	Type of cross	Relative maturity	Yield per acre ¹ (bushels)					Broken stalks ² (percent)					
			Staples	Morris	Rose-mount	Lamber-ton	Waseca	Staples	Morris	Rose-mount	Lamber-ton	Waseca	
Minhybrid 8201	single	80	111	85	114			3	6	5			
Minhybrid 8301	3-way	80	99	84	107			5	8	7			
Minhybrid 7301	3-way	90	105	91	113			3	4	6			
Minhybrid 6301	3-way	95		111	126					2	1		
Minhybrid 6304	3-way	95		108	133					4	1		
Minhybrid 6305	3-way	95	117	125	126			4	4	0			
Minhybrid M309	3-way	100		107	135					1	2		
Minhybrid 5201	single	105		117	137	131	175			1	2	2	0
Minhybrid 5202	single	105				143	179					1	0
Minhybrid 5301	3-way	105				136	170					4	1
Minhybrid 5303	3-way	105		133	147	131	185			3	1	1	2
Minhybrid 4201	single	110				128	173					2	2
Minhybrid 4202	single	110				137	171					0	1
Minhybrid 4203	single	110				148	185					2	2
Minhybrid 4303	3-way	110				140	182					2	2
LSD 5%			5	5	6	6	8						

¹15.5% moisture basis. ²Below ear.

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 Agricul-

ture Canada, Ottawa, from crosses involving Chancellor, Early Raymond, and Stirling. Licensed in 1960.

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

VARIETIES NOT ADEQUATELY TESTED

Lenca—High yield. Medium to early. Long-vined. Medium size, cream-colored seed. Good cooking quality. Susceptible to powdery mildew. Originated by Agriculture Canada, Morden,

from a cross of Century x Costa Rica. Production of certified seed limited to Canada.

Miranda—Very high yield. Very early. Very short. Very large, cream-colored seed. Developed by Cebeco-Handelsraad of The Netherlands. Variety protection pending.

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. Production of certified seed limited to Canada.

OTHER VARIETIES

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.

Table 13. Characteristics of field pea varieties

Variety	Seed yield/acre (pounds)			Weight/ 100 seeds (grams)	Seed protein ¹ (percent)	Planting to		Vine length (inches)
	Becker 1977-78, 80-81	Grand Rapids 1980-81	Crookston 1980-81			bloom (days)	maturity (days)	
Century	1830	2219	2000	22.0	26.0	60	96	44
Paloma	2894	2972	2285	28.1	25.4	55	92	18
Lenca ²	2051	2230	2259	18.1	25.6	58	93	37
Miranda ²	2746	2239	2901	32.9	24.0	53	87	17
Tara	1968	2508	2225	19.2	24.6	60	94	40
Trapper	1919	2652	1773	13.5	25.8	58	93	37
LSD 5%	156	270	379					

¹Oven-dry. ²1981.

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 1980 production amounted to 47 percent navy, 46 percent pinto, 2 percent red kidney, 2 percent small red, and 2 percent other classes. Varietal recommendations are confined to varieties within the navy, small white, pinto, dark red kidney, pink, black turtle soup, great northern, and small red classes. Other classes are grown successfully, but important differences among varieties within their classes have not yet been identified in our trials.

RECOMMENDED VARIETIES

Aurora small white—Medium yield. Medium late. 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. Large, prostrate vine. Large, white seed. Resistant to V-1, V-1A mosaic. 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.

Fleetwood navy—High yield. Late. Medium-size bush. Small, white seed. Disease reactions similar to those of other navy varieties. Developed by Agriculture Canada (Harrow). Licensed in 1977.

Montcalm dark red kidney—Medium yield. Late. Large, erect bush. Very large, dark red seed. Resistant to V-1, V-15 mosaic, alpha anthracnose, and halo blight. Susceptible to white mold, beta and gamma 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. 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. Resistant to V-1 mosaic and alpha and beta anthracnose. Susceptible to white mold, V-15 mosaic, and common and fuscous blights. Developed by Clarence Muehlfeld (Bridgeport, MI) from crosses involving Gratiot, Sanilac, Snow-Flake, and experimental navy strains. Released in 1974.

T39 black turtle soup—Medium yield. Medium late. Erect, viny bush. Small, black seed. Resistant to rust and V-1, V-1A mosaic. Susceptible to V-15 mosaic and anthracnose. Selected from black turtle soup by California Agricultural Experiment Station.

UI-37 small red—Medium yield. Very early. Short, usually erect vine. Large, dark red seed. Resistant to V-1, V-1A mosaic. Susceptible to rust, white mold and blight. Developed by Idaho Agricultural Experiment Station from a cross of UI-56 great northern and UI-34 small red. Released in 1964. *Recommended only as a very early maturing field bean; other small red varieties yield more in a normal growing season.*

UI-114 pinto—High yield. Late. Large, prostrate vine. Tan and brown mottled seed. Resistant to mosaic V-1, V-1A, and V-15. Tolerant of halo blight and *Fusarium* root rot. 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. Resistant to V-1 mosaic and alpha anthracnose. Susceptible to V-15 mosaic, beta anthracnose, white mold, and common and fuscous blights. Developed by Clarence Muehlfeld (Bridgeport, MI) from a cross of Snow-Flake and a navy

bean mutation. Released in 1974.

Viva Pink—Medium yield. Late maturity. Large, prostrate vine. Pink seed resistant to splitting. Resistant to mosaic V-1, V-1A, and V-15. Tolerant of *Fusarium* root rot. Very susceptible to rust. Susceptible to white mold and blight. Developed by Washington Agricultural Experiment Station and USDA from crosses involving UI-35 small red, PI 203958, and Sutter pink. Released in 1974.

VARIETIES NOT ADEQUATELY TESTED

Admiral navy—Medium yield. Late. Developed by Idaho Seed Bean Co., Twin Falls, ID. Released in 1981. Variety protection pending.

Artic navy—Low yield. Early. Small bush. Developed by Clarence Muehlfeld, Bridgeport, MI. Named in 1981.

Black Beauty black turtle soup—Medium yield. Late. Vine. Wilbur-Ellis Co., Spokane, WA.

Bos'n navy—Low yield. Late. Developed by Idaho Seed Bean Co., Twin Falls, ID. Released in 1981. Variety protection pending.

Captain navy—Medium yield. Late. Developed by Idaho Seed Bean Co., Twin Falls, ID. Released in 1981. Variety protection pending.

Ebony black turtle soup—Medium yield. Medium late. Semivine. Wilbur-Ellis Co., Spokane, WA. Variety protection pending.

Fiesta pinto—Medium yield. Early. Large, prostrate vine. Large seed. Resistant to V-1 and V-15 mosaic. Developed by Idaho Seed Bean Co., Twin Falls, ID. Named in 1980. Variety protection pending.

Gala pinto—Medium-high yield. Medium maturity. Large, prostrate vine. Large seed. Resistant to V-15 mosaic. Developed by Idaho Seed Bean Co., Twin Falls, ID. Named in 1980. Variety protection pending.

Harris great northern—High yield. Very late. Large, prostrate vine. Medium size, great northern seed. Seed quality frequently poor. Tolerant to bacterial blight. Resistant to common and bean yellow mosaic. An early-maturing selection of Valley from the Nebraska Agricultural Experiment Station. Released in 1980. Seed sale regulated by U.S. Variety Protection Act.

Midnight black turtle soup—Medium yield. Late. Erect bush of excellent type for direct combine-harvest. Resistant to rust, V-1 and V-15 mosaic, and gamma anthracnose. Tolerant to *Pythium* damping off and *Fusarium* root rot. Developed by Cornell Univer-

sity Agricultural Experiment Station from a composite of black bean introductions selected for large root systems. Released in 1980. Variety protection pending.

Olathe pinto—Medium yield. Medium late. Large vine. Small, pinto seed. Resistant to rust and V-1A mosaic. Developed by Colorado Agricultural Experiment Station from crosses involving rust-resistant pinto, pinto, light red kidney, and dark red kidney. Released in 1979. Seed sale regulated by U.S. Variety Protection Act.

Pindak pinto—Medium high yield. Early. Large, prostrate vine. Small, pinto seed. Resistant to prevalent races of rust, mosaic, and New York 15 mosaic and tolerant to *Fusarium* root rot. Released by USDA and North Dakota Agricultural Experiment Station from crosses involving UI-114, Japanese bush bean, and PI 203958. Released in 1981.

Tall Bun-Yan navy—High yield. Late. Large bush. Developed by Clarence Muehlfeld, Bridgeport, MI. Named in 1981.

UI-36 small red—High yield. Medium maturity. Large, prostrate vine. Seed quality frequently poor. Same disease resistance, parentage, and origin as UI-37. Released in 1964.

OTHER VARIETIES

NW 410 pinto—Lower yield than UI-114. Late. Large, prostrate vine. Small, pinto seed. More resistant to *Fusarium* root rot than UI-114. Developed by USDA and Washington Agricultural Experiment Station from a cross of Sutter pink x UI-114. Released in 1980.

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

Tuscola navy—Medium yield. Late. More resistance to splitting than most navy varieties. Developed by Michigan Agricultural Experiment Station. Released in 1977.

UI-111 pinto—Lower yield than UI-114 but earlier maturing. Less resistant to mosaic and root rot than UI-114. Developed by Idaho Agricultural Experiment Station from a cross of UI-34 small red and pinto. Released in 1945.

Wyo 166 pinto—Lower yield than UI-114 but earlier maturing. Developed by Wyoming Agricultural Experiment Station from an interspecies cross of Golden pinto and White Runner (*P. coccineus*) garden bean. Released in 1965.

Table 14. Characteristics of field bean varieties, 1980-81

Class and variety	Seed yield/acre (pounds)				Yield/acre (pounds)	Weight/100 seeds (grams)	Average—4 locations			
	Becker	Lamberton	Morris	Crookston			Planting to maturity (days)	Plant length (inches) ¹	Rust (percent) ²	Growth (habit)
Pinto										
UI-114	2670	1838	2185	1855	2137	37.3	111	21	33	vine
Fiesta	2258	1646 ³	1629	1905	1860	41.0	99	16	27	vine
Gala	2437	1988 ³	1717	1833	1994	39.5	101	19	33	vine
NW-410	2430	1048	1308	1695	1620	33.1	110	21	15	vine
Olathe	2233	1368	1159	1781	1635	33.4	106	20	0	vine
Pindak	2595	1591 ³	1776	1711	1918	32.2	100	17	2	vine
UI-111	2159	1586	1535	1766	1762	36.2	107	20	28	vine
Wyo 166	2414	1510	1329	1418	1668	35.3	106	19	20	vine
Navy										
Fleetwood	2142	1629	1206	1806	1696	17.5	107	16	0	bush
Snow-Bunting	1525	982	876	1634	1254	17.7	94	13	0	bush
Up-Land	1591	1065	1003	1565	1306	17.2	95	12	0	bush
Admiral ³	1746	1473	945	1119	1321	16.2	113	14	0	bush

Table 14 (continued). Characteristics of field bean varieties, 1980-81

Class and variety	Seed yield/acre (pounds)				Yield/acre (pounds)	Average—4 locations				
	Becker	Lamberton	Morris	Crookston		Weight/100 seeds (grams)	Planting to maturity (days)	Plant length (inches) ¹	Rust (percent) ²	Growth (habit)
Artic ³	1358	662	531	848	850	14.5	95	12	—	bush
Bos'n ³	1502	961	647	1254	1091	15.1	109	14	7	bush
Bunsi	1448	953	1083	1558	1261	17.5	96	14	2	bush
Captain ³	1493	1458	594	992	1134	15.1	112	13	0	bush
Sanilac	1477	1216	992	1235	1230	17.0	104	14	6	bush
Seafarer	1388	1143	958	1707	1299	17.9	94	12	5	bush
Tall Bun-Yan ³	2027	1422	963	1396	1452	19.2	109	17	2	bush
Tuscola	1504	1209	825	1212	1188	16.9	107	14	4	bush
Small White										
Aurora	2153	1348	1828	1617	1737	14.7	104	16	0	viny bush
Great Northern										
Emerson	2824	1711	1803	1946	2071	44.8	103	16	40	vine
Harris	2434	1939	2057	2302	2183	35.1	115	17	8	vine
USDA 1140	2383	1629	1677	1664	1838	33.7	108	19	28	vine
Small Red										
UI-37	1777	634	882	1357	1163	29.9	92	16	40	erect vine
UI-36	2329	1261	1749	1822	1790	31.4	98	17	47	vine
Pink										
Viva	1906	1471	1539	1824	1685	24.7	110	17	57	vine
Black Turtle Soup										
T 39	2384	1159	1886	1731	1790	19.3	101	16	0	viny bush
Black Beauty ³	2350	674	1884	1751	1665	19.0	106	16	0	vine
Ebony ³	2423	1005	2143	1927	1875	19.6	104	16	0	semivine
Midnight	2270	914	1800 ³	1466 ³	1613	18.3	109	17	0	bush
Dark Red Kidney										
Montcalm	2181	1225	1410	1215	1508	49.8	112	15	0	bush
LSD 5%	316	229	291	285	141					

¹Crookston. Plant length is often considerably longer.²Lamberton, 1981.³1981.

FLAX

RECOMMENDED VARIETIES

Culbert—Very high yield. Early, brown seed, blue flowers. High oil percent and very high iodine value. Resistant to rust, moderately 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.

Flor—High yield. Medium-maturity, brown seed, blue flowers. High oil percent and medium iodine value. Resistant to rust, moderately susceptible to wilt and pasmo. Avoid sowing on soil that grew flax during any of 3 previous years. Released in 1981 by North Dakota Agricultural Experiment Station from backcrossing Linott to Bison M³ and Bison P³.

Linott—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.



Straw length differences between linen flax (left) and oilseed flax (right) are shown by agronomist V. E. Comstock. Oilseed varieties are grown in Minnesota, but linen varieties are tested occasionally in case changing economic conditions make linen production profitable.

VARIETIES NOT ADEQUATELY TESTED

McGregor—High yield when sown early. Very late, brown seed, blue flowers. Very resistant to lodging. Medium in oil percent. Resistant to rust, moderately resistant to wilt, and susceptible to pasmo. Licensed in 1981 by Agriculture Canada, Ottawa from a cross of Redwood 65 and FP 539.

OTHER VARIETIES

Culbert 79—High yield. Early, brown seed, blue flowers. High oil percent and high iodine value. Resistant to rust, moderately resistant to wilt, moderately susceptible to pasmo. Released in 1979 by South Dakota Agricultural Experiment Station as a selection of Culbert.

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.

Wishek—High yield. Early, brown seed, blue flowers. High oil percent and iodine value. Resistant to rust, moderately susceptible to wilt and pasmo. Released in 1979 by North Dakota Agricultural Experiment Station from a cross of Koto and CI.1220B sel.

Table 15. Yields of flax varieties in bushels per acre, 1979-81

Variety	Early-sown							Late-sown		
	Lamberton	Morris	Crookston	Stephen	Grand Rapids	Roseau	Average	Lamberton	Morris	Average
	1979-81	1979-80	1979-81	1979-81	1979-81	1981	1979-81	1980-1981	1979	1979-81
Culbert	26	31	20	19	23	12	22	16	34	22
Dufferin	25	32	25	20	22	14	23	5	31	14
Flor	25	32	23	21	—	17	24	11	38	20
Linott	24	32	23	20	23	15	22	13	35	20
Norstar	25	33	24	18	21	11	22	8	35	17
Culbert 79	27	32	20	19	25	14	22	15	32	21
McGregor	26	31	22	20	—	—	23	9	36	18
Wishek	25	30	23	21	22	16	23	14	27	18
LSD 5%	2	2	2	3	3	3	1	4	7	3

Table 16. Characteristics of flax varieties, 1979-81

Variety	Days from sowing to		Height (inches)	Lodging (score) ¹	Wilt (score) ¹	PasmO (score) ¹	Rust ²	Oil (percent) ³
	first bloom	full bloom						
Culbert	48	54	22	2.6	3	2.3	R	41.0
Dufferin	53	59	24	3.1	2	4.4	R	41.1
Flor	51	57	22	3.3	6	3.9	R	40.5
Linott	48	53	22	2.5	6	4.5	R	40.4
Norstar	52	58	24	3.1	3	4.8	MS	40.9
Culbert 79	48	54	22	2.6	2	2.9	R	41.2
McGregor	53	59	24	2.0	4	5.1	R	—
Wishek	48	53	22	2.1	6	4.5	R	40.3

¹1 = best, 9 = poorest. ²R = resistant, MS = moderately susceptible. ³8 percent moisture basis.

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 4 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 at harvest.

Companies with hybrids in these trials include: Barzen of Minneapolis Inc., 455 NE Harrison, Minneapolis, MN 55413; Cargill Seed Division (also P-A-G), Box 9300, Minneapolis, MN 55440; DeKalb AgResearch Inc., Box 225, Glenvil, NE 68941; Jacques Seed Co., Prescott, WI 54021; Northrup King Co., 1500 NE Jackson, Minneapolis, MN 55413; Paymaster Seeds, Plainview, TX 79072; Pfizer Genetics, Box 166, Olivia, MN 56277; Pioneer Hi-Bred International Inc., 7000 Pioneer Parkway, Johnston, IA 50131; Pride Company, Glen Haven, WI 53810. Company reports indicate hybrids in the table that are resistant to greenbug biotype C (not E) include 1210, 20, J-150, M518G, P151GB, A-28⁺, P508GB, 2250, DK-38, B-38⁺, and M548G.

Table 17. Characteristics of grain sorghum hybrids at Lamberton, 1977-81

Hybrid and company	Grain yield/acre (pounds) ¹		Head moisture (percent)		Test weight/ bushel (pounds)	Weight/ 100 seeds (grams)	Planting to heading (days)	Height (inches) ²
	1981	1977-79, 81	September 23	October 10				
M1, Minnesota AES	3127	3847	26.2	24.4	57.1	2.4	57	55
RS 455, Minnesota AES	4280	5162	30.3	25.4	57.2	2.6	62	57
52, Northrup King	3540	4044	31.7	25.8	56.2	2.0	60	41
8790 ³ , Pioneer	4074	—	33.2	27.2	57.6	2.3	70	—
894, Pioneer	4489	5079	34.1	27.3	57.8	2.1	68	42
R-920, Paymaster	3956	5178	33.1	27.9	56.9	2.2	65	51
354 ⁴ , P-A-G	4289	5149	34.6	28.1	56.2	2.1	71	47
1210 ³ , Northrup King	4533	—	33.2	28.3	55.1	2.2	69	—
20 ⁵ , Cargill	4115	4844	34.7	28.5	54.6	2.0	71	41
J-150 ³ , Jacques	4354	—	34.4	28.8	56.9	2.1	67	—
1580, Northrup King	4811	5470	36.9	28.8	58.1	2.3	72	49
J-101, Jacques	4140	5338	36.0	28.9	56.5	2.4	67	47
121A ⁴ , Northrup King	5008	6005	36.5	29.0	57.0	2.3	69	46
M518G, Pfizer Genetics	3664	5220	37.7	29.3	57.0	2.2	70	45
P151GB ³ , Pride	4251	—	33.1	29.5	55.2	2.0	71	—
A-28 ⁺ , DeKalb	4330	5432	41.0	30.0	57.5	2.2	70	47
P508GB ⁴ , Pride	3823	5201	37.0	30.6	57.0	2.2	71	48
2250 ⁵ , P-A-G	3431	—	37.8	30.7	53.5	2.1	71	—
180, Northrup King	4235	5505	38.8	30.7	57.0	2.0	72	51
DK-38 ³ , DeKalb	3355	—	35.6	31.1	52.2	1.9	75	—
B-38 ⁺ , DeKalb	3399	5313	41.6	31.4	56.7	2.2	72	47
M548G, Pfizer Genetics	2689	4671	38.9	31.9	55.8	2.1	74	52
Stockmans Brand 30Y ³ , Barzen	2918	—	39.3	33.0	51.5	1.9	75	—
LSD 5%	925	380	3.5	1.5				

¹Oven-dry. ²1977-79. ³1981. ⁴1978-79, 81. ⁵1979, 81.

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. Very late. Very tall. Poor lodging resistance. Very small, plump yellow seed of low 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 high test weight. Selected from white proso by Minnesota Agricultural Experiment Station. Released in 1976.

Minsum—White proso. Early. Medium height. Poor lodging resistance. Large, white seed of medium test weight. Open heads with long, spreading branches contrast with more compact heads of

other white proso varieties. Selected from white proso by Minnesota Agricultural Experiment Station. Released in 1980.

VARIETIES NOT ADEQUATELY TESTED

Sno-Fox—Foxtail. Late. Medium height. Poor lodging resistance. Small, white seed of medium test weight. Selected from Rockefeller Foundation's collection of millets by Nebraska Agricultural Experiment Station. Released in 1980.

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.

Cope—White proso. 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.

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

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

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.

Table 18. Yields of millet varieties in pounds per acre, 1978-81

Type and variety	Grain ¹			Forage ^{2,3}		
	Rosemount	Becker	Average	Rosemount	Becker	Average
Foxtail						
Empire ³	2939	1751	2345	9912	6725	8318
Sno-Fox ³	2664	902	1783	7470	3039	5255
Proso						
Dawn	2710	1191	1951	5135	3364	4250
Minco	3257	1919	2588	7244	4283	5764
Minsum	2736	2007	2372	6320	4528	5424
Cope	2811	1661	2236	7122	4305	5714
Cerise	3193	1796	2495	6779	4497	5638
Turghai	2889	1753	2321	6381	4542	5462
LSD 5%	262	164	155	667	595	447

¹10 percent moisture basis. ²Oven-dry including grain. ³1980-81.

Table 19. Characteristics of millet varieties, two location average

Type and variety	Planting to heading (days)	Planting to maturity (days)	Lodging (score) ¹	Height (inches)	Weight/100 seeds (grams)	Test weight/bushel (pounds)
Foxtail						
Empire ²	66	112	2.8	49	.20	47.8
Sno-Fox ²	61	100	3.0	36	.23	52.9
Proso						
Dawn	50	83	3.4	29	.70	51.6
Minco	53	96	3.2	41	.67	54.3
Minsum	50	87	4.9	38	.74	51.6
Cope	57	100	3.4	45	.71	51.6
Cerise	48	82	2.9	40	.58	55.9
Turghai	48	83	1.9	40	.57	55.3

¹1 = erect, 9 = flat. ²1980-81.

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

Benson—Medium maturity, high yield, medium height, fair lodging resistance, medium test weight, high groat percent, medium protein percent, cream colored seed. Some resistance to crown rust, resistant to smut. Selected at Minnesota Agricultural Experiment Station from a cross between Portage and Burnett. Released in 1979. Seed sale regulated by U.S. Variety Protection Act.

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

Moore—Late, high yield, tall, fair lodging resistance, high test weight and groat percent, low protein percent, white seed. Some resistance to crown rust and smut. Selected at Minnesota Agricultural Experiment Station from a cross between Lodi and Mn 65B1286, a crown rust resistant selection. Released in 1979. Seed sale regulated by U.S. Variety Protection Act.

Noble—Early-medium maturity, medium yield, medium height, good lodging resistance, medium test weight, groat percent and protein percent, 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

Larry—Early, medium yield, short, good lodging resistance, high test weight, medium groat percent and protein percent, yellow seed. Susceptible to crown rust and smut. Tolerant to "red leaf." Selected at Illinois Agricultural Experiment Station from a cross of Tyler, Egdolon and Orbit. Released in 1981.

Ogle—Early-medium maturity, high yield, medium height, good lodging resistance, medium test weight, high groat percent, low protein percent, yellow seed. Susceptible to crown rust and smut, tolerant to "red leaf." Selected at Illinois Agricultural Experiment Station from a cross of Brave, Tyler and Egdolon. Released in 1981.

Porter—Late, high yield, medium height, poor lodging resistance, medium test weight, groat percent and protein percent, ivory seed. Resistant to crown rust and smut, tolerant to "red leaf." Selected at Purdue Agricultural Experiment Station from a cross involving many lines. Released in 1981. Seed sale regulated by U.S. Variety Protection Act.

OTHER VARIETIES

Chief—Early-medium maturity, medium yield and height, fair lodging resistance, high test weight and groat percent, medium

protein percent, 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 percent, high protein percent, 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, medium yield and height, fair lodging resistance, high test weight and groat percent, medium protein percent, 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.

Iowa Early Multiline Blend (E73, E74, and E76)—Early, low yield, medium height, good lodging resistance, high test weight and groat percent, medium protein percent, 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 percent, medium protein percent, 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.

Lancer—Early-medium maturity, high yield, medium height, good lodging resistance, high test weight, groat percent and protein percent, white seed. Susceptible to smut and crown rust. Selected at South Dakota Agricultural Experiment Station from a cross between Neal and Clintland 64. Released in 1979.

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

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

Marathon—Late, high yield, tall, good lodging resistance, medium test weight, high groat percent and protein percent, ivory seed. Resistant to crown rust, susceptible to smut. Selected at Wisconsin Agricultural Experiment Station from a cross between Holden and a sister line of Dal. Released in 1979. Seed sale regulated by U.S. Variety Protection Act.

Otana—Late, medium yield, tall, poor lodging resistance, medium test weight, low groat percent and protein percent, 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.

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.

Stout—Early-medium maturity, medium yield, short, good lodging resistance, high test weight and groat percent, medium protein percent, 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.

Table 20. Yield of oat varieties in bushels per acre, 1979-1981

Variety	Rosemount	Waseca	Morris	Grand Rapids	Stephen	Average 5 locations	Lamberton ¹	Crookston ²
Larry ³	73	68	107	58	102	82	136	117
Ogle ³	93	86	120	71	110	96	141	113
Noble	79	73	109	59	91	82	134	109
Lancer	92	89	109	62	96	89	122	121
Benson	89	80	112	68	97	89	121	95
Lyon	86	77	112	65	107	89	128	118
Moore	95	83	115	69	118	96	121	112
Porter ⁴	80	94	123	88	—	—	—	116
LSD 5%	7	8	7	7	9	4	10	15

¹1980. ²1981. ³1980-81. ⁴1981.

Table 21. Characteristics of oat varieties, 1979-1981

Variety	Heading (date)	Height (inches)	Lodging (score) ¹	Test weight/bushel (pounds)	Groat (percent)	Protein percent ²		Protein/ acre (pounds) ²	Reactions to disease ³	
						groat	seed		crown rust	smut
Larry ⁴	6-24	34	2.7	36	72	17.4	12.6	348	S	S
Ogle ⁴	6-25	36	2.4	35	74	16.7	12.3	376	S	S
Noble	6-26	35	2.5	36	73	17.3	12.4	339	S	R
Lancer	6-26	36	2.4	38	75	18.1	13.5	403	MS	S
Benson	6-27	39	3.4	36	74	17.8	13.0	379	MR	R
Lyon	6-28	43	3.3	38	74	18.0	13.4	387	MR	R
Moore	6-29	41	3.1	37	74	16.2	12.0	363	MR	MR
Porter ⁵	7-1	39	5.0	36	73	17.0	12.8	392	MR	R

¹1 = erect, 5 = flat. ²7% moisture. ³R = resistant, MR = moderately resistant, MS = moderately susceptible, and S = susceptible. ⁴1980-81. ⁵1981.

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 winterhardiness 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 22. Characteristics of orchardgrass varieties with dry matter yields expressed as percentage of Hallmark at two locations, 1971-1981

Variety	Developer or owner ¹	Yield (percent of Hallmark)			Winter injury ²		Rust reaction ³
		Grand Rapids	Rosemount	Average	Grand Rapids	Rosemount	
No. of trial years		10	9				
<i>Early</i>							
Boone	Kentucky Agr. Exp. Sta. ^a	85	96	90	—	4.8	MS
Chinook	Agr. Canada, Lethbridge ^a	83	85	83	—	4.5	—
<i>Medium</i>							
Able	Farmers Forage Res. Coop. ^c	89	95	92	1.5	2.3	MS
Comet	Northrup King Co. ^{ik}	97	99	98	4.1	3.3	S
Dart	Land O'Lakes Inc. ^f	102	99	101	1.5	3.0	S
Dayton	Midland Coop. Inc. ^h	94	101	97	2.7	5.0	S
Frode	Swedish Seed Assoc. ⁱ	94	92	92	—	—	—
Hallmark, ton/acre	Farmers Forage Res. Coop. ^{ch}	3.4	3.9	3.6	2.2	4.8	S
Hawk hybrid	North American Plant Breeders ^{dn}	72	101	91	3.1	—	MS
Ina	Ontario Agr. Coll., Guelph ^a	90	89	89	—	3.3	MS
Juno	Agr. Canada, Ottawa ^a	100	100	100	1.7	4.7	S
Napier	Rudy Patrick Co. ^{dejn}	99	101	100	3.7	3.8	MS
Potomac	USDA and Coop. State Exp. Sta. ^b	88	89	87	1.7	—	MS
Prime	Northrup King Co. ^l	—	84	—	—	8.3	MS
Sterling	Iowa Agr. Exp. Sta. ^{chog}	103	96	100	4.3	4.9	S
<i>Late</i>							
Kay	Agr. Canada, Ottawa ^a	92	89	91	3.7	—	S
Majestic	Maple Leaf Mills, Inc. ^a	—	91	91	—	3.0	S
Orion	Northrup King Co. ^l	88	107	98	8.1	—	MR
LSD 5%		8	7	2			

¹1982 seed supplies and sources: a. not available or very limited, b. available from most sources, c. Cenex Coop. Inc., d. Field Seed Farms, e. Interstate Seed & Grain, f. Land O'Lakes, g. Lincoln Seed & Feed Co., h. Midland Coop. Inc., i. Northrup King Co., j. P-A-G Seeds, k. Payco Seeds, l. Pride Seed Co., m. Ramy Seed Co., n. Ziller Seed Farms Inc., o. Werner Farm Seeds. ²1 = most damaged, 9 = least damaged. ³MR = moderately resistant, MS = moderately susceptible, S = susceptible.

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 diseases. 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 23. Average yields of red clover varieties expressed as percentage of Lakeland for all tests in Minnesota 1966-1979

Variety	Developer or owner ¹	Yield (percent of Lakeland)				Stand 3 years after seeding (percent)
		Year after seeding			Average	
		1	2	3	1st 2 years	
Lakeland	Wisconsin Agr. Exp. Sta. & USDA (tons/acre, 15% M) ^{acdfghijkl}	3.6	3.5	2.2	3.5	55
Florex	Northrup King Co. ^e	125	100	102	116	—
Arlington	Wisconsin Agr. Exp. Sta. & USDA ^{adfgghijkl}	118	105	100	113	85
Prosper I	Pride Co. Inc. ⁱ	113	105	106	111	—
Dollard	Macdonald College, Canada ^m	104	96	95	100	23
Redman	Farmers Forage Res. Coop. ^{ad}	98	100	97	99	70
Redland	Illinois Agr. Exp. Sta. ^{bn}	96	92	88	95	55
Kenland	Kentucky Agr. Exp. Sta. & USDA ^m	98	89	86	94	38
Kenstar	Kentucky Agr. Exp. Sta. & USDA ^m	90	100	97	93	63
Pennscott	Pennsylvania Agr. Exp. Sta. ^m	96	78	0	89	28
Tensas	Louisiana Agr. Exp. Sta. ^m	56	62	0	59	23

¹1982 seed suppliers: a. Cenex, b. Field Seed Farms, c. Interstate Seed and Grain Co., d. Midland Cooperatives, Inc., e. Northrup King Co., f. Peterson-Biddick Co., g. Peterson Forage Seed Div., h. Premium Seed Co., i. Pride Co. Inc., j. The Sexauer Co., k. Twin City Seed Co., l. Werner Farm Seeds, Inc., m. not available or very limited, n. Ziller Seed Farms, Inc..

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. Satisfactory 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 24. Dry matter yields of reed canarygrass varieties expressed as percentage of Rise at four locations and average for 1972-81

Variety	Developer or owner ¹	Lamberton	Grand Rapids	Morris	Rosemount	Average
No. of trial years		2	8	2	12	
Rise ton/acre	Rudy Patrick Co. ^{cd}	2.9	4.2	3.2	4.6	4.4
Flare	Land O'Lakes Inc. ^b	—	99	—	101	100
Frontier	Agr. Canada, Ottawa	96	101	101	97	99
Vantage	Iowa Agr. Exp. Sta. ^{ae}	96	101	102	97	99
LSD 5%		10	3	5	3	2

¹1982 seed supplies and sources: a. Field Seed Farms, b. Land O'Lakes Inc., c. Midland Coop., d. Interstate Seed & Grain, e. Ziller Seed Farms Inc.

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 tables 25 to 27 are averages of two or more years. The data for all locations except Grand Rapids and Roseau are from replicated, combine-harvested plots. Data from these two locations are from smaller replicated, multiple-row nursery plots. Data were not obtained at Becker or Fairmont in 1979 or at Fairmont in 1981 because of hail. Also data were not obtained

at Crookston or Moorhead in 1980 because of drought. Row spacings at Crookston, Grand Rapids, Moorhead and Roseau varied from 12 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 mid-June.

Varieties are placed in three geographical groupings. Certain transitional varieties appear in more than one grouping. Comparisons, should be made within groupings.

Data on maturity, lodging resistance, plant height, seed size, and seed quality in table 28 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 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.

RECOMMENDED VARIETIES

Clay—North central, central, and northern zones. Has given good yields and is outstanding for oil and protein in its maturity class. Highly susceptible to phytophthora. Developed by Minnesota Agricultural Experiment Station from a cross of Renville and Capital. Released in 1968.

Corsoy 79—Southern zone. Very similar to Corsoy, which has been the leading variety in Minnesota for several years, except that it is resistant to races 1, 2, 3, 6, 7, 8 and 9 of phytophthora. Developed by Illinois Agricultural Experiment Station by five backcrosses in which Corsoy was the recurrent parent and Lee 68 was the nonrecurrent source of phytophthora resistance. Released in 1979.

Evans—North central, central, and south central zones. Resistant to races 1 and 2 of phytophthora. Developed by Minnesota Agricultural Experiment Station from a cross of Merit and Harosoy. Released in 1974. Seed sale regulated by U.S. Variety Protection Act.

Hardin—Southern zone. Resistance to race 1 of phytophthora. Developed by Iowa Agricultural Experiment Station from two backcrosses in which Corsoy was the recurrent parent and Cutler 71 was the resistant, nonrecurrent parent. Released in 1980. Seed sale regulated by the U.S. Variety Protection Act.

Hodgson 78—South central and southern zones. Similar to Hodgson, except resistant to races 1 and 2 of phytophthora. Developed by Minnesota Agricultural Experiment Station by six backcrosses 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. Susceptible to phytophthora. Developed by 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 by Minnesota Agricultural Experiment Station from crosses involving Lincoln, Richland, Capital, and Korean. Released in 1972.

Vickery—Southern Zone. Similar to Corsoy except that it is resistant to races 1, 2, 3, 5, 6, 7, 8 and 9 of phytophthora. Developed jointly by the Iowa and Ohio Agricultural Experiment Stations by three backcrosses in which Corsoy was the recurrent parent and Mack was the nonrecurrent source of phytophthora resistance. Released in 1978. Seed sale regulated by U.S. Variety Protection Act.

Weber—Southern zone. Similar to Corsoy in yield and lodging. Good tolerance to high lime soils. Susceptible to phytophthora rot. Developed by Iowa Agricultural Experiment Station from crosses involving Swift, Blackhawk, Harosoy, Lincoln and Ogden. Released in 1979. Seed sale regulated by the U.S. Variety Protection Act.

VARIETIES NOT ADEQUATELY TESTED

Lakota—Similar in maturity to Hodgson 78. Taller and lodges more than Hodgson 78. Resistant to chlorosis on high lime soils. Resistant to races 1 and 2 of phytophthora. Developed at Iowa Agricultural Experiment Station from crosses involving a number of parental strains. Released in 1981. Seed sale regulated by the U.S. Variety Protection Act.

Maple Presto—About 10 days earlier than McCall. Resistant



Agronomist J. W. (Jean) Lambert is completing 36 years of plant breeding at the University of Minnesota. Dr. Lambert developed many varieties of soybean including Hodgson 78, Hodgson, Evans, McCall, Clay, Swift, Grande, Steele, Wilkin, Norman, Renville, and Traverse. Soybean germ-plasm and breeding procedures developed in the Minnesota program and students trained by Dr. Lambert will continue to improve soybean production in the future.

to races 1 and 2 of phytophthora. Developed by Agriculture Canada, Ottawa, from crosses involving Amsoy, Portage, and Holmberg 840-7-3. Licensed in 1979. Production of certified seed limited to Canada.

OTHER VARIETIES

Altona—Similar to McCall in maturity but yields less. Resistant to several races of phytophthora. Developed at University of Manitoba from a cross of PI 194654 and Flambeau. Released in 1966.

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.

Corsoy—A leading variety in Minnesota for many years. Now largely superseded by its phytophthora-resistant backcross derivatives. Developed by Iowa Agricultural Experiment Station from a cross of Harosoy and Capital. Released in 1967.

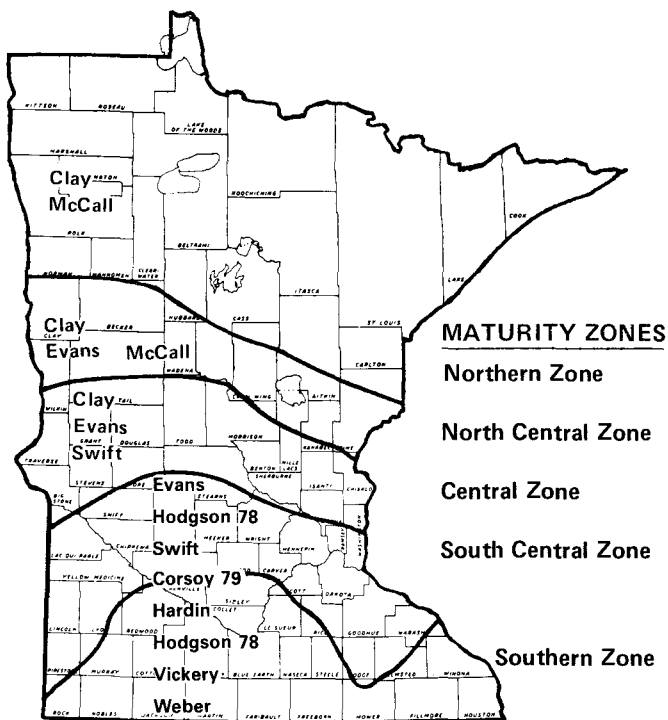
Harcor—Similar to Corsoy in yield but later and lodges more. Resistant to races 1 and 2 of phytophthora. Developed by Agriculture Canada, Harrow, from crosses involving Corsoy and Harosoy 63. Licensed in 1975.

Harlon—Similar to Evans in yield but several days later and lodges more. Resistant to races 1 and 2 of phytophthora. Developed by Agriculture Canada from a cross of Blackhawk and Harosoy 63. Licensed in 1975.

Hodgson—A leading variety in south central Minnesota for several years. Now largely superseded by its phytophthora-resistant backcross derivative, Hodgson 78. Developed by 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.

Maple Arrow—About 4 days later than McCall. Good resistance to lodging. Resistant to several races of phytophthora. Developed by Agriculture Canada, Ottawa, from a cross of Harosoy and Holmberg 840-7-3. Licensed in 1976.

Portage—Earlier than McCall. Good resistance to lodging. Susceptible to shattering, to chlorosis on high lime soils, and to



phytophthora rot. Developed at University of Manitoba from a cross of Acme and Comet. Licensed in 1964.

Steele—Similar to Hodgson in maturity but yields less. Resistant to races 1 and 2 of phytophthora. Developed by 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 races 1 and 2 of phytophthora. Developed by Indiana Agricultural Experiment Station from crosses involving Harosoy, Lincoln, Ogden, and Blackhawk. Released in 1972. Seed sale regulated by U.S. Variety Protection Act.

Wells II—Very similar to Wells except that it is resistant to races 1, 2, 3, 5, 6, 7, 8 and 9 of phytophthora. Developed by Indiana Agricultural Experiment Station by six backcrosses in which Wells was the recurrent parent and Arksoy was the nonrecurrent source of phytophthora resistance. Released in 1978. Seed sale regulated by U.S. Variety Protection Act.

Wilkin—Similar to Clay in maturity. Excellent resistance to lodging. Resistant to races 1 and 2 of phytophthora. Good tolerance to high-lime soils. Developed at Minnesota Agricultural Experiment Station from a cross of Merit x Harosoy. Released in 1972.

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 1979, 1980, and 1981. A later group was planted at Fairmont, Lamberton, and Waseca in the same years. The Becker and Fairmont tests in 1979 and the Fairmont test in 1981 were not harvested because of hail.

The tests were planted in four-row plots, 12 feet long with 30-inch spacings between rows. There were three or four replications. 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 1981, 1980-81 and 1979-81 are given in table 29. Yields of the late group for the same periods are given in table 30. The varieties are arranged in two sections with the publicly developed varieties first and the privately developed varieties second. Each section is arranged alphabetically, according to company names.

Other characteristics for 1981 are given in tables 31 and 32 for the early and late groups, respectively. For several of the characteristics, an average is shown for the three locations of each group. The phytophthora reactions are from laboratory tests made by the Department of Plant Pathology. The chlorosis scores are based on observations made in a high lime nursery at Lamberton. Protein and oil determinations were made on a Neotec GQA 41 Grain Analyzer.

The companies entering varieties in the 1981 Minnesota tests were: ACCO Paymaster Seed, P.O. 5645, Minneapolis, MN 55440; Agricultural Exports, Inc., P.O. 266, Hudson, IA 50643; Anderson Seeds, R.R. 1, Dassel, MN 55325; Arrowhead, Inc., Watertown, SD 57201; Asgrow Seed Co., 7000 Portage Road, Kalamazoo, MI 49001; Dairyland Seed Co., Inc., 3570 Hwy. H, P.O. 958, West Bend, WI 53095; Farmacy Seed Co., P.O. 123, Dodge Center, MN 55927; Field Seed Farms, R.R. 1, P.O. 39, Byron, MN 55920; FFR Cooperative, 4112 East State Road 225, West Lafayette, IN 47906; Funk Seeds International, 1300 West Washington St., P.O. 2911, Bloomington, IL 61701; Growers Seed Association, P.O. 1656, Lubbock, TX 79408; Hoffman Seed Farms, Inc., R.R. 1, Iowa Falls, IA 50126; Hofler Seed Co., Nora Springs, IA 50458; Hy Vigor Seeds, Paullina, IA 51046; Jacques Seed Co., 720 St. Croix St., Prescott, WI 54021; Kruger Seed Co., Hwy 57 West, P.O. 807, Cedar Falls, IA 50613; Land O'Lakes, Inc., R.R. 2 Webster City, IA 50595; Latham Seed Co., Alexander, IA 50420; Lynnville Seed Co., Lynnville, IA 50153; Midland Cooperatives, Inc., P.O. 1395, Minneapolis, MN 55440; Midwest Oilseeds, Inc., R.R. 3, P.O. 204, Adel, IA 50003; Agripro Division, North American Plant Breeders, R.R. 2, Hwy 30 East, Ames, IA 50010; Migro Division, North American Plant Breeders, P.O. 2955, Mission, KS 66201; Northrup King Co., P.O. 959, Minneapolis, MN 55440; Peterson Seed Division, 3261 West Airline Hwy, Waterloo, IA 50701; Pfizer Genetics, Inc., P.O. 166, Olivia, MN 56277; Pride Co., Inc., P.O. 8, Glen Haven, WI 53810; Soybean Research Foundation, P.O. 72, Mason City, IL 62664; Stine Seed Farm, Inc., R.R. 3, P.O. 204, Adel, IA 50003; Willette Seed Farm, Inc., Delavan, MN 56023; Ziller Seed Co., R.R. 1, P.O. 122, Bird Island, MN 55310.

Table 25. Yields of publicly-developed soybean varieties in northern Minnesota in bushels per acre

Variety	Crookston 1979, 81	Grand Rapids 1980-81	Moorhead 1979, 81	Morris 1979-81	Roseau 1980-81
Altona	37	34	34	32	—
Clay	37	36	40	34	20
Maple Arrow	34	39	33	30	29
Maple Presto	—	25	—	—	16
McCall	45	36	36	37	35
Portage	—	33	—	—	24
LSD 5%	5	3	3	2	5

Table 26. Yields of publicly-developed soybean varieties in central Minnesota in bushels per acre

Variety	Becker 1978, 80, 81	Dawson 1979-81	Moorhead 1979, 81	Morris 1978-81	Rosemount 1979-81	St. Paul 1978-81
Clay	39	—	40	32	—	35
Coles	—	33	—	—	38	—
Evans	47	30	42	34	36	42
Hardin	—	—	—	—	—	—
Hodgson 78	48	30	—	36	35	44
Swift	45	28	—	35	34	43
Vickery	—	31	—	—	38	—
Weber	—	29	—	—	34	—
LSD 5%	4	4	3	2	3	2

Table 27. Yields of publicly-developed soybean varieties in southern Minnesota in bushels per acre

Variety	Lamberton				Waseca				Fairmont	
	Mid-May planting			Mid-June planting 1978, 79, 81	Mid-May planting			Mid-June planting 1978-81	Mid-May planting	
	Late April planting 1980-81	Early- maturing 1980-81	Late- maturing 1980-81		Late April planting 1980-81	Early- maturing 1980-81	Late- maturing 1980-81		Early- maturing 1978, 80	Late- maturing 1978, 80
Clay	—	—	—	37	—	—	—	35	—	—
Corsoy 79	51	—	49	—	47	—	53	—	—	—
Evans	—	37	—	39	—	49	—	39	43	—
Hardin	—	—	47	—	—	—	57	—	—	—
Hodgson 78	45	46	45	44	43	54	51	40	49	55
McCall	—	—	—	39	—	—	—	37	—	—
Swift	—	40	—	39	—	48	—	36	45	—
Vickery	49	—	48	44	48	—	55	41	—	52
Weber	50	—	49	—	45	—	53	—	—	—
LSD 5%	3	—	3	3	4	—	3	2	4	4

Table 28. Characteristics of publicly-developed varieties, planted about mid-May

Variety	Mature (September)	Lodging (score) ¹	Height (inches)	Weight/ 100 seeds (grams)	Seed quality (score) ¹	Protein (percent) ²	Oil (percent) ²	Phytoph- thora (reaction) ³	Chlorosis (score) ¹
<i>Northern Minnesota (average Crookston 1979-81; Grand Rapids 1980-81)</i>									
Altona	15	2.4	32	18.7	2.4	41.3	18.3	R	4.5
Clay	20	1.6	33	18.8	3.2	40.5	18.9	S	2.2
Maple Arrow	19	1.8	34	19.7	2.6	40.9	20.0	R	3.6
Maple Presto	2	1.0	23	16.6	3.4	38.9	18.9	R	3.2
McCall	15	1.9	31	13.5	2.0	39.8	18.1	S	3.0
Portage	10	1.6	29	17.9	2.5	39.5	18.7	S	4.0
<i>Central Minnesota (average Morris and St. Paul, 1978-81)</i>									
Clay	9	1.9	27	17.1	2.8	41.2	21.1	S	2.2
Evans	15	2.0	35	16.0	2.5	40.3	20.3	R	1.5
Hodgson 78	26	2.6	36	17.2	2.0	40.1	19.9	R	2.3
Swift	22	3.3	38	17.0	2.4	39.7	19.7	S	1.4
<i>Southern Minnesota (average Lamberton and Waseca 1980-81)</i>									
Corsoy 79	24	2.6	40	16.9	2.6	39.9	19.8	R	4.5
Hardin	21	2.6	39	16.2	2.4	39.2	19.9	R	4.5
Hodgson 78	19	1.6	35	18.1	2.4	40.0	20.0	R	2.6
Vickery	23	2.8	39	16.9	2.5	40.1	18.9	R	4.1
Weber	20	2.4	37	14.6	1.8	39.4	19.9	S	1.1

¹1 = excellent, 5 = very poor. ²Moisture-free. ³R = resistant, S = susceptible.

Table 29 . Yields of private soybean varieties in bushels per acre, early group, 1981, 1980-81, 1979-81

Company; brand	Variety or number	1981				1980-81				1979-81	
		Becker	Morris	Rose- mount	Average	Becker	Morris	Rose- mount	Average	Morris	Rose- mount
	Evans	42	47	41	43	44	47	38	43	47	41
	Hodgson 78	46	49	47	47	49	48	40	46	46	43
	Swift	43	45	44	44	42	46	40	43	45	41
ACCO Paymaster	101	43	45	43	44	45	46	38	43	46	41
Agricultural Exports, Inc.	Gieso	40	38	41	40						
Arrowhead, Inc.	DSG-1	40	48	39	42						
Arrowhead, Inc.	9144	46	45	42	44						
Asgrow	A1179	44	45	38	42						
Asgrow	A1564	46	46	41	44						
Dairyland	DSR-120	49	44	44	46	46	45	42	44	44	42
Dairyland	DSR-141	48	47	41	45	45	46	41	44	43	42
Hy Vigor	E-90	46	45	44	45						
Hy Vigor	Hardy	49	47	46	47						
Jacques	J82	42	50	43	45						
Jacques	J88	49	48	46	48	49	49	43	47		
Kruger	K-1005	48	46	41	45						
Land O'Lakes, Inc.	LL4504	47	47	45	46	48	49	44	47	48	45
Land O'Lakes, Inc.	GO-45	50	49	43	47	51	49	41	47		
Land O'Lakes, Inc.	LL4503	49	45	44	46						
Midland	HC800	44	46	45	45	44	47	41	44	47	42
Midland	HC895	45	45	49	46						
Midland	HC900A	44	45	44	44						
NAPB; Agripro	AP10	51	47	50	49	50	48	46	48	46	46
Northrup King Co.	Multivar 31	48	44	40	44	47	46	36	43		
Northrup King Co.	S09-90	49	48	41	46						
Northrup King Co.	S0512	38	48	37	41						
Northrup King Co.	S1346	49	45	49	48	47	46	47	47	45	48
Pfizer Genetics	12E-80	45	48	47	47	45	48	43	45		
Pfizer Genetics	CX282	43	44	40	42	42	46	38	42	45	39
Pride	B070	38	42	41	40						
Pride	B186	48	45	45	46						
Pride	PK107	46	43	46	45						
Soybean Res. Found.	SRF69-707-25	48	50	43	47	48	50	40	46	47	42
Stine	1100	45	46	45	45						
Ziller	BT-1210	44	42	42	43	45	47	38	43		
Ziller	TC-137	49	49	47	48						
LSD 5%		5	5	5	3	4	4	4	2	3	3

Table 30. Yields of private soybean varieties in bushels per acre, late group, 1981, 1980-81, and 1979-81

Company; brand	Variety or number	1981			1980-81			1979-81			1980
		Lamberton	Waseca	Average	Lamberton	Waseca	Average	Lamberton	Waseca	Average	Fairmont
	Hodgson 78	48	54	51	45	55	50	44	54	49	49
	Vickery	48	59	54	48	58	53	47	58	52	48
	Weber	54	55	54	51	53	52	48	52	50	47
ACCO Paymaster	201	56	60	58	51	55	53	48	54	51	47
ACCO Paymaster	251	56	47	51							
Anderson Seeds;											
Gutwein	180	47	52	49							
Anderson Seeds	108	51	57	54							
Arrowhead, Inc.	8155	50	53	51							
Asgrow	A1564	50	52	51							
Asgrow	A1937	50	59	54							
Asgrow	A2575	46	58	52	48	55	52	46	52	49	40
Asgrow	A2656	49	52	50	48	54	51	48	52	50	48
Dairyland	DSR-141	48	51	49	45	50	48	44	50	47	43
Dairyland	DSR-171	49	59	54	47	55	51	45	53	49	46
Dairyland	DSR-207	53	58	56	51	57	54	48	55	51	47

Table 30 (continued). Yields of private soybean varieties in bushels per acre, late group, 1981, 1980-81, and 1979-81

Company; brand	Variety or number	1981			1980-81			1979-81			1980
		Lamberton	Waseca	Average	Lamberton	Waseca	Average	Lamberton	Waseca	Average	Fairmont
Farmacy	Abel	50	59	55							
Farmacy	Enterprize	48	49	49							
Farmacy	Eve	55	61	58							
Field	100	48	58	53	49	54	52				48
FFR	1518	58	51	54							
FFR	1526	51	53	52							
Funk	E3236	48	54	51	44	51	48				43
Funk	12042	55	54	54							
Growers Seed Ass'n	GSA100	51	61	56							
Hoffman Seed	7800	46	61	54	46	56	51				42
Hoffman Seed	7902	52	52	52	50	54	52				48
Hoffman Seed	8001	55	62	58							
Hofler Seed Co.	Norsoy	52	53	53	51	53	52	47	54	50	47
Hy Vigor	E-90	47	54	50							
Hy Vigor	Hardy	42	50	46							
Hy Vigor	Rowtunda	56	55	55	54	54	54	48	53	50	47
Jacques	J102A	52	56	54	46	55	51	45	54	49	52
Jacques	J103	53	60	57							
Kruger; DeSoy	295	44	56	50							
Kruger; DeSoy	302A	51	59	55	49	59	54				53
Kruger; DeSoy	305	52	57	55	49	57	53	48	56	52	46
Kruger; DeSoy	433	51	57	54	49	55	52	47	54	50	49
Land O'Lakes, Inc.	GO-43	49	56	52							
Land O'Lakes, Inc.	GO-44	48	57	52	48	56	52				54
Land O'Lakes, Inc.	LL4303	54	55	54							
Land O'Lakes, Inc.	LL4404	46	53	49	48	54	51	47	53	50	49
Latham	150	44	52	48	45	52	49				
Latham	300	50	52	51	48	52	50	45	53	49	45
Latham	Ex500	51	61	56							
Lynville Seed; Riverside	4041	52	49	50							
Lynville Seed; Riverside	4042	50	62	56							
Midland	HC900A	51	51	51	48	52	50	45	51	48	49
Midland	HC1000	51	55	53	47	53	50	45	52	49	51
Midland	HC1010	48	54	51	48	52	50				45
Midwest Oilseeds	1290	51	55	53							
Midwest Oilseeds	2100A	54	53	53							
NAPB; Agripro	AP10	47	56	52	46	55	50	45	54	49	42
NAPB; Agripro	AP200	54	61	57	49	57	53	45	55	50	44
NAPB; Agripro	AP225C	45	51	48	46	52	49	45	51	48	43
NAPB; Migro	HP20-20	52	58	55	49	55	52	49	55	52	45
Northrup King Co.	Multivar 43	48	53	50	47	53	50				44
Northrup King Co.	S1346	47	57	52	46	54	50	46	52	49	41
Northrup King Co.	S1492	56	58	57							
Northrup King Co.	S2596	48	62	55	48	58	53				52
Peterson	3100	51	55	53							
Pfizer Genetics, Inc.	CB151P	46	60	53	47	58	52	47	54	51	54
Pfizer Genetics, Inc.	CX155	52	61	56	48	56	52	47	54	51	47
Pride	B216	52	53	52	51	55	53	48	54	51	54
Pride	B220	49	55	53	49	55	52	47	54	50	52
Pride (Experimental)	119403	53	57	55							
Soybean Res. Found.	SRF74-7272	55	62	58							
Soybean Res. Found.	SRF 150P	47	58	53	47	54	50	45	53	49	45
Stine	1800	52	51	52							
Stine	2100	57	57	57							
Willette; Wilsoy	82	53	57	55							
Ziller	BT-2450	45	50	48	42	50	46	41	49	45	48
Ziller	TC-137	47	57	52							
LSD 5%		7	7	5	5	5	3	4	4	3	7

Table 31. Characteristics of private soybean varieties, early group, average Becker, Morris, and Rosemount, 1981

Company; brand	Variety or number	Type ¹	Mature (September)	Lodging (score) ²	Height (inches)	Weight/100 seeds (grams)	Seed quality (score) ²	Protein (percent) ³	Oil (percent) ³	Phytophthora (reaction) ⁴	Chlorosis (score) ²
ACCO Paymaster Agricultural Exports, Inc.	Evans	P	14	2.2	38	16.1	2.1	40.2	20.1	R	1.0
	Hodgson 78	P	26	2.0	41	17.6	1.7	40.7	19.8	R	2.0
	Swift	P	20	2.8	40	17.2	2.6	39.5	20.3	S	1.0
	101	P	27	3.0	44	16.8	3.3	41.3	20.3	R	3.0
	Gieso	P	12	2.4	26	16.2	2.1	39.8	19.4	M	2.5
Arrowhead, Inc.	DSG-1	P	22	2.0	38	17.0	2.2	41.5	19.5	R	3.0
Arrowhead, Inc.	9144	P	16	2.1	34	16.3	2.2	39.9	19.1	S	2.0
Asgrow	A1179	P	23	1.9	40	15.8	2.1	41.2	20.5	R	3.0
Asgrow	A1564	P	27	2.6	42	18.2	1.9	41.7	20.2	R	4.0
Dairyland	DSR-120	P	22	1.8	35	18.7	2.1	42.8	19.4	M	3.2
Dairyland	DSR-141	P	27	1.8	43	18.3	1.8	42.0	19.0	S	3.5
Hy Vigor	E-90	B	31	2.7	39	18.1	2.7	40.9	19.3	R	3.5
Hy Vigor	Hardy	P	25	1.8	35	17.8	2.7	41.6	18.1	R	3.0
Jacques	J82	P	26	2.4	42	16.0	2.5	40.8	18.8	S	1.0
Jacques	J88	P	26	2.0	39	17.2	1.7	41.0	19.3	S	2.0
Kruger	K-1005	P	27	2.7	40	17.3	2.0	40.7	18.8	R	3.0
Land O'Lakes, Inc.	GO-45	B	27	2.0	39	18.2	2.6	41.2	19.9	R	3.5
Land O'Lakes, Inc.	LL4503	P	25	2.6	34	19.4	2.8	41.6	19.9	R	2.5
Land O'Lakes, Inc.	LL4504	P	23	2.1	35	19.6	3.0	41.4	18.2	R	3.5
Midland	HC800	B	17	2.2	38	16.8	2.1	40.4	20.5	R	1.0
Midland	HC895	P	22	2.3	38	15.8	1.7	40.9	19.4	R	1.0
Midland	HC900A	B	30	2.8	42	17.3	1.5	40.3	20.0	R	1.5
NAPB; Agripro	AP10	P	27	2.7	39	17.2	1.5	41.7	19.7	R	3.0
Northrup King Co.	Multivar 31	B	19	2.8	40	17.1	2.5	40.2	20.0	M	4.0
Northrup King Co.	S09-90	P	22	2.0	38	17.7	3.0	39.6	19.7	R	1.0
Northrup King Co.	S0512	P	16	2.1	36	14.2	2.3	40.5	18.7	S	1.0
Northrup King Co.	S1346	P	28	1.2	37	19.3	2.9	38.6	18.3	S	4.2
Pfizer Genetics, Inc.	12E-80	B	27	2.4	39	17.7	2.3	40.0	20.2	R	1.2
Pfizer Genetics, Inc.	CX282	P	22	2.2	41	17.7	1.8	41.4	20.3	S	1.0
Pride	B070	P	15	3.0	37	13.8	2.4	41.2	19.6	R	4.0
Pride	B186	P	26	2.2	40	17.2	1.9	42.3	17.8	S	2.2
Pride	PK107	P	27	2.0	39	18.2	2.8	39.7	18.7	M	3.0
Soybean Res. Found.	SRF69-707-25	P	26	1.4	36	13.8	1.9	41.1	19.7	S	5.0
Stine	1100	P	27	3.0	41	17.1	2.2	40.4	19.6	R	3.5
Ziller	BT-1210	P	15	2.2	35	15.8	2.3	39.7	20.4	S	2.5
Ziller	TC-137	P	26	2.1	39	17.4	2.0	40.8	18.2	R	3.0

¹P = pure line, B = blend. ²1 = excellent, 5 = very poor. ³Moisture-free. ⁴R = resistant, S = susceptible, M = mixture of R and S.

Table 32. Characteristics of private soybean varieties, late group, average Lamberton and Waseca, 1981

Company; brand	Variety or number	Type ¹	Mature (September)	Lodging (score) ²	Height (inches)	Weight/100 seeds (grams)	Seed quality (score) ²	Protein (percent) ³	Oil (percent) ³	Phytophthora (reaction) ⁴	Chlorosis (score) ²
ACCO Paymaster	Hodgson 78	P	15	2.0	36	16.4	2.2	41.1	20.3	R	2.0
	Vickery	P	22	2.7	41	15.8	2.2	40.8	19.6	R	3.0
	Weber	P	17	2.5	39	13.8	2.0	40.4	20.1	S	1.0
	201	B	+1	2.0	41	20.7	2.7	40.9	19.1	S	5.0
ACCO Paymaster	251	P	21	1.8	38	20.6	2.5	42.6	19.6	R	1.0
Anderson Seeds;											
Gutwein	180	P	17	1.8	37	20.1	2.5	42.1	18.2	M	5.0
Anderson Seeds	108	B	18	2.7	40	17.6	2.8	40.9	20.4	R	1.0
Arrowhead, Inc.	8155	P	18	2.5	38	17.0	2.0	40.0	21.9	R	2.5
Asgrow	A1564	P	17	2.3	40	18.0	2.7	42.2	18.8	R	4.0
Asgrow	A1937	P	18	1.5	38	17.4	2.7	40.4	19.4	M	3.0
Asgrow	A2575	P	24	2.4	42	18.1	2.2	40.9	19.2	R	2.0
Asgrow	A2656	P	24	3.5	41	17.3	2.7	39.3	19.5	R	2.5
Dairyland	DSR-141	P	19	1.8	41	18.6	2.3	41.6	19.5	S	3.5
Dairyland	DSR-171	P	22	2.7	42	16.9	2.3	41.8	19.6	S	4.6
Dairyland	DSR-207	P	26	2.2	40	19.8	2.2	42.7	18.9	S	5.0

Table 32 (continued). Characteristics of private soybean varieties, late group, average Lamberton and Waseca, 1981

Company; brand	Variety or number	Type ¹	Mature (September)	Lodging (score) ²	Height (inches)	Weight/100 seeds (grams)	Seed quality (score) ²	Protein (percent) ³	Oil (percent) ³	Phytophthora (reaction) ⁴	Chlorosis (score) ²
Farmacy	Abel	P	22	2.6	40	16.0	2.0	40.5	20.3	S	3.5
Farmacy	Enterprize	P	16	2.8	37	17.1	2.3	41.4	20.5	R	3.0
Farmacy	Eve	P	26	2.0	40	18.7	2.2	41.2	20.3	R	5.0
Field	100	B	20	2.2	39	17.8	1.8	40.0	21.1	M	3.0
FFR	1518	P	24	1.6	44	20.0	2.2	42.7	19.9	R	5.0
FFR	1526	P	25	1.5	40	19.4	2.0	42.8	18.5	M	4.0
Funk	G-3236	P	30	2.8	40	19.4	1.8	42.9	18.5	R	3.5
Funk	12042	P	24	2.8	40	17.2	2.5	41.4	19.7	S	3.5
Growers Seed Ass'n	GSA100	B	22	3.0	40	17.4	2.2	41.3	21.0	M	4.3
Hoffman Seed	7800	P	23	3.0	42	15.8	1.8	41.0	20.3	S	4.0
Hoffman Seed	7902	B	23	2.6	40	16.8	1.8	41.4	19.1	S	4.0
Hoffman Seed	8001	B	22	2.8	42	16.0	1.8	41.3	20.2	M	3.5
Hofler Seed Co.	Norsoy	P	22	2.8	42	16.3	2.5	41.7	18.5	S	3.0
Hy Vigor	E-90	B	20	2.5	37	18.7	2.8	40.7	20.8	R	3.5
Hy Vigor	Hardy	P	14	1.6	36	17.8	3.0	41.7	20.8	R	3.0
Hy Vigor	Rowtunda	P	22	3.0	38	17.6	3.4	41.9	19.9	M	2.0
Jacques	J102A	P	22	3.0	40	16.2	2.2	41.2	20.5	S	3.5
Jacques	J103	P	23	2.4	40	18.0	2.8	40.3	21.0	S	2.5
Kruger; DeSoy	295	B	19	2.5	37	14.6	1.8	40.0	19.9	M	3.5
Kruger; DeSoy	302A	B	22	2.8	41	15.6	2.0	42.2	18.5	M	4.0
Kruger; DeSoy	305	B	23	3.0	42	16.2	2.0	41.1	20.1	M	4.3
Kruger; DeSoy	433	B	23	3.0	43	15.8	2.0	41.6	17.9	M	4.2
Land O'Lakes, Inc.	GO-43	B	24	2.5	41	17.4	2.5	41.0	19.8	R	4.6
Land O'Lakes, Inc.	GO-44	B	20	2.4	40	16.8	3.2	40.6	19.7	R	4.0
Land O'Lakes, Inc.	LL4303	P	24	1.8	41	19.0	2.5	42.5	18.7	R	4.6
Land O'Lakes, Inc.	LL4404	P	18	1.5	37	20.0	3.8	40.1	19.3	R	3.0
Latham	150	P	16	2.7	38	17.2	2.3	41.1	19.8	R	3.2
Latham	300	B	19	2.5	38	17.8	2.2	40.6	20.5	M	3.0
Latham	Ex500	P	22	2.2	40	17.6	3.3	40.1	20.3	R	3.0
Lynville Seed; Riverside	4041	P	26	1.7	43	19.6	2.3	43.7	19.0	R	1.5
Lynville Seed; Riverside	4042	B	24	2.3	42	17.0	2.2	41.1	19.1	M	3.2
Midland	HC900A	B	18	2.3	42	16.8	2.3	40.8	21.2	R	1.5
Midland	HC1000	B	21	2.7	40	16.0	2.5	40.3	20.7	M	1.5
Midland	HC1010	P	20	2.5	40	17.4	2.3	40.0	20.1	R	3.5
Midwest Oilseeds	1290	P	22	2.8	40	17.1	2.2	41.5	19.3	R	3.2
Midwest Oilseeds	2100A	P	22	2.0	38	16.9	2.5	42.1	19.2	R	3.5
NAPB; Agripro	AP10	P	15	2.4	38	17.6	2.2	41.9	19.9	R	3.0
NAPB; Agripro	AP200	P	21	2.7	40	17.8	2.5	40.6	17.9	R	2.5
NAPB; Agripro	AP225C	P	22	2.2	39	20.0	2.5	41.2	18.9	R	3.5
NAPB; Migro	HP20-20	P	22	2.7	39	18.7	2.5	40.8	20.4	S	2.0
Northrup King Co.	Multivar 43	B	20	2.0	38	17.6	3.3	40.0	20.9	M	1.5
Northrup King Co.	S1346	P	16	1.2	35	19.0	3.3	39.1	19.2	S	4.2
Northrup King Co.	S1492	P	26	2.5	42	16.6	2.0	42.7	19.0	S	4.0
Northrup King Co.	S2596	P	26	1.8	36	20.0	2.3	41.0	20.5	S	3.0
Peterson	3100	B	23	2.3	40	17.2	2.3	41.1	19.8	M	2.0
Pfizer Genetics, Inc.	CB151P	B	20	2.7	40	17.0	2.2	40.4	18.5	M	2.0
Pfizer Genetics, Inc.	CX155	P	22	3.0	40	16.8	2.2	41.1	19.6	S	3.2
Pride	B216	P	26	2.8	40	17.3	2.5	41.9	20.1	S	4.0
Pride	B220	P	26	2.2	42	18.0	2.2	42.5	19.6	R	4.3
Pride (Experimental)	119403	P	24	2.7	41	17.0	2.0	42.0	18.8	R	4.3
Soybean Res. Found.	SRF74-7272	P	24	2.5	42	16.3	1.8	40.9	19.5	R	4.4
Soybean Res. Found.	SRF150P	P	24	2.5	42	16.3	1.8	41.2	20.4	R	5.0
Stine	1800	B	20	2.5	40	17.0	2.0	40.0	21.5	M	4.0
Stine	2100	P	22	2.3	39	20.0	2.8	40.1	20.6	R	3.5
Willette; Wilsoy	82	B	24	2.8	42	16.1	2.3	41.3	19.2	R	5.0
Ziller	BT-2450	B	18	2.5	38	16.8	2.0	41.3	20.7	R	3.0
Ziller	TC-137	P	16	1.8	36	17.5	2.8	41.1	19.2	R	3.0

¹P = pure line, B = blend. ²1 = excellent, 5 = very poor. ³Moisture-free. ⁴R = resistant, S = susceptible, M = mixture of R and S.

SUNFLOWER

The oilseed varieties are used for oil and protein-feed extraction. The nonoilseed varieties are used for nutmeats, salted whole seed, or birdfeed.

Row spacings in these trials were 30 inches, and plant populations averaged 20,000 for oilseed and 15,000 for nonoilseed varieties.

The head moisture and seed moisture columns in the tables show comparative moisture percentages among the hybrids at harvest time. Hybrids of low moisture percentages dried faster than those of high moisture percentages. However, damage from diseases and insects affect drying rate. Consequently, yield and other characteristics should be considered when making moisture comparisons among hybrids.

A major advantage of some hybrids over the old varieties is their ability to produce a normal yield despite a shortage of insect pollinators. However, this is artifact not true autogamy because the hybrids increase seed size to compensate for fewer seeds per head. Hybrids of 70 percent artifact autogamy suffered a 30 percent yield reduction when insect pollinators were excluded by bags; no yield reduction occurred with hybrids of 100 percent artifact autogamy.

The larger seeds resulting from a shortage of insect pollinators are usually lower in oil percentage than normal-size seeds.

Companies with hybrids in these trials include: Agway Inc., Grandin, ND 58038; Barzen of Minneapolis Inc., 455 NE Harrison, Minneapolis, MN 55413; Cal/West Seeds, Woodland, CA 95695; Cargill Seed Division (also P-A-G), Box 9300, Minneapolis, MN 55440; Dahlgren and Company, 1220 Sunflower St., Crookston, MN 56716; DeKalb AgResearch, Inc., Box 8AA, Glyndon, MN 56547; Golden Harvest Seeds, Inc., Waterloo, NE 68069; Growers Seed Association, Box 1656, Lubbock, TX 79408; Interstate Seed and Grain Company, Box 470, Fargo, ND 58102; Jacques Seed Co., Prescott, WI 54021; Kraig Seed & Supply, Inc., Sheldon, ND 58068; Minnesota Farm Bureau, Box 43370, St. Paul, MN 55164; Northrup King Co., 1500 NE Jackson St., Minneapolis, MN 55413; Pfizer Genetics, Box 166, Olivia, MN 56277; RBA (Stauffer), 979 Durkin Drive, Springfield, IL 62704; Red River Commodities, Inc., Box 3022, Fargo, ND 58108; SeedTec International Inc., Box 5522, Fargo, ND 58105; Sigco Research, Box 150, Breckenridge, MN 56520; Sokota Hybrid Producers, Box 250, Brookings, SD 57006.

Table 33. Yields of sunflower varieties in pounds per acre

Variety and company	Crookston 1981	Morris 1981	Lamberton 1981	Rosemount 1981	Crookston 1978-81	Morris 1978-81	Lamberton 1978, 80-81	Rosemount 1979, 81	Average 4 locations
Oilseed varieties									
894, USDA	675	1640	1807	2622	1985	2073	2214	2208	2120
903, USDA	589	1601	1852	3220	1874	1982	2288	2379	2131
CMH 15, Agriculture Canada	1216	1777	1904	2983	—	—	—	—	2338 ¹
HY 42-L, Cal/West Seeds	790	1624	1828	3096	—	—	—	—	2203 ¹
HY 54-K, Cal/West Seeds	659	1811	1684	2869	—	—	—	—	2124 ¹
HY 57-K, Cal/West Seeds	987	1810	1682	2703	—	—	—	—	2164 ¹
HY 64-P, Cal/West Seeds	932	1729	1647	2950	—	—	—	—	2183 ¹
204, Cargill	935	1573	1501	2966	1880	2154	2104	2494	2158
205, Cargill	1289	1583	2098	3069	2172	2146	2187	2466	2243
206, Cargill	1513	1904	2005	3219	2541 ²	2337 ²	2359 ²	2781 ²	2505 ²
DO 164, Dahlgren	411	1315	1729	2967	1822 ³	1941 ³	2214 ³	2642 ³	2155 ³
DO 704 XL, Dahlgren	989	1712	1797	3337	2165	2092	2107	2750	2279
DO 705, Dahlgren	1335	1735	1734	2620	—	—	—	—	2224 ¹
DO 844, Dahlgren	480	1258	1880	2858	1974	1869	2296	2303	2111
DKS-37, DeKalb	995	1860	1648	2384	—	—	—	—	2090 ¹
GH 10, Golden Harvest	1275	1837	1468	2550	1971	2140	1932	2193	2059
Sungro 372A, G.S.A.	1581	2396	2171	3075	1965	2326	2138	2675	2276
Sungro 378, G.S.A.	843	1863	1734	2620	1888 ³	2117 ³	2014 ³	2190 ³	2052 ³
Sungro 380A, G.S.A.	1041	2047	1662	3422	1877	2258	2040	2880	2264
Genex 7101, Interstate	635	1489	1466	2902	—	—	—	—	1967 ¹
IS 907 Elite, Interstate	314	1226	1662	2820	—	—	—	—	1874 ¹
IS 3100, Interstate	1068	1918	1721	2665	1949 ²	2313 ²	2125 ²	2227 ²	2154 ²
IS 7000, Interstate	813	1419	1521	2414	—	—	—	—	1910 ¹
IS 7116, Interstate	1013	1811	1662	2637	1957 ²	2108 ²	2144 ²	2199 ²	2102 ²
IS 7775, Interstate	847	1852	1666	2706	2047	2218	2334	2494	2273
J-503, Jacques	755	1961	1879	3384	—	—	—	—	2363 ¹
898, Kraig	1302	1703	1593	2731	2086	2066	2062	2323	2134
Dakota Gold, Kraig	1219	1773	1493	2815	—	—	—	—	2193 ¹
Golden Glo, Kraig	708	1765	1920	2985	—	—	—	—	2213 ¹
New Dawn, Kraig	950	1592	1693	2423	—	—	—	—	2033 ¹
Sundance, Kraig	714	1287	1879	2977	1836 ²	1791 ²	2325 ²	2539 ²	2123 ²
Hy-Sun 101, MN Farm Bureau	1120	1515	1648	2393	2085	2201	2349	2325	2240
Hy-Sun 104, MN Farm Bureau	451	1038	1605	2693	—	—	—	—	1815 ¹
Sunbred 212, Northrup King	341	1475	2298	3285	1637	2159	2349	2870	2254
Sunbred 254, Northrup King	1127	1928	1633	2906	2004	2242	2262	2444	2238

Table 33 (continued). Yields of sunflower varieties in pounds per acre

Variety and company	Crookston 1981	Morris 1981	Lamberton 1981	Rosemount 1981	Crookston 1978-81	Morris 1978-81	Lamberton 1978, 80-81	Rosemount 1979, 81	Average 4 locations
Sunbred 265, Northrup King	632	2044	1589	2283	1978	2378	2197	2167	2180
Sunbred 275, Northrup King	1064	1770	1721	2625	—	—	—	—	2163 ¹
SF 101, P-A-G	1501	1880	1876	2499	2115 ³	2224 ³	2268 ³	2056 ³	2166 ³
SF 102, P-A-G	1345	1775	2150	3074	2372 ²	2027 ²	2473 ²	2636 ²	2377 ²
Pfizer P620, Pfizer Genetics	736	1785	2086	3192	1848 ²	2073 ²	2324 ²	2754 ²	2250 ²
300 G, RBA	1235	1854	1515	2772	1999	2286	2219	2676	2295
303, RBA	816	1547	1443	2765	1818 ²	2072 ²	1991 ²	2327 ²	2052 ²
3101, RBA	527	1656	1664	2190	—	—	—	—	1878 ¹
Imperial 672, Red River Com.	791	1753	1580	2902	1902 ²	2187 ²	2025 ²	2464 ²	2145 ²
Imperial 673, Red River Com.	1128	1928	1525	3007	—	—	—	—	2265 ¹
Imperial 675, Red River Com.	645	1566	1611	2258	1813 ²	1999 ²	2007 ²	1820 ²	1910 ²
Imperial 897, Red River Com.	819	1866	1721	2363	—	—	—	—	2061 ¹
ST 315, SeedTec	1417	2032	1671	3139	2276 ²	2495 ²	1898 ²	2701 ²	2343 ²
ST 327, SeedTec	462	1751	1668	2927	1671 ²	2124 ²	2193 ²	2489 ²	2119 ²
ST 349, SeedTec	1762	2308	1708	3770	—	—	—	—	2755 ¹
Sigco 448, Sigco Research	731	1537	1918	2931	1736	2111	2341	2395	2146
Sigco 449, Sigco Research	549	1367	1671	2611	2038	2027	2107	2358	2133
Sigco 472, Sigco Research	781	1505	1933	2653	1862 ²	2135 ²	2307 ²	2215 ²	2130 ²
Sokota 4000, Sokota Hybrid	1355	1640	1669	3078	2155 ²	2119 ²	2242 ²	2640 ²	2289 ²
Sokota 5000, Sokota Hybrid	963	1821	1625	2661	—	—	—	—	2136 ¹
Sokota 6000, Sokota Hybrid	581	1580	1941	2491	—	—	—	—	2027 ¹
Peredovik	—	—	—	3038	—	—	—	2443	—
Sputnik	—	—	—	3132	—	—	—	2297	—
LSD 5%	465	399	394	531	251	213	201	364	133
Nonoilseed varieties									
924, USDA	888	1948	1807	2487	2115	2110	2340	2664	2307
RH 2121, Agway	775	1612	1997	3107	1980 ²	1864 ²	2290 ²	3284 ²	2355 ²
RH 2141, Agway	855	1812	2549	3338	—	—	—	—	2639 ¹
BZ 4004, Barzen	385	1773	1426	2158	—	—	—	—	1936 ¹
D105, Dahlgren	1482	2669	1728	3002	—	—	—	—	2721 ¹
D131, Dahlgren	1502	2388	2279	3386	—	—	—	—	2889 ¹
D135, Dahlgren	943	1629	2023	2728	1919 ²	2039 ²	2497 ²	2905 ²	2340 ²
D716, Dahlgren	1250	2015	1837	2613	—	—	—	—	2429 ¹
IS 8000, Interstate	846	1981	1314	2439	—	—	—	—	2146 ¹
Sigco 8824, Sigco Research	771	1573	1296	2030	1914 ²	2087 ²	2058 ²	2207 ²	2067 ²
Sigco 934, Sigco Research	866	1900	1649	2305	—	—	—	—	2181 ¹
Sigco 954, Sigco Research	1333	1868	2014	2675	—	—	—	—	2473 ¹
LSD 5%	479	472	812	352	242	306	382	333	160

¹1981 ²1980-81. ³1979-81.

Table 34. Characteristics of oilseed sunflower varieties, four location average

Variety and company	Oil (percent) ¹	Planting to bloom (days) ²	Lodging (percent) ³	Height (inches) ⁴	Head moisture (percent) ⁵	Seed moisture (percent) ⁶	Midge damage (percent) ⁷	Artifact autogamy (percent) ⁸
894, USDA	46	72	15	62	42	16	70	100
903, USDA	45	72	11	61	53	19	50	59
CMH 15, Agriculture Canada ⁹	—	74	29	62	29	9	60	35
HY 42-L, Cal/West Seeds ⁹	—	75	18	63	43	20	59	74
HY 54-K, Cal/West Seeds ⁹	—	75	18	62	42	9	70	87
HY 57-K, Cal/West Seeds ⁹	—	75	18	61	50	19	64	99
HY 64-P, Cal/West Seeds ⁹	—	74	18	62	48	15	59	96
204, Cargill	46	72	19	60	39	15	60	93
205, Cargill	48	71	19	57	33	20	66	86
206, Cargill ¹⁰	46	75	23	62	46	19	45	78
DO 164, Dahlgren ¹¹	44	70	23	62	44	21	72	64
DO 704 XL, Dahlgren	45	71	27	60	45	19	65	65
DO 705, Dahlgren ⁹	—	70	22	61	41	21	43	87
DO 844, Dahlgren	44	71	13	62	36	19	78	91
DKS-37, DeKalb	—	77	17	60	55	27	42	84

Table 34 (continued). Characteristics of oilseed sunflower varieties, four location average

Variety and company	Oil (percent) ¹	Planting to bloom (days) ²	Lodging (percent) ³	Height (inches) ⁴	Head moisture (percent) ⁵	Seed moisture (percent) ⁶	Midge damage (percent) ⁷	Artifact autogamy (percent) ⁸
GH 10, Golden Harvest	45	73	18	60	42	16	45	76
Sungro 372A, G.S.A.	47	78	30	72	57	19	27	100
Sungro 378, G.S.A. ¹¹	48	74	17	61	57	22	62	52
Sungro 380A, G.S.A.	49	77	17	64	62	26	49	100
Cenex 7101, Interstate ⁹	—	74	25	61	38	12	71	60
IS 907 Elite, Interstate ⁹	—	71	18	61	40	20	85	76
IS 3100, Interstate ¹⁰	49	74	15	59	50	24	43	29
IS 7000, Interstate ⁹	—	70	22	58	20	6	61	51
IS 7116, Interstate ¹⁰	47	75	16	62	52	19	57	55
IS 7775, Interstate	44	73	23	66	52	21	65	90
J-503, Jacques ⁹	—	75	18	65	53	16	60	83
898, Kraig	48	75	19	63	56	21	52	70
Dakota Gold, Kraig ⁹	—	76	16	58	31	14	55	35
Golden Glo, Kraig ⁹	—	77	19	64	54	26	63	83
New Dawn, Kraig ⁹	—	74	19	63	57	34	47	88
Sundance, Kraig ¹⁰	45	74	13	63	47	20	69	80
Hy-Sun 101, MN Farm Bureau	44	71	26	63	46	23	59	62
Hy-Sun 104, MN Farm Bureau ⁹	—	73	23	59	32	25	79	87
Sunbred 212, Northrup King	46	71	8	67	59	33	93	85
Sunbred 254, Northrup King	46	74	14	62	45	28	47	91
Sunbred 265, Northrup King	47	72	25	55	45	21	58	86
Sunbred 275, Northrup King ⁹	—	77	18	68	59	27	60	100
SF 101, P-A-G ¹¹	47	72	17	57	37	15	60	100
SF 102, P-A-G ¹⁰	46	75	25	62	31	22	55	78
Pfizer P620, Pfizer Genetics ¹⁰	43	75	21	64	53	20	60	78
300 G, RBA	44	71	20	62	48	18	45	51
303, RBA ¹⁰	46	74	19	62	48	13	57	93
3101, RBA ⁹	—	71	22	53	25	11	57	75
Imperial 672, Red River Com. ¹⁰	48	75	21	60	48	24	57	75
Imperial 673, Red River Com. ⁹	—	75	18	61	58	21	47	49
Imperial 675, Red River Com. ¹⁰	48	75	15	60	46	23	59	70
Imperial 897, Red River Com. ⁹	—	76	18	62	46	18	54	100
ST 315, SeedTec ¹⁰	45	76	23	67	55	23	27	100
ST 327, SeedTec ¹⁰	46	75	15	65	52	19	67	76
ST 349, SeedTec ⁹	—	78	19	71	63	27	25	93
Sigco 448, Sigco Research	50	73	28	60	42	24	63	67
Sigco 449, Sigco Research	44	72	17	65	42	18	74	77
Sigco 472, Sigco Research ¹⁰	45	75	20	65	49	18	68	89
Sokota 4000, Sokota Hybrid ¹⁰	45	74	15	60	40	21	50	86
Sokota 5000, Sokota Hybrid ⁹	—	74	17	60	39	12	52	59
Sokota 6000, Sokota Hybrid ⁹	—	75	20	61	60	36	70	79
Peredovik	44	—	35	—	54	—	—	8
Sputnik	47	—	32	—	55	—	—	13
LSD 5%					6	8	17	16

¹Oven-dry, 1978-80; ²Morris 1978-81; Crookston 1978-80; Lamberton 1978, 1980; Rosemount 1979. ³Crookston and Morris 1981 and Rosemount 1980 trials in which lodging was severe. ⁴Crookston and Morris 1980-81. ⁵Crookston and Rosemount 1979, 1981. ⁶Lamberton 1980-81. ⁷Damaged ray flowers and cupped heads at Crookston and Morris, 1981. ⁸100 times yield of self-pollinated plants (covered with bags) divided by yield of cross-pollinated plants (no bags) at Rosemount 1978-81. ⁹1981. ¹⁰1980-81. ¹¹1979-81.

Table 35. Characteristics of nonoilseed sunflower varieties, four location average

Variety and company	Large seed (percent) ¹	Test weight/ bushel (pounds)	Weight 100 seeds (grams)	Planting to bloom (days) ²	Lodging (percent) ³	Height (inches) ⁴	Head moisture (percent) ⁵	Seed moisture (percent) ⁶	Midge damage (percent) ⁷	Artifact autogamy (percent) ⁸
924, USDA	73	25.9	13.2	81	29	60	54	27	69	88
RH 2121, Agway ⁹	46	27.3	12.4	81	29	60	60	22	70	72
RH 2141, Agway ¹⁰	43	27.8	11.9	82	20	62	62	21	75	52
BZ 4004, Barzen ¹⁰	58	25.8	11.5	80	32	58	50	20	92	80
D105, Dahlgren ¹⁰	36	28.0	12.1	82	20	64	57	19	30	86
D131, Dahlgren ¹⁰	36	26.9	11.6	81	20	59	62	20	41	63
D135, Dahlgren ⁹	24	26.3	11.4	82	36	62	57	30	53	55
D716, Dahlgren ¹⁰	23	26.6	11.5	83	21	61	53	15	65	69
IS 8000, Interstate ¹⁰	64	25.5	12.4	84	31	61	51	26	77	62
Sigco 8824, Sigco Research ⁹	62	26.3	13.0	81	23	59	57	24	69	89
Sigco 934, Sigco Research ¹⁰	49	26.2	12.4	80	23	60	58	37	71	77
Sigco 954, Sigco Research ¹⁰	58	25.2	14.6	80	25	60	57	25	59	50
LSD 5%							6	11	12	17

¹Held on a 20/64 round-hole sieve, 1981. ²Morris 1981. ³Crookston and Morris 1981 and Rosemount 1980 trials in which lodging was severe. ⁴Crookston and Morris 1981. ⁵Crookston and Rosemount 1979, 1981. ⁶Lamberton 1980-81. ⁷Damaged ray flowers and cupped heads at Crookston and Morris, 1981. ⁸100 times yield of self-pollinated plants (covered with bags) divided by yield of cross-pollinated plants (no bags) at Rosemount 1978-81. ⁹1980-81. ¹⁰1981.

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 in-

jured 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 36. Dry matter yields of tall fescue varieties expressed as percentage of Ky-31 at two locations and average for 1973-81

Variety	Developer or owner ¹	Grand Rapids		Rosemount		Average	Winter injury ²
		No. of trial years	5	6	1		Rosemount
Ky-31 ton/acre	Ky, Agr. Exp. Sta. & USDA ^b		3.9	4.8	2.0	4.2	1 6.9
Aronde	J. Joorden, Vento-Berlick, Netherlands ^a		100	99	92	99	2.8
Clarine	I.N.R.A., Paris, France ^a		—	—	99	99	1.7
Fawn	Oregon Agr. Exp. Sta. ^{ce}		78	79	—	78	—
Festal	D.J. van der Have, Netherlands ^a		—	—	83	83	3.3
Forager	Farmers Forage Res. Coop. ^c		100	89	—	92	—
Kenhy	Ky. Agr. Exp. Sta., & USDA ^{dfg}		102	102	99	102	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-Andreux, France ^a		—	77	91	81	3.3
MO-96	Mo. Agr. Exp. Sta. ^a		77	—	85	80	3.5
S-170	Nat'l. Seed Dev. Org., Cambridge, U.K. ^a		—	88	—	88	3.6
LSD 5%			6	4	12	2	

¹1982 seed supplies and sources: a. not available or very limited, b. available from many sources, c. Cenex Coop. Inc., d. Land O'Lakes, Inc., e. Lincoln Seed and Feed Co., f. Twin City Seed Co., g. Werner Farm Seeds. ²1 = 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 37. 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	
<u>Very early</u>					
Clair	Kentucky Agr. Exp. Sta. ^a	101	101	102	101
<u>Medium-early</u>					
Basho	Agr. Canada, Ottawa ^a	89	—	99	95
Champlain	New York Agr. Exp. Sta. ^a	88	—	83	87
Champ	Agr. Canada, Ottawa ^a	94	—	101	96
Timfor	Northrup King Co. ^f	96	—	102	100
Toro	Institute le Colture Foraggere, Milano, Italy ^c	98	—	98	98
<u>Medium</u>					
Bounty	Agr. Canada, Ottawa ^a	—	—	92	92
Climax	Agr. Canada, Ottawa ^b	92	100	97	95
<i>Itasca ton/acre</i>	Minnesota Agr. Exp. Sta. ^{edgi}	3.9	3.7	3.2	3.6
Milton	Macdonald Coll., Quebec ^a	97	—	97	97
Pronto	Pride Seed Co. ^h	97	—	97	97
<u>Medium-late</u>					
Lorain	Ohio Agr. Exp. Sta. & USDA ^f	92	91	99	96
Verdant	Wisconsin Agr. Exp. Sta. & USDA ^{ei}	94	87	98	94
LSD 5%		4	10	5	2

¹1982 seed supplies and sources: a. not available or very limited, b. available from many sources, c. Field Seed Farms, d. Lincoln Seed and Feed Co., e. Midland Coop., f. Northrup King Co., g. Payco Seeds, h. Pride Seed Co., i. Twin City Seed Co., j. Ziller Seed Farms Inc.

DURUM WHEAT

RECOMMENDED VARIETIES

Cando—Awned, midseason to late, semidwarf and good lodging resistance. Resistant to stem rust and susceptible to leaf rust. Medium yield and low test weight and seed weight. Satisfactory quality. Selected from crosses involving Lakota, Willet 'sib' Norin 10/Brevor, Langdon, Leeds, and Wells. Released by North Dakota Agricultural Experiment Station in 1975.

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

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

Vic—Awned, midseason, medium height and good lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. High yield and low to medium test weight with medium seed weight. Satisfactory quality. Superior quality for export market. Selected from a cross of Edmore and Ward. Released by North Dakota Agricultural Experiment Station in 1979.

Ward—Awned, early to midseason, medium height and lodg-

ing resistance. Resistant to stem rust and moderately susceptible to leaf rust. High yield and test weight with medium seed weight. Satisfactory quality. Selected from crosses involving Langdon, Leeds, and Wells. Released by North Dakota Agricultural Experiment Station in 1972.

OTHER VARIETIES

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

Calvin—Awned, midseason to late, semidwarf with good lodging resistance. Resistant to stem rust and susceptible to leaf rust. Low yield, test weight and seed weight. Satisfactory quality. Selected from crosses involving Leeds and 61130. Released by North Dakota Agricultural Experiment Station in 1978.

Edmore—Awned, midseason, medium height and good lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. Medium yield and low test weight and seed weight. Satisfactory quality. Selected from crosses involving 561, Cappelli, Leeds, 62220, and 61130. Released by North Dakota Agricultural Experiment Station in 1978.

Mindum—Awned, late, tall, and poor lodging resistance. Susceptible to scab, leaf rust, stem rust and lodging. Low yield and

high test weight with medium seed weight. Satisfactory quality. A durum type selected from a bread wheat field. Released by Minnesota Agricultural Experiment Station in 1917.

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

yield and high test weight with high seed weight. Satisfactory quality. Selected from crosses involving Ld. 393, Langdon, Ld. 398, Ld. 357 and ST 464. Released by North Dakota Agricultural Experiment Station in 1971.

Table 38. Characteristics of durum wheat varieties, 1979-81

Variety	Heading (June)	Height (inches)	Lodging (score) ¹	Rust reaction ²		Weight/ 1000 seeds (grams)	Test weight/ bushel (pounds)	Yield/acre (bushels)			
				leaf	stem			Morris	Crookston	Stephen	Average
Cando	30	29	1.4	S	R	37	58.9	42	45	55	48
Crosby	27	37	2.9	MS	R	40	60.4	50	47	57	51
Rugby	28	38	2.4	MS	R	39	60.4	51	55	51	52
Vic	29	38	2.0	MS	R	40	59.1	49	49	54	51
Ward	28	37	2.1	MS	R	39	60.2	52	51	56	53
Botno	26	36	2.6	MS	R	41	60.7	53	50	51	51
Calvin	29	27	1.1	S	R	38	58.8	35	45	51	44
Edmore	28	38	2.6	MS	R	38	59.1	46	48	54	49
Mindum	31	43	5.9	S	S	39	61.1	45	41	46	44
Rolette	26	37	2.9	S	R	41	60.7	47	47	49	47
LSD 5%								8	7	8	5

¹1 = erect, 9 = flat.

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

HARD RED SPRING WHEAT

HIGH PERFORMING VARIETIES

Butte—Awned, early to midseason, medium height. Released by North Dakota Agricultural Experiment Station and USDA-ARS in 1979. *Advantages*—Resistant to stem and leaf rust. Tolerant of loose smut and ergot. Very high yield and test weight with medium protein percent. Satisfactory milling and baking characteristics. Because of early heading, may be suitable for later seeding. *Disadvantages*—Susceptible to black chaff and moderately susceptible to tan spot and lodging. Very tough threshing and may be erratic in yield.

Era—Awned, late to midseason, semidwarf. Released by Minnesota Agricultural Experiment Station in 1970. *Advantages*—Resistant to stem and leaf rust. Tolerant of loose smut and ergot. Medium lodging resistance. Very high yield and high test weight. Satisfactory milling. *Disadvantages*—Low protein percent and bake absorption. Because of later maturity, less suitable for late seeding in southern Minnesota.

Kitt—Awned, late to midseason, semidwarf. Released by Minnesota Agricultural Experiment Station and USDA-ARS in 1975. *Advantages*—Resistant to stem and leaf rust. Tolerant of tan spot and ergot. High yield and medium protein percent. Satisfactory milling and baking. *Disadvantages*—Low test weight, moderately susceptible to loose smut, shattering, and lodging.

Len—Awned, midseason, semidwarf. Released by North Dakota Agricultural Experiment Station and USDA-ARS in 1979. *Advantages*—Resistant to stem and leaf rust. Moderately tolerant of loose smut and ergot. Good lodging resistance. High yield and test weight. Medium protein percent. Satisfactory milling and baking. *Disadvantages*—Moderately susceptible to tan spot and shattering.

Olaf—Awned, midseason, semidwarf. Released by North Dakota Agricultural Experiment Station and USDA-ARS in 1973. *Advantages*—Resistant to stem and leaf rust. Moderately tolerant of ergot. Good lodging resistance. High yield and test weight. Medium protein percent. Satisfactory milling yield. *Disadvantages*—Susceptible to tan spot. Moderately susceptible to loose smut and shattering. Tendency to have long and strong dough mixing requirements.

Solar—Awned, late to midseason, semidwarf, similar to Era. Released by Northrup King Co. in 1977. Seed sale regulated by U.S. Variety Protection Act. *Advantages*—Resistant to stem and leaf rust. Tolerant of loose smut and ergot. Medium lodging resistance. Very high yield and high test weight. Satisfactory milling. *Disadvantages*—Low protein percent and bake absorption. Because of later maturity, less suitable for late seeding in southern Minnesota.

Wared—Awned, late to midseason, semidwarf. Selected at the Minnesota Agricultural Experiment Station. Released by Washington Agricultural Experiment Station and USDA-ARS in 1974. *Advantages*—Resistant to stem and leaf rust. Tolerant of loose smut and ergot. Good lodging resistance. High yield and test weight. Satisfactory milling. *Disadvantages*—Low to medium protein percent. Low bake absorption. Because of later maturity, less suitable for late seeding in southern Minnesota.

VARIETIES NOT ADEQUATELY TESTED

Alex—Awnless, midseason, medium height. Released by North Dakota Agricultural Experiment Station and USDA-ARS in 1981. *Advantages*—Resistant to stem and leaf rust. High yield and test weight. Medium protein percent. Satisfactory milling and baking. *Disadvantages*—Moderately susceptible to lodging, ergot, loose smut, and tan spot.

Oslo—Awned, early to midseason, semidwarf. Released by North American Plant Breeders in 1981. Seed sale regulated by U.S. Variety Protection Act. *Advantages*—Moderately resistant to stem and leaf rust and moderately tolerant of ergot. Good lodging resistance. High yield and medium test weight. Satisfactory milling. *Disadvantages*—Low protein percent and bake absorption. Moderately susceptible to loose smut and tan spot.

PR2360—Awned, midseason, semidwarf. Released by Pioneer Hi-Bred in 1981. Seed sale regulated by U.S. Variety Protection Act. *Advantages*—Resistant to stem rust and moderately resistant to leaf rust. Good lodging resistance. High yield and test weight. Satisfactory milling. *Disadvantages*—Low protein percent and bake absorption.

Walera—Awned, late to midseason, semidwarf. Released by

Northrup King Co. in 1980. Seed sale regulated by U.S. Variety Protection Act. *Advantages*—Resistant to stem and leaf rust. Moderately resistant to loose smut and ergot. Medium lodging resistance. High yield and test weight. Satisfactory milling. *Disadvantages*—Low protein percent and bake absorption.

711—Awned, midseason to early, semidwarf. Released by Northrup King Co. in 1980. Seed sale regulated by the U.S. Variety Protection Act. *Advantages*—Resistant to stem rust. Moderately tolerant to loose smut. Medium lodging resistance. High yield and test weight. Satisfactory milling. *Disadvantages*—Moderately susceptible to leaf rust, ergot, and tan spot. Low protein percent and bake absorption.

OTHER VARIETIES

Aim—Awned, midseason, semidwarf. Released by Western Plant Breeders, Inc. in 1978. Seed sale regulated by U.S. Variety Protection Act. *Advantages*—Moderately resistant to leaf rust and loose smut. Good lodging resistance. Medium to high yield and medium to low test weight. *Disadvantages*—Susceptible to stem rust and moderately susceptible to ergot and tan spot. Low protein percent and unsatisfactory milling and baking quality.

Angus—Awned, bronze chaff, midseason, semidwarf. Released by Minnesota Agricultural Experiment Station and USDA-ARS in 1978. *Advantages*—Resistant to stem and leaf rust. Tolerant of ergot, tan spot, and moderately tolerant of loose smut. Good lodging resistance. High test weight. Medium protein percent. Satisfactory milling and baking. *Disadvantages*—Susceptible to bacterial leaf blight and moderately susceptible to shattering and black chaff. Medium yield.

Benito—Awned, midseason, medium height. Licensed by Agriculture Canada, Winnipeg in 1980. Production of certified seed limited to Canada. *Advantages*—Moderately resistant to stem and leaf rust. Tolerant of loose smut. High test weight and high protein percent. Satisfactory milling and baking. *Disadvantages*—Moderately susceptible to ergot and lodging. Medium to low yield.

Chris—Awnless, midseason, medium height. Released by Minnesota Experiment Station and USDA-ARS in 1965. *Advantages*—Resistant to stem rust but ranges from resistant to moderately susceptible to leaf rust. Tolerant of ergot and moderately tolerant of loose smut. High test weight and protein percent. Satisfactory milling and baking. *Disadvantages*—Susceptible to lodging. Low to medium yield.

Coteau—Awned, midseason to late, medium height. Released by North Dakota Agricultural Experiment Station and USDA-ARS in 1978. *Advantages*—Resistant to stem and leaf rust. High test weight. Very high protein percent. Satisfactory milling and baking. *Disadvantages*—Moderately susceptible to ergot, loose smut, and lodging. Medium to low yield.

Eureka—Awnless, midseason to early, medium height. Released by South Dakota Agricultural Experiment Station in 1978. *Advantages*—Resistant to stem rust. Moderately tolerant of ergot and loose smut. Medium to high yield and test weight. High protein percent. Satisfactory milling and baking. *Disadvantages*—Moderately susceptible to leaf rust, tan spot and lodging. Better adapted to west-central and southwest.

James—Awned, early, medium height. Released by South Dakota Agricultural Experiment Station in 1979. *Advantages*—Resistant to stem rust. High to medium yield. Medium test weight and protein percent. Satisfactory milling and baking. Because of early maturity, may be suitable for late seeding. *Disadvantages*—Moderately susceptible to leaf rust, loose smut, ergot, tan spot and lodging.

World Seeds 1809—Awnless, very early, semidwarf. Released by World Seeds, Inc. in 1970. Seed sale regulated by U.S. Variety Protection Act. *Advantages*—Resistant to stem rust and tolerant of ergot. Good lodging resistance. Medium test weight and protein percent. Satisfactory milling and baking. *Disadvantages*—Susceptible to loose smut and tan spot. Moderately susceptible to leaf rust. Low to medium yield.

715—Awned, late to midseason, semidwarf. Released by Northrup King Co. in 1980. Seed sale regulated by U.S. Variety Protection Act. *Advantages*—Moderately resistant to loose smut. Medium lodging resistance. High yield. *Disadvantages*—Moderately susceptible to stem and leaf rust. Low test weight. Low to medium protein percent. Unsatisfactory milling and baking.

906R—Awned, very early, semidwarf. Released by Western Plant Breeders, Inc. in 1979. Seed sale regulated by U.S. Variety Protection Act. *Advantages*—Tolerant of loose smut and moderately tolerant to ergot. Good lodging resistance. Medium protein percent. *Disadvantages*—Susceptible to leaf rust and moderately susceptible to stem rust and tan spot. Medium yield and low test weight. Poor milling and low to medium baking.



Agronomist R. H. Busch answers farmers' questions about hard red spring wheat varieties while agronomist L. H. Smith gathers information for classroom teaching.

Table 39. Yield of spring wheat varieties in bushels per acre, 1979-81

Variety	Crookston	Stephen	Northern average	St. Paul ¹	Morris	Lamberton ¹	Waseca	Southern average ²	State average ²
Butte	49	47	48	55	53	55	54	54	51
Era	53	54	53	57	50	49	49	52	52
Kitt	48	50	49	53	49	46	50	49	49
Len	47	48	48	58	46	48	49 ³	51	49
Olaf	46	47	47	59	47	53	53	53	49
Solar	57	56	57	55	50	44	48	50	53
Wared	53	50	51	52	46	44	51	47	49
Aim	48	47	48	50	45	51	—	49	48
Alex	50	50	50	52	52	52	—	52	51
Angus	48	43	45	52	46	42	42	46	46
Benito	43	46	44	42	46	42	—	44	44
Chris	37	40	38	43	43	46	—	44	41
Coteau	45	42	44	49	45	49	—	48	45
Eureka	47	41	44	48	49	54	48 ³	50	48
James	46	49	47	56	47	52	49 ³	51	49
Oslo	48	—	—	57	46	—	—	—	—
PR2360	49 ³	—	—	56	47 ³	—	—	—	—
Walera	53 ³	—	—	56	50 ³	—	—	—	—
World Seeds 1809	46	39	43	50	41	47	—	46	44
711	50	42 ³	46	56	48	—	49 ³	—	48 ³
715	49 ³	—	—	54	52 ³	—	—	—	—
906R	48	42	45	52	46	44	—	47	46
LSD 5%	7	10	6		7		7	5	4

¹1979-80. ²Waseca not included. ³1980-81 data adjusted to 3 year average.

Table 40. Characteristics of hard red spring wheat varieties, 1979-81

Variety	Heading (June)	Height (inches)	Lodging (score) ¹	Rust reaction ²		Weight/ 1000 seeds (grams)	Test weight/ bushel (pounds)	Wheat protein (percent) ³	Milling and baking quality
				leaf	stem				
Butte	22	34	3.5	R	R	34	61.1	13.9	medium
Era	28	30	2.8	MR	R	32	59.7	13.3	low-med.
Kitt	28	30	3.1	R	R	34	57.2	14.2	med.-high
Olaf	25	31	2.0	MR	R	34	59.5	14.1	medium
Len	25	31	1.7	MR	R	36	59.5	14.5	high-med.
Solar	28	31	2.5	MR	R	32	59.5	13.0	low
Wared	28	31	2.3	R	R	30	59.4	13.5	medium
Aim	25	30	2.1	MR	S	29	58.2	13.1	low
Alex	26	37	3.4	MR	R	34	60.7	14.5	high-med.
Angus	26	31	2.0	R	R	34	59.7	14.2	med.-high
Benito	26	36	3.5	MR	MR	29	58.6	14.8	high-med.
Chris	26	37	5.0	R-MS	R	29	59.9	15.1	v. high
Coteau	27	36	2.9	R	R	33	59.8	15.4	high
Eureka	24	36	2.9	MS	MR	36	58.7	14.8	med.-high
James	21	33	2.9	MS	R	34	58.3	14.0	medium
Oslo	22	29	1.4	MR	MR	35	58.4	13.3	low-med.
PR2360	26	30	2.2	MR	R	32	59.2	13.3	low-med.
Walera	28	30	3.0	MR	R	32	59.4	13.1	low-med.
World Seeds 1809	20	27	1.9	MS	R	32	58.8	14.3	medium
711	24	31	2.8	MS	R	34	59.4	13.3	low-med.
715	29	32	2.7	MS	MS	34	58.0	13.7	v. low
906R	20	28	2.1	S	MS	39	57.8	14.0	low

¹1 = erect, 9 = flat. ²Reaction to prevalent races: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible. ³14% moisture basis.

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.

RECOMMENDED VARIETIES

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

Roughrider—Awned, tall, winterhardy, medium maturity and fair lodging resistance. Susceptible to leaf rust but resistant to stem rust. High yield and test weight. Satisfactory quality. Selected from crosses involving NE 63265, Hume, Yogo, Frontana, and Minter. Released by the North Dakota Agricultural Experiment Station in 1975.

Winoka—Awned, tall, winterhardy, medium maturity and fair lodging resistance. Susceptible to leaf rust and moderately susceptible to stem rust. Severe leaf necrosis in certain years. Medium yield and high test weight. Satisfactory quality. Reselection from Winalta by South Dakota Agricultural Experiment Station in 1968.

OTHER VARIETIES

Centurk—Awned, early, medium height and good lodging resistance. Winterhardiness is not satisfactory. Susceptible to leaf rust and moderately susceptible to stem rust. Low yield and medium test weight. 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, tall, late and poor lodging resistance. Susceptible to leaf and stem rust. Medium 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, tall, winterhardy, medium maturity, and poor lodging resistance. Moderately resistant to stem rust and susceptible to leaf rust. High yield and medium 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 poor lodging resistance. Winterhardiness lower than Minter and Winoka. Moderately resistant to leaf rust and resistant to stem rust. Low yield and high 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.

Norstar—Awned, tall, winterhardy and good lodging resistance. Susceptible to leaf and stem rust. High yield and medium test weight. Satisfactory quality. Selected from a cross involving Winalta and Alabaskaja. Licensed by Agriculture Canada in 1978.

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

Table 41. Characteristics of winter wheat varieties, 1979-81

Variety	Heading (June)	Height (inches)	Winter survival (percent)	Lodging (score) ¹	Rust reaction ²		Test weight/bushel (pounds)	Yield/acre (bushels)			
					leaf	stem		St. Paul ³	Morris ⁴	Crookston ⁴	Average
Minter	10	43	72	7	MS	MS	60.7	52	38	39	43
Roughrider	13	40	73	4	S	R	60.3	52	38	44	45
Winoka	13	42	67	5	S	MR	59.9	45	34	39	39
Centurk	10	38	61	3	S	MS	58.5	52	26	31 ⁵	36
Eklund	17	39	72	6	S	S	58.3	43	37	40	40
Froid	15	42	74	7	S	MR	58.6	46	43	41	43
Gent	7	39	64	6	MR	R	60.0	47	26	29 ⁵	34
Norstar	17	44	75	2	S	S	58.8	46	46	50	47
Sundance	17	43	69	4	S	S	57.3	46	43	45	45
LSD 5%									7		9

¹1 = erect, 9 = flat. ²Reaction to prevalent races: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible. ³1979-80. ⁴1980-81. ⁵Greater than 50% shattering 1980.

WILD RICE

Cultivated wild rice is grown on 14,000 acres in Minnesota. Most wild rice is produced from varieties with nonshattering tendency, but some fields are still producing from shattering types. Grand Rapids trials are fall-seeded and Excelsior (St. Paul) trials are spring-seeded. No recommendations regarding specific varieties are made. Because of the likelihood of preharvest losses due to high winds, storms, blackbird damage, and killing frost before varietal maturity, growers should favor early to medium maturing varieties. All varieties shatter to some extent and are lodging and disease susceptible.

VARIETIES

Johnson—Tall, late maturity, and medium yield if the variety matures before frost. Seed made available by Algot Johnson in 1969.

K2—Medium height, early to medium maturity, and medium to high yield. Developed by Kosbau Bros. in 1972.

M1—Medium height and medium to late maturity. Developed by Manomin Development Co. in 1970.

M3—Medium height, medium to late maturity, and high yield

in our tests. Diverse in plant and panicle type. Developed by Manomin Development Co. in 1974.

Netum—Medium height, early maturity, and low to medium

yield. Because of its earlier maturity, it frequently will produce higher yields than M1, M3 and Johnson. Developed by the Minnesota Agricultural Experiment Station and released in 1978.

Table 42. Characteristics of wild rice varieties, 1978-80

Variety	Yield/acre (pounds) ¹		Heading (July)	Harvest (August)
	Grand Rapids	Excelsior		
Johnson	1535	1328	18	26
K2	1951	1352	14	21
M1 ²	1830	1422	21	29
M3	2072	1603	15	24
Netum	1617	1212	6	16
LSD 5%	373	290		

¹Adjusted green weight of grain at 40% moisture. ²1979.

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 selection 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.

VARIETIES NOT ADEQUATELY TESTED

Hancock—High yield, fair winterhardiness, medium late, medium height, and medium lodging resistance. Large seed of predominantly tan color and high test weight. Originated by Wisconsin Agricultural Experiment Station from crosses involving Von Lochow and Wisconsin synthetics of tan seed color. Released in 1979.

Musketeer—High yield, good winterhardiness, medium late, medium height, and fair lodging resistance in Canadian trials. Large seed of green color and medium test weight. Originated by Agriculture Canada, Swift Current, from crosses of Harrach, Petkus, and Dakold. Licensed in 1980. Production of certified seed limited to Canada.

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.

Von Lochow—Medium yield, fair to poor winterhardiness, 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 43. Yields of winter rye varieties in bushels per acre, 1980-81

Variety	Rosemount	Grand Rapids	Crookston	Morris	Average
Puma	63	43	55	44	51
Rymin	72	51	60	49	58
Hancock	74	52	61	48	59
Musketeer ¹	67	—	—	—	—
LSD 5%	4	4	5	5	2

¹1981

Table 44. Characteristics of winter rye varieties, 4 location average

Variety	Winterkill (percent)	Heading (May)	Mature (July) ¹	Lodging (score) ²	Height (inches) ³	Weight/100 seeds (grams)	Test weight/bushel (pounds)
Puma	9	28	23	4.1	51	2.6	55.3
Rymin	9	28	23	3.6	48	2.9	55.7
Hancock	10	28	23	3.9	50	3.0	55.6

¹Crookston, Grand Rapids. ²1 = erect, 9 = flat. Rosemount, Crookston, Grand Rapids. ³Rosemount, Crookston, Grand Rapids.

PLANTING RATE AND DATE

Rates are based on normal seedbeds and on use of normal size, good quality seed. Rates used will vary greatly depending on seed cost, desired stand, expected mortality, emerging ability, seed weight, seed germination, seedbed condition, depth of planting, and planting equipment.

Crop	Bushel weight (pounds) ¹	Rate/acre (pounds)	Rate (seeds)	Date
Barley	48	85	28/square foot	Early spring
Corn	56	17	24,000/acre	Late April or early May
Field Bean	60	45	105,000/acre	May 20 to June 15
Black turtle soup				
Great northern		90	90,000/acre	
Kidney		90	80,000/acre	
Navy		45	105,000/acre	
Pink		50	90,000/acre	
Pinto		75	90,000/acre	
Small Red		75	100,000/acre	
Small White		35	105,000/acre	
Flax	56	42	85/square foot	April 15 to May 15
Forage Grasses (perennial)	If mixed with legume, sow at time indicated for the legume.			
Bromegrass alone	14	16	50/square foot	Early spring or summer
in mixtures		10	31/square foot	
Orchardgrass in mixtures	14	2	30/square foot	Early spring or summer
Reed canarygrass alone	46	7	85/square foot	Early spring or summer
in mixtures		5	60/square foot	
Tall fescue in mixtures	25	4	21/square foot	Early spring or summer
Timothy in mixtures	45	3	85/square foot	Early spring or summer
Forage Legumes (perennial)				
Alfalfa alone	60	11	50/square foot	Early spring to August 10
with grass		7	32/square foot	
Alsike clover in mixtures	60	2	30/square foot	Early spring to August 10
Birdsfoot trefoil alone	60	7	60/square foot	Early spring or summer
with grass		4	34/square foot	
Ladino clover in mixtures	60	1	18/square foot	Early spring to August 10
Red clover alone	60	9	50/square foot	Early spring to August 10
with grass		5	30/square foot	
Oat	32	80	28/square foot	Early spring
Rye	56	60	25/square foot	September
Sorghum 18- to 40-inch rows	56	10	150,000/acre	May 20 to June 5 for grain
6- to 14-inch rows		15	5/square foot	
Soybean 6- to 8-inch rows	60	80	3/foot of row	May 5 to May 25
20-inch rows		65	7/foot of row	
30-inch rows		55	9/foot of row	
40-inch rows		50	11/foot of row	
Sunflower Nonoilseed	24	4	17,000/acre	May
Oilseed	27	3	23,000/acre	
Wheat Durum	60	90	25/square foot	Early spring
Hard red spring		80	28/square foot	Early spring
Winter		75	25/square foot	August 20 to September 20
Other Crops				
Adzuki bean	60	30	105,000/acre	May 20 to June 10
Annual canarygrass	50	30	40/square foot	Early spring
Buckwheat	48	50	17/square foot	June 15-July 20
Field pea	60	180	9/square foot	Early spring
With 1½ to 2 bushels of oat		70	4/square foot	
Fababean-medium size	60	180	5/square foot	Early spring
With 2 bushels of oat		60	2/square foot	
Millet Foxtail	48	15	75/square foot	June 15-July 15
Proso	56	20	30/square foot	June 15-July 15
Mustard	56	13	25/square foot	May
Rape Forage	50	6	20/square foot	Early spring with oat
Oilseed	50	8	25/square foot	May
Sudangrass 18- to 40-inch rows	40	10	25/foot of row	May 20 to June 10
6- to 14-inch rows		20	20/square foot	
Sweetclover	60	10	55/square foot	Early spring
Wild rice (wet)	25	30	30,000/acre	Late fall

¹U.S. legal if established. If not established, weight given is that most widely accepted in the United States.