

1980 EDITION

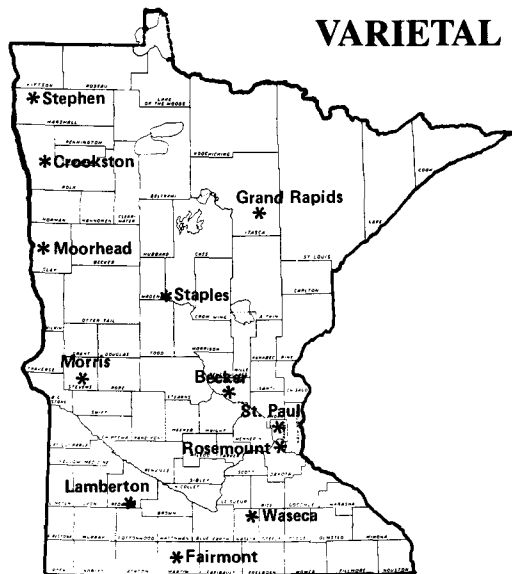
Revised December 1979

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VARIETAL TESTS OF FIELD CROPS

VARIETAL TRIALS OF FARM CROPS



*1979 varietal trials were conducted at these locations.

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

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

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

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

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

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

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

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

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

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

These trials are 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 1980 Planting. This annual publication can be obtained without charge from the Minnesota Crop Improvement Association, 1900 Hendon Avenue, St. Paul, Minnesota 55108, or from county extension agents' offices.

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

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

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

ALFALFA

Many alfalfa varieties are available from both private and public plant breeders. Certified seed should be used because it provides the best assurance of varietal purity and performance. For this reason only varieties eligible for certification, that will be sold in Minnesota in 1980, are listed in this report.

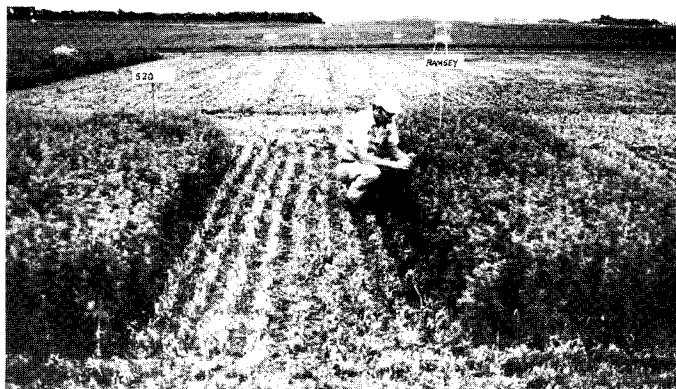
WINTERHARDINESS AND YIELD—Severe Minnesota winters make winterhardiness a primary consideration in variety selection. Greater winterhardiness is usually needed in southern and western Minnesota and in the Red River Valley than in other parts of the state.

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

Nonwinterhardy varieties should not be grown in Minnesota except for plowdown in the seedling year. Varieties in this group are not listed in the tables but include 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 Apollo, Answer, Trident, and 120 have been released with Phytophthora resistance as great or greater than Agate.



The harvested plot of Ramsey was cut twice before July 11 and the standing plot only once. Agronomist C. C. Sheaffer is studying the response of alfalfa varieties to three and four harvests per year.

Table 1. Average yields of alfalfa varieties expressed as percentage of Vernal for all tests in Minnesota, 1959-79

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	—	95	90
Ladak	3	87	88	78	89	—	88	82
Travois	3	88	88	88	87	—	88	88
Ramsey	21	100	101	103	114	111	101	109

Table 1. Average yields of alfalfa varieties expressed as percentage of Vernal for all tests in Minnesota, 1959-79 (continued)

Variety	Number tests	Yield (percent of Vernal)						
		Year after seeding					Average over years	
		1st	2nd	3rd	4th	5th-9th	1-2	3-9
WINTERHARDY								
Baker	8	97	100	107	106	124	100	109
Vernal, tons 15% DM hay/acre	66	4.8	4.6	4.5	4.4	4.2	4.7	4.2
Titan	10	101	101	104	103	104	101	104
Conquest	5	97	98	107	107	112	98	109
123	6	101	104	101	102	110	102	102
WL 215	6	101	102	101	101	115	101	104
Agate	23	99	98	104	97	105	99	102
Iroquois	12	109	104	105	110	105	107	106
Ladak 65	3	99	104	101	99	102	102	100
Nugget	6	102	101	100	100	100	101	100
520	12	104	105	107	111	114	105	110
521	6	100	100	100	96	96	100	97
524	4	104	108	114	113	—	106	114
Blazer	3	103	100	109	—	—	102	109
545	2	98	99	—	—	—	98	—
SX-10	6	94	95	96	102	107	95	102
Phytor	2	98	—	—	—	—	98	—
Valor	8	100	103	100	107	118	101	105
Weevlchek	6	106	107	109	103	98	107	105
120	1	102	97	—	—	—	100	—
Anchor	9	102	108	114	109	117	105	113
Gladiator	1	103	107	102	109	—	105	105
Polar 1	7	105	101	102	99	118	103	106
Ranger	26	97	98	97	99	93	97	97
WL 220	1	106	—	—	—	—	106	—
MODERATELY WINTERHARDY								
Pacer	8	102	104	110	112	115	103	112
Citation	8	105	104	112	102	112	105	109
Marathon	5	109	104	106	98	93	106	99
Apollo	8	100	100	90	111	—	100	100
Tempo	8	100	106	92	103	86	103	93
A 59	8	101	104	108	110	101	102	104
Classic	2	100	99	—	—	—	100	—
530	6	100	101	90	96	95	100	94
WL 309	5	105	104	102	103	110	105	105
WL 311	4	100	102	104	96	—	101	100
Answer	2	100	100	—	—	—	100	—
Honeoye	4	102	101	110	107	—	102	108
Primal	1	100	107	121	105	—	104	115
Saranac AR	7	104	103	108	105	—	104	107
WL 318	6	100	95	104	—	—	98	104
G777	4	100	100	97	104	98	100	100
Saranac	39	101	100	103	105	101	101	103
Thor	9	103	104	100	104	105	104	103
Trident	1	102	97	—	—	—	100	—
SX-418	1	94	107	111	102	—	101	106
A57	3	103	102	98	105	108	103	104
Warrior	15	97	103	99	101	82	100	95
131	2	103	104	104	98	102	103	101
531	3	102	95	—	—	—	99	—
Olympic	4	97	95	99	95	—	96	97
WL 219	6	101	104	106	—	—	102	106
Hy-Phy	1	95	—	—	—	—	95	—

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

Variety	Developer or owner ¹	Winterhardness (Index) ²	RESISTANT PLANTS ³	
			Bacterial wilt (percent)	Phytophthora root rot (percent)
VERY WINTERHARDY				
Norseman	Barzen of Minneapolis ^a	7.9	30	4
Ladak	USDA (foreign introduction) ^{chr}	7.5	8	2
Travois	S. Dakota Agr. Exp. Sta. ^{cr}	7.4	37	1
Ramsey	Minnesota Agr. Exp. Sta. & USDA ^m	6.7	37	9
WINTERHARDY				
Baker	Nebraska Agr. Exp. Sta. & USDA ^{crn}	6.5	50	3
Vernal	Wisconsin Agr. Exp. Sta. & USDA ^{cehijkmoqrstu}	6.5	42	2
Titan	Rudy Patrick Co. ^f	6.4	60	2
Conquest	Pioneer Hi-Bred International Inc. ^m	6.3	21	4
123	DeKalb Ag Research Inc. ^d	6.3	41	3
WL 215	Waterman-Loomis Co. ^{ci}	6.3	36	4
Agate	Minnesota Agr. Exp. Sta. & USDA ^{chijkmoqrstu}	6.0	65	43
Iroquois	Cornell University ^{oijostu}	6.0	61	1
Ladak 65	Montana Agr. Exp. Sta. ^a	6.0	36	2
Nugget	P-A-G ¹	5.9	46	<1
520	Pioneer Hi-Bred International Inc. ⁿ	5.9	40	1
521	Pioneer Hi-Bred International Inc. ⁿ	5.9	19	1
524	Pioneer Hi-Bred International Inc. ⁿ	5.9	24	1
Blazer	Land O'Lakes ^l	5.9	53	19
545	Pioneer Hi-Bred International Inc. ⁿ	5.8	35	25
SX-10	Sexauer Co. ^r	5.7	5	3
Phytor	Northrup King & Co. ^k	5.5	34	24
Valor	Land O'Lakes ^l	5.5	36	2
Weevlichek	Farmers Forage Res. Coop. ^c	5.5	57	2
120	DeKalb Ag. Research Inc. ^d	5.5	57	39
Anchor	Rudy Patrick Co. ^f	5.4	36	3
Gladiator	Northrup King Co. ^k	5.4	57	1
Polar 1	Pride Seed Co. ^p	5.4	49	8
Ranger	Nebraska Agr. Exp. Sta. & USDA ^{cehijmoru}	5.4	18	2
WL 220	Waterman-Loomis Co. ^l	5.4	49	12
MODERATELY WINTERHARDY				
Pacer	Land O'Lakes ^l	5.3	33	8
Citation	North American Plant Breeders ^j	5.2	45	2
Marathon	Cargill ^b	5.2	36	2
Apollo	North American Plant Breeders ^f	5.1	36	40
Tempo	Farmers Forage Res. Coop. ^c	5.1	26	2
A59	E.F. Mangelsdorf & Bros. Inc. ^q	5.0	16	4
Classic	Farmers Forage Res. Coop. ^c	5.0	39	7
530	Pioneer Hi-Bred International Inc. ⁿ	5.0	38	2
WL 309	Waterman-Loomis Co. ^{ci^u}	4.7	25	3
WL 311	Waterman-Loomis Co. ^c	4.7	36	2
Answer	Midland Cooperatives, Inc. ^j	4.6	50	66
Honeoye	Cornell University ^a	4.6	16	<1
Primal	Pride Seed Co. ^p	4.6	62	9
Saranac AR	Cornell University	4.6	29	8
WL 318	Waterman-Loomis Co. ^{ci^u}	4.6	32	20
G777	Funk Seed Int. ^g	4.5	25	4
Saranac	Cornell University ^{imo}	4.5	49	2
Thor	Northrup King & Co. ^r	4.5	69	1
Trident	P-A-G ¹	4.5	37	71
SX-418	The Sexauer Co. ^r	4.5	33	—
A-57	Embro Seed Co. Inc. ^q	4.4	12	6
Warrior	Northrup King & Co. ^k	4.3	20	<1
131	Cal/West Seeds ^d	4.3	10	1
531	Pioneer Hi-Bred International Inc. ⁿ	4.3	23	3
Olympic	North American Plant Breeders ^e	4.2	39	3
WL 219	Waterman-Loomis Co. ^c	4.2	27	9
Hi-Phy	Farmers Forage Res. Coop. ^c	4.1	64	26

¹1980 seed suppliers: a. Barzen of Minneapolis, b. Cargill Seeds, c. Cenex, d. DeKalb, e. Farmland Industries, 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. Peterson Forage Seed Div., n. Pioneer Hi-Bred International, Inc., o. Premium Seed Co., p. Pride Co., Inc., q. Remy Seed Co., r. The Sexauer Co., s. Twin City Seed Co., t. Werner Farm Seeds, Inc., u. Peterson-Biddick 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 3. Yields of annual canarygrass varieties in pounds per acre

Variety	Rosemount 1972-79	Crookston 1976-79	Stephen 1975-79	Average 3 locations
Alden	1083	1377	1272	1244
Keet	1255	1561	1430	1415
LSD 5%	74	134	124	66

Table 4. 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	62	103	4.6	35	.72	46.9
Keet	58	100	3.5	35	.73	48.0

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 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.

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.

Morex — High yield. Medium maturity and lodging resis-

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

Park — High yield. Medium early. Good lodging resistance. Six-row, rough-awn, short rachilla hairs, colorless aleurone. Classified as a malting variety by MBIA. Resistant to stem rust and spot blotch and tolerant to net blotch and Septoria leaf blotch. Developed by North Dakota Agricultural Experiment Station from crosses involving Dickson, Traill, CI 4738, UM 570, and ND B133. Released in 1977.



Minnesota's two newest malting barley varieties and their breeder, agronomist D. C. Rasmussen.

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 Malting Barley Improvement Association (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.

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

Table 5. Yield of barley varieties in bushels per acre, 1974-79

Variety	Morris 4 ¹	Crookston 6	Stephen 2	St. Paul 1	Lamberton 2	Mean 15
Bonanza	60	72	90	52	66	69
Larker	58	71	80	47	60	66
Manker	62	80	78	56	62	71
Morex	62	78	88	45	71	72
Glen	57	80	88	63	62	71
Park	61	77	88	63	61	71
LSD 5%	6	5	10	15	7	4

¹Number of trials.

Table 6. Characteristics of barley varieties

	Heading (June)	Height (inches)	Lodging (percent)	Plump kernels (percent)	Protein (percent) ¹	Reactions to Disease ²		
						Stem rust	Loose smut	Spot blotch
Bonanza	30	35	34	59	—	R	R	S
Larker	28	33	41	73	13.6	R	S	S
Manker	29	33	33	69	13.0	R	S	R
Morex	28	35	36	64	13.2	R	R	MR
Glen	26	33	26	69	13.2	R	R	R
Park	29	34	31	66	13.8	R	S	R

¹14 percent moisture. 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 7. Average yields of birdsfoot trefoil varieties expressed as percentage of Empire for all tests in Minnesota 1967-77

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

¹Seed supplies: a. not available or very limited, b. available from several sources, c. Field Seed Farms, d. Midland Cooperatives, Inc., e. Peterson Forage Seed Div., f. Werner Farm Seeds.

BROMEGRASS

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

are of the southern type and are satisfactory in winterhardiness. Some stand losses may occur when bromegrass 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 8. Dry matter yields of bromegrass varieties expressed as percentage of Fox at five locations, and average for 1966-1979

Variety	Developer or owner ¹	Crookston	Grand Rapids	Lamberton	Morris	Rosemount	Average
No. of trial years		2	5	1	2	8	
<i>Fox ton/acre</i>	Minnesota Agr. Exp. Sta. ^c	3.1	4.7	3.6	3.6	3.8	3.9
Barton	Land O'Lakes Inc. ^e	—	86 ²	—	102 ²	110	107
Baylor	Rudy Patrick Co. ^{dhi}	106	94	104	100	105	101
Beacon	F.S. Services, Inc.	—	96 ²	—	93 ²	109	106
Blair	Midland Coop. Inc. ^f	105	93	103	112	104	102
Bromex	Northrup King Co. ^g	—	—	—	—	105 ³	105
Lincoln	Nebraska Agr. Exp. Sta. ^b	97	91	98	98	96	95
Regro	South Dak. Agr. Exp. Sta. ^a	—	99 ²	—	—	105 ³	102
Sac	Wisconsin Agr. Exp. Sta. ^{ig}	102	93	99	95	106	100
Saratoga	New York Agr. Exp. Sta. ^a	103	102	105	105	102	102
Tempo	Agr. Canada, Ottawa ^a	—	99 ²	—	—	96 ⁴	97
LSD 5%		15	9	12	11	5	4

¹1980 seed supplies and sources: a. not available or very limited, b. available from several sources, c. Cenex Coop. Inc., d. Field Seed Farms, e. Land O'Lakes Inc., f. Midland Coop. Inc., g. Northrup King & Co., h. P-A-G Seeds, i. Ziller Seed Farms. ²One year. ³Two years. ⁴Three years.

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.

VARIETIES NOT ADEQUATELY TESTED

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

OTHER VARIETIES

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

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

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

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

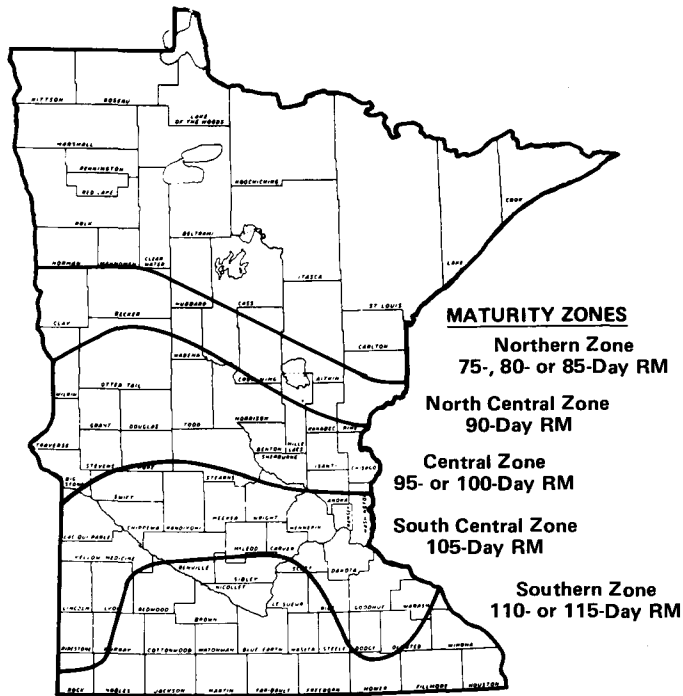


Plastic mesh supported by posts behind student C. A. Westerlund prevents birds from eating ripening buckwheat seeds in August from this variety trial planted July 10.

Table 9. Characteristics of buckwheat varieties on sandy soil at Becker, 1977-79

Variety	Seed yield/acre (pounds)	Test weight/bushel (pounds)	Weight/100 seeds (grams)	Height (inches)	Lodging (score) ¹	Planting to bloom (days)
Mancan	1860	45.1	3.3	50	3.9	31
Giant American	1868	42.9	3.7	49	3.4	32
LSD 5%	161					

¹1 = erect, 9 = flat.



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 10 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.

Table 10. Performance of corn hybrids, 1978-79

Hybrid	Type of cross	Relative maturity	Yield per acre ¹ (bushels)						Broken stalks ² (percent)						
			Crook-ston	Staples	Morris	Rose-mount	Lamber-ton	Waseca	Crook-ston	Staples	Morris	Rose-mount	Lamber-ton	Waseca	
Minhybrid 8201	single	80	82	120	87	124				10	2	6	5		
Minhybrid 8301	3-way	80	79	113	85	126			14	6	5	7			
Minhybrid 7301	3-way	90	75	118	87	135	96	140	7	4	5	6	5	2	
Minhybrid 6301	3-way	95			114	147	152	175			3	1	2	1	
Minhybrid 6304	3-way	95			103	150	128	180			4	1	0	5	
Minhybrid 6305	3-way	95	85	141	126	153	130	178	6	3	4	0	1	1	
Min. 309	3-way	100			114	155	151	178			4	2	1	2	
Minhybrid 5201	single	105			116	162	144	186			2	2	2	0	
Minhybrid 5202	single	105					155	186					1	0	
Minhybrid 5301	3-way	105					155	177					4	1	
Minhybrid 5303	3-way	105			134	178	148	200			2	1	1	2	
Minhybrid 4201	single	110					148	181					2	2	
Minhybrid 4202	single	110					165	183					0	1	
Minhybrid 4203	single	110					167	193					2	2	
Minhybrid 4301	3-way	110					130	180					4	1	
Minhybrid 4303	3-way	110					155	187					2	2	
LSD 5%			7	10	12	11	16	14							

¹15.5% moisture basis.

²Below ear.

DRY EDIBLE BEAN OR FIELD BEAN

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

There are more than 15 market classes of dry, edible bean, but only eight have been grown commercially in Minnesota. Minnesota's 1978 production amounted to 61 percent navy, 37 percent

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



On July 17, Emerson and some other great northern bean varieties show good recovery from hail on June 26. Pinto bean showed some recovery, navy bean less, and adzuki bean was killed.

RECOMMENDED VARIETIES

Aurora small white—Medium yield, medium-late maturity. Erect, viny bush. Very small, white seed. Resistant to rust and mosaic V-1, V-15. Tolerant of halo blight. Susceptible to common blight. Developed by New York Agricultural Experiment Station from a cross of Black Turtle Soup and Cornell 49-242. Released in 1973.

Emerson great northern—High yield. Medium-late maturity. Large, prostrate vine. Large white seed. 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. Devel-

oped 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 Muehlfield (Bridgeport, Mich.) from crosses involving Gratiot, Sanilac, Snow-Flake, and experimental navy strains. Released in 1974.

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

T39 black turtle soup—Medium yield and maturity. Erect, viny bush. Small, black seed. Resistant to rust and V-1, V-1A mosaic. Reported resistant to white mold. Susceptible to V-15 mosaic and beta 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. 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 maturity. Large prostrate vine. Tan and brown mottled seed. Resistant to mosaic V-1, V-1A. 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, Mich.) from a cross of Snow-Flake and a navy bean mutation. Released in 1974.

Table 11. Characteristics of field bean varieties

Class and variety	Seed yield/acre (pounds)				Average — 4 locations		
	Lamberton 1977-79	Morris 1977-79	Crookston 1977-79	Becker ¹ 1976-78	Yield/acre (pounds)	Weight/100 seeds (grams)	Planting to maturity (days)
Pinto							
UI-114	2128	2342	1845	2222	2134	39.1	104
Columbia	1921	1880	1440	1659 ²	1725	36.3	94
Olathe	1761	1910	1548 ³	2106 ²	1831	34.0	100
Ouray ⁴	1563	1404	1256	1212	1359	37.8	97
UI-111	1747	2070	1705	1824	1837	36.7	100
Wyo 166	1880	2027	1618	2063 ²	1897	37.4	100
Navy							
Fleetwood	1501	1803	1391 ³	1827 ²	1631	17.9	106
Seafarer	1388	1181	599	1290	1115	18.7	95
Snow-Bunting	1452	1359	1097	1273	1295	18.3	93
Snow-Flake	1339	1327	948	1111	1181	19.0	94
Up-Land	1416	1475	1217	1330	1360	17.3	97
Bunsi	1784 ³	1836 ³	1568 ³	1413 ⁵	1650	18.5	99
Sanilac ⁶	1216	1136	411	—	928	16.0	106
Tuscola	1348	1512	965	1398	1306	17.5	107
Small White							
Aurora	1625	1819	1483	1796	1681	15.1	104
Great Northern							
Emerson	2167	2173	1917 ³	2173	2108	45.2	98
Early Valley	2323 ³	2126 ³	1770 ³	1776 ²	1999	37.2	97
Star	2228	2129	2055 ³	1959	2093	36.3	104
UI-59	1953 ⁴	2093 ⁴	1943 ⁶	—	1942	34.4	98
Valley	2308	2343	1297 ³	2062	2003	34.7	114
Pink							
Viva	1812	1989	1716 ³	1768	1821	26.4	104
Dark Red Kidney							
Montcalm	1458	1378	1331 ³	1587	1439	47.1	106
Light Red Kidney							
Sacramento	1469 ³	810 ³	1157 ³	1489 ⁵	1231	50.3	89
Black Turtle Soup							
Black Turtle T39	1888	1788	1448	1832	1739	18.8	102
Small Red							
UI-37	1345 ³	1579 ³	1209 ⁶	1096 ⁵	1307	33.1	84
Miscellaneous							
Swedish Brown ⁶	1678	1489	1289	—	1493	39.7	104
Adzuki	1647	1417	83	2389	1384	17.7	115
LSD 5%	200	189	290	269	120		

¹Irrigated, ²Not tested in 1976, ³Not tested in 1977, ⁴Not tested in 1978, ⁵Not tested in 1976-77, ⁶Not tested in 1977-78.

DRY EDIBLE PEA AND FIELD PEA

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

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

RECOMMENDED VARIETIES

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

VARIETIES NOT ADEQUATELY TESTED

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

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

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

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

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

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

Tracer—Low yield. Early. Medium vine length. Small, green

seed. Selected from Alaska "New Line" at Washington Agricultural Experiment station. Released in 1976.

OTHER VARIETIES

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

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

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

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



Century, recommended pea variety for seed production, may also be used for forage in mixture with oat. Both plots beside agronomist C. C. Sheaffer are erect; usually pea-oat mixtures lodge more than oat alone.

Table 12. Characteristics of pea varieties at Becker, 1976-78¹.

Variety	Seed yield/acre (pounds)			Weight/100 seeds (grams)	Seed protein (percent) ²	First bloom (date)	Mature (date)	Vine length (inches)
	Dryland	Irrigated	Average					
Century	1331	1834	1583	21.4	26.2	6-6	7-16	34
Campbell Scotch	723	1326	1025	18.8	26.4	5-21	6-27	20
Finale	1405	2690	2048	27.8	26.0	5-31	7-9	11
Paloma	1523	2690	2107	25.7	25.1	6-1	7-8	12
CEB 102 ³	1388	2767	2078	28.4	25.4	6-1	7-9	11
Fenn ³	832	2612	1722	11.3	27.0	6-12	7-27	37
Garfield ⁴	1140	1807	1474	18.5	27.7	6-2	7-10	31
Maple ³	424	737	581	19.6	28.3	6-15	7-27	46
Tara ³	1201	1870	1536	18.1	26.5	6-5	7-14	29
Tracer ⁴	863	1487	1175	13.2	24.0	5-26	7-7	27
Trapper ³	1022	1928	1475	12.3	26.3	6-3	7-14	28
LSD 5%	188	246	155					

¹1979 trials were destroyed by hail. ²Oven-dry. ³1977-78. ⁴1978.

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.

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

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

OTHER VARIETIES

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

Culbert 79—Very 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.



The large maturity difference between Dufferin (still blooming) and Culbert (boll stage) flax on July 12 is shown by agronomist V. E. Comstock.

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—Very 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 13. Yields of flax varieties in bushels per acre, 1975-77, 79

Variety	Early-sown						Late-sown		
	Grand Rapids	Lamberton	Morris	Crookston	Stephen	Average	Lamberton	Morris	Average
	1979	1975-77, 79	1975, 77, 79	1975-77, 79	1976, 77, 79	15 trials	1975, 77	1975, 77, 79	5 trials
Culbert	28	26	31	25	29	28	30	26	28
Dufferin	27	25	33	27	30	29	19	23	21
Linott	30	24	30	28	29	29	29	25	27
Norstar	29	23	31	29	28	28	21	25	23
Cubert 79	30	26	31	23	30	28	29	24	27
Wishek	28	24	31	28	30	28	29	24	26
LSD 5%	4	2	2	2	3	2	4	3	3

Table 14. Characteristics of flax varieties, 1975-77, 79

Variety	Days from sowing to		Height	Lodging (score) ¹	Pasmo (score) ¹	Wilt (score) ¹	Rust ²	Oil (percent) ³
	First bloom	Full bloom						
Culbert	44	50	20	2.0	2.9	1.1	R	40.9
Dufferin	50	57	24	2.4	5.1	2.9	R	40.6
Linott	43	49	20	1.7	5.1	7.0	R	40.2
Norstar	48	54	22	2.5	5.2	3.3	MS	40.0
Cubert 79	45	51	20	2.2	3.1	1.0	R	41.2
Wishek	44	49	20	1.9	4.9	6.8	R	40.6

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

GRAIN SORGHUM

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

Trials were planted between May 21 and June 3 at the rate of

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

Table 15. Characteristics of grain sorghum hybrids at Lamberton, 1977-79

Hybrid and originator	Grain yield/acre (pounds) ¹		Head moisture (percent)	Test weight/ bushel (pounds)	Weight/ 100 seeds (grams)	Planting to heading (days)	Height (inches)
	1977-79	1979					
P158GB ² Pride	5098	5228	23.3	57.0	2.3	63	45
1, Minnesota AES	4087	4129	23.9	56.8	2.3	57	55
52, Northrup King	4212	4008	23.9	56.3	2.0	59	41
RS 455, Minnesota AES	5455	5190	24.5	57.1	2.6	61	57
8901, Pioneer	5417	5612	24.6	55.6	2.2	65	46
894, Pioneer	5276	5267	25.5	57.9	2.1	65	42
129, Northrup King	5752	5035	25.7	58.8	2.7	67	54
R-920, Acco	5585	5956	25.9	57.1	2.3	64	51
M518G, Pfizer Genetics	5738	5143	26.0	58.4	2.4	68	45
354 ² , P-A-G	5413	5222	26.1	56.7	2.2	71	47
1580, Northrup King	5689	5559	26.3	58.0	2.5	70	49
101, Jacques	5738	5167	26.6	57.8	2.5	66	47
121A ² , Northrup King	6338	6156	26.8	57.5	2.2	68	46
A25a ⁺ , DeKalb	5724	5838	26.9	56.4	2.5	66	42
180, Northrup King	5928	5732	27.0	58.1	2.2	70	51
P-508GB ² , Pride	5724	5100	27.3	59.1	2.5	70	48
B-38 ⁺ , DeKalb	5951	5676	27.7	58.7	2.4	69	47
A-28 ⁺ , DeKalb	5799	6065	27.8	58.1	2.3	67	47
M548G, Pfizer Genetics	5331	3952	28.0	58.1	2.3	72	52
20 ³ , Cargill	4850	4570	29.2	55.9	2.0	72	41
202, Jacques	5100	4361	29.5	57.6	2.1	74	51
R-980, Acco	5183	4515	29.7	59.7	2.3	73	46
30 ³ , Cargill	4653	4373	29.7	55.9	2.5	75	53
4433 ³ , P-A-G	4043	3763	33.4	53.5	2.2	78	53
LSD 5%	402	894	1.7				

¹Oven-dry. ²1978-79. ³1979.

MILLET

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

RECOMMENDED VARIETIES

FORAGE

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

GRAIN

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

Dawn—White proso. Very early. Short. Fair lodging resis-

tance. Large, white seed of medium test weight. Bulk selection from IPm 1108 (PI 260053) by Nebraska Agricultural Experiment Station. Released in 1976.

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

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

VARIETIES NOT ADEQUATELY TESTED

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

Agronomist D. D. Warnes compares one-sided (contractum) heads of Minco proso millet in his left hand with the spreading open heads of Turghai in his right hand.



OTHER VARIETIES

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

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

Manta—Foxtail. Early. Short. Poor lodging resistance. Small, orange seed. Low forage yield. Selection from Manchurian by South Dakota Agricultural Experiment Station. Released in 1958.

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

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

Table 16. Characteristics of foxtail millet varieties at Rosemount, 1974-76

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

¹Oven-dry. ²1 = erect, 9 = flat.

Table 17. Grain yields of proso millet varieties in pounds per acre

Variety	Rosemount 1974-79	Elk River-Becker 1974-79	Grand Rapids 1976-78	Morris 1977-78	Lamberton 1976-77	Average (5 locations)
Dawn	3366	1648	1558	2354	2543	2294
Minco	3654	2036	1247	2876	1966	2356
Cerise	3137	1953	1427	2807	1974	2260
Turghai	3021	1843	1315	2963	1989	2226
Cope ¹	3095	2118	—	—	—	2312
LSD 5%	231	143	149	277	284	101

¹1978-79.

Table 18. Characteristics of proso millet varieties, 1974-79

Variety	Planting to heading (days)	Planting to maturity (days)	Lodging (score) ¹	Height (inches)	Weight/100 seeds (grams)	Test weight/bushel (pounds)
Dawn	50	82	3.0	30	.66	52.2
Minco	52	93	3.0	37	.62	52.8
Cerise	49	81	2.6	38	.58	56.3
Turghai	49	82	1.8	38	.55	55.9
Cope ²	58	97	2.5	43	.66	52.3

¹1 = erect, 9 = flat. ²1978-79.

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, good 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, good 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, high yield, medium height, good lodging resistance, high test weight, medium 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

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.

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.

OTHER VARIETIES

Chief—Early-medium maturity, high yield, medium height, good 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, high yield, medium 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.

Lang—Early, high yield, short, good lodging resistance, high test weight, medium 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, high 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.

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

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

Stout—Early-medium maturity, high 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.

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



Minnesota's three newest oat varieties and their breeder, agronomist D. D. Stuthman.

Table 19. Yield of oat varieties in bushels per acre 1977-79

Variety	Rosemount	Waseca	Lamberton ¹	Morris ²	Crookston ¹	Grand Rapids	Stephen	Average
Noble	84	94	88	93	104	69	109	92
Lancer ²	91	105	86	95	106	60	115 ³	94
Benson	92	99	91	105	107	66	114 ²	96
Lyon	87	90	92	102	110	59	114	93
Moore	98	89	95	105	129	73	130	103
Otana ²	58	76	64	77	138	66	142	91
Lodi	90	80	75	98	116	62	113	91
Marathon	99	96	94	106	117	63	125 ³	100
LSD 5%	7	9	8	8	10	8	8	3

¹1977-78. ²1978-79. ³1979.

Table 20. Characteristics of oat varieties, 1977-79

Variety	Heading (June)	Height (inches)	Lodging (score) ¹	Test		Protein percent ²		Protein/ acre (pounds)	Reactions to disease ³	
				weight/bushel (pounds)	Groat (percent)	groat	seed		Crown rust	Smut
Noble	22	34	2.0	38	75	17.0	12.6	355	S	R
Lancer	23	35	1.8	38	77	18.8	14.6	439	S	S
Benson	23	38	2.9	37	74	18.0	13.3	398	MR	R
Lyon	25	42	2.6	38	75	18.0	13.5	394	MR	R
Moore	27	40	2.2	38	75	16.3	12.2	387	MR	MR
Otana	27	41	3.5	33	70	15.7	10.9	292	MR-MS	S
Lodi	28	44	2.5	36	72	17.5	12.7	360	S	S
Marathon	29	41	2.2	37	74	19.0	14.1	432	R	S

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



Agronomists A. W. Hovin and D. L. Rabas in an orchardgrass variety trial on July 19.

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 21. Characteristics of orchardgrass varieties with dry matter yields expressed as percentage of Hallmark at three locations, 1971-1979

Variety	Developer or owner ¹	Yield (percent of Hallmark)				Winter injury ²		Rust reaction ³
		Grand Rapids	Morris	Rosemount	Average	Grand Rapids	Rosemount	
No. of trial years		8	3	7				
<i>Early</i>								
Boone	Kentucky Agr. Exp. Sta. ^a	85	—	96	90	—	4.8	MS
Chinook	Agr. Canada, Lethbridge ^a	83	81	85	83	—	4.5	—
<i>Medium</i>								
Able	Farmers Forage Res. Coop. ^d	90	—	95	92	1.0	—	MS
Comet	Northrup King & Co. ¹	98	—	97	97	1.7	2.3	S
Crown	North American Plant Breeders ^e	—	—	97 ⁴	97	—	—	MS
Dart	Land O'Lakes Inc. ^g	103	—	97	100	1.3	—	S
Dayton	Midland Coop. Inc. ^c	93	—	100	96	—	—	S
Frode	Swedish Seed Assoc. ^h	94	89	92	92	—	—	—
<i>Hallmark</i>								
ton/acre	Farmers Forage Res. Coop. ^{dh}	3.7	3.0	4.1	3.7	1.5	4.8	S
Hawk hybrid	North American Plant Breeders ^{fm}	—	—	100	100	—	—	MS
Ina	Ontario Agr. Coll., Guelph ^a	90	—	89	89	—	3.3	MS
Juno	Agr. Canada, Ottawa ^a	100	—	100	100	1.0	—	S
Napier	Rudy Patrick Co. ^{fm}	99	—	98	98	1.5	3.8	MS
Potomac	USDA and Coop. State Exp. Sta. ^b	96 ⁴	—	90	95	—	—	MS
Sterling	Iowa Agr. Exp. Sta. ^{dhk}	98	103	95	97	1.5	4.9	S
<i>Late</i>								
Kay	Agr. Canada, Ottawa ^a	92	—	88 ⁵	90	3.7	—	S
Majestic	Maple Leaf Mills, Inc. ^a	—	—	91 ⁵	91	—	—	S
Orion	Northrup King & Co. ¹	97 ⁴	—	103 ⁴	100	—	—	MR
LSD 5%		9	9	8				

¹1980 seed supplies and sources: a. not available or very limited, b. available from several sources, c. Barzen of Minneapolis, d. Cenex Coop. Inc., e. Farmland Industries, f. Field Seed Farms, g. Land O'Lakes Inc., h. Midland Coop. Inc., i. Northrup King & Co., j. P-A-G Seeds, k. Pioneer Hibred Int., Peterson Forage Seed Div., l. Ramy Seed Co., m. Ziller Seed Farms Inc. ²1 = most damaged, 9 = least damaged, 1977. ³MR = moderately resistant, MS = moderately susceptible, S = susceptible. ⁴Two years. ⁵Three years.

RED CLOVER

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

years. Red clover should not be seeded with alfalfa for hay because red clover seedlings are more aggressive than alfalfa seedlings and may prevent alfalfa from becoming established. Red clover is better adapted to acid soils than alfalfa, but where alfalfa can be grown successfully it will yield more than red clover.



Two red clover varieties which differ greatly in yield have about the same amount of regrowth July 19 at Grand Rapids according to agronomist C. C. Sheaffer.

Table 22. 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)			Average 1st 2 years	Stand 3 years after seeding (percent)
		Year after seeding				
		1	2	3		
Lakeland	Wisconsin Agr. Exp. Sta. & USDA (tons 15% DM hay/acre) ^{acdeghiklmn}	3.6	3.5	2.2	3.5	55
Florex	Northrup King & Co. ^f	125	100	102	116	—
Arlington	Wisconsin Agr. Exp. Sta. & USDA ^{adefghilmn}	118	105	100	113	85
Prosper ¹	Pride Co. Inc. ^l	113	105	106	111	—
Dollard	Macdonald College, Canada ^o	104	96	95	100	23
Redman	Farmers Forage Res. Coop. ^{ae}	98	100	97	99	70
Redland	Illinois Agr. Exp. Sta. ^b	96	92	88	95	55
Florie	Northrup King & Co.	85	111	99	95	—
Kenland	Kentucky Agr. Exp. Sta. & USDA ^o	98	89	86	94	38
Kenstar	Kentucky Agr. Exp. Sta. & USDA ^o	90	100	97	93	63
Pennscott	Pennsylvania Agr. Exp. Sta. ^o	96	78	0	89	28
Tensas ²	Louisiana Agr. Exp. Sta. ^o	56	62	0	59	23

¹1980 seed suppliers: a. Cenex, b. Field Seed Farms, c. Interstate Seed and Grain Co., d. Land O'Lakes, Inc., e. Midland Cooperatives, Inc., f. Northrup King, and Co., g. Peterson-Biddick Co., h. Peterson Forage Seed Div., i. Premium Seed Co., j. Pride Co. Inc., k. Ramy Seed Co., l. The Sexauer Co., m. Twin City Seed Co., n. Werner Farm Seeds, Inc., o. not available or very limited.

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 utiliza-

tion 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 23. Dry matter yields of reed canarygrass varieties expressed as percentage of Rise at four locations and average for 1972-79

Variety	Developer or owner ¹	Lamberton	Grand Rapids	Morris	Rosemount	Average
No. of trial years		2	6	2	9	
Rise ton/acre	Rudy Patrick Co. ^{bg}	2.9	4.2	3.2	4.5	4.2
Castor	Agr. Canada, Beaverlodge ^a	91	94 ²	96	94 ²	94
Flare	Land O'Lakes Inc. ^{de}	—	100 ²	—	100 ²	99
Frontier	Agr. Canada, Ottawa ^{ef}	96	102	101	99	100
Vantage	Iowa Agr. Exp. Sta. ^{cg}	96	102	102	103	101
LSD 5%		10	4	5	3	2

¹1980 seed supplies and sources: a. not available or very limited, b. Barzen of Minneapolis, c. Field Seed Farms, d. Land O'Lakes Inc., e. Pioneer Hi-Bred Int., Peterson Forage Seed Div., f. Premium Seed Co., g. Ziller Seed Farms Inc. ²Three years.

SOYBEAN

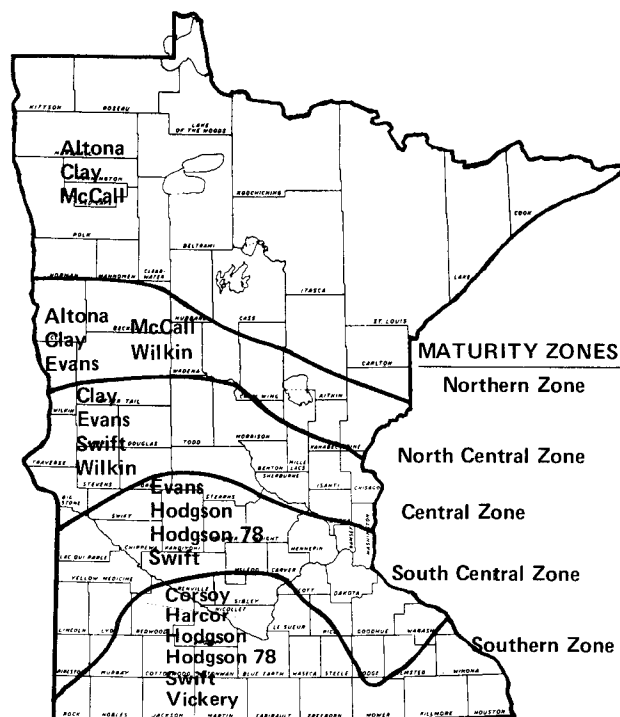
Information on soybean is presented in two sections. The first section deals with varieties that have been developed and released by publicly supported institutions and that are considered for recommendation by the Minnesota Agricultural Experiment Station. The second section deals with privately developed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

PUBLICLY DEVELOPED VARIETIES

Yield data reported in table 24 are averages of two or more years. The data for all locations except Grand Rapids are from replicated combine-harvested plots. Data from Grand Rapids are from replicated multiple-row nursery plots. No 1979 data were obtained at Becker or Fairmont because of hail. Row spacings at Crookston, Grand Rapids, and Moorhead varied from 22 to 28 inches in various years. At all other locations the spacing was 30 inches. Seeding rate was about 10 viable seeds per foot of row in 30-inch rows and slightly less in narrower row spacings. The majority of the tests were planted from May 5 to May 30. However, at Lamberton and Waseca, certain tests were planted in mid-June.

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

Data on maturity, lodging resistance, plant height, seed size, and seed quality in table 25 are from locations suited to particular maturity groups. Phytophthora reactions were determined by University of Minnesota's Department of Plant Pathology. Chlorosis scores were obtained from plantings at Crookston and on a high-



lime soil near Lamberton. Protein and oil determinations were made on a Neotec GQA 41 Grain Analyzer.

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

Agronomist L. L. Hardman examines Fiskeby V, earliest-maturing soybean variety in 1979 trials; McCall variety, two weeks later, yields an average of 6 bushels more per acre.

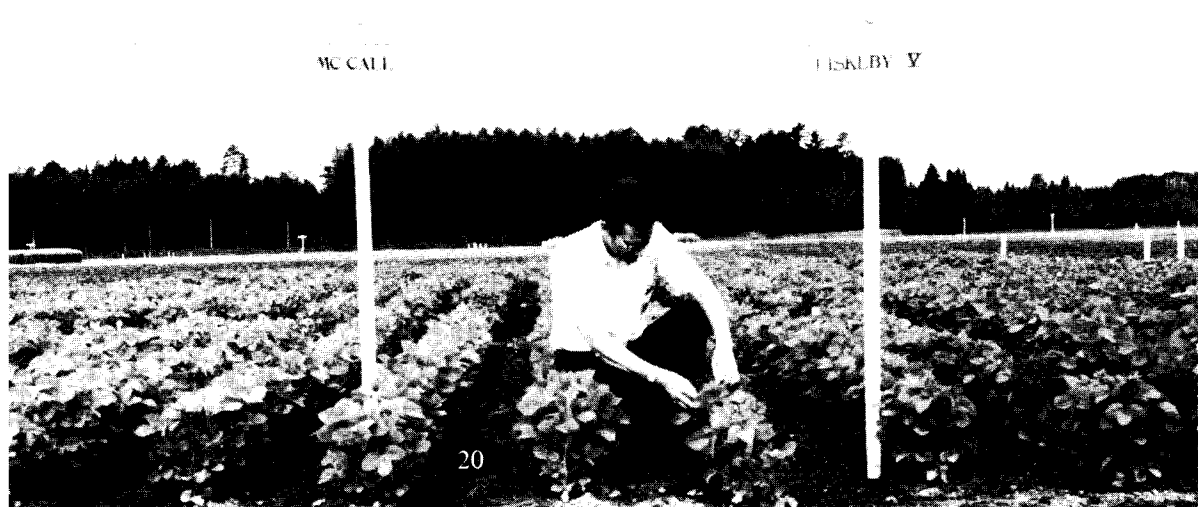


Table 24. Yields of publicly developed soybean varieties in bushels per acre

Variety	Crookston 1973-79	Grand Rapids 1977-79	Moor- head 1974-79	Morris 1977-79	Becker 1977-78	St. Paul 1977-79	Lamberton		Waseca		Fair- mont 1977-78
							Mid-May planting 1978-79	Mid-June planting 1978-79	Mid-May planting 1978-79	Mid-June planting 1978-79	
Early-maturing group											
Fiskeby V		20									
McCall	26	26	25	28							
Altona	23	24	23	25							
Maple Arrow											
Clay	26	19	27	28							
Wilkin	26	24	26	29							
LSD 5%	2	4	1	2							
Medium-maturing group											
Clay			27	29	37	35					
Evans			29	31	50	41	41	39	47	40	43
Swift				32	52	42	43	39	48	37	46
Hodgson				32	58	41	43	43	51	42	50
Hodgson 78				32	54	41	43	43	50	41	49
LSD 5%			2	2	4	2	3	3	3	3	4
Late-maturing group											
Hodgson							45	43	51	42	51
Hodgson 78							46	43	49	41	50
Coles							46		49		53
Corsoy							46	44	53	45	50
Vickery							47	44	53	44	50
Harcor							45		52		51
LSD 5%							2	3	2	3	5

RECOMMENDED VARIETIES

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

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

Corsoy—Southern zone. High yield, tall, medium resistance to lodging. Has occupied a large part of the soybean acreage in southern Minnesota in recent years. Susceptible to phytophthora. Developed at Iowa Agricultural Experiment Station from a cross of Harosoy and Capital. Released in 1967.

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

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

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

Hodgson 78—South central and southern zones. Similar to Hodgson, except resistant to phytophthora. Developed at Minnesota Agricultural Experiment Station by a backcrossing procedure involving Hodgson as recurrent parent and Merit as the non-recurrent,

phytophthora-resistant parent. Released in 1978. Seed sale regulated by U.S. Variety Protection Act.

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

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

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

Wilkin—Central and north central zones. Excellent resistance to lodging. Resistant to phytophthora. Good tolerance to high-lime soils. Developed at Minnesota Agricultural Experiment Station from a cross of Merit x Harosoy. Released in 1972.

VARIETIES NOT ADEQUATELY TESTED

Corsoy 79—Very similar to Corsoy except that it is resistant to phytophthora. Developed at Illinois Agricultural Experiment Station by backcrosses in which Corsoy was the recurrent parent and Lee 68 was the nonrecurrent source of phytophthora resistance. Released in 1979.

Maple Arrow—About four days later than McCall. Good resistance to lodging. Resistant to phytophthora. Developed by Agriculture Canada from a cross of Harosoy and a Swedish introduction (Holmberg 840-7-3). Licensed in 1976.

Weber—About four days later than Hodgson. Taller and lodges more than Hodgson. Fairly tolerant to high lime soils.

Developed at Iowa Agricultural Experiment Station from an inter-mating system involving 40 breeding lines. Released in 1979.

Wells II—Very similar to Wells except that it is resistant to additional races of phytophthora. Developed at Indiana Agricultural Experiment Station by backcrosses in which Wells was the recurrent parent and Arksoy was the nonrecurrent source of phytophthora resistance. Released in 1978.

OTHER VARIETIES

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

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

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

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

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

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

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

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

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

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

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

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

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

Table 25. Characteristics of publicly developed soybean varieties

Variety	Mature (September)	Lodging (score) ¹	Height (inches)	Weight/100 seeds (grams)	Seed quality (score) ¹	Protein (percent) ²	Oil (percent) ²	Phytophthora (reaction) ³	Chlorosis (score) ¹
Early-maturing group (average of Crookston and Grand Rapids, 1977-79)									
Fiskeby V	3	1.0	20	15.8	2.1	40.6	16.6	S	2.5
McCall	14	1.1	26	14.5	3.0	39.6	18.2	S	1.5
Altona	15	1.5	26	18.1	3.0	41.6	16.6	R	2.5
Maple Arrow	20	1.5	28	17.3	2.6	39.7	17.5	R	2.0
Clay	22	1.3	26	16.5	2.9	41.2	18.4	S	2.0
Wilkin	22	1.0	26	14.4	2.7	40.6	17.2	R	1.5
Medium-maturing group (average of Morris and St. Paul, 1977-79)									
Clay	14	1.7	27	17.2	2.8	41.6	20.6	S	2.0
Evans	15	1.7	34	15.9	2.4	40.9	20.0	R	1.5
Swift	22	3.4	36	16.3	2.3	40.2	18.5	S	1.0
Hodgson	26	2.5	37	16.4	2.2	41.2	19.3	S	1.5
Hodgson 78	26	2.8	37	16.8	2.1	41.2	19.1	R	1.5
Late-maturing group (average of Lamberton and Waseca, 1978-79)									
Hodgson	22	2.1	38	17.2	2.5	41.4	20.0	S	1.5
Hodgson 78	23	2.4	39	17.2	2.8	41.1	19.8	R	1.5
Coles	27	3.3	46	19.6	2.5	43.4	17.9	S	2.5
Corsoy	26	2.9	42	17.0	2.4	41.9	18.3	S	3.0
Vickery	27	3.3	43	16.7	2.3	42.4	18.4	R	2.5
Harcor	27	3.0	44	15.9	2.6	42.1	18.1	R	2.5

¹1 = excellent, 5 = very poor.

²Moisture-free; 1979 data only for early-maturing group.

³R = resistant, S = susceptible.

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 1977, 1978 and 1979. A later group was planted at Fairmont, Lambertson, and Waseca in the same years. The Becker and Fairmont tests were not harvested in 1979 because of hail. Accordingly, data for Becker and Fairmont are not included in the 1979 tables. Data for these locations, however, appear in previous editions of this bulletin.

The tests were planted in four-row plots, 12 feet long with 30-inch spacings between rows. There were three 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 1979 and for 1977-79 periods are given in table 26. Yields of the late group for 1979 and longer periods are given in table 28. The varieties are arranged in two sections with the publicly developed varieties first and the privately developed varieties second. Each section is arranged alphabetically.

Other characteristics for 1979 are given in tables 27 and 29 for the early and late groups, respectively. For several of the characteristics, an average is shown for the two 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 high lime nurseries at Lambertson and Crookston. Protein and oil determinations were made on a Neotec GQA 41 Grain Analyzer.

The companies entering varieties in the 1979 Minnesota tests were: ACCO Seed Co., P.O. Box 307, 515 River Ave. N., Belmond, IA 50421; Asgrow Seed Co., 9001 Hickman Road, Des Moines, IA 50053; Dairyland Seed Co., Inc., Box 958, West Bend, WI 53095; FFR Cooperative, 4112 E. State Road 225, West Lafayette, IN 47906; Farmland Industries, Inc., Box 7305, Kansas City, MO 64116; Field Seed Farms, RR1, Byron, MN 55920; Hofler Seed Co., Box 426, Nora Springs, IA 50458; Hy-Vigor Seeds, Inc., Paullina, IA 51046; Jacques Seed Co., 720 St. Croix, Prescott, WI 54021; Kruger Seed Co., RR4, Box 807, Cedar Falls, IA 50613; Land O'Lakes, Inc., Answer Farm, Webster City, IA 50595; Latham Seed Farm, Alexander, IA 50420; Midland Cooperatives, Inc., 2021 E. Hennepin Ave., Minneapolis, MN 55413; North American Plant Breeders, RR2, New Highway 30 East, Ames, IA 50010; Northrup King Co., Box 49, Washington, IA 52353; North Star Seed Co., RR1, Box 100, Springfield, MN 56087; Pfizer Genetics, Box 166, Olivia, MN 56277; Peterson Seed Division-Pioneer Hi-Bred International, Inc., 3261 West Airline Highway, Waterloo, IA 50701; Pride Co., Inc., Box 8, Glen Haven, WI 53810; Schettler Seed Farm, Inc., RR2, Carroll, IA 51401; Soybean Research Foundation, Box 72, Mason City, IL 62664; V.R. Seeds, Inc., Box M, Plymouth, IN 46563; Ziller Seed Farms, Inc., RR1, Box 122, Bird Island, MN 55310.

Table 26. Yields of private soybean varieties in bushels per acre, early group, 1979 and 1977-79

Company	Brand and/or variety	Morris		Rosemount		Average	
		1979	1977-79	1979	1977-79	1979	1977-79
	Evans	45	43	47	45	46	44
	Hodgson 78	43	42	44	46	43	44
	Swift	42	40	41	42	42	41
ACCO Seed Co.	ACCO 101	44	41	46	45	45	43
Asgrow Seed Co.	A1564	42	41	47	45	44	43
Dairyland Seed Co., Inc.	DSR 106			42		41	
Dairyland Seed Co., Inc.	DSR 120	43		43		43	
Dairyland Seed Co., Inc.	DSR 141	38		43		40	
Farmland Industries, Inc.	CO-OP 85	37		40		39	
Field Seed Farms	A-810	40		42		41	
Jacques Seed Co.	J84A	40	40	41	42	41	41
Jacques Seed Co.	J88A	42		43		42	
Land O'Lakes, Inc.	LL 4503	42		43		42	
Land O'Lakes, Inc.	LL 4504	44		48		46	
Midland Cooperatives, Inc.	HC800	46		45		45	
N.A. Plant Breeders	Agripro AP10	43	40	47	46	45	43
Northrup King Co.	Multivar 42	45		46		45	
Northrup King Co.	S1346	42		50		46	
North Star Seed Co.	Dotson	36		41		39	
Pfizer Genetics, Inc.	CB 151	42		45		44	
Pfizer Genetics, Inc.	CX 282	43		42		42	
Pioneer Hi-Bred Int'l., Inc.	Peterson 0877	49	42	49	49	49	45
Pioneer Hi-Bred Int'l., Inc.	Peterson 1677	41	41	50	48	45	45
Soybean Res. Foundation	69-707-25	42		46		44	
LSD 5%		5	3	5	3	4	2

Table 27. Characteristics of private soybean varieties, early group, average Morris, and Rosemount, 1979

Company	Brand and/or variety	Type ¹	Mature (September)	Lodging (score) ²	Height (inches)	Weight/100 seeds (grams)	Phytophthora (reaction) ³	Chlorosis (score) ²	Protein (percent) ⁴	Oil (percent) ⁴
	Evans	P	19	2.4	40	14.9	R	1.5	41.7	18.4
	Hodgson 78	P	27	2.4	41	16.2	R	1.5	42.0	17.8
	Swift	P	22	3.0	40	16.2	S	1.2	40.8	16.8
ACCO Seed Co.	ACCO 101	P	29	3.0	42	16.6	R	2.6	43.4	17.5
Asgrow Seed Co.	A1564	P	30	3.0	44	17.3	R	3.6	44.0	17.9
Dairyland Seed Co., Inc.	DSR 106	P	29	2.6	42	16.8	S	1.2	42.2	18.1
Dairyland Seed Co., Inc.	DSR 120	P	25	2.4	36	17.6	S	5.0	44.5	17.5
Dairyland Seed Co., Inc.	DSR 141	P	29	3.2	43	17.8	S	4.0	43.0	17.4
Farmland Industries, Inc.	CO-OP 85	P	29	3.5	38	16.8	R	3.8	43.7	17.4
Field Seed Farms	A-810	P	28	3.2	35	15.3	R	2.4	43.1	17.9
Jacques Seed Co.	J84A	P	26	2.5	43	15.4	S	3.0	41.4	16.5
Jacques Seed Co.	J88A	P	30	4.0	42	16.1	S	2.8	41.8	16.4
Land O'Lakes, Inc.	LL 4503	P	28	3.2	34	18.4	H	1.0	42.7	16.8
Land O'Lakes, Inc.	LL 4504	P	28	2.4	34	18.4	H	2.2	42.0	17.3
Midland Cooperatives, Inc.	HC 800	B	20	2.4	40	15.2	R	1.8	41.3	17.9
N.A. Plant Breeders	Agripro AP10	P	28	3.4	40	16.6	R	2.2	44.1	17.4
Northrup King Co.	Multivar 42	B	28	2.2	40	16.8	H	3.4	41.2	17.2
Northrup King Co.	S1346	P	29	1.5	38	18.4	H	4.4	38.9	16.7
North Star Seed Co.	Dotson	P	26	2.5	38	21.8	S	4.2	43.7	15.2
Pfizer Genetics, Inc.	CB 151	B	30	3.0	42	15.5	H	3.4	42.2	17.4
Pfizer Genetics, Inc.	CX 282	P	26	2.8	40	15.4	H	2.8	42.3	17.5
Pioneer Hi-Bred Int'l., Inc.	Peterson 0877	P	22	2.6	38	16.9	R	3.4	42.4	17.5
Pioneer Hi-Bred Int'l., Inc.	Peterson 1677	P	30	2.3	40	14.3	S	2.6	41.0	17.0
Soybean Res. Foundation	69-707-25	P	24	2.2	37	14.0	S	4.4	43.2	16.8

¹B = blend, P = pure line. ²1 = excellent, 5 = very poor. ³H = heterogeneous, R = resistant, S = susceptible. ⁴Moisture-free.

Table 28. Yields of private soybean varieties in bushels per acre, late group, 1979, 1978-79, and 1977-79

Company	Brand and/or variety	Lamberton			Waseca			Average		
		1979	1978-79	1977-79	1979	1978-79	1977-79	1979	1978-79	1977-79
	Coles	41	50		51	55		46	52	
	Corsoy	43	50	47	53	55	55	48	52	51
	Harcor	49	51	48	49	53	52	49	52	50
	Hodgson 78	41	51	47	52	52	52	46	52	50
	Vickery	45	53	49	57	58	56	51	56	52
	Weber	40			50			45		
	Wells	39	42	41	43	49	51	41	46	46
ACCO Seed Co.	ACCO 101	40	47	44	50	51	50	45	49	47
ACCO Seed Co.	ACCO 201	41	47	46	52	52	53	46	50	50
Asgrow Seed Co.	A1564	43	49	45	46	48	46	45	48	46
Asgrow Seed Co.	A2440	46	51	49	49	51	52	47	51	50
Asgrow Seed Co.	A2575	40	46	45	45	48	51	43	47	48
Asgrow Seed Co.	A2656	46	50	49	50	54	54	48	52	52
Dairyland Seed Co., Inc.	DSR 141	41	47	45	51	53	51	46	50	48
Dairyland Seed Co., Inc.	DSR 171	41			49			45		
Dairyland Seed Co., Inc.	DSR 207	43			50			46		
FFR Cooperative	FFR0005	42			48			45		
FFR Cooperative	FFR2743	35			43			39		
Farmland Industries, Inc.	CO-OP 95	41	48		44	47		43	48	
Field Seed Farms	A-895	41			46			44		
Hofler Seed Co.	Norsoy	40	50		55	54		48	52	
Hi-Vigor Seeds, Inc.	Rowtunda	36			50			43		
Jacques Seed Co.	J88A	43			50			47		
Jacques Seed Co.	J102A	43	53		50	54		47	54	
Jacques Seed Co.	J104	43			51			47		
Kruger Seed Co.	DeSoy 305	46			54			50		
Kruger Seed Co.	DeSoy 433	42			50			46		
Kruger Seed Co.	DeSoy 444	44	49	46	48	51	52	46	50	49

Table 28. Yields of private soybean varieties in bushels per acre, late group, 1979, 1978-79, and 1977-79 (continued)

Company	Brand and/or variety	Lamberton			Waseca			Average		
		1979	1978-79	1977-79	1979	1978-79	1977-79	1979	1978-79	1977-79
Kruger Seed Co.	DeSoy 555	42			52			47		
Kruger Seed Co.	K2010	43			50			46		
Land O'Lakes, Inc.	LL 4403	41			45			43		
Land O'Lakes, Inc.	LL 4404	43			50			46		
Land O'Lakes, Inc.	LL 4502	42			51			46		
Latham Seed Farm	Latham 300	40	51		55	57		47	54	
Latham Seed Farm	Latham 600	43			50			46		
Latham Seed Farm	Latham 700	44			49			46		
Midland Cooperatives, Inc.	HC 900A	40			49			44		
Midland Cooperatives, Inc.	HC 1000	42			51			46		
N.A. Plant Breeders	AP10	44	50	46	51	51	50	48	50	48
N.A. Plant Breeders	AP 200	40	48		51	48		45	48	
N.A. Plant Breeders	AP 225C	41			50			46		
N.A. Plant Breeders	Ex 1551	41			50			46		
N.A. Plant Breeders	Migro HP20-20	47	54		53	55		50	54	
Northrup King Co.	Multivar 42	42			51			47		
Northrup King Co.	S1346	46	51		48	50		47	50	
Northrup King Co.	S1492	44	49		47	51		45	50	
North Star Seed Co.	Dotson	41			44			42		
Pfizer Genetics, Inc.	CB 151	47	55		47	50		47	52	
Pfizer Genetics, Inc.	CB 200	45	53		54	54		49	54	
Pfizer Genetics, Inc.	CB 244	44	47		50	50		47	48	
Pfizer Genetics, Inc.	CX 155	45	53	51	49	53	54	47	53	52
Pioneer Hi-Bred Int'l., Inc.	Peterson 1677	47	53	51	51	55	56	49	54	54
Pioneer Hi-Bred Int'l., Inc.	Peterson 1980	44			52			48		
Pioneer Hi-Bred Int'l., Inc.	Peterson 2180	41			50			46		
Pioneer Hi-Bred Int'l., Inc.	Peterson 3100	42	48	45	48	52	54	45	50	50
Pride Co., Inc.	B216	42	48		53	55		47	52	
Pride Co., Inc.	B220	43			50			47		
Schettler Seed Farm, Inc.	Ex0198	40			50			45		
Schettler Seed Farm, Inc.	Ex0215	43			44			44		
Schettler Seed Farm, Inc.	TC 137	42			46			44		
Schettler Seed Farm, Inc.	TC 204	51			49			50		
Soybean Res. Foundation	SRF 150P	41	46	45	50	52	52	45	49	48
Soybean Res. Foundation	SRF 200	40	42	42	44	49	50	42	46	46
V.R. Seeds, Inc.	Beam	36			41			38		
V.R. Seeds, Inc.	Duke	34			42			38		
V.R. Seeds, Inc.	Erik	38			43			41		
V.R. Seeds, Inc.	Viking	41			46			43		
Ziller Seed Farms, Inc.	Exp. 10	44			47			45		
Ziller Seed Farms, Inc.	Exp. 30	37			52			44		
Ziller Seed Farms, Inc.	Exp. 50	36			48			42		
Ziller Seed Farms, Inc.	Exp. 450	40			47			43		
Ziller Seed Farms, Inc.	Exp. 530	40			51			45		
LSD 5%		6	5	4	6	5	4	4	3	3

Table 29. Characteristics of private soybean varieties, late group, average Lamberton and Waseca, 1979

Company	Brand and/or variety	Type ¹	Date mature	Lodging (score) ²	Height (inches)	Weight/100 seeds (grams)	Phytophthora (reaction) ³	Chlorosis (score) ²	Protein (per-cent) ⁴	Oil (per-cent) ⁴
	Coles	P	9-28	3.5	46	19.2	S	2.8	42.1	17.5
	Corsoy	P	9-26	3.0	42	17.0	S	3.4	41.0	17.5
	Harcor	P	9-28	3.3	42	16.8	R	2.6	40.5	17.6
	Hodgson 78	P	9-22	1.8	38	16.6	R	1.5	40.5	19.4
	Vickery	P	9-26	3.3	41	17.0	R	2.6	41.5	17.5

Table 29. Characteristics of private soybean varieties, late group, average Lamberton and Waseca, 1979 (continued)

Company	Brand and/or variety	Type ¹	Date mature	Lodging (score) ²	Height (inches)	Weight/100 seeds (grams)	Phytophthora (reaction) ³	Chlorosis (score) ²	Protein (percent) ⁴	Oil (percent) ⁴
	Weber	P	9-25	2.8	41	13.8	S	1.8	41.4	18.1
	Wells	P	9-28	1.7	42	17.0	R	2.6	42.9	18.2
ACCO Seed Co.	ACCO 101	P	9-24	2.5	42	17.0	R	2.6	42.0	19.0
ACCO Seed Co.	ACCO 201	B	9-28	2.8	41	19.1	S	4.8	41.6	18.4
Asgrow Seed Co.	A1564	P	9-24	2.7	42	17.7	R	3.6	42.7	19.2
Asgrow Seed Co.	A2440	P	9-28	2.8	42	17.1	H	3.2	40.8	17.8
Asgrow Seed Co.	A2575	P	9-30	2.5	44	18.2	R	2.8	42.0	18.1
Asgrow Seed Co.	A2656	P	9-30	3.7	44	18.5	R	1.8	39.6	18.1
Dairyland Seed Co., Inc.	DSR 141	P	9-24	2.7	44	20.2	S	4.0	43.6	18.8
Dairyland Seed Co., Inc.	DSR 171	P	9-28	3.5	45	16.8	H	4.4	43.8	18.4
Dairyland Seed Co., Inc.	DSR 207	P	10-1	3.0	42	18.8	R	4.4	42.7	17.9
FFR Cooperative	FFR 0005	P	9-24	3.2	42	16.6	S	4.8	42.4	18.1
FFR Cooperative	FFR 2743	P	9-30	3.3	45	17.0	S	4.4	41.1	17.1
Farmland Industries Inc.	CO-OP 95	B	9-23	2.4	40	19.0	R	3.2	41.8	19.0
Field Seed Farms	A-895	P	9-26	2.8	40	16.4	R	1.8	42.1	17.0
Hofler Seed Co.	Norsoy	P	9-26	2.8	42	16.7	H	4.0	41.3	18.7
Hi-Vigor Seeds, Inc.	Rowtunda	P	9-27	2.5	42	18.4	H	1.8	42.0	18.6
Jacques Seed Co.	J88A	P	9-24	2.8	43	18.2	S	2.8	40.3	17.4
Jacques Seed Co.	J102A	P	9-28	3.2	42	17.5	H	2.4	41.2	17.6
Jacques Seed Co.	J104	B	9-30	3.2	46	17.4	H	2.8	40.9	17.5
Kruger Seed Co.	DeSoy 305	B	9-28	3.2	42	17.3	R	3.0	41.3	17.5
Kruger Seed Co.	DeSoy 433	B	9-28	2.8	42	16.3	H	2.8	41.3	17.0
Kruger Seed Co.	DeSoy 444	B	9-30	3.3	46	19.4	S	3.0	41.6	17.5
Kruger Seed Co.	DeSoy 555	B	9-30	3.2	42	17.0	R	3.2	41.6	16.4
Kruger Seed Co.	K2010	P	10-2	2.7	43	17.6	S	3.2	42.3	18.5
Land O'Lakes, Inc.	LL 4403	P	9-24	2.5	41	19.4	H	1.8	42.3	18.7
Land O'Lakes, Inc.	LL 4404	P	9-24	1.7	38	20.2	R	3.0	40.6	19.3
Land O'Lakes, Inc.	LL 4502	P	9-23	2.8	40	17.6	R	2.0	40.7	18.3
Latham Seed Farm	Latham 300	B	9-26	2.2	41	18.0	H	1.4	40.4	19.4
Latham Seed Farm	Latham 600	B	10-1	2.7	42	18.8	H	3.2	40.5	18.3
Latham Seed Farm	Latham 700	B	9-30	3.5	45	18.1	H	2.4	41.9	17.7
Midland Cooperatives, Inc.	HC 900A	B	9-24	2.7	42	16.4	R	1.6	39.7	20.3
Midland Cooperatives, Inc.	HC 1000	B	9-27	2.8	43	16.4	S	2.0	41.2	18.1
N.A. Plant Breeders	AP10	P	9-23	2.2	40	17.8	R	2.2	43.3	18.5
N.A. Plant Breeders	AP 200	P	9-26	2.5	40	18.3	R	3.0	40.0	17.2
N.A. Plant Breeders	AP 225C	P	9-28	2.5	42	20.1	R	1.8	42.2	17.8
N.A. Plant Breeders	Ex 1551	P	9-30	2.8	44	18.3	R	4.6	40.7	18.3
N.A. Plant Breeders	Migro HP20-20	P	9-28	2.5	40	19.6	S	4.0	40.6	18.8
Northrup King Co.	Multivar 42	B	9-24	2.0	38	18.3	H	3.4	39.9	19.5
Northrup King Co.	S1346	P	9-25	1.2	34	19.6	H	4.4	37.8	18.4
Northrup King Co.	S1492	P	10-2	2.7	42	17.8	H	4.4	42.8	17.7
North Star Seed Co.	Dotson	P	9-16	1.7	38	22.0	S	4.2	41.7	15.9
Pfizer Genetics, Inc.	CB 151	B	9-26	2.3	41	17.0	H	3.4	41.1	18.6
Pfizer Genetics, Inc.	CB 200	B	9-28	2.7	42	16.6	H	4.4	40.8	17.4
Pfizer Genetics, Inc.	CB 244	B	10-2	3.2	42	19.5	R	3.4	42.8	17.1
Pfizer Genetics, Inc.	CX 155	P	9-27	2.8	40	16.7	H	3.4	40.8	18.1
Pioneer Hi-Bred Int'l., Inc.	Peterson 1677	P	9-24	1.8	39	15.2	S	2.6	39.2	17.5
Pioneer Hi-Bred Int'l., Inc.	Peterson 1980	B	9-26	2.2	40	16.6	S	3.2	40.0	17.4
Pioneer Hi-Bred Int'l., Inc.	Peterson 2180	P	9-28	3.3	42	18.6	R	2.2	40.6	17.8
Pioneer Hi-Bred Int'l., Inc.	Peterson 3100	B	9-28	2.7	42	17.4	H	2.8	41.6	18.0
Pride Co., Inc.	B216	P	10-1	2.8	43	17.2	H	5.0	42.3	18.0
Pride Co., Inc.	B220	P	10-1	3.0	46	18.0	R	4.0	42.7	17.0
Schettler Seed Farm, Inc.	Ex 0198	B	10-1	2.8	40	18.8	H	4.0	42.4	17.0
Schettler Seed Farm, Inc.	Ex 0215	B	9-28	2.3	41	18.8	R	3.4	41.1	17.3
Schettler Seed Farm, Inc.	TC 137	P	9-23	2.0	39	16.6	H	1.4	40.8	17.5
Schettler Seed Farm, Inc.	TC 204	B	10-2	2.8	43	17.4	S	4.8	41.9	16.8
Soybean Res. Foundation	SRF 150P	P	10-1	2.8	48	15.7	H	4.7	41.9	17.8
Soybean Res. Foundation	SRF 200	P	10-2	3.0	48	16.8	R	3.4	39.3	16.6
V.R. Seeds, Inc.	Beam	P	9-30	2.8	40	15.7	S	3.6	41.2	17.3

Table 29. Characteristics of private soybean varieties, late group, average Lamberton and Waseca, 1979 (continued)

Company	Brand and/or variety	Type ¹	Date mature	Lodging (score) ²	Height (inches)	Weight/100 seeds (grams)	Phytophthora (reaction) ³	Chlorosis (score) ²	Protein (per-cent) ⁴	Oil (per-cent) ⁴
V.R. Seeds, Inc.	Duke	P	9-30	2.7	44	17.8	H	3.0	41.4	16.3
V.R. Seeds, Inc.	Erik	P	9-27	3.8	46	18.3	R	3.4	41.9	17.4
V.R. Seeds, Inc.	Viking	P	9-30	3.8	45	16.0	H	3.2	41.2	17.1
Ziller Seed Farms, Inc.	Exp. 10	P	9-21	2.0	40	17.6	R	3.8	41.4	17.5
Ziller Seed Farms, Inc.	Exp. 30	P	9-27	2.7	41	17.0	R	4.6	41.7	18.4
Ziller Seed Farms, Inc.	Exp. 50	P	9-24	2.5	42	16.0	R	2.4	40.7	19.6
Ziller Seed Farms, Inc.	Exp. 450	B	9-26	2.2	40	17.0	H	2.6	39.9	18.6
Ziller Seed Farms, Inc.	Exp. 530	B	9-26	2.3	42	16.8	R	3.6	41.5	18.9

¹B = blend, P = pureline. ²1 = excellent, 5 = very poor. ³H = heterogeneous, R = resistant, S = susceptible. ⁴Moisture-free.

SUNFLOWER

The oilseed varieties in table 30 are grown for oil and protein-feed extraction. The nonoilseed varieties in tables 31-32 are grown for use as nutmeats, salted whole seed, or birdfeed.

All varieties in these tables are hybrids produced by the cytoplasmic male-sterility and genetic fertility-restoration method. Most of these hybrids are resistant to downy mildew fungi and resistant or moderately resistant to rust fungi. Most of the oilseed hybrids are resistant or moderately resistant to *Verticillium*, but most of the nonoilseed hybrids are susceptible to *Verticillium*. All varieties are susceptible to stem and head rots caused by *Sclerotinia*.

Row spacings in these trials were 30 inches, and plant populations ranged from 16 to 24 thousand for oilseed hybrids and 14 to 21 thousand for nonoilseed hybrids.

All hybrids in a trial were harvested the same day. Consequently hybrids of low head moisture are either earlier maturing or more rapid driers than hybrids of high head moisture. Low head moisture can also result from premature ripening. However, the

premature ripening problem was not prevalent in these trials.

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

Companies with hybrids in these trials include: Cargill Seed Department (P-A-G), Box 2373, Fargo, ND 58102; Dahlgren and Company, 1220 Sunflower St., Crookston, MN 56716; David & Sons Inc., 5626 E. Shields, Fresno, CA 93727; Four Winds Sales, Highway 14 Bypass, Brookings, SD 57006; Funk, Peterson-Bid-dick Co., Wadena, MN 54682; Rob • See • Co (Golden Harvest), Waterloo NE 68069; Growers Seed Association (Sun-Gro), Box 1656, Lubbock, TE 79408; Interstate, Box 470, Fargo, ND 58102; Jacques Seed Co., Prescott, WI 54021; RBA (Master Farmer), Olivia, MN 56277; Minnesota Farm Bureau, St. Paul, MN; Northrup King & Co. (Sunbred), 1500 NE Jackson, Minneapolis, MN 55413; Pacific Oilseeds Inc. (Sun-Hi), Box 1008, Woodland, CA 95695; Sigco Sun Products, Box 150, Breckenridge, MN 56520.



Student D. Becker putting bags on sunflower heads to prevent bird feeding.

Table 30. Characteristics of oilseed sunflower varieties, 1978-79

Variety and originator	Seed yield/acre (pounds)						Averages — Crookston, Morris, Rosemount, Lambertton				
	Crookston 1978-79	Morris 1978-79	Rosemount 1979	Lamberton 1978	Average		Oil (percent) ¹	Planting to bloom (days)	Head moisture (percent) ²	Self compatibility (percent) ³	
					6 trials	1979					
241, USDA	2401	2212	2190	2717	2356	2109	46.0	74	very high	100	
893, USDA	2726	2215	1965	2482	2388	2254	46.5	73	low	92	
894, USDA	2619	2164	1793	2321	2280	2214	45.5	72	very low	100	
897, USDA	2596	2192	1704	2115	2233	2087	46.1	72	low	100	
898, USDA	2352	2061	1914	2222	2160	2046	47.3	74	medium	84	
903, USDA	2611	2206	1538	2598	2295	2105	44.5	72	medium	77	
904, USDA ⁴	2217	2047	1933	—	2126	2034	43.0	71	low	100	
907, USDA ⁴	2261	2085	1886	—	2149	2046	44.1	72	medium	100	
993, USDA	2373	2091	1865	2533	2221	2046	47.2	74	medium	82	
994, USDA	2647	2072	1584	2140	2194	2054	44.4	73	low	100	
034, USDA ⁴	2170	2138	1702	—	2097	1972	45.8	75	medium	53	
204, Cargill	2412	2178	2022	2145	2225	2212	45.3	73	low	100	
205, Cargill	2712	2315	1863	1885	2300	2328	46.6	71	very low	100	
DO 164, Dahlgren ⁴	2559	2068	2317	—	2348	2283	43.8	69	medium	82	
DO 704, Dahlgren	2811	2420	2163	2512	2523	2452	45.0	71	medium	71	
DO 844, Dahlgren	2730	2173	1748	2510	2344	2150	44.0	70	low	100	
4W 900, F. Wind ⁴	2459	2141	2003	—	2274	2170	44.8	71	low	80	
4W 1100C, F. Wind ⁴	2346	1889	1709	—	2069	1950	46.9	76	medium	100	
4W 1100E, F. Wind ⁴	2596	2456	2023	—	2459	2327	43.5	71	low	89	
6625, Funk ⁴	2407	2215	2053	—	2293	2194	45.9	72	very low	99	
6630, Funk ⁴	2640	2240	1706	—	2327	2164	47.1	74	medium	100	
GH 10, Gold. Harv.	2404	2089	1835	2235	2176	2107	45.1	73	low	87	
GH 20, Gold. Harv.	2594	2141	2119	2709	2383	2287	44.4	73	medium	100	
GH 20A, Gold. Harv. ⁴	2589	2068	1766	—	2250	2109	46.9	73	medium	100	
GH 30, Gold. Harv.	2291	2146	2158	2479	2252	2276	46.7	74	medium	72	
Sun-Gro 372A, GSA	2432	2079	2275	2769	2344	2104	46.9	77	medium	100	
Sun-Gro 378, GSA	2562	1771	1759	—	2119	1999	48.1	75	medium	82	
Sun-Gro 380A, GSA	2288	2249	2337	2416	2305	2213	48.5	77	high	100	
3102, Interstate ⁴	2033	2133	1860	—	2072	1977	46.3	73	low	37	
3107, Interstate ⁴	2062	2290	2195	—	2213	2151	48.1	76	medium	100	
3114, Interstate ⁴	2474	2232	2417	—	2399	2343	47.8	75	medium	46	
7101, Interstate ⁴	2790	2440	1828	—	2491	2321	45.4	71	very low	70	
7102, Interstate ⁴	2413	1969	2051	—	2197	2113	45.9	73	low	65	
7103, Interstate ⁴	2574	2259	2401	—	2447	2380	44.3	71	low	98	
7104, Interstate ⁴	2252	2205	2592	—	2335	2318	46.5	74	medium	77	
7775, Interstate	2559	2381	2281	3036	2533	2330	44.1	73	medium	92	
J401, Jacques	2536	2234	1977	2688	2368	2112	43.4	70	low	100	
J501, Jacques	2469	1978	1791	2296	2164	1999	45.4	72	very low	100	
J701, Jacques	2168	2037	1547	2497	2076	1955	47.6	74	medium	100	
MF 700-OM, Mast. Farm. ⁴	2570	2550	2232	—	2528	2419	44.9	72	low	71	
MF 800, Mast. Farm ⁴	2633	2102	1844	—	2296	2162	45.9	73	very low	100	
Hy-Sun 101, Mn. Farm Bur.	2661	2490	2257	2706	2544	2418	42.9	71	medium	62	
Sunbred 212, NK	2229	2384	2455	2609	2382	2396	46.5	70	medium	87	
Sunbred 254, NK	2452	2257	1981	2588	2331	2201	45.8	73	low	100	
Sunbred 265, NK	2638	2149	2051	2678	2384	2289	46.9	73	medium	88	
SF 101, P-A-G ⁴	2670	2378	1612	—	2375	2188	46.8	73	low	100	
Sun-Hi 301A, POI	2199	2024	2099	1919	2077	2033	47.7	75	medium	76	
Sun-Hi 304, POI	2495	2231	1775	2195	2237	2128	45.3	72	low	94	
Sun-Hi 309, POI ⁴	2711	2037	1440	—	2221	2031	46.4	70	very low	100	
Sun-Hi 311, POI ⁴	2654	2332	2038	—	2436	2310	43.5	74	medium	100	
Sun-Hi 325, POI	2203	2263	1941	2653	2254	2077	45.3	71	medium	91	
Sun-Hi 335, POI ⁴	2190	2273	2157	—	2250	2175	46.0	76	very high	45	
Sun-Hi 337, POI ⁴	2515	2177	1792	—	2269	2130	45.7	73	low	89	
Sun-Hi 345, POI	2108	2168	2252	2334	2190	2251	47.6	73	medium	65	
300 G, RBA	2507	2342	2580	2499	2463	2487	42.9	71	medium	54	
400 D, RBA ⁴	2754	2239	1773	—	2385	2224	45.8	72	very low	100	
241A, Sigco ⁴	2458	2289	2020	—	2336	2224	47.5	74	medium	81	
448, Sigco	2277	2216	1858	2613	2243	2160	49.4	73	very low	76	

Table 30. Characteristics of oilseed sunflower varieties, 1978-79 (continued)

Variety and originator	Seed yield/acre (pounds)					Averages — Crookston, Morris, Rosemount, Lambertton				
	Crookston	Morris	Rosemount	Lamberton	Average		Oil	Planting to bloom	Head moisture	Self compatibility
	1978-79	1978-79	1979	1978	6 trials	1979	(percent) ¹	(days)	(percent) ²	(percent) ³
449, Sigco	2683	2184	2105	2302	2357	2298	44.0	72	low	96
450, Sigco ⁴	2502	2313	1982	—	2356	2234	46.7	73	medium	60
454, Sigco ⁴	2394	2169	2428	—	2344	2299	45.9	73	medium	93
894A, Sigco	2423	2183	1862	2318	2232	2121	45.9	72	very low	100
LSD 5%	354	250	499	456	201	250	1.0			23

¹Oven-dry. ²Crookston and Rosemount 1979. ³100 times yield of self-pollinated plants (covered with bags) divided by yield of cross-pollinated plants (no bags) at Rosemount, 1978-79. ⁴1979.

Table 31. Yields of nonoilseed sunflower varieties in pounds per acre

Variety and originator	Crookston	Morris	Lamberton	Rosemount	Average	
	1977-79	1977-79	1978	1979	8 trials	1979
850, USDA ¹	2380	1762	—	2449	2130	2103
853, USDA ²	2291	2039	2090	2191	2159	2110
880, USDA ¹	2218	2538	—	2275	2368	2250
883, USDA	2372	2075	2355	1911	2201	2143
923, USDA	2087	2217	1489	2334	2092	1963
924, USDA	2755	2243	2795	2840	2579	2417
D715, Dahlgren	2638	2295	2907	2334	2505	2466
D722, Dahlgren ¹	2798	2363	—	1991	2501	2290
D820, Dahlgren ¹	2687	2387	—	2571	2547	2454
DS 29, Davids ¹	2837	2334	—	1702	2464	2197
DS 31, Davids ¹	1724	1931	—	1677	1811	1684
LSD 5%	283	232	456	565	203	281

¹1979. ²1978-79.

Table 32. Characteristics of nonoilseed sunflower varieties, 4 location averages, 1977-79

Variety and originator	Large seed	Test weight/	Weight/	Planting	Head	Self
	(percent) ¹	bushel	100 seeds	to bloom	moisture	compatibility
		(pounds)	(grams)	(days)	(percent) ²	(percent) ³
850, USDA ⁴	34	26.8	11.8	69	medium	65
853, USDA ⁵	12	28.4	9.8	69	medium	65
880, USDA ⁴	44	24.4	12.0	71	very high	74
883, USDA	4	26.7	9.5	69	low	69
923, USDA	26	25.0	9.9	72	medium	100
924, USDA	36	27.1	11.4	70	high	97
D715, Dahlgren	6	27.0	9.5	71	medium	64
D722, Dahlgren ⁴	6	26.3	10.2	71	high	85
D820, Dahlgren ⁴	6	27.6	9.5	73	high	65
DS 29, Davids ⁴	26	24.2	9.5	68	medium	73
DS 31, Davids ⁴	45	22.3	10.2	72	low	52
LSD 5%						25

¹Held on a 20/64 round-hole screen. ²Crookston and Rosemount 1979. ³100 times yield of self-pollinated plants (covered with bags) divided by yield of cross-pollinated plants (no bags) at Rosemount, 1977-79. ⁴1979. ⁵1978-79.

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 33. Dry matter yields of tall fescue varieties expressed as percentage of Ky-31 at two locations and average for 1973-79

Variety	Developer or owner ¹	Grand Rapids	Rosemount	Average	Winter injury ² Rosemount	
No. of trials years		3	4	1	7	1
Ky-31 ton/acre	Ky. Agr. Exp. Sta. & USDA ^b	4.3	5.4	2.0	4.4	6.9
Aronde	J. Joorden, Vento-Belrick, Netherlands ^a	100	99	92	100	2.8
Clarine	I.N.R.A., Paris, France ^a	—	—	99	99	1.7
Festal	D.J. van der Have, Netherlands ^a	—	—	83	83	3.3
Forager	Farmers Forage Res. Coop. ^{ce}	—	88 ³	—	88	—
Kenhy	Ky. Agr. Exp. Sta. & USDA ^a	100	103	99	101	7.0
Ludelle	I.N.R.A., Paris, France ^a	—	—	81	81	3.3
Ludion	I.N.R.A., Paris, France ^{d,gh}	—	—	95	95	3.5
Manade	Vilmorin-Andrieux, France ^a	—	77	91	81	3.3
MO-96	Mo. Agr. Exp. Sta. ^a	—	—	85	85	3.5
S-170	Nat'l. Seed Dev. Org., Cambridge, U.K. ^a	—	88	—	88	3.6
LSD 5%		6	4	12		

¹1980 seed supplies and sources: a. not available or very limited, b. available from several sources, c. Cenex Coop. Inc., d. Land O'Lakes Inc., e. Midland Coop. Inc., f. Northrup King & Co., g. Twin City Seed Co., h. Werner Farm Seeds. ²1 = most damaged, 9 = least damaged, 1977. ³Three years.

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 34. 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 ²	—	99 ³	95
Champlain	New York Agr. Exp. Sta. ^a	88	—	83 ²	87
Champ	Agr. Canada, Ottawa ^a	94	—	101 ²	96
Timfor	Northrup King & Co. ^f	96 ²	—	102	100
Toro	Institute le Colture Foraggere, Milano, Italy ^a	98 ²	—	98 ²	98
<u>Medium</u>					
Bounty	Agr. Canada, Ottawa ^a	—	—	92 ²	92
Climax	Agr. Canada, Ottawa ^b	92	100	97	95
Itasca ton/acre	Minnesota Agr. Exp. Sta. ^{de}	3.9	3.7	3.2	3.6
Milton	Macdonald Coll., Quebec ^a	97 ²	—	97 ²	97
Pronto	Pride Seed Co. ^h	97 ²	—	97	97
<u>Medium-late</u>					
Lorain	Ohio Agr. Exp. Sta. & USDA ⁱ	92 ²	91	99	96
Verdant	Wisconsin Agr. Exp. Sta. & USDA ^{g,i}	94	87	98 ³	94
LSD 5%		4	10	5	

¹1980 seed supplies and sources: a. not available or very limited, b. available from several sources, c. Barzen of Minneapolis, d. Field Seed Farms, e. Midland Coop. Inc., f. Northrup King & Co., g. Pioneer Hi-Bred Int., Peterson Forage Seed Div., h. Pride Seed Co., i. Twin City Seed Co. ²Three years. ³Four years.

DURUM WHEAT

RECOMMENDED VARIETIES

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

Crosby—Awned, early, medium height and lodging resistance. Resistant to leaf and stem rust. High yield and medium test weight with large seed. Satisfactory quality for semolina prod-

ucts. Selected from crosses involving Langdon, ST 464, and Leeds. Released by North Dakota Agricultural Experiment Station in 1973.

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

Ward—Awned, early, medium height and lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. High yield, medium test weight, and seed weight. Satisfactory quality

All four recommended durum varieties have been released since 1972. Ward, the oldest, is examined by pathologists H. L. Bissonnette and L.E. Sweets.



for semolina products. Selected from crosses involving Langdon, Leeds, and Wells. Released by North Dakota Agricultural Experiment Station in 1972.

VARIETIES NOT ADEQUATELY TESTED

Vic—Awned, early to midseason, medium height and lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. Medium to high yield and test weight. Satisfactory for semolina products. Selected from a cross of Edmore and Ward. Released by North Dakota Agricultural Experiment Station in 1979.

OTHER VARIETIES

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

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

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

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

Leeds—Awned, early, medium height and lodging resistance. Moderately resistant to leaf rust, resistant to stem rust and loose smut. Medium yield and very high test weight with large seed. Satisfactory quality for semolina products. Selected from crosses involving Br. 180 and Wells. Released by North Dakota Agricultural Experiment Station in 1966.

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

Rolette—Awned, early, medium height, and good lodging resistance. Resistant to stem rust, moderately susceptible to leaf rust. Medium yield and high test weight. Satisfactory quality for semolina products. Selected from crosses involving Ld. 393, Langdon, Ld. 398, Ld. 357, and St. 464. Released by North Dakota Agricultural Experiment Station in 1971.

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

Table 35. Characteristics of durum wheat varieties, 1977-79

Variety	Heading (days from June 1)	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	31	31	1.1	R	MS	37	58.9	33	54	59	49
Crosby	29	41	4.7	R	MR	40	60.4	43	44	53	47
Rugby	30	41	3.9	R	MR	39	60.4	40	54	55	49
Ward	28	42	3.7	R	MS-S	40	59.8	42 ³	51	54	49
Botno	29	41	4.4	R	MR	41	59.9	41	50	54	47
Calvin	34	28	1.0	R	MS	38	57.0	29	46	53 ⁴	43
Coulter	30	39	4.0	R	S	38	58.9	33	51	58 ³	47
Edmore	34	39	3.2	R	MS	38	55.9	33	47	53 ⁴	44
Mindum	31	46	5.9	S	S	39	60.4	31	43	44	39
Rolette	29	39	3.7	R	S	41	59.0	37	49	53	46
Vic	30	41	3.6	R	MS	39	59.8	36	47	49 ⁴	44
LSD 5%								6	7	7	5

¹1 = erect, 9 = flat.
ceptible. ³2 years.

²Reaction to prevalent races: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible. ⁴1979.

HARD RED SPRING WHEAT

RECOMMENDED VARIETIES

Angus—Awned, bronze chaff, medium maturity semidwarf with good lodging resistance. Resistant to stem and leaf rust. Tolerant of ergot but susceptible to bacterial leaf blight. Medium yield and high test weight. Susceptible to shattering. Milling and

baking characteristics are satisfactory. Protein content and bake absorption are lower than Chris, but better than Era. Selected from crosses involving Frontana, Thatcher, Mida, Kenya 117A, Kenya 58, Lee, Newhatch, Pembina, and Polk 'sib.' Released by Minnesota Agricultural Experiment Station and USDA, SEA-AR in 1978.



Agronomist R. H. Busch and pathologist D. V. McVey looking at disease symptoms in a variety trial of hard red spring wheat.

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

Kitt — Awned, midseason to late semidwarf with good lodging resistance. Resistant to stem rust and has broader spectrum of resistance to leaf rust than Chris and Era. Tolerant of black chaff, bacterial leaf blight, and ergot, but susceptible to loose smut. High yield and medium to low test weight. Susceptible to shattering. Milling and baking characteristics are satisfactory. Protein content and bake absorption are lower than Chris, but better than Era. Selected from crosses involving Frontana, Thatcher, Mida, Kenya

117A, Kenya 58, Lee, Newthatch, Pembina, and Polk 'sib.' Released by Minnesota Agricultural Experiment Station and ARS-USDA in 1975.

Len—Awned, midseason semidwarf with good lodging resistance. Resistant to stem and leaf rust. More resistant to leaf spot disease and shattering than Olaf. Medium to high yield and high test weight. Milling and baking characteristics are satisfactory. Selected from crosses involving ND499, Justin, RL4205, and Wisconsin 261. Released by North Dakota Agricultural Experiment Station and USDA-SEA-AR in 1979.

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

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

VARIETIES NOT ADEQUATELY TESTED

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

OTHER VARIETIES

Aim—Awned, midseason to early semidwarf with good lodging resistance. Susceptible to stem rust and moderately susceptible to leaf rust. Medium yield and test weight. Milling and baking characteristics are inadequately tested. Released by Western Plant Breeders, Inc. in 1978. Seed sale regulated by U.S. Variety Protection Act.

B-1—Awned, late maturing semidwarf with medium lodging resistance. Susceptible to stem and leaf rust. Medium yield with very low test weight. Classified by the Federal Grain Inspection Service as a soft red winter wheat, but has spring growth habit. Unsatisfactory milling and baking quality. Selected as an individual plant from the variety Lark by Mr. Allen in northwest Minnesota. Seed was available in 1979.

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

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

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

Ellar—Awnless, early, medium height and lodging resistance. Resistant to stem rust and moderately resistant to leaf rust. Medium yield and test weight. Flour yield and wheat protein are lower than Chris, but better than Era. Milling and baking characteristics are satisfactory. Selected from crosses involving Waldron, Kenya Farmer, Lee, Mida, and Cadet. Released by North Dakota Agricultural Experiment Station in 1974.

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

James—Awned, early to midseason. Medium height and lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. Susceptible to loose smut and ergot. Medium yield and test weight. Milling and baking characteristics are satisfactory. Selected from a cross of Olaf by ND 510-2. Released by South Dakota Agricultural Experiment Station in 1979.

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

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

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

Table 36. Characteristics of hard red spring wheat varieties, 1977-79

Variety	Heading (Days from June 1)	Height (inches)	Lodging (score) ¹	Rust reaction ²		Weight/ 1000 seeds (grams)	Test weight/ bushel (pounds)	Wheat protein (percent) ³	Milling, baking quality	Yield/acre (bushels)						
				Leaf	Stem					Waseca	Lamberton ⁴	Morris	St. Paul	Crookston	Stephen ⁶	Average ⁷
Angus	28	31	2.0	R	R	32	59.3	14.8	med-high	43	34	29	42	43	47	39
Era	30	31	2.3	R-MR	R	30	59.5	13.8	low-med.	59	36	34	51	47	60	46
Kitt	29	31	2.8	R	R	32	57.2	15.0	med.-high	57	38	34	46	42	55	43
Olaf	28	33	2.0	R	R	34	59.8	15.2	medium	58	40	36	47	42	57	44
Wared	30	31	1.9	R-MR	R	30	59.4	14.4	medium	60	36	29	47	46	55	43
Len	28	33	2.0	R	R	34	59.0	15.1	med-high	—	38	35	45	42	53 ⁵	43
James	26	35	2.8	MS	R	30	58.4	15.0	medium	—	38	35	47	40	54 ⁵	44
Butte	26	35	3.4	R	R	33	60.8	14.9	med.-high	63	41	38	51	51	50	46
Aim ⁵	27	31	2.2	MS	S	—	58.8	—	—	—	38	34	40	44	57 ⁵	43
B-1 ⁵	32	34	3.2	S	S	—	53.0	—	—	—	25	18	43	42	52 ⁵	36
Chris	29	39	4.1	R-MS	R	29	59.8	16.0	v. high	—	34	37	37	31	48	37
Coteau	29	37	3.0	R	R	33	59.6	16.2	high-med	59	40	37	43	42	47 ⁵	42
Ellar	27	37	2.8	MS-MR	R	34	59.3	15.6	med-high	—	38	30	44	38	39	38
Eureka	28	37	3.5	MS-MR	R	33	58.6	15.5	med-high	—	40	39	42	40	42 ⁵	41
Prodax	28	32	2.7	S	MS	32	56.1	14.2	low-med.	—	27	26	45	46	64	42
Protor	26	30	2.0	MS	R	31	59.7	14.8	low	—	40	35	49	51	50	45
Solar ⁴	30	31	2.1	R-MR	R	30	59.4	13.6	low	—	36	30	51	50	62 ⁵	46
Waldron	27	37	2.4	MS-MR	R	34	58.4	15.7	high	49	40	33	39	44	46	40
World Seeds 1809	23	28	2.0	R-MR	R	30	59.0	14.9	medium	—	36	31	46	42	52	41
LSD 5%											6	6	7	7	6	4

¹1 = erect, 9 = flat. ²Reaction to prevalent races: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible. ³14 percent moisture, 1976-78. ⁴1978-79. ⁵1979. ⁶1977, 1979. ⁷Waseca not included.

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

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

Winoka—Awned, winterhardy, medium height, maturity, and lodging resistance. Susceptible to leaf rust and moderately resistant to stem rust. Severe leaf necrosis in certain years. Satisfac-

tory milling and baking characteristics. Reselection from Winalta by South Dakota Agricultural Experiment Station in 1968.

OTHER VARIETIES

Bronze—Awned, early, medium height and lodging resistance. Moderately winterhardy. Susceptible to leaf rust, but resistant to stem rust. High yield and medium test weight. Milling and baking characteristics satisfactory. Selected from Cycle II, Series I of a recurrent selection scheme. Released by South Dakota Agricultural Experiment Station in 1972.

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

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

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

Gent—Awned, early, medium height and lodging resistance. Winterhardness lower than Minter and Winoka. Moderately resistant to leaf rust and resistant to stem rust. High yield and test

weight. Satisfactory quality. Made by compositing nine selections from crosses of Agent and Scout. Developed at Hays, Kansas, but tested and released by South Dakota Agricultural Experiment Station in 1974.

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

Table 37. Characteristics of winter wheat varieties, 1977-1979

Variety	Heading (June)	Height (inches)	Winter survival (percent)	Lodging (score) ¹	Rust reaction ²		Test weight/ bushel (pounds)	Yield/acre (bushels) ³
					Leaf	Stem		
Gent	6	40	75	5.2	MR	R	60.2	38
Winoka	9	43	92	5.8	S	MR	61.1	45
Eklund	11	45	96	5.8	S	S	57.3	28
Minter	10	45	95	5.9	MS	MS	60.8	42
Froid	9	44	93	5.9	S	MR-S	59.0	38
Roughrider	8	43	95	5.0	S	R	60.7	45
Sundance	12	44	95	4.1	S	S	56.7	38
Centurk	7	40	69	3.9	S	MS	58.7	40
LSD 5%								5

¹1 = erect, 9 = flat ²Reaction to prevalent races: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible. ³St. Paul. Trials at Morris winterkilled in 1978 and 1979..

WINTER RYE

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

Agricultural Experiment Station from crosses involving Von Lochow and Wisconsin synthetics of tan seed color. Released in 1979.

RECOMMENDED VARIETIES

Puma—Medium yield, good winterhardness, 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 winterhardness, 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, winterhardy, medium late, medium height, and good lodging resistance in Wisconsin. Seed of predominantly tan color and high test weight. Originated by Wisconsin

OTHER VARIETIES

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

Frontier—Medium yield, very winterhardy, medium maturity, tall. Poor lodging resistance. Small seed of predominantly blue-gray color and high test weight. Developed by Agriculture Canada, Swift Current, from a cross of Dakold23 and Petkus. Licensed in 1965. *If winterhardness is of primary concern, grow Frontier instead of the recommended varieties.*

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

Table 38. Yields of winter rye varieties in bushels per acre

Variety	Rosemount 1973-79	Grand Rapids 1973-79	Crookston 1975-79	Morris 1973-76, 78-79	Average (4 locations)
Puma	53	44	49	39	46
Rymin	63	45	52	36	49
LSD 5%	2	2	4	3	1

Table 39. Characteristics of winter rye varieties, 4 location average

Variety	Winterkill (percent)	Heading (June)	Mature (July)	Lodging (score) ¹	Height (inches)	Weight/100 seeds (grams)	Test weight/bushel (pounds)
Puma	9	1	21	3.2	49	2.4	55.1
Rymin	12	2	21	2.3	48	2.7	55.5

¹1 = erect, 9 = flat.

Rymin rye and its breeder, agronomist R. G. Robinson.



NOTES

NOTES

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		45	105,000/acre	
Great northern		90	90,000/acre	
Kidney		90	80,000/acre	
Navy		45	105,000/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	56	10	150,000/acre	May 20 to June 5 for grain
18- to 40-inch rows		15	5/square foot	
6- to 14-inch rows				
Soybean	60	80	3/foot of row	May 5 to May 25
6- to 8-inch rows		65	7/foot of row	
20-inch rows		55	9/foot of row	
30-inch rows		50	11/foot of row	
40-inch rows				
Sunflower	24	4	17,000/acre	May
Nonoilseed		3	23,000/acre	
Oilseed	27			
Wheat	60	90	25/square foot	Early spring
Durum		80	28/square foot	Early spring
Hard red spring		75	25/square foot	August 20 to September 20
Winter				
Other Crops				
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	
Fababeans-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

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