

# 1985 EDITION

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## CONTENTS

### FORAGE CROPS

Alfalfa .....	3
Birdsfoot Trefoil .....	5
Bromegrass .....	6
Orchardgrass .....	6
Red Clover .....	6
Reed Canarygrass .....	6
Tall Fescue .....	6
Timothy .....	7

### GRAIN CROPS

Annual canarygrass .....	7
Barley .....	8
Buckwheat .....	9
Corn .....	9
Grain Sorghum .....	10
Millet .....	11
Oat .....	12
Wheat, Durum .....	14
Wheat, Hard Red Spring .....	14
Wheat, Winter .....	17
Wild Rice .....	18
Winter Rye .....	18

### OILSEED CROPS

Flax .....	19
Mustard, canola, oilseed rape .....	21
Soybean .....	22
Sunflower .....	30

### PULSE CROPS

Adzuki .....	34
Fieldbean .....	34
Fieldpea, fababean, lupine .....	38
Lentil .....	39

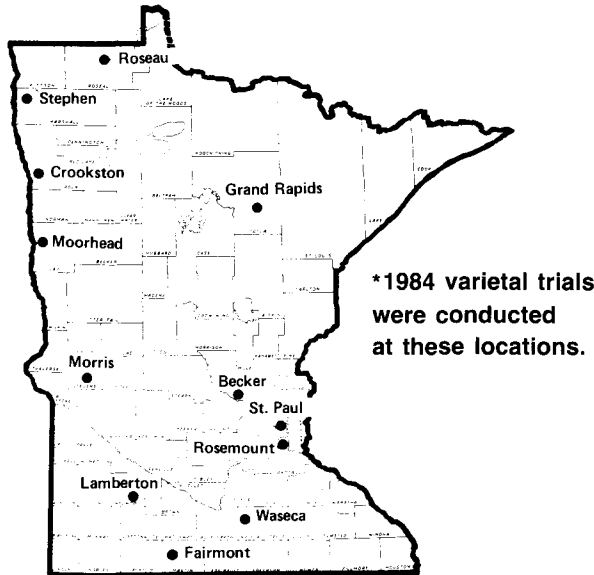
PLANTING RATE AND DATE .....	40
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# VARIETALS

AGRICULTURAL EXPERIMENT STATION—UNIVERSITY OF MINNESOTA

ITEM NO. AD-15 (FORMERLY MINNESOTA REPORT 74)

# VARIETAL TRIALS OF FARM CROPS



Successful crop production depends to a considerable extent on selecting the best varieties for a particular farm. For that reason, varieties are compared in trial plots on Minnesota Agricultural Experiment Station fields at St. Paul, Rosemount, Waseca, Lambertson, Morris, Crookston, Grand Rapids, and Becker, and on farmers' fields. 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.

Varieties of many of the crops are classed into three groups: "recommended varieties," "varieties not adequately tested," and "other varieties." For these crops, the varietal descriptions are arranged in alphabetical order within the groups. The classifications of varieties as "recommended varieties" and "other varieties" are determined each year by the Minnesota Agricultural Experiment Station Crop Variety Review Committee. A variety is not usually eligible for the "recommended varieties" group unless it has been better than other varieties in important characteristics in 3 years of testing. New varieties from other public experiment stations and private plant breeders but not sufficiently evaluated here are listed as "varieties 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.

Varieties of all three groups may be eligible for certification, and the use of certified seed is suggested. However, 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 1985 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.

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.

Authors of the crop sections are: R.G. Robinson (adzuki, annual canarygrass, buckwheat, fieldbean, fieldpea-fababean-lupine, grain sorghum, lentil, millet, mustard-canola-oilseed rape, sunflower, and rye); D.K. Barnes and N.P. Martin (alfalfa, birdsfoot trefoil, bromegrass, orchardgrass, red clover, reed canarygrass, tall fescue, and timothy); D.C. Rasmusson (barley); J.L. Gadelmann and R.H. Peterson (corn); V.E. Comstock (flax); D.D. Stuthman (oat); J.H. Orf (soybean); R.H. Busch (wheat—durum, hard red spring, and winter); R.E. Stucker (wild rice). Extension agronomist L.L. Hardman also participated in preparing this publication.

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

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

# Forage Crops

## 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 that are eligible for certification or approved for Plant Variety Protection, and that will be sold in Minnesota in 1985, 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.

Table 1. Average yields of alfalfa varieties expressed as percentage of Vernal for all tests in Minnesota, 1959-84

Variety	Number tests	Yield (percent of Vernal)						
		Year after seeding					Average over years	
		1st	2nd	3rd	4th	5th-9th	1-2	3-9
<b>VERY WINTERHARDY</b>								
Prowler	6	98	93	92	—	—	95	92
Ladak	3	87	88	78	89	—	88	82
Spredor II	1	100	93	91	—	—	97	91
Teton	3	89	93	86	93	—	91	90
Travois	3	88	88	88	87	—	88	88
Maverick	4	95	99	—	—	—	97	—
<b>WINTERHARDY</b>								
Victoria	2	99	100	100	95	106	100	98
Vernal, tons/acre, 15% M	77	4.8	4.6	4.5	4.4	4.2	4.7	4.2
Baker	13	98	97	105	106	112	98	108
Dawson	4	100	104	104	100	98	102	101
526	5	106	109	—	—	—	107	—
Vancor	5	103	100	96	—	—	102	96
G2818	3	103	102	97	—	—	102	97
Agate	29	98	99	101	98	100	99	100
Iroquois	14	106	104	104	109	103	105	106
Ladak 65	5	100	101	98	97	98	101	98
520	13	104	105	110	111	109	104	110
524	9	106	101	105	104	96	104	104
Blazer	10	105	104	111	110	99	104	110
545	8	100	102	104	105	104	101	104
Thunder	6	102	103	104	107	—	102	105
Phytor	8	102	104	107	108	122	103	108
Valor	9	100	103	103	105	114	101	106
120	9	109	110	114	113	—	109	114
A-54	5	101	112	113	102	—	106	107
Ranger	26	97	98	97	99	93	97	97
532	6	110	106	104	108	—	108	105
Pacer	9	102	104	108	107	105	103	107
Polar II	6	99	95	91	99	—	97	95
<b>MODERATELY WINTERHARDY</b>								
Arc	4	102	101	98	—	—	102	98
Marathon	6	104	104	100	98	93	104	99
Oneida	6	105	101	105	105	—	103	105

The varieties listed in tables 1 and 2 are ranked according to winterhardiness index which is an indication of rate of growth and degree of winterhardiness. *Very winterhardy varieties* are slow to recover after cutting. These varieties will survive nearly all winters. They usually are not high yielding because they recover slowly for the second crop and produce only a small third crop because of early dormancy. *Winterhardy varieties* are adapted to all areas of the state. Forage yields vary among varieties in this group, primarily because of disease and insect resistance. Three or four years of production can be expected from most winterhardy varieties, but a few can be productive for 5 or more years. *Moderately winterhardy*

Table 1 (continued). Average yields of alfalfa varieties expressed as percentage of Vernal for all tests in Minnesota, 1959-84

Variety	Number tests	Yield (percent of Vernal)						
		Year after seeding					Average over years	
		1st	2nd	3rd	4th	5th-9th	1-2	3-9
Apollo	11	101	100	103	107	108	101	105
Vernema	4	105	107	—	—	—	106	—
Expo	5	101	104	106	102	—	102	104
G7730	6	100	103	108	115	—	101	111
Magnum	7	105	101	109	113	—	103	111
Advantage	5	104	103	101	104	—	104	102
Answer	7	105	102	105	102	—	103	104
Endure	2	105	108	—	—	—	106	—
Primal	7	106	106	101	100	—	106	100
Saranac AR	17	103	101	102	99	106	102	102
Apollo II	6	102	102	97	—	—	102	97
Duke	6	101	103	103	106	—	101	104
DK 135	5	103	107	—	—	—	103	—
Peak	9	106	106	112	112	108	106	112
Preserve	1	99	104	—	—	—	102	—
Saranac	39	104	103	101	102	98	103	100
Thor	10	103	103	100	102	105	103	102
Trident	8	103	104	103	108	—	103	105
Spectrum	4	103	103	—	—	—	103	—
SX-418	8	101	102	98	94	—	101	96
Drummor	2	100	108	—	—	—	104	—
G-2815	6	97	103	103	102	—	100	103
A-57	7	99	99	93	98	—	99	95
Trumpetor	6	103	106	96	—	—	104	96
Aquarius	5	97	103	99	94	—	100	97
Decathlon	3	103	105	—	—	—	104	—
Armor	5	104	105	103	103	—	104	103
Hi-Phy	7	102	107	113	119	—	104	115
Epic	7	101	107	112	123	—	104	117
Cimarron	2	103	103	87	94	—	103	90
Maxim	0	—	—	—	—	—	—	—
Challenger	1	98	96	—	—	—	97	—

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, Florida 77, Granada, Hayden, Joaquin II, Lew, Maxidor, Mesa Sirsa, Mesilla, Moapa 69, Pierce, Sonora 70, 183, WL 504, WL 508, WL 514, WL 515, WL 600, UC Cibola, UC Salton, Validor, 572, and 581.

**BACTERIAL WILT**—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 fungus 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.

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

**ANTHRACNOSE**—This fungus disease was first found in Minnesota in 1978 and has become more prevalent each year. It infects stems and crowns and will kill susceptible plants. The disease is favored by hot, moist conditions; therefore, it will be most frequently observed in SE Minnesota.

**VERTICILLIUM WILT**— This is a new, potentially destructive fungus disease that was first found in several Minnesota fields in 1981. It has usually been found in 2- or 3-year-old fields. If the disease has been identified in the immediate vicinity, consider planting a resistant variety. The only varieties listed in tables 1 and 2 having at least moderate levels of resistance are Apollo II, Decathlon, DK 135, Endure, Maxim, Trumpetor, and Vernema.

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

Variety	Developer or owner <sup>1</sup>	Winter hardiness (index) <sup>2</sup>	RESISTANT PLANTS <sup>3</sup>			Anthracnose (rating) <sup>4</sup>
			Bacterial wilt (percent)	Phytophthora root rot (percent)	Fusarium wilt (percent)	
<b>VERY WINTERHARDY</b>						
----- highest value best -----						
Prowler	Pride Seed Co. <sup>r</sup>	7.9	72	2	18	S
Ladak	USDA (foreign introduction) <sup>ah</sup>	7.5	8	2	29	S
Spredor II	Northrup King Co. <sup>l</sup>	7.5	58	5	24	S
Teton	S. Dakota Agr. Exp. Sta. <sup>a</sup>	7.4	15	7	26	S
Travois	S. Dakota Agr. Exp. Sta. <sup>ju</sup>	7.4	37	1	15	S
Maverick	AgriPro <sup>tz</sup>	7.3	42	17	36	S
<b>WINTERHARDY</b>						
Victoria	Arkansas Agr. Exp. Sta. <sup>p</sup>	6.9	5	12	48	S
Vernal	Wisconsin Agr. Exp. Sta. & USDA <sup>acthijmoqtuw</sup>	6.5	42	5	32	S
Baker	USDA & Nebraska Agr. Exp. Sta. <sup>aju</sup>	6.5	50	2	37	LR
Dawson	USDA & Nebraska Agr. Exp. Sta. <sup>ai</sup>	6.5	15	1	35	S
526	Pioneer Hi-Bred International Inc. <sup>p</sup>	6.5	57	8	15	LR
Vancor	Northrup King Co. <sup>l</sup>	6.2	56	22	38	R
G2818	Funk Seeds Intl. <sup>g</sup>	6.1	58	24	44	LR
Agate	USDA & Minnesota Agr. Exp. Sta. <sup>ahjioqtuw</sup>	6.0	65	43	54	MR
Iroquois	Cornell University <sup>ioqtw</sup>	6.0	61	1	22	S
Ladak 65	Montana Agr. Exp. Sta. <sup>oip</sup>	6.0	36	2	15	S
520	Pioneer Hi-Bred International Inc. <sup>p</sup>	5.9	40	4	29	LR
524	Pioneer Hi-Bred International Inc. <sup>p</sup>	5.9	24	8	44	LR
Blazer	Land O'Lakes <sup>l</sup>	5.9	49	24	26	LR
545	Pioneer Hi-Bred International Inc. <sup>p</sup>	5.8	35	30	30	LR
Thunder	AgriPro <sup>fxz</sup>	5.7	43	49	55	MR
Phytor	Northrup King Co. <sup>l</sup>	5.5	34	30	39	S
Valor	Land O'Lakes <sup>l</sup>	5.5	36	2	30	LR
120	DeKalb-Pfizer Genetics <sup>e</sup>	5.5	57	39	20	LR
A-54	Ramey Seed Co. <sup>l</sup>	5.4	26	11	25	—
Ranger	USDA & Nebraska Agr. Exp. Sta. <sup>achijnoq</sup>	5.4	18	4	25	S
532	Pioneer Hi-Bred International Inc. <sup>p</sup>	5.4	63	7	37	MR
Pacer	Land O'Lakes <sup>l</sup>	5.3	33	8	20	LR
Polar II	Pride Seed Co. <sup>r</sup>	5.3	57	60	34	S
<b>MODERATELY WINTERHARDY</b>						
Arc	USDA & N. Carolina Agr. Exp. Sta.	5.2	7	3	34	HR
Marathon	Cargill Inc. <sup>b</sup>	5.2	36	2	13	S
Oneida	Cornell University <sup>g</sup>	5.1	62	52	62	S

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

Variety	Developer or owner <sup>1</sup>	Winter hardiness (index) <sup>2</sup>	RESISTANT PLANTS <sup>3</sup>			Anthracnose (rating) <sup>4</sup>
			Bacterial wilt (percent)	Phytophthora root rot (percent)	Fusarium wilt (percent)	
Apollo	AgriPro <sup>fxz</sup>	5.1	36	36	40	LR
Vernema	USDA & Washington Agr. Exp. Sta. <sup>w</sup>	4.8	21	13	38	S
Expo	Paymaster Seeds <sup>n</sup>	4.7	37	47	42	MR
G7730	Funk Seed Int. <sup>9o</sup>	4.7	55	62	62	LR
Magnum	Dairyland Seed Co. Inc. <sup>d</sup>	4.7	51	5	32	MR
Advantage	DeKalb-Pfizer Genetics <sup>e</sup>	4.6	42	44	32	MR
Answer	Midland Cooperatives, Inc. <sup>c</sup>	4.6	50	66	58	LR
Endure	PAG Seeds <sup>m</sup>	4.6	45	28	41	MR
Primal	Pride Seed Co. <sup>r</sup>	4.6	62	9	33	S
Saranac AR	Cornell University <sup>ia</sup>	4.6	35	14	44	HR
Apollo II	AgriPro <sup>jk</sup>	4.5	43	54	47	MR
Duke	AgriPro <sup>k</sup>	4.5	43	55	43	MR
DK 135	DeKalb-Pfizer Genetics <sup>e</sup>	4.5	26	20	46	MR
Peak	Research Seeds, Inc. <sup>pa</sup>	4.5	52	16	28	LR
Preserve	Pride Seed Co. <sup>r</sup>	4.5	40	19	35	LR
Saranac	Cornell University <sup>ia</sup>	4.5	49	3	34	S
Thor	Northrup King Co. <sup>l</sup>	4.5	69	1	30	S
Trident	PAG Seeds <sup>m</sup>	4.5	37	71	55	MR
Spectrum	W.L. Research Inc. <sup>c</sup>	4.5	56	29	33	MR
SX-418	Sexauer Co. <sup>u</sup>	4.5	33	5	20	LR
Drummor	Northrup King Co. <sup>l</sup>	4.4	38	29	17	MR
G 2815	Funk Seed Int. <sup>9</sup>	4.4	51	16	56	MR
A-57	Embro Seed Co. Inc. <sup>t</sup>	4.4	12	7	38	—
Trumpetor	Northrup King Co. <sup>l</sup>	4.4	28	8	51	R
Aquarius	Lincoln Seed & Feed Co. <sup>j</sup>	4.3	75	2	47	HR
Decathlon	Cargill, Inc. <sup>bn</sup>	4.3	66	21	43	MR
Armor	AgriPro <sup>fxz</sup>	4.2	39	43	44	MR
Hi-Phy	Farmers Forage Res. Coop. <sup>c</sup>	4.1	64	27	57	—
Epic	Larry Peterson, Ltd. <sup>svp</sup>	3.9	58	34	45	S
Cimarron	Great Plains Research <sup>y</sup>	3.6	44	15	52	HR
Maxim	Cenex <sup>c</sup>	3.6	42	15	42	R
Challenger	Cargill, Inc. <sup>b</sup>	3.5	46	46	22	R

<sup>1</sup>1985 seed sources are listed at the end of the forage crops section. <sup>2</sup>Based on fall growth after cutting 1st week of September: 1 = tallest (least winterhardy), 9 = shortest. <sup>3</sup>Plants with little or no injury are classified as resistant. <sup>4</sup>Resistance rating (percent resistant plants): HR = high resistance (51+), R = resistant (31-50), MR = moderate resistance (16-30), LR = low resistance (6-15), and S = susceptible (0-5).

## 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.

Varieties were evaluated for about 14 years in pure stands. Average hay yield for the variety Empire was 3.7, 3.2, and 3.0 tons/acre for the first, second, and third years after seed-

ing, respectively. The relative 3-year yield of varieties sold in Minnesota (% of Empire) and 1985 sources of seed<sup>1</sup> are: Leo-112<sup>qw</sup>, Carroll-109<sup>pa</sup>, Dawn-108<sup>lz</sup>, Noreen-105<sup>pa</sup>, Empire-100<sup>chijouquw</sup>, and Fergus (no data available)<sup>lz</sup>

Norcen was released in 1983 by the agricultural experiment stations of Minnesota and six other states. It has performed well in grazing trials.

<sup>1</sup>1985 seed sources are listed at the end of the forage crops section.

## BROMEGRASS

Bromegrass is generally grown for hay in mixture with alfalfa or is used as pasture in mixture with other grasses and legumes. 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. Varieties presently being sold in Minnesota are of the southern type except for Manchar which is a northern type. All varieties are winterhardy. Some stand losses may occur when bromegrass is managed under three- and four-cut alfalfa harvest systems.

Varieties were evaluated in pure stands for about 15 years at most Minnesota experiment stations. Average hay yields were about 4.7 tons/acre at Grand Rapids, 3.9 tons/acre at Rosemount, and about 3.5 tons/acre at the other locations. Average hay yield for Fox bromegrass has been about 4.0 tons/acre. The relative yield of varieties sold in Minnesota (% of Fox) and 1985 sources of seed<sup>1</sup> are: Barton-105<sup>i</sup>, Rebound-102<sup>aj</sup>, Baylor-101<sup>fmxz</sup>, and Lincoln-95<sup>acfhijouqw</sup>

<sup>1</sup>1985 seed sources are listed at the end of the forage crops section.

## ORCHARDGRASS

Orchardgrass is used with other grasses and 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. Varieties were evaluated in pure stands at Rosemount and Grand Rapids over a period of 10 years. Average annual hay yield for the variety Hallmark was 3.4 tons/acre at Grand Rapids and 3.9 tons/acre at

Rosemount, Minnesota. The relative yield of varieties sold in Minnesota (% of Hallmark) and 1985 sources of seed<sup>1</sup> are: Dart-102<sup>i</sup>, Hallmark-100<sup>c</sup>, Sterling-100<sup>iw</sup>, Napier-100<sup>m</sup>, Comet-98<sup>l</sup>, Able-92<sup>c</sup>, Hawk-91<sup>fxz</sup>, and Potomac-87<sup>ijouqw</sup>

<sup>1</sup>1985 seed sources are listed at the end of the forage crops section.

## 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. Most of the varieties presently sold in Minnesota can persist for 3 years with good winter snow cover. Varieties were evaluated at Rosemount, Grand Rapids, Lamberton, Morris, and Waseca, Minnesota, for about 13 years. Average hay yield for the variety Lakeland was 3.6, 3.5, and 2.2 tons/acre for the first, second, and

third years after seeding, respectively. The relative 2-year yield of varieties sold in Minnesota (% of Lakeland) and 1985 sources of seed<sup>1</sup> are: Florex-116<sup>l</sup>, Arlington-113<sup>cijouqw</sup>, Prosper I-111<sup>f</sup>, Lakeland-100<sup>hjqv</sup>, Redman-99<sup>c</sup>, Reddy (no data available)<sup>c</sup>, Redfield (no data available)<sup>m</sup>, Redland II<sup>2fxz</sup>, and Ruby<sup>2d</sup>.

<sup>1</sup>1985 seed sources are listed at the end of the forage crops section.

<sup>2</sup>Not tested in Minnesota, but similar to Lakeland in University of Wisconsin tests.

## REED CANARYGRASS

Reed canarygrass is adapted throughout Minnesota for use as hay, pasture, or silage. It is one of the best grass species for use on poorly drained soil, in swampy areas, and in areas subject to spring flooding. The species is also well adapted to upland soils. The seedling vigor is not as good as that of other commonly used forage grasses. Reed canarygrass is less palatable than most species seeded for hay and pasture, but cattle will produce well on the grass if it is used before it becomes mature. Satisfactory pasture utilization occurs if the grass is grazed when it is between 6 and 24 inches tall. Harvesting hay between heading and early bloom is preferred, because the quality declines with advanced maturity. Available varieties are winterhardy and persistent.

Varieties were evaluated in pure stands at Grand Rapids,

Lamberton, Morris, and Rosemount for 10 years. Average annual hay yields for all varieties were about 3.0 tons/acre at Lamberton and Morris and 4.4 tons/acre at Grand Rapids and Rosemount.

The latest development in reed canarygrass breeding has been the development of varieties with low concentrations of indole alkaloids. In grazing trials, lambs and steers gained more weight and sheep had less diarrhea on low alkaloid varieties than on the common reed canarygrass varieties. Seeds of two low alkaloid varieties: Palaton<sup>l</sup> and Venture<sup>pq</sup>, and three common reed canarygrass varieties: Flare<sup>i</sup>, Rise<sup>h</sup>, and Vantage<sup>pq</sup> are available<sup>1</sup>.

<sup>1</sup>1985 seed sources are listed at the end of the forage crops section.

## 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.

Varieties were evaluated for about 8 years at Grand Rapids and

Rosemount, Minnesota. Average annual hay yields were about 4.2 tons/acre at both locations for the variety Kentucky-31. The relative yield of varieties sold in Minnesota (% of Kentucky-31) and 1985 sources of seed<sup>1</sup> are: Kenhy-102<sup>w</sup>, Kentucky-31<sup>hjqtw</sup>, Forager-92<sup>c</sup>, Fawn-78<sup>l</sup>, and Olympic (no data available)<sup>q</sup>.

<sup>1</sup>1985 seed sources are listed at the end of the forage crops section.

## 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 presently available in Minnesota are of medium and medium-late maturity and should not be harvested more than twice during the growing season. Therefore, timothy and red clover are compatible

in mixtures for hay production.

Varieties were evaluated in pure stands for about 13 years in Minnesota. Average annual hay yields were about 3.6 tons/acre for the variety Itasca. The relative yield of varieties sold in Minnesota (% of Itasca) and 1985 sources of seed<sup>1</sup> are: Timfor-100<sup>1r</sup> and Climax-95<sup>achijoquaw</sup>. No data are available for Basho<sup>w</sup>, Mohawk<sup>c</sup>, Mor-tim<sup>m</sup>, and Tim<sup>l</sup>.

<sup>1</sup>1985 seed sources are listed at the end of the forage crops section.

1985 forage seed sources are: a. Arrowhead, Inc., Box 667, Watertown, SD 57201; b. Cargill Seed Division, P. O. Box 5645, Minneapolis, MN 55440; c. Cenex Seed Department, P. O. Box 43089, St. Paul, MN 55164; d. Dairyland Seed Co., Inc., P. O. Box 958, West Bend, WI 53095; e. DeKalb-Pfizer Genetics, 3100 Sycamore Road, DeKalb, IL 60115; f. Field Seed Farms, RR#1, Box 39, Byron, MN 55920; g. Funk Seeds, Int'l, P. O. Box 2911, Bloomington, IL 61701; h. Interstate Seed Co., 417 Main Ave., Fargo, ND 58102; i. Land O'Lakes, Inc., P. O. Box 1395, Minneapolis, MN 55440; j. Lincoln Seed & Feed Co., Box 1044, Sioux City, IA 51102; k. AgriPro, P. O. Box 2955, 5201 Johnson Dr., Mission, KS 66205; l. Northrup King Co., 1500 Jackson St. NE, Minneapolis, MN 55413; m. PAG Seeds, P. O. Box 5645, Minneapolis, MN 55440; n. Paymaster Seeds, P. O. Box 5645, Minneapolis, MN 55440; o. Peterson-Biddick Co., Wadena, MN 56482; p. Pioneer Hi-Bred Int'l, Inc., for alfalfa = P. O. Box 85, Johnston IA 50131, for other forage seeds = P. O. Box 346, Savage, MN 55378; q. Premium Seed Co., 7800 E. State, Hwy 101, Shakopee, MN 55379; r. Pride Co., Inc., RFD Box 58, Glen Haven, WI 53810; s. Profiseed, Inc., RR#2, Hampton, IA 50441; t. Ramy Seed Co., 1229 North Front St., Mankato, MN 56001; u. The Sexauer Co., P. O. Box 58, Brookings, SD 57006; v. Stamer Seed Co., RR#3, Hector, MN 55342; w. Werner Farm Seeds, RR#1, Box 28A, Dundas, MN 55019; x. Ziller Seed Farm, Inc., RR#1, Box 122, Bird Island, MN 55310; y. Great Plains Research, Inc., P. O. Box 1745, Stillwater, OK 74076; z. Sigco Research, Inc., P. O. Box 289, Breckenridge, MN 56520.

# Grain Crops

## 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. Devel-

oped cooperatively by Minnesota Agricultural Experiment Station and Minn-Dak Growers Association. Released in 1973.

**Elias**—High yield, medium maturity and height. Fair lodging resistance. Medium size seed of very high test weight. Released by Minnesota Agricultural Experiment Station in 1983.

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

Table 3. Yields of annual canarygrass varieties in pounds per acre

Variety	Stephen 1979-84	Crookston 1979-84	Rosemount 1979-84	Becker <sup>1</sup> 1982-84	Average 21 trials
Alden	1162	1460	1081	910	1188
Elias	1554	1794	1224	918	1437
Keet	1318	1649	1142	925	1306
Checks <sup>2</sup>	1026	1186	919	736	1000
LSD 5%	127	148	99	80	58

<sup>1</sup>Irrigated. <sup>2</sup>1984 data of progeny of seed lots and varieties imported 10 to 30 years ago.

Table 4. Characteristics of annual canarygrass varieties

Variety	Planting to heading (days)	Planting to maturity (days)	Lodging (score) <sup>1</sup>	Height (inches)	Seeds/pound (number)	Test weight/ bushel (pounds)
Alden	65	106	4.1	36	60,900	48
Elias	64	105	2.7	36	58,200	51
Keet	62	103	3.1	35	61,500	49
Checks <sup>2</sup>	64	105	4.4	34	56,300	49

<sup>1</sup>1 = erect, 9 = flat. <sup>2</sup>1984 data of progeny of seed lots and varieties imported 10 to 30 years ago.



# BARLEY

## RECOMMENDED VARIETIES

**Glenn**—High yield. Early. Good lodging resistance. Six-row, rough-awn, long rachilla hairs, colorless aleurone. Classified as a malting variety by American Malting Barley Association (AMBA). Resistant to stem rust and spot blotch. Developed by North Dakota Agricultural Experiment Station from crosses involving Br 5755-3, ND B138, and Trophy. Released in 1977.

**Morex**—High yield. Early. Medium lodging resistance. Kernel plumpness intermediate to high. Six-row, semi-smooth awn, short rachilla hairs, colorless aleurone. Awns may drop off as crop approaches maturity. Threshes easily. Classified as a malting variety by AMBA. Resistant to stem rust and moderately resistant to spot blotch. Developed by Minnesota Agricultural Experiment Station from cross of Cree and Bonanza. Released in 1978.

**Robust**—Very high yield. Later maturing than Morex. Superior to Morex in lodging resistance and kernel plumpness. Six-row, semi-smooth awn, short rachilla hairs, colorless aleurone. Classified as a malting variety by AMBA. Resistant to stem rust and spot blotch. Susceptible to loose smut. Developed by Minnesota Agricultural Experiment Station from cross of Morex and Manker. Released in 1983. Variety protection pending.

## VARIETIES NOT ADEQUATELY TESTED

**Hazen**—Very high yield. Similar to Robust in maturity. Good kernel plumpness and good lodging resistance. Six-row, semi-smooth awn, long rachilla hairs, colorless aleurone. Malting quality status undetermined. Resistant to stem rust and spot blotch. Susceptible to loose smut. Developed by North Dakota Agricultural Experiment Station from a cross involving Glenn, Nordic, Dickson, Trophy and Azure. Released in 1984.

## OTHER VARIETIES

**Azure**—Very high yield. Medium maturity. Six-row, semi-smooth awn, long rachilla hairs, blue aleurone. Classified as a malting variety by AMBA. Resistant to stem rust and spot blotch. Yielded 1 bushel per acre less than Robust in Minnesota trials. Not recommended because of limited demand for a blue aleurone malting variety and the associated marketing problem. Developed by North Dakota Agricultural Experiment Station from a cross involving Bonanza, Nordic, and NDB130. Released in 1982.

**Bonanza**—Medium yield. Later maturing than Morex. Six-row, semi-smooth awn, long rachilla hairs, blue aleurone. Classified as a malting variety by AMBA. Resistant to stem rust.



Experiment station assistant director R. L. Thompson and oat agronomist D. D. Stuthman admire Robust, Minnesota's newest and highest yielding malting barley variety.

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

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

**Larker**—Low yield. Early. Six-row, semi-smooth awn, long rachilla hairs, colorless aleurone. Good kernel plumpness. Classified as a malting variety by AMBA. 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 Trill and a selection from UM 570. Released in 1961.

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

Table 5. Yields of barley varieties in bushels per acre, 1980-1984

Variety	Crookston 9 <sup>1</sup>	Morris 10 <sup>1</sup>	Stephen 5 <sup>1</sup>	St. Paul 5 <sup>1</sup>	Lamberton 4 <sup>1</sup>	Average 5 locations	Roseau 1 <sup>1</sup>
Glenn	79	76	71	75	73	76	77
Morex	77	80	80	70	73	77	80
Robust	83	83	83	77	77	81	81
Hazen	80 <sup>2</sup>	84 <sup>3</sup>	84 <sup>2</sup>	87 <sup>2</sup>	78 <sup>2</sup>	83	—
Larker	70	76	74	62	65	71	70
LSD 5%	4	3	8	6	8	3	14

<sup>1</sup>Number of trials. <sup>2</sup>1984 data adjusted to 5-year average. <sup>3</sup>1982-84 data adjusted to 5-year average.

Table 6. Characteristics of barley varieties, 1982-1984

Variety	Heading (June)	Height (inches)	Lodging (percent)	Plump kernels (percent)	Malt extract (percent) <sup>1</sup>	Seeds/pound (number)	Reaction to disease <sup>2</sup>		
							stem rust	loose smut	spot blotch
Glenn	21	30	27	87	75.8	12,700	R	S	R
Morex	22	33	36	85	77.3	13,200	R	S	MR
Robust	25	32	28	89	77.8	12,600	R	S	R
Hazen	25	31	—	94	76.7	11,900	R	S	R
Larker	23	31	50	88	75.4	12,700	R	S	S

<sup>1</sup>Data from regional trial, 1983. <sup>2</sup>R = resistant, MR = moderately resistant, and S = susceptible.



# BUCKWHEAT

## RECOMMENDED VARIETIES

**Mancan**—High yield. Large seed. Low test weight but good market acceptability. Released by Agriculture Canada, Morden. Licensed in 1974.

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

**Winsor Royal**—High yield. Large seed. Low test weight but good market acceptability. Released by Winsor Grain Co., Grain Exchange, Minneapolis, MN 55415 in 1982. Seed sale regulated by U.S. Variety Protection Act.

## OTHER VARIETIES

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

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

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

**Tokyo**—High yield. Small to medium seed. High test weight. Originated by Agriculture Canada, Ottawa in 1955.

Table 7. Yields of buckwheat varieties in pounds per acre

Variety	Becker 1982-84	Grand Rapids 1982-84	Crookston 1983-84	Morris 1983-84	Lamberton 1982-84	Waseca 1983-84	Rosemount 1982, 84	Average 7 locations
Mancan	680	425	583	1556	964	1420	1442	1010
Manor	643	413	591	1986	1210	1293	1569	1101
Winsor Royal	744	394	681	1601	1262	1517	1662	1123
LSD 5%	146	37	247	376	335	414	242	92

Table 8. Characteristics of buckwheat varieties, seven location average

Variety	Planting to bloom (days)	Lodging (score) <sup>1</sup>	Height (inches)	Weight/ 100 seeds (grams)	Seeds/ pound (number)	Test weight/ bushel (pounds)
Mancan	32	5.2	40	3.0	15,100	44
Manor	32	4.8	40	2.9	15,600	45
Winsor Royal	32	4.6	39	3.0	15,100	45

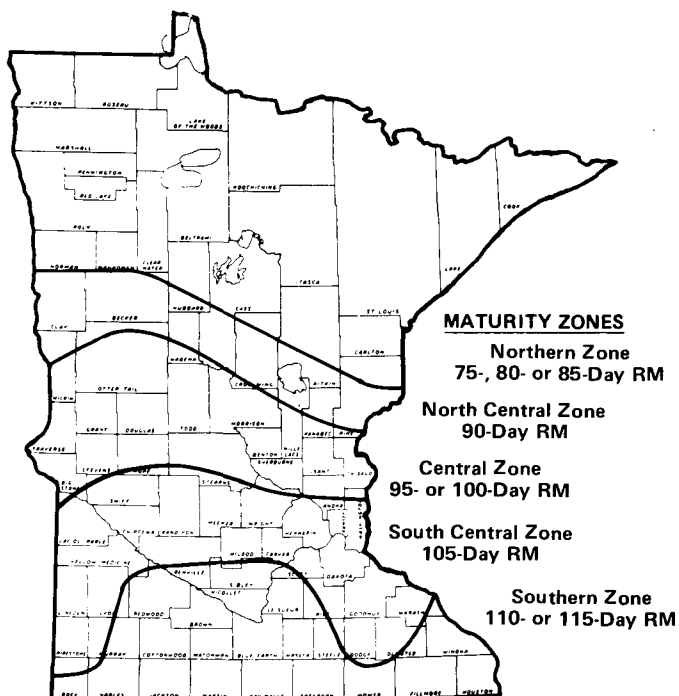
<sup>1</sup>1 = erect, 9 = flat.

# CORN

Many corn hybrids are produced by private companies. A total of 1,482 hybrids were registered for sale in Minnesota in 1984. Information on the performance of these closed-pedigree or private hybrids is usually available from the companies selling them.

The Minnesota Agricultural Experiment Station conducts research in corn breeding, including the development of inbred lines which are used as parents of hybrids. These Minnesota inbreds, designated by the letter "A", are released to private companies through the Minnesota Crop Improvement Association. Private companies may use these inbreds to produce hybrid seed corn for farmers. Inbreds developed by the Minnesota Agricultural Experiment Station accounted for 16 percent of the total United States' hybrid seed production in 1979, the most recent year for which accurate survey data are available. Information on the performance of these inbreds is available from the Corn Breeding Project, 303 Agronomy, University of Minnesota, 1509 Gortner Avenue, St. Paul, MN 55108.

Open-pedigree or public hybrids developed by the Minnesota Agricultural Experiment Station are called Minhybrids. Some recent Minhybrids, their pedigrees, and their Minnesota relative maturity (RM) ratings are listed in table 9. The zones of adaptation on the accompanying map show the areas for which hybrids of a particular RM rating are considered to be full-season maturity.





Many inbred lines developed by agronomist J. L. Geadelmann's project have been released to corn breeders and used to develop new corn hybrids.

Table 9. Description of some recent Minhybrids

Minhybrid	Pedigree	Relative maturity
8201	A641 × W182B	80
8301	(A639 × A641) × W182B	80
7301	(A638 × A639) × W182B	90
6301	(B9A × A239) × A635	95
6305	(A658 × A659) × A665	95
5202	A665 × Mo17	105
5303	(A658 × A659) × A632	105
4201	A619 × A632	110
4202	A634 × Mo17	110
4303	(A665 × A634) × Mo17	110

## 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 tables may be of acceptable maturity for southern Minnesota, and the earliest hybrids usually are satisfactory for some parts of central Minnesota. Late hybrids usually yield less than early hybrids in years with low temperatures in August or early September.

Trials were planted between May 21 and June 4 at the rate of 150,000 seeds per acre in rows 30 inches apart. Sorghum was harvested when it was dry enough to combine but not dry enough to store without artificial drying. Consequently, these trials do not measure lodging that might occur during natural drying in the field. All hybrids were harvested the same day for relative moisture

comparisons. Hybrids in the tables are ranked from earliest to latest based on head moisture in September.

Companies enter hybrids in these trials voluntarily, and adapted hybrids are usually tested for 3 years. Data reported for hybrids not included in all trials are adjusted to be comparable with average data of all hybrids tested.

Companies with hybrids in these trials include: Cargill Seed Division, Box 5645, Minneapolis, MN 55440; DeKalb-Pfizer Genetics, Box 225, Glenvil, NE 68941; Jacques Seed Co., Prescott, WI 54021; Northrup King Co., 1500 NE Jackson, Minneapolis, MN 55413; PAG Seeds, Box 9480, Minneapolis, MN 55440; Paymaster Seeds, Box 9493, Minneapolis, MN 55440; Pioneer Hi-Bred International Inc., 7000 Pioneer Parkway, Johnston, IA 50131.

Table 10. Characteristics of grain sorghum hybrids at Lamberton

Hybrid and company	Grain yield/acre (pounds) <sup>1</sup>		Head moisture (percent)		Test weight/ bushel (pounds) <sup>4</sup>	Seeds/ pound (number) <sup>4</sup>	Planting to heading (days) <sup>4</sup>	Height (inches) <sup>5</sup>
	1984	1978-79, 81-84	September 15 <sup>2</sup>	October 2 <sup>3</sup>				
M1, Minnesota AES	2813	4105	32	26	58	18,100	61	57
NK 1040, Northrup King <sup>6</sup>	3502	4638	34	29	58	19,700	62	43
RS 455, Minnesota AES	3012	4969	38	30	58	17,400	65	58
DK-18, DeKalb <sup>6</sup>	4129	5827	39	27	60	17,400	66	47
NK 1210, Northrup King <sup>7</sup>	—	5240	40	36	58	23,900	71	44
8855, Pioneer <sup>8</sup>	3622	4964	40	21	60	19,700	70	—
894, Pioneer <sup>9</sup>	—	5251	41	33	58	21,600	71	43
8790, Pioneer <sup>7</sup>	—	4895	43	36	59	22,700	73	45
PAG 2250, PAG Seeds <sup>7</sup>	—	4526	44	38	57	22,700	74	45
NK 121A, Northrup King <sup>10</sup>	—	6024	44	34	58	20,600	73	46
DK-28, DeKalb <sup>6</sup>	2979	5024	45	33	60	18,900	72	45
J-150, Jacques <sup>7</sup>	—	4912	45	40	59	26,700	74	47
NK 1580, Northrup King <sup>9</sup>	—	5432	45	36	59	19,700	76	49
Cargill 22, Cargill <sup>6</sup>	2927	4540	47	37	59	25,200	73	47
NK 180, Northrup King <sup>10</sup>	—	5582	48	36	58	22,700	77	51
930, Paymaster <sup>11</sup>	1901	4378	51	39	57	21,600	74	45
PAG 3339, PAG Seeds <sup>12</sup>	1337	—	63	40	55	30,200	77	—
LSD 5%	426	301	3	2				

<sup>1</sup>Oven-dry. <sup>2</sup>1978, 81-84. <sup>3</sup>1978-79, 81, 82, 84. <sup>4</sup>1978-79, 81-84. <sup>5</sup>1978-79, 82. <sup>6</sup>1982-84. <sup>7</sup>1981-83. <sup>8</sup>1983-84. <sup>9</sup>1978-79, 81-82. <sup>10</sup>1978-79, 81. <sup>11</sup>1982, 84. <sup>12</sup>1984.

Table 11. Characteristics of grain sorghum hybrids in central and northern maturity zones, 1983-84

Hybrid and company	Grain yield/acre (pounds) <sup>1</sup>			Head moisture (percent) <sup>2</sup>			Test weight/ bushel (pounds)	Planting to heading (days)	Lodging (percent)
	Morris	Crookston	Grand Rapids	Morris	Crookston	Grand Rapids			
MI, Minnesota AES	4563	4195	1206	21	27	27	57	69	53
NK 1040, Northrup King	5245	4849	1770	26	29	36	56	68	11
RS 455, Minnesota AES <sup>3</sup>	4828	4785	1315	28	27	30	56	71	20
DK-18, DeKalb	6016	4652	1059	30	38	32	56	73	4
LSD 5%	493	490	600	1	3	2			

<sup>1</sup>Oven-dry. <sup>2</sup>September 21-29. <sup>3</sup>1984.

## MILLET

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

### RECOMMENDED VARIETIES

#### FORAGE

**Empire**—Foxtail. Very late. Very tall. Poor lodging resistance. Very small, plump yellow seed of low test weight. Released by Agriculture Canada.

#### GRAIN

**Cerise**—Red proso. Very early. Medium height. Fair lodging resistance. Small, orange seed of high test weight. Released by Nebraska Agricultural Experiment Station in 1974.

**Dawn**—White proso. Very early. Short. Fair lodging resistance. Medium size, white seed of medium test weight. Released by Nebraska Agricultural Experiment Station in 1976.

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

**Minsum**—White proso. Early. Medium height. Poor lodging resistance. Large, white seed of medium test weight. Open heads with long, spreading branches contrast with more compact heads of other white proso varieties. Released by Minnesota Agricultural Experiment Station in 1980.

### VARIETIES NOT ADEQUATELY TESTED

**Rise**—White proso. Medium maturity. Short. Fair lodging resistance. Medium size, white seed of medium test weight. Released by Nebraska Agricultural Experiment Station in 1983.

### OTHER VARIETIES

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

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

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

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

**Red Leonard**—Red proso. Very late. Tall. Fair lodging resistance. Medium size, orange seed of high test weight. Lower grain yield than Cerise in 1982 trials. Released by Colorado Agricultural Experiment Station in 1983.

**Sno-Fox**—Foxtail. Late. Medium height. Poor lodging resistance. Small, white seed of medium test weight. Released by Nebraska Agricultural Experiment Station in 1980.

Table 12. Yields of millet varieties in pounds per acre, 1983-84

Type and variety	Grain <sup>1</sup>			Forage <sup>2</sup>		
	Rosemount	Becker	Average	Rosemount	Becker	Average
<b>Foxtail</b>						
Empire	1829	389	1109	8703	4973	6838
<b>Proso</b>						
Dawn	2808	1096	1952	6674	3406	5040
Minco	3572	1290	2431	9369	3997	6683
Minsum	3158	1444	2301	7616	4241	5929
Rise	3379	1329	2354	8003	3811	5907
Cerise	2961	1317	2139	8239	4139	6189
LSD 5%	388	267	235	536	389	331

<sup>1</sup>10 percent moisture basis. <sup>2</sup>Dry matter basis and includes grain.

Table 13. Characteristics of millet varieties, two location average

Type and variety	Planting to		Lodging (score) <sup>1</sup>	Height (inches)	Seeds/pound (number)	Test weight/ bushel (pounds)
	heading (days)	maturity (days)				
<b>Foxtail</b>						
Empire	59	94	2.8	48	238,700	49
<b>Proso</b>						
Dawn	39	72	3.6	30	67,700	50
Minco	41	82	4.1	40	70,900	52
Minsum	39	77	5.3	39	63,900	51
Rise	41	80	3.8	34	73,200	50
Cerise	38	71	3.4	39	81,000	56

<sup>1</sup>1 = erect, 9 = flat.

## 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

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

**Moore**—Late, very high yield, tall, fair lodging resistance, high test weight and groat percent, low protein percent, white seed. Some resistance to crown rust and smut, some tolerance to red leaf. Selected at Minnesota Agricultural Experiment Station from a cross between Lodi and Mn 65B1286, a crown rust resistant selection. Released in 1979.

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

**Preston**—Early maturity, medium yield and height, good lodging resistance, high test weight, medium groat percent, high protein percent, ivory seed. Moderately resistant to crown rust, resistant to smut, some tolerance to red leaf. Selected at Minnesota Agricultural Experiment Station from a cross between Dal and Otee. Released in 1982.

### VARIETIES NOT ADEQUATELY TESTED

**Centennial**—Late, high yield, medium height, fair lodging resistance, medium test weight, high groat percent, low protein percent, yellow seed. Resistant to crown rust and smut, some tolerance to red leaf. Selected at Wisconsin Agricultural Experiment Station from a cross involving Holden, Garland, and Froker. Released in 1983. Seed sale regulated by U.S. Variety Protection Act.

**Pierce**—Late, very high yielding, tall, fair lodging resistance, high test weight, medium groat percent and protein percent, white seed. Resistant to crown rust and smut. Selected at North Dakota Agricultural Experiment Station from a cross between Hudson and Dal. Released in 1983.

**Steele**—Late, very high yield, tall, good lodging resistance, high test weight, medium groat and protein percent, white seed. Resistant to crown rust and smut. Selected at North Dakota Agricultural Experiment Station from a cross between Dal derivative and Noble.

**Webster**—Early, medium yield and height, good lodging resistance, medium test weight, medium groat and protein percent, yellow seed. Resistant to crown rust and smut. Selected at Iowa Agricultural Experiment Station as a multi-line with Lang as recurrent parent.

### OTHER VARIETIES

**Benson**—Medium maturity, high yield, medium height, poor lodging resistance, medium test weight, medium groat and protein percent, cream colored seed. Some resistance to crown rust, resistant to smut, some tolerance to red leaf. 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.

**Chief**—Early-medium maturity, medium yield and height, fair lodging resistance, high test weight and groat percent, medium protein percent, yellow seed. Susceptible to crown rust, smut, and red leaf. 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, susceptible to red leaf. 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.

**Iowa Early Multiline Blend (E73, E74, E76, and E77)**—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.

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

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

Tyler and Orbit. Released in 1976.

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

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

**Porter**—Late, very high yield, medium height, poor lodging resistance, medium test weight, groat percent and protein percent,

ivory seed. Resistant to crown rust and smut, tolerant to red leaf. Selected at Purdue Agricultural Experiment Station from a cross involving many lines. Released in 1981. Seed sale regulated by U.S. Variety Protection Act.

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

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

Table 14. Yields of oat varieties in bushels per acre, 1982-84

Variety	Rosemount	Waseca	Lamberton	Morris	Crookston	Grand Rapids	Average 6 locations	Stephen	Roseau	Average 8 locations
Webster <sup>1</sup>	104	86	100	89	101	55	89	—	—	—
Kelly	87	78	98	102	101	60	88	—	—	—
Preston	89	73	92	101	113	66	89	76	80 <sup>2</sup>	86
Noble	90	82	93	95	122	65	91	88	94	91
Ogle	107	104	109	109	136	83	108	102	99	106
Lyon	94	92	99	104	119	62	95	86	94	94
Benson	96	89	97	104	123	75	97	91	101	97
Centennial <sup>2</sup>	102	75	98	119	136	75	101	111 <sup>1</sup>	99	102
Steele <sup>2</sup>	104	107	114	116	140	85	111	110 <sup>1</sup>	110 <sup>1</sup>	111
Moore	105	97	110	119	138	73	107	103	101	106
Pierce <sup>2</sup>	98	96	106	125	132	82	107	108	100	106
Porter	105	92	103	110	139	91	107	115 <sup>3</sup>	108 <sup>3</sup>	108
LSD 5%	9	9	10	9	9	8	3	9	—	3

<sup>1</sup>1984. <sup>2</sup>1983-84. <sup>3</sup>1982-83.

Table 15. Characteristics of oat varieties, 1982-84<sup>1</sup>

Variety	Heading (date)	Height (inches)	Lodging (score) <sup>2</sup>	Seeds/pound (number)	Test weight/bushel (pounds)	Groat (percent)	Protein percent <sup>3</sup>		Protein/acre <sup>3</sup> (pounds)	Reactions to disease <sup>4</sup>	
							groat	seed		crown rust	smut
Webster <sup>5</sup>	June 25	36	2.3	15,000	39	75	17.6	13.1	355	R	R
Kelly	June 26	37	2.9	15,100	42	77	19.4	14.8	402	MR	HR
Preston	June 26	36	2.4	16,800	41	75	21.2	15.8	415	R	HR
Noble	June 28	36	2.2	16,600	39	72	17.6	12.9	354	S	HR
Ogle	June 29	35	2.0	15,000	38	76	15.7	11.8	383	S	S
Lyon	June 29	40	2.5	14,200	38	75	18.7	14.0	405	MS	HR
Benson	June 30	40	2.9	14,500	39	75	17.7	13.3	397	MS	HR
Centennial <sup>6</sup>	July 1	36	2.5	15,700	39	76	17.2	13.0	398	HR	R
Steele <sup>5</sup>	July 1	40	2.0	15,700	40	75	17.6	13.2	452	HR	R
Moore	July 2	40	2.6	15,700	40	76	16.9	12.8	425	R	R
Pierce <sup>6</sup>	July 2	38	2.3	14,600	41	75	18.2	13.6	440	MR	MR
Porter	July 4	37	2.4	15,100	39	74	17.5	11.8	435	S	HR

<sup>1</sup>Does not include Stephen and Roseau. <sup>2</sup>1 = erect, 5 = flat. <sup>3</sup>1983-84. <sup>4</sup>HR = highly resistant, R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible. <sup>5</sup>1983. <sup>6</sup>1983-84.

## DURUM WHEAT

### RECOMMENDED VARIETIES

**Cando**—Awned, midseason to late, semidwarf and good lodging resistance. Resistant to stem rust and susceptible to leaf rust. Medium yield and test weight with low seed weight. Satisfactory quality. Better adapted to Northern Minnesota. Released by North Dakota Agricultural Experiment Station in 1975.

**Crosby**—Awned, midseason, medium height and fair lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. High yield and test weight with high seed weight. Satisfactory quality. Released by North Dakota Agricultural Experiment Station in 1973.

**Rugby**—Awned, midseason, medium height and fair lodging resistance. Resistant to stem and moderately susceptible to leaf rust. High yield, and medium test weight and seed weight. Satisfactory quality. Released by North Dakota Agricultural Experiment Station in 1973.

**Vic**—Awned, midseason, medium height and fair lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. High yield, test weight, and seed weight. Satisfactory quality. Superior quality for export market. Released by North Dakota Agricultural Experiment Station in 1979.

**Ward**—Awned, midseason, medium height, and fair lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. High yield and test weight with medium seed weight. Satisfactory quality. Released by North Dakota Agricultural Experiment Station in 1972.

### VARIETIES NOT ADEQUATELY TESTED

**Lloyd**—Awned, midseason to late, semidwarf and good lodging resistance. Resistant to stem rust and moderately susceptible to

leaf rust. High yield and low test weight with low seed weight. Satisfactory quality. Superior quality for export market. Released by North Dakota Agricultural Experiment Station in 1983.

### OTHER VARIETIES

**Botno**—Awned, early, medium height and fair lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. High yield, test weight, and seed weight. Satisfactory quality. Released by North Dakota Agricultural Experiment Station in 1973.

**Calvin**—Awned, midseason to late, semidwarf with good lodging resistance. Resistant to stem rust and susceptible to leaf rust. Low yield, medium test weight and low seed weight. Satisfactory quality. Released by North Dakota Agricultural Experiment Station in 1978.

**Edmore**—Awned, midseason, medium height and fair lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust. Medium yield and low test weight and seed weight. Satisfactory quality. Released by North Dakota Agricultural Experiment Station in 1978.

**Mindum**—Awned, late, tall, and poor lodging resistance. Susceptible to leaf rust, stem rust, and lodging. Low yield and high test weight with medium seed weight. Satisfactory quality. A durum type selected from a bread wheat field. Released by Minnesota Agricultural Experiment Station in 1917.

**Rolette**—Awned, early, medium height and fair lodging resistance. Resistant to stem rust and susceptible to leaf rust. Medium yield with high test weight and seed weight. Satisfactory quality. Released by North Dakota Agricultural Experiment Station in 1971.

Table 16. Characteristics of durum wheat varieties, 1982-84

Variety	Heading (June)	Height (inches)	Lodging (score) <sup>1</sup>	Rust reaction <sup>2</sup>		Seeds/ pound (number)	Test weight/ bushel (pounds)	Yield/acre (bushels)			
				leaf	stem			Morris	Crookston	Stephen	Average
Cando	36	29	1.5	S	R	12,300	59.8	45	45	55	48
Crosby	33	37	2.1	MS	R	11,400	60.4	54	48	50	51
Rugby	34	37	1.7	MS	R	11,600	59.9	54	43	53	50
Vic	34	37	1.9	MS	R	11,400	60.7	50	46	52	50
Ward	34	38	2.3	MS	R	11,600	60.4	54	41	48	48
Botno	32	37	1.9	MS	R	11,100	60.2	53	45	50	49
Calvin	35	27	1.3	S	R	11,900	59.6	44	40	47	44
Edmore	34	38	1.9	MS	R	11,900	58.4	47	38	47	42
Lloyd	35	29	1.4	MS	R	12,300	58.9	46 <sup>3</sup>	47 <sup>3</sup>	60 <sup>3</sup>	51 <sup>3</sup>
Mindum	37	46	3.8	S	S	11,600	61.5	54	39	40	44
Rolette	31	37	2.1	S	R	11,100	61.8	52	45	45	48
LSD 5%								6		7	4

<sup>1</sup>1 = erect, 9 = flat.

<sup>2</sup>Reaction to prevalent races: R = resistant, MS = moderately susceptible, S = susceptible.

<sup>3</sup>2-year data adjusted to 3-year mean.

## HARD RED SPRING WHEAT

Publicly developed varieties are classed into Recommended, Not Adequately Tested, and Other Varieties categories. Privately developed varieties are listed and described in alphabetical order after a minimum of two years testing.

### RECOMMENDED VARIETIES

**Butte**—Released by North Dakota Agricultural Experiment Station and USDA-ARS in 1977. Awned, early, medium height. Resistant to stem rust. Tolerant of loose smut and ergot. High yield

and test weight with medium protein percent. Satisfactory milling and baking characteristics. Because of early heading, may be suitable for later seeding. Disadvantages—Susceptible to leaf rust and to black chaff. Moderately susceptible to tan spot and lodging. Very tough threshing and may be erratic in yield.

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

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

**Marshall**—Released by Minnesota Agricultural Experiment Station and USDA-ARS in 1982. Variety protection pending. Awned, midseason, semidwarf. Resistant to stem and leaf rust. Tolerant of loose smut and moderately tolerant of ergot. Good lodging resistance. Very high yield and high test weight. Low to medium protein percent. Satisfactory milling. Disadvantages—Low bake absorption.

**Wheaton**—Released by Minnesota Agricultural Experiment Station and USDA-ARS in 1983. Awned, midseason, semidwarf. Resistant to stem and leaf rust. Moderately tolerant of loose smut and ergot. Medium lodging resistance. Very high yield. Satisfactory milling. Disadvantages—Low protein percent and test weight.

#### VARIETIES NOT ADEQUATELY TESTED

**Guard**—Released by South Dakota Agricultural Experiment Station in 1983. Variety protection pending. Awned, early, semidwarf. Resistant to leaf rust and moderately resistant to stem rust. Moderately tolerant of loose smut and ergot. Medium lodging

resistance. Resistant to hessian fly. Very high yield and high test weight. Medium protein percent. Satisfactory milling and baking.

**Stoa**—Released by North Dakota Agricultural Experiment Station in 1984. Awned, midseason, medium height. Resistant to stem and leaf rust. Moderately tolerant of loose smut and ergot. Medium lodging resistance. Very high yield and medium test weight. Low to medium protein percent. Satisfactory milling and baking. Disadvantages—Higher potential for lodging.

#### OTHER VARIETIES

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

**Centa**—Released by South Dakota Agricultural Experiment Station in 1982. Awned, very early, medium height. Resistant to stem rust. Medium yield and high test weight. Medium protein. Satisfactory milling and baking characteristics. Disadvantages—Susceptible to lodging and moderately susceptible to leaf rust and loose smut.

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

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



Minnesota's "big 3" wheat varieties: Era, 16 percent; Marshall, 57 percent; and Wheaton, 6 percent of 1984 acreage. The newest, Wheaton, is the highest yielding variety in Minnesota trials.



## PRIVATELY DEVELOPED VARIETIES

**A99AR**—Released by Weather Master in 1982. Seed sale regulated by U.S. Variety Protection Act. Awless, late to midseason, tall. Moderately resistant to stem rust. Tolerant of loose smut. Very high yield and medium test weight. Low to medium protein percent. Disadvantages—Moderately susceptible to ergot and lodging. Susceptible to leaf rust. Very long and strong dough mixing requirements.

**Buckshot**—Released by North American Breeders in 1983. Variety protection pending. Awned, midseason semidwarf. Resistant to stem rust. Moderately tolerant of loose smut and ergot. Medium lodging resistance. High yield and medium test weight and low to medium protein percent. Satisfactory milling and baking. Disadvantage—Moderately susceptible to leaf rust.

**Erik**—Released by North American Plant Breeders in 1983. Seed sale regulated by U.S. Variety Protection Act. Awned, late to midseason, semidwarf. Moderately resistant to stem and leaf rust. Good lodging resistance. High yield. Low to medium protein percent. Disadvantages—Moderately susceptible to loose smut and mildew. Low test weight.

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

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

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

**Victory 283**—Sold exclusively by Dakota Oat Processors in 1983. Seed sale regulated by U.S. Variety Protection Act. Awned, midseason to early, medium height. Medium yield and high test weight. Medium protein percent. Disadvantages—Susceptible to leaf rust and moderately susceptible to stem rust, loose smut, and lodging. Low flour yield.

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

**2369**—Released by Pioneer Hi-Bred in 1983. Seed sale regulated by U.S. Variety Protection Act. Awned, midseason, semidwarf. Moderately resistant to stem rust and tolerant to loose smut. Very high yield and high test weight. Low to medium protein percent. Medium lodging resistance. Disadvantages—Susceptible to leaf rust.

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

Table 17. Yields of hard red spring wheat varieties in bushels per acre, 1982-84

Variety	Crookston	Stephen	Roseau	Northern average	St. Paul	Morris <sup>1</sup>	Lamberton <sup>2</sup>	Waseca	Southern average	State average
Publicly developed varieties										
Butte	48	48	45	47	49	54	40	51	49	48
Era	54	54	41	50	50	55	42	45	48	49
Len	48	47	42	45	47	51	42	47	47	46
Marshall	54	55	50	53	50	52	44	52	50	51
Wheaton	57	57	46	53	51	60	46	53	52	53
Angus	51	41	42	45	48	51	42	44	46	45
Centa	44	46	40	43	45	51	37	47	45	44
Chris	37	38	40	38	36	45	33	39	38	38
Guard	51	53 <sup>3</sup>	46 <sup>3</sup>	50 <sup>3</sup>	53	53	—	53 <sup>3</sup>	51 <sup>3</sup>	51 <sup>3</sup>
Olaf	45	48	41	45	47	54	40	45	46	46
Stoa	56	55 <sup>3</sup>	50 <sup>3</sup>	54 <sup>3</sup>	52	60	—	—	—	—
Privately developed varieties										
A99 AR	52	50	58 <sup>3</sup>	53 <sup>3</sup>	46 <sup>3</sup>	60	—	54 <sup>3</sup>	52 <sup>3</sup>	52 <sup>3</sup>
Buckshot	50	55 <sup>3</sup>	44 <sup>3</sup>	49 <sup>3</sup>	53	50	—	53 <sup>3</sup>	51 <sup>3</sup>	50 <sup>3</sup>
Erik	55	56	39	50	39	52	45	58	49	49
Oslo	51	50	45	49	49	53	39	48	47	48
PR2360	50	53	44	49	46	50	38	51	47	48
Solar	53	54	43	50	47	51	41	49	47	48
Victory 283	45	48	39	44	43	48	42	49	46	45
Walera	52	53	43	49	49	52	41	48	48	48
2369	54	53	49	52	54	55	43	52	51	51
711	53	53	45	50	56	54	40	45	49	50
LSD 5%	7	8	6	4	6	5		7	4	3

<sup>1</sup>1983-84. <sup>2</sup>1982, 1984. <sup>3</sup>1983-84 data adjusted to 3-year average.

Table 18. Characteristics of hard red spring wheat varieties, 1982-84

Variety	Heading (June)	Height (inches)	Lodging (score) <sup>1</sup>	Rust reaction <sup>2</sup>		Seeds/ pound (number)	Test weight/ bushel (pounds)	Wheat protein (percent) <sup>3</sup>	Milling and baking quality
				leaf	stem				
<b>Publicly developed varieties</b>									
Butte	28	35	3	S	R	13,400	62	13.6	med.-high
Era	34	30	2	MR	R	15,100	60	12.5	low-med.
Len	32	31	2	MR	R	13,200	60	14.4	high-med.
Marshall	33	30	1	MR	R	14,600	61	13.0	med.-low
Wheaton	31	29	2	R	R	13,000	59	12.6	low-med.
Angus	33	31	2	R	R	13,400	61	14.2	med.
Centa	28	35	4	MS	R	14,600	61	13.7	high-med.
Chris	33	38	5	MR	MR-R	15,700	60	15.1	v. high
Guard	29	30	2	R	MR-MS	13,400	61	13.7	med.
Olaf	33	31	2	MS	R	13,000	60	14.2	med.-low
Stoa	31	36	2	R	R	15,100	60	13.3	med.
<b>Privately developed varieties</b>									
A99AR	34	40	3	S	MR-MS	11,400	60	13.3	low
Buckshot	32	32	2	MS	R	13,200	60	13.5	med.
Erik	35	32	2	R-MR	MR-MS	15,100	59	13.0	low-med.
Oslo	29	29	2	MS	MR	13,200	59	12.8	low-med.
PR2360	32	31	2	MR	MR	14,600	60	12.7	low-med.
Solar	35	30	2	MR	R	14,600	60	12.5	low-med.
Victory 283	31	36	3	S	MS	13,200	62	13.9	low-med.
Walera	35	30	2	MR	R	13,200	60	12.2	low
2369	31	30	2	S	MR-MS	13,000	61	13.2	low-med.
711	31	31	2	S	MR-R	13,200	61	12.7	med.-low

<sup>1</sup>1 = erect, 9 = flat. <sup>2</sup>Reaction to prevalent races: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible. <sup>3</sup>14 percent moisture.

## 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

**Rose**—Awned, medium height, winterhardy, medium maturity and good lodging resistance. Moderately susceptible to leaf rust and resistant to stem rust. High yield and test weight. Satisfactory quality. Released by South Dakota Agricultural Experiment Station in 1981.

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

### VARIETIES NOT ADEQUATELY TESTED

**Agassiz**—Awned, tall, winterhardy, medium maturity and fair lodging resistance. Susceptible to leaf rust and moderately resistant to stem rust. Medium yield and test weight. Satisfactory quality. Released by North Dakota Agricultural Experiment Station in 1983.

### OTHER VARIETIES

**Brule**—Awned, early, semidwarf with good lodging resistance. Winterhardiness is not satisfactory. Moderately susceptible to leaf rust and moderately resistant to stem rust. Very high yield and low test weight. Satisfactory quality. Released by Nebraska Agricultural Experiment Station and USDA-ARS in 1982. Seed sale regulated by U.S. Variety Protection Act.

**Froid**—Awned, tall, winterhardy, medium maturity, and poor lodging resistance. Moderately resistant to stem rust and susceptible to leaf rust. Medium yield and high test weight. Satisfactory milling and baking characteristics. Released by Montana Agricultural Experiment Station in 1968.

**Minter**—Awned, tall, winterhardy, late, and poor lodging resistance. Moderately susceptible to leaf and moderately resistant to stem rust. Medium yield and high test weight. Satisfactory quality. Released by the Minnesota Agricultural Experiment Station and USDA-ARS in 1949.

**Nell**—Awned, early, medium height, winter hardy, and good lodging resistance. Susceptible to leaf rust and resistant to stem rust. Medium yield and high test weight. Released by South Dakota Agricultural Experiment Station in 1981.

**Norstar**—Awned, tall, winterhardy, late, and fair lodging resistance. Susceptible to leaf and stem rust. Medium yield and test weight. Satisfactory quality. Licensed by Agriculture Canada in 1978.

**Sundance**—Awned, tall, winterhardy, and fair lodging resistance. Susceptible to leaf and stem rust. Medium yield and low test weight. Satisfactory quality. Licensed by Agriculture Canada in 1971.

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

Table 19. Characteristics of winter wheat varieties, 1982-84

Variety	Heading (June)	Height (inches)	Winter survival (percent)	Lodging (score) <sup>1</sup>	Rust reaction <sup>2</sup>		Test weight/bushel (pounds)	Yield/acre (bushels)				Average
					leaf	stem		Rosemount <sup>3</sup>	Morris	Crookston <sup>4</sup>	Roseau <sup>5</sup>	
Rose	14	36	81	1.4	S-MS	R	62.2	40	50	47	39	45
Roughrider	15	40	92	2.2	S	R	61.5	35	52	44	40	44
Brule	13	35	71	1.8	MS-S	MR	59.0	43	54	48	45	48
Froid	17	44	96	3.2	S	MR	60.7	34	49	43	39	42
Minter	18	44	91	2.8	MS	MR	61.7	33	47	38	37	40
Nell	12	37	83	1.7	S	R	61.4	40	46	34	38	40
Norstar	18	45	91	2.3	S	S	60.4	35	50	43	31	41
Sundance	17	43	92	3.0	S	S	57.1	35	50	45	27	40
Winoka	15	41	82	2.5	S	MR	61.8	33	47	44	31	40
LSD 5%										7		5

<sup>1</sup>1 = erect, 9 = flat. <sup>2</sup>Reaction to prevalent races: R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible. <sup>3</sup>1982 and 1984. <sup>4</sup>1982-1983. <sup>5</sup>1983-84.

## WILD RICE

Cultivated wild rice is grown on 18,000 acres in Minnesota. Most wild rice is produced from varieties with nonshattering tendency, but some fields are still producing shattering types. No recommendations regarding specific varieties are made. Because of the likelihood of preharvest losses due to high winds, storms, blackbird damage, and killing frost before varietal maturity, growers should favor early to medium maturing varieties. All varieties shatter to some extent and are lodging and disease susceptible.

### VARIETIES

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

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

**M3**—Medium height, medium to late maturity, and high yield. Diverse in plant and panicle type. Developed by Manomin Development Co. in 1974.

**Netum**—Medium height, early maturity, and low to medium yield. Because of its earlier maturity, it frequently will produce higher yields than M3 and Johnson. Developed by Minnesota Agricultural Experiment Station and released in 1978.

**Voyager**—Short to medium height, early maturity, and medium to high yield. Should equal or exceed K2 in yield and mature a few days earlier. Developed by Minnesota Agricultural Experiment Station and released in 1983.

Table 20. Characteristics of wild rice varieties; Grand Rapids, Excelsior, and Waskish averages, 1981-83<sup>1</sup>

Variety	Yield/acre (pounds) <sup>2</sup>	Heading (July)	1981-82		Height (inches)	Seeds <sup>3</sup> per pound
			Harvest (August)			
Johnson	1244	19	27		78	—
K2	1509	17	21		71	7300
M3	1607	19	25		73	—
Netum	1525	11	18		68	8300
Voyager	1697	9	16		65	8600
LSD 5%	127	2	—		5	—

<sup>1</sup>1984 data not included because of poor stands.

<sup>2</sup>Adjusted green weight of grain at 40% moisture.

<sup>3</sup>Seeds per pound based on wet, stored seed.

## WINTER RYE

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

### RECOMMENDED VARIETIES

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

**Musketeer**—High yield, good winterhardiness, medium late, medium height, and poor lodging resistance. Large seed of green

color and medium test weight. Originated by Agriculture Canada, Swift Current, from crosses of Harrach, Petkus, and Dakold. Licensed in 1980. Production of certified seed limited to Canada.

**Rymin**—High yield, fair winterhardiness, medium late, medium height. Good lodging resistance. Large 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

**Frederick**—Medium yield, fair winterhardiness, medium late, medium height, and poor lodging resistance. Medium size seed of

predominantly tan color and high test weight. Selected from Von Lochow by South Dakota Agricultural Experiment Station. Released in 1984.

### OTHER VARIETIES

**Aroostook**—Low yield, good winterhardness, very early, tall, and poor lodging resistance. Small seed of brown and tan color and low test weight. Selected from Balbo by USDA Soil Conservation Service in New York. Released by USDA, Cornell University, and Maine Department of Agriculture in 1981.

**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.

**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.

**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 21. Yields of winter rye varieties in bushels per acre

Variety	Rosemount 1981-84	Becker 1982-84	Morris 1982-84	Crookston 1982-84	Grand Rapids 1982-84	Average 5 locations
Hancock	59	46	59	68	56	58
Musketeer	59	50	62	75	52	60
Rymin	59	51	63	76	57	61
Frederick	51 <sup>1</sup>	44	56 <sup>2</sup>	63	51 <sup>2</sup>	53
LSD 5%	2	5	3	5	5	2

<sup>1</sup>1982-84. <sup>2</sup>1982-83.

Table 22. Characteristics of winter rye varieties, average 5 locations

Variety	Winterkill (percent)	Heading (May)	Mature (July)	Lodging (score) <sup>1</sup>	Height (inches)	Seeds/pound (number)	Test weight/ bushel (pounds)
Hancock	3	31	22	3.0	54	16,000	56
Musketeer	2	30	21	3.4	53	16,600	56
Rymin	2	31	21	3.2	52	16,400	57
Frederick	3	31	21	3.8	54	17,300	57

<sup>1</sup>1 = erect, 9 = flat.

# Oilseed Crops

## FLAX

### RECOMMENDED VARIETIES

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

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

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

### OTHER VARIETIES

**Clark**—High yield. Early, brown seed, blue flowers. Medium oil percent and iodine value. Resistant to rust, moderately resistant to wilt and pasmo. Released in 1983 by South Dakota Agricultural Experiment Station from a cross of Linott and CI.2783.

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

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

**McGregor**—High yield when sown early. Very late, brown seed, blue flowers. Very resistant to lodging. Medium in oil

percent. Resistant to rust, moderately resistant to wilt, and susceptible to pasmo. Licensed in 1981 by Agriculture Canada, Ottawa from a cross of Redwood 65 and FP 539. Production of certified seed limited to Canada.

**Norlin**—High yield. Medium maturity, brown seed, blue flowers. Medium oil percent and iodine value. Resistant to rust, moderately susceptible to wilt. Licensed in 1982 by Agriculture Canada, Ottawa from crosses involving Linott, Rocket, and Raja. Production of certified seed limited to Canada.

**NorMan**—High yield. Medium maturity, brown seed, blue flowers. Medium oil percent, medium-low iodine value. Resistant to rust, moderately resistant to wilt, moderately susceptible to pasmo. Licensed in 1984 by Agriculture Canada, Morden from a

cross of FP 579 and Linott. Production of certified seed limited to Canada.

**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.

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

Table 23. Yields of flax varieties in bushels per acre, 1981-84

Variety	Lamberton	Morris	Crookston	Stephen	St. Paul	Grand Rapids	Roseau	Average
	1981-84	1982-83	1981-82, 84	1981-82, 84	1981-84	1982-84	1982-84	1981-84
Culbert	21	32	14	12	18	25	21	20
Dufferin	22	34	16	14	19	28	22	21
Flor	20	33	17	13	17	28	20	20
Clark	19	33	15	11	17	25	22	20
Linott	19	31	14	11	18	25	25	20
NorMan	20	34	17	14	19	—	—	21
LSD 5%	3	3	3	3	4	5	5	4

Table 24. Characteristics of flax varieties, 1981-84

Variety	Days from sowing to		Height (inches)	Lodging (score) <sup>1</sup>	Pasmo (score) <sup>1</sup>	Wilt (score) <sup>1</sup>	Rust <sup>2</sup>	Oil (percent) <sup>3</sup>
	first bloom	full bloom						
Culbert	50	55	22	2.4	2.5	1.8	R	42.4
Dufferin	56	61	24	2.8	4.0	2.0	R	43.4
Flor	53	58	22	3.2	2.8	4.8	R	42.6
Clark	51	55	22	3.3	3.0	3.2	R	41.4
Linott	51	55	22	3.2	3.5	5.5	R	42.3
NorMan	53	58	23	3.6	4.2	3.6	R	42.3

<sup>1</sup>1 = best, 9 = poorest.    <sup>2</sup>R = resistant.    <sup>3</sup>Oven-dry basis.



Tri-state flax breeders confer at St. Paul. V. E. Comstock (MN), K. Grady (SD), J. F. Miller (ND), J. J. Hammond (ND), and J. Mitchell (ND).

## MUSTARD, CANOLA, AND OILSEED RAPE

Mustard seed is produced for condiment food markets. Canola and oilseed rape are oilseed crops used for oil and protein feed extraction. Production of yellow mustard on Minnesota farms started nearly 25 years ago. Oriental mustard, brown mustard, canola, and oilseed rape are occasionally produced in Minnesota when market prices are high.

Canola is a new crop developed from oilseed rape by Canadian agronomists. The first canola variety was licensed in 1974. Canola seed oil contains less than 2 percent (5 percent is legal maximum) of erucic acid compared with 20 to 40 percent in rape varieties formerly grown for food oil. Furthermore, the protein meal remaining after oil extraction contains less than 1 percent of glucosinolate sulfur compounds compared with about 10 percent in rapeseed meal. High levels of erucic acid in food oils are now considered hazardous to health, and high levels of glucosinolates are detrimental in livestock feeds. Consequently, canola is replacing oilseed rape for food oil and livestock feed.

However, high erucic acid oil is needed for industrial uses, so Canadian agronomists developed oilseed rape varieties with oil of over 40 percent erucic acid. These varieties are grown under contract so that they will not be marketed as canola.

### VARIETIES

**Gisilba**—Yellow mustard. Similar to Ochre in field performance. Originated in Germany. Distributed by Northern Sales Co. Ltd., Winnipeg, Manitoba. Licensed in 1974.

**Kirby**—Yellow mustard. Released by Colman Foods, Norwich, England in 1970. Distributed by Minn-Dak Growers Association, Grand Forks, ND.

**Ochre**—Yellow mustard. Originated by Agriculture Canada, Saskatoon. Licensed in 1981.

**Tilney**—Yellow mustard. Similar to Kirby in field performance but has a high mucilage content desired by processors. Released by Colman Foods of Norwich, England in 1978. Distrib-

uted by Minn-Dak Growers Association, Grand Forks, ND.

**Carrow 85**—Oriental mustard. Undesirably small seed. Released by Colman Foods of Norwich, England about 1980.

**Domo**—Oriental mustard. Originated by Agriculture Canada, Saskatoon. Licensed in 1977.

**Lethbridge 22A**—Oriental mustard. Released by Agriculture Canada, Lethbridge, in 1967. Licensed in 1974.

**Blaze**—Brown mustard. Released by Agriculture Canada, Saskatoon. Licensed in 1976.

**Altex**—Canola. Originated by University of Alberta. Licensed in 1978.

**Andor**—Canola. Released by University of Alberta in 1981 with distribution rights to Can-Alta Seeds Ltd., Red Deer, Alberta.

**OAC Triton**—Canola. Tolerant of triazine (Sencor, Lexone, atrazine, etc.) herbicides. Originated by University of Guelph, Ontario. Licensed in 1984.

**Regent**—Canola. Originated by University of Manitoba. Licensed in 1977.

**Tower**—Canola. Originated by University of Manitoba. Licensed in 1974.

**Westar**—Canola. Originated by Agriculture Canada, Saskatoon. Licensed in 1982. Production of certified seed limited to Canada.

**Candle**—Canola. Originated by Agriculture Canada, Saskatoon. Licensed in 1977.

**Tobin**—Canola. Originated by Agriculture Canada, Saskatoon. Licensed in 1981. Production of certified seed limited to Canada.

**Reston**—Oilseed rape. Over 40 percent erucic acid in oil and less than 1 percent glucosinolate in meal. Originated by University of Manitoba. Licensed in 1982.

**R-500**—Oilseed rape. Over 50 percent erucic acid in oil and very high glucosinolate in meal. Originated by Agriculture Canada, Saskatoon. Licensed in 1975.

Table 25. Characteristics of mustard, canola, and oilseed rape varieties

Crop and variety	Seed yield/acre			Oil (percent)	Test weight/ bushel (pounds)	Seeds/ pound (thousands)	Planting to		Lodging (score) <sup>4</sup>	Height (inches)
	Rosemount <sup>1</sup>	Roseau <sup>2</sup>	Crookston <sup>3</sup>				bloom maturity (days)	(days)		
<b>Yellow mustard (<i>Brassica hirta</i>)</b>										
Kirby	1144	1494	639	23	56	91	43	94	3	41
Ochre	1166	1491	669	25	56	93	42	92	4	38
<b>Oriental mustard (<i>Brassica juncea</i>)</b>										
Carrow 85	1646	1609	1035	34	54	197	46	93	4	45
Domo	1626	1403	972	33	53	174	45	93	4	45
Lethbridge 22A	1568	1545	470	—	53	174	45	93	5	44
<b>Brown mustard (<i>Brassica juncea</i>)</b>										
Black	1395	1715	998	—	54	197	47	92	4	46
Blaze	1466	1677	767	31	54	197	47	93	4	45
<b>Canola (<i>Brassica napus</i>)</b>										
Altex	1348	1351	590	37	51	151	49	97	5	40
Andor	1435	1567	—	42	50	142	50	99	6	41
OAC Triton	—	1143	—	39	51	—	—	—	—	—
Regent	1360	1437	590	40	51	151	52	99	4	43
Tower	1335	1258	702	—	51	151	53	99	5	43
Westar	1652	2464	—	42	51	123	50	97	5	42
<b>Canola (<i>Brassica campestris</i>)</b>										
Candle	1101	801	351	35	52	216	42	88	5	35
Tobin	1379	1216	—	36	52	206	41	86	4	35
<b>Oilseed rape (<i>Brassica napus</i>)</b>										
Reston	1254	1324	—	40	50	146	50	100	5	43
<b>Oilseed rape (<i>Brassica campestris</i>)</b>										
R-500	1139	—	—	38	52	130	47	97	2	33
LSD 5%	117	316	284	—	—	—	—	—	—	—

<sup>1</sup>1979-83. <sup>2</sup>1981, 82, 84. <sup>3</sup>1980-81. <sup>4</sup>1 = erect, 9 = flat.

# SOYBEAN

Many different soybean varieties are available in Minnesota. These varieties have been developed by public and/or private organizations. The important characteristics of these soybean varieties are presented in the following tables. Tables 26 to 30 deal with those varieties that were developed by publicly supported institutions and are being considered for recommendation by Minnesota Agricultural Experiment Station. Tables 31 to 33 show performance characteristics of privately developed varieties as well as several public varieties. Recommendations are not made for these private varieties because they are voluntarily submitted by the owners and long term performance data (3 years or more) are not available on many of them.

Many factors need to be considered in selecting varieties. The major ones are listed below.

**MATURITY**—Soybeans are sensitive to day length, so the date of maturity is affected by production zone latitude. Because of this, each soybean variety has a narrow range of adaptation. Varieties that mature before the fall killing frost should be selected to obtain high yield and quality. A soybean variety is considered mature when 95 percent of the pods have reached their mature color. Harvesting would normally be done 1 to 2 weeks after this stage is reached, depending on drying conditions. The accompanying map relates production zones to the recommended varieties discussed in the text and tables.

**YIELD**—Varieties in the tables are arranged in order of increasing maturity. Normally, later maturing varieties are expected to have a higher yield potential than earlier maturing varieties. When comparing yields, it is best to look within a maturity range of about 5 days. Yield comparisons are more reliable if data are available for several years. Data from different tables should not be compared. All yield data reported in these tables were obtained from replicated tests harvested with a plot combine.

**PLANT HEIGHT AND LODGING**—These measurements give an indication of the stem strength and standability of a variety and relate somewhat to ease of combining. The actual height and lodging score is influenced by environmental conditions, so values may vary from year to year. A good way to use these values is to compare scores of newer varieties to scores of a familiar variety.

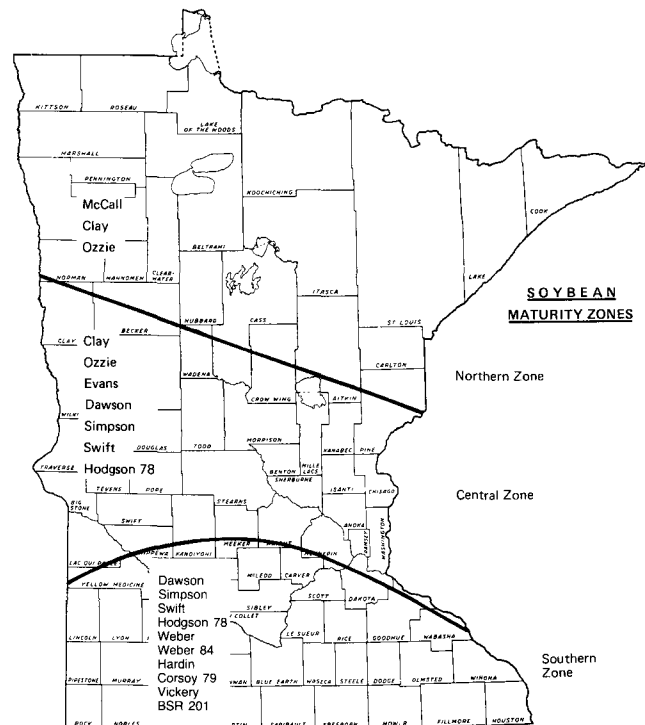
**PHYTOPHTHORA**—Phytophthora root rot can cause significant yield losses in susceptible varieties exposed to wet weather and poorly drained fields. Since there are numerous races of this fungus, it is important to know which are present in a particular situation. The phytophthora reactions listed in the tables were determined on greenhouse-grown plants by the University of Minnesota's Department of Plant Pathology. *These reactions are only to phytophthora races 1 and 2.*

**CHLOROSIS**—The chlorosis score listed for each variety is a measure of how much leaf yellowing occurred in tests conducted on a high lime (high pH) soil near Lamberton. This score indicates how well a variety will perform on high lime soils.

Performance data for public and private soybean varieties are presented in northern, central and southern zone tables. The test locations for each zone are indicated in each table. Becker was the only irrigated test location. All tests were planted between May 5 and May 25 unless otherwise indicated.

## RECOMMENDED VARIETIES

**BSR 201**—Southern zone. Slightly later than Corsoy 79 in maturity. Good resistance to brown stem rot and good yield potential. Not tolerant to iron chlorosis on high lime soils. Suggested for fields where soybean is planted after soybean. Developed by Iowa Agricultural Experiment Station. Released in 1982. Seed sale regulated by U.S. Variety Protection Act.



**Clay**—Northern and central zones. Has given good yields and is outstanding for oil and protein in its maturity class. Highly susceptible to phytophthora. Developed by Minnesota Agricultural Experiment Station. Released in 1968.

**Corsoy 79**—Southern zone. Very similar to Corsoy, which has been the leading variety in Minnesota for several years, except that it is resistant to races 1, 2, 3, 6, 7, 8 and 9 of phytophthora. Has poor chlorosis ratings and is somewhat lodging susceptible. Developed by Illinois Agricultural Experiment Station. Released in 1979.

**Dawson**—Central and southern zones. Very good tolerance to iron chlorosis on high lime soils and higher yielding than Swift. Good lodging resistance. Resistant to races 1 and 2 of phytophthora. Developed by Minnesota Agricultural Experiment Station. Released in 1983. Seed sale regulated by U.S. Variety Protection Act.

**Evans**—Central zone. Resistant to races 1 and 2 of phytophthora. A good variety for late season plantings in the southern zone. Developed by Minnesota Agricultural Experiment Station. Released in 1974. Seed sale regulated by U.S. Variety Protection Act.

**Hardin**—Southern zone. Earlier than Corsoy, good yield performance. Resistant to races 1 and 2 of phytophthora. Developed by Iowa Agricultural Experiment Station. Released in 1980. Seed sale regulated by U.S. Variety Protection Act.

**Hodgson 78**—Central and southern zones. Similar to Hodgson, except resistant to races 1 and 2 of phytophthora. Developed by Minnesota Agricultural Experiment Station. Released in 1978. Seed sale regulated by U.S. Variety Protection Act.

**McCall**—Northern zone. High yield, tall and good lodging resistance in its maturity class. Susceptible to phytophthora. Developed by Minnesota Agricultural Experiment Station. Released in 1978.

**Ozzie**—Northern and central zones. High yield and good lodging resistance for its maturity. Resistant to races 1 and 2 of phytophthora. Developed by Minnesota Agricultural Experiment Station. Released in 1983. Seed sale regulated by U.S. Variety Protection Act.



**Simpson**—Central and southern zones. High yield with good lodging resistance. Resistant to races 1 and 2 of phytophthora. Developed by Minnesota Agricultural Experiment Station. Released in 1982. Seed sale regulated by U.S. Variety Protection Act.

**Swift**—Central and southern zones. Very good tolerance to iron chlorosis on high-lime soils. Susceptible to phytophthora. Developed by Minnesota Agricultural Experiment Station. Released in 1972.

**Vickery**—Southern zone. Similar to Corsoy except that it is resistant to races 1, 2, 3, 6, 7, 8 and 9 of phytophthora. Developed jointly by the Iowa and Ohio Agricultural Experiment Stations. Released in 1978. Seed sale regulated by U.S. Variety Protection Act.

**Weber**—Southern zone. Similar to Corsoy 79 in yield and lodging. Good tolerance to high lime soils. Susceptible to phytophthora rot. Developed by Iowa Agricultural Experiment Station. Released in 1979. Seed sale regulated by U.S. Variety Protection Act.

**Weber 84**—Southern zone. Similar to Weber except resistant to races 1 and 2 of phytophthora. Developed by Iowa Agricultural Experiment Station. Released in 1984.

#### VARIETIES NOT ADEQUATELY TESTED

**Elgin**—Matures several days later than Corsoy 79. Not tolerant to iron chlorosis on high lime soils. Not resistant to any races of phytophthora. Fair lodging resistance. Developed by Iowa Agricultural Experiment Station. Released in 1983. Seed sale regulated by U.S. Variety Protection Act.

#### OTHER VARIETIES

**Chico**—A small-seeded variety for specialty markets. Matures slightly earlier than Clay. Seed weight is about 5 grams per 100 seeds less than Clay. Yields less than Clay. Resistant to races 1 and 2 of phytophthora. Developed by Minnesota Agricultural Experiment Station. Released in 1983.

**Corsoy**—A leading variety in Minnesota for many years. Now largely superseded by phytophthora-resistant backcross derivatives. Developed by Iowa Agricultural Experiment Station. Released in 1967.

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

**Hodgson**—A leading variety in central Minnesota for several years. Now largely superseded by phytophthora-resistant Hodgson 78. Developed by Minnesota Agricultural Experiment Station. Released in 1974. Seed sale regulated by U.S. Variety Protection Act.

**Lakota**—Similar in maturity to Hodgson 78. Taller and lodges more than Hodgson 78. Tolerant to chlorosis on high lime soils. Resistant to races 1 and 2 of phytophthora. Developed at Iowa Agricultural Experiment Station. Released in 1982. Seed sale regulated by U.S. Variety Protection Act.

**Maple Amber**—Matures 6 days earlier than McCall. High percentage of oil and protein for its maturity. Resistant to races 1 and 2 of phytophthora. Developed by Agriculture Canada, Ottawa. Licensed in 1982.

**Maple Arrow**—Matures about 6 days later than McCall. Resistant to races 1 and 2 of phytophthora. Developed by Agriculture Canada, Ottawa. Licensed in 1976.

**Maple Presto**—Matures 12 days earlier than McCall. May be too early for high yields in Minnesota. Resistant to races 1 and 2 of phytophthora. Developed by Agriculture Canada, Ottawa. Li-

censed in 1979. Production of certified seed limited to Canada.

**Wells II**—Similar to Wells except that it is resistant to races 1, 2, 3, 5, 6, 7, 8 and 9 of phytophthora. Developed by Indiana Agricultural Experiment Station. Released in 1978. Seed sale regulated by U.S. Variety Protection Act.

#### PRIVATELY DEVELOPED VARIETIES

The private companies entering varieties in the 1984 Minnesota tests and the brand names were: AgriPro Seeds, Route 2, Hwy 30 East, Ames, IA 50010 (AgriPro); Arrowhead Inc., West Hwy 212, Watertown, SD 57201 (Arrowhead); Asgrow Seed Company, 7000 Portage Road, Kalamazoo, MI 49001 (Asgrow); Cenex, P.O. Box 43089, St. Paul, MN 55164, STA 355 Seed Dept. (Cenex); Cetus Madison Corporation, 8520 University Green, Middleton, WI 53562 (CMC); Challenger Seed Ltd., P.O. Box 747, Cedar Falls, IA 50613 (Challenger); Country Brand Seed, Inc., 4735 Sergeant Road, Waterloo, IA 50701 (Country Brand); Dairyland Seed Company, Inc., P.O. Box 958, West Bend, WI 53095 (Dairyland); DeKalb-Pfizer Genetics, 3100 Sycamore Road, DeKalb, IL 60115 (DeKalb); Domestic Seed and Supply, Inc., 306 S. Washington Avenue, Madison, SD 57042 (Mustang Brand); Farmacy Seed Company, Route 2 Box 123, Dodge Center, MN 55927 (Farmacy); FFR Cooperative, 4112 E. State Road 225, West Lafayette, IN 47906 (FFR); Field Seed Farms, Route 1 P.O. Box 39, Byron, MN 55920 (Field Seed Farm); Funk Seeds International, P.O. Box 2911, Bloomington, IL 61701 (Funk); Green Field Seed, P.O. Box 56, Comfrey, MN 56019 (Green Field Seed); Golden Harvest, the J.C. Robinson Seed Company, Waterloo, NE 68069 (Golden Harvest); Hoffman Seed Farms, Inc., Route 1, Box 148, Iowa Falls, IA 50126 (Hoffman); Hofler Seed Company, Inc., Nora Springs, IA 50458 (Hofler); Hy-Vigor Seeds, Inc., Route 1, Paullina, IA 51046 (Hy-Vigor Seeds); Interstate Seed Company, 417 Main Street, Fargo, ND 58107 (Interstate); Jacques Seed Company, 720 St. Croix St., Prescott, WI 54021 (Jacques); Kaltenberg Seed Farms, Inc., 5506 Hwy 19 Route 2, Waunakee, WI 53597 (Kaltenberg Seeds); Kruger Seed Company, P.O. Box A, Dike, IA 50624 (Kruger, DeSoy); Land O' Lakes, Inc., 2827 8th Avenue South, Fort Dodge, IA 50501 (Land O' Lakes); Latham Brothers Farms, Alexander, IA 50420 (Latham); Latham Seed Company, Route 1, Alexander, IA 50420 (Latham); Lynks Seeds, P.O. Box 637, Marshalltown, IA 50158 (Lynks Seeds); Lynnville Seed Company, Lynnville, IA 50153 (Riverside); Midwest Oilseeds, Inc., Route 3, Box 204, Adel, IA 50003 (Midwest Oilseeds); North Country Seed, Inc., Route 1 P.O. Box 330, Trimont, MN 56176 (North Country Seed); Northrup King Company, 1500 Jackson St. N.E., Minneapolis, MN 55413 (Northrup King); Payco Seeds, P.O. Box 70, Dassel, MN 55325 (Payco Select); Paymaster Seeds, P.O. Box 307, Belmond, IA 50421 (Paymaster, Paymaster Bounty Brand); Pride Company, Inc., Route 1, Box 58, Glen Haven, WI 53810 (Pride); ProfiSeed Inc., Route 2, Hampton, IA 50441 (ProfiSeed); Roebke Seed Company, E. Hwy 212, Hector, MN 55342 (Roebke); Sand Seed Service, Inc., P.O. Box 648, Marcus, IA 51035 (Sands); Schechinger Seed Company, Route 1, Harlan, IA 51537 (S-Brand); Schettler Seed, Inc., 626 North Court, Carroll, IA 51401 (Diamond Brand); Soybean Research Foundation, Inc., 115 North Perry St., Mason City, IL 62664 (SRF); Stine Seed Farm, Inc., Route 3, Box 204, Adel, IA 50003 (Stine); Thompson Farms Seeds, Route 1, Leland, IA 50453 (Thompson); Willette Seed Farm, Inc., Delavan, MN 56023 (Wilsoy); Ziller Seed Company, Route 1, P.O. Box 122, Bird Island, MN 55310 (Ziller).

Table 26. Yields of publicly developed soybean varieties in northern zone in bushels per acre

Variety	Grand Rapids		Moorhead 1982-84	Morris 1982-84	Roseau 1982-84
	Crookston 1982-84	1982-84			
Maple Presto	23	28	—	—	24
Maple Amber	25	30	27	29	27
Portage	—	33	—	—	30
McCall	32	37	30	35	36
Chico	28	27 <sup>2</sup>	32	33	—
Clay	34	32	35	35	34
Maple Arrow	31	32	27	31	30
Ozzie	32 <sup>1</sup>	—	35	41	—
Evans	35 <sup>1</sup>	—	37	42	—
Simpson	—	—	35	41	—
Dawson	—	—	37	42	—
LSD 5%	4	4	3	3	5

<sup>1</sup>1983-84. <sup>2</sup>1982-83.

Table 27. Yields of publicly developed soybean varieties in 10-inch and 30-inch spacings in central zone in bushels per acre

Variety	Rosemount and Morris 1983-84		Rosemount 30-inch 1982-84	Morris 30-inch 1982-84	Becker 30-inch 1982-84	Average 30-inch 1982-84
	10-inch	30-inch				
Chico	41	34	36	32	41 <sup>1</sup>	36
Clay	41	38	39	32	47 <sup>1</sup>	38
Ozzie	47	43	43	37	51	44
Evans	48	43	42	39	50	44
Simpson	49	45	44	41	52	46
Dawson	48	46	43	42	50	45
Swift	47	44	41	40	46	42
Hodgson 78	52	47	45	41	53	46
LSD 5%	4	3	3	3	3	2

<sup>1</sup>1982-83.

Table 28. Yields of publicly developed soybean varieties in 10-inch and 30-inch spacings in southern zone in bushels per acre

Variety	Waseca and Lamberton				Fairmont mid-May planting 1982-84 30-inch	Waseca mid-May planting 1982-84 30-inch	Lamberton mid-May planting 1982-84 30-inch	Average mid-May planting 1982-84 30-inch	
	late-April planting 1982-84		mid-May planting 1982-84						mid-June planting 1982-84 30-inch
	30-inch	10-inch	30-inch	30-inch					
McCall	—	—	—	28	—	—	—		
Clay	—	—	—	27	—	—	—		
Ozzie	—	—	36	30 <sup>1</sup>	44	34	38		
Evans	—	—	38	31	44	37	39		
Simpson	—	—	39	31 <sup>1</sup>	48	36	42		
Dawson	—	—	39	33 <sup>1</sup>	45	37	41		
Swift	—	—	40	—	44	36	44		
Hodgson 78	39	44	43	33	51	40	46		
Lakota	—	41	38	—	46	37	39		
Weber	41	44	44	33	49	46	42		
Weber 84	41	44	44	33	49	46	42		
Hardin	42	50	45	32 <sup>1</sup>	55	43	47		
Corsoy 79	43	47	44	31	50	40	47		
Vickery	—	47	44	—	49	41	47		
BSR 201	—	44	41	—	51	39	42		
Elgin	—	45	43	—	47	40	45		
Gnome	—	37	36	—	45	32	39		
LSD 5%	2	2	2	2	4	3	3		

<sup>1</sup>1983-84.

Table 29. Field characteristics of publicly developed soybean varieties

Variety	Mature		Lodging (score) <sup>1</sup>	Height (inches)	Phytophthora (reaction) <sup>2</sup>	Chlorosis (score) <sup>1</sup>
	mid-May planting (days after August 31)	mid-June planting				
<b>Northern Zone</b>						
Maple Presto	1	—	1.0	20	R	3.6
Maple Amber	3	—	1.0	23	R	4.2
Portage	4	—	1.0	28	S	2.6
McCall	6	—	1.6	25	S	2.8
Chico	8	—	1.4	26	R	2.4
Clay	8	—	1.7	25	S	2.4
Maple Arrow	12	—	1.3	28	R	3.8
Ozzie	13	—	1.3	27	R	2.6
Evans	15	—	1.4	30	R	2.8
Simpson	18	—	2.3	34	R	2.8
Dawson	18	—	3.0	33	R	1.6
<b>Central Zone</b>						
Chico	7	—	2.8	30	R	2.4
Clay	9	—	2.5	26	S	2.4
Ozzie	14	—	2.0	33	R	2.6
Evans	15	—	3.2	37	R	2.8
Dawson	17	—	3.0	33	R	1.6
Simpson	19	—	2.3	34	R	2.8
Swift	19	—	3.5	41	S	1.6
Hodgson 78	20	—	2.8	38	R	2.4
Lakota	21	—	3.8	40	R	1.6
Weber	26	—	3.3	39	S	2.2
Weber 84	26	—	3.3	39	R	2.2
Hardin	27	—	2.8	36	R	3.8
Corsoy 79	29	—	2.6	41	R	4.4
Vickery	29	—	3.0	38	R	4.4
<b>Southern Zone</b>						
McCall	—	18	—	—	S	2.8
Clay	—	21	—	—	S	2.4
Ozzie	7	24	1.0	27	R	2.6
Evans	7	25	1.5	27	R	2.8
Dawson	9	26	1.4	27	R	1.6
Simpson	11	27	1.0	27	R	2.8
Swift	11	—	1.6	31	S	1.6
Hodgson 78	15	28	1.8	34	R	2.4
Lakota	15	—	3.8	40	R	1.6
Weber	19	31	3.3	39	S	2.2
Weber 84	19	31	3.3	39	R	2.2
Hardin	19	30	2.8	36	R	3.8
Corsoy 79	22	31	2.6	41	R	4.4
Vickery	22	—	3.0	38	R	4.4
BSR 201	23	—	2.8	36	R	4.8
Elgin	23	—	2.3	38	S	3.5
Gnome	29	—	1.0	28	S	3.6

<sup>1</sup>1 = excellent, 5 = very poor. <sup>2</sup>R = resistant, S = susceptible to races 1 and 2.

Table 30. Plant characteristics of publicly developed soybean varieties

Variety	Color			Seeds/ pound (number)	Seed quality (score) <sup>4</sup>	Protein (percent) <sup>5</sup>	Oil (percent) <sup>5</sup>
	flower <sup>1</sup>	pubes- cence <sup>2</sup>	hilum <sup>3</sup>				
<u>Northern Zone</u>							
Maple Presto	P	T	G	2650	2.5	40.6	18.1
Maple Amber	P	T	Br	2770	2.3	43.5	19.4
Portage	P	G	Y	2320	1.3	40.8	16.9
McCall	P	G	Y	2900	2.0	41.3	18.3
Chico	W	G	Bf	4000	1.7	42.7	20.5
Clay	P	G	Y	2700	2.5	42.3	20.4
Maple Arrow	P	T	Br	2800	2.8	41.9	18.7
Ozzie	P	G	Y	2640	1.5	43.4	19.1
Evans	W	G	Y	2720	1.5	41.9	19.3
Simpson	P	G	Bf	2700	1.9	42.3	17.9
Dawson	P	G	Y	3100	1.7	41.8	19.7
<u>Central Zone</u>							
Chico	W	G	Bf	3750	1.7	42.7	20.5
Clay	P	G	Y	2770	1.8	42.3	20.4
Ozzie	P	G	Y	2640	1.5	43.4	19.1
Evans	W	G	Y	2720	1.5	41.9	19.3
Simpson	P	G	Bf	2700	1.9	42.3	17.9
Dawson	P	G	Y	3100	1.7	41.8	19.7
Swift	W	T	Bl	2600	1.3	40.7	18.1
Hodgson 78	P	G	Bf	2730	1.7	41.6	19.4
Lakota	P	T	Bl	3310	1.7	41.2	19.2
Weber	W	T	Bl	3570	1.4	39.9	19.9
Weber 84	W	T	Bl	3570	1.4	39.9	19.9
Hardin	P	G	Y	3290	1.5	39.7	19.6
Corsoy 79	P	G	Y	3040	1.8	40.3	19.5
Vickery	P	G	Y	3130	1.6	40.6	18.7
<u>Southern Zone</u>							
McCall	P	G	Y	—	—	—	—
Clay	P	G	Y	—	—	—	—
Ozzie	P	G	Y	2780	2.2	41.3	19.2
Evans	W	G	Y	2950	1.9	39.7	20.7
Simpson	P	G	Bf	3340	1.5	39.3	19.6
Dawson	P	G	Y	3130	1.8	39.1	19.6
Swift	W	T	Bl	2950	1.7	38.8	19.4
Hodgson 78	P	G	Bf	3020	1.5	39.2	20.8
Lakota	P	T	Bl	3310	1.7	41.2	19.2
Weber	W	T	Bl	3570	1.4	39.9	19.9
Weber 84	W	T	Bl	3570	1.4	39.9	19.9
Hardin	P	G	Y	3290	1.5	39.7	19.6
Corsoy 79	P	G	Y	3040	1.8	40.3	19.5
Vickery	P	G	Y	3130	1.6	40.6	18.7
BSR 201	W	G	Bf	3260	1.9	39.8	19.8
Elgin	P	T	Bl	3000	1.5	39.9	19.4
Gnome	P	T	Bl	3440	2.1	42.2	17.5

<sup>1</sup>P = purple, W = white. <sup>2</sup>T = tawny, G = gray. <sup>3</sup>Y = yellow, G = gray, Br = brown, Bl = black, Bf = buff. <sup>4</sup>1 = excellent, 5 = very poor. <sup>5</sup>Oven dry.

Table 31. Yields and characteristics of public and private soybean varieties, northern zone, 1983-84 (Crookston, Moorhead, Morris)

Brand or originator	Variety	Mature (days after August 31)	Yield/acre (bushels)		Lodging (score) <sup>2</sup>	Height (inches)	Phytophthora (reaction) <sup>3</sup>	Chlorosis (score) <sup>2,4</sup>
			1984	1983-84				
Agric. Canada	Maple Presto	1	16	—	1.0	20	R	2.7
Minn. AES	McCall	6	34	34	1.6	25	S	2.8
Agric. Canada	Maple Amber	7	23	26	1.0	23	R	4.2
Interstate	505	7	33	34	1.6	26	S	1.6
Minn. AES	Clay	8	35	35	1.7	25	S	2.4
Minn. AES	Chico	8	35	34	1.4	26	R	2.4
Minn. AES	Ozzie	13	37	—	1.3	27	R	2.7
Agric. Canada	Maple Arrow	14	27	30	1.3	28	R	3.8
Stine	0510	15	37	—	1.4	26	S	—
Minn. AES	Evans	15	40	40	1.4	30	R	3.0
Jacques	J-72	16	35	36	1.3	31	S	—
Northrup King	S0512	16	36	—	1.9	32	—	—
Interstate	545	16	36	37	1.4	28	S	2.2
Jacques	E8475	17	36	—	1.8	32	R	—
Land O'Lakes	HC-800 <sup>1</sup>	18	39	—	1.4	31	R	—
Interstate	515	18	31	34	1.4	29	R	2.2
Roebke	R021	22	35	—	1.5	32	—	—
Roebke	EXP 01	22	37	—	1.5	31	R	—
LSD (5%)			4	2				

<sup>1</sup>Blend. <sup>2</sup>1 = excellent, 5 = very poor. <sup>3</sup>R = resistant, S = susceptible to races 1 and 2. <sup>4</sup>1983.

Table 32. Yields and characteristics of public and private soybean varieties, central zone, 1982-84 (Morris, Becker, Rosemount)

Brand or originator	Variety	Mature (days after August 31)	Yield/acre (bushels)			Lodging (score) <sup>1</sup>	Height (inches)	Phytophthora (reaction) <sup>2</sup>	Chlorosis (score) <sup>1,3</sup>
			1984	1983-84	1982-84				
Minn. AES	Ozzie	11	42	40	—	1.6	29	R	2.7
Minn. AES	Evans	12	43	41	41	2.6	33	R	3.0
Minn. AES	Dawson	16	45	—	—	2.2	32	R	1.6
Interstate	545	16	40	—	—	2.2	31	S	2.2
Diaryland	DST801	16	43	—	—	1.8	33	S	—
AgriPro	AP120	17	46	44	43	2.4	33	S	2.6
Interstate	515	17	42	—	—	1.9	31	R	2.2
Jacques	J-82	17	46	46	—	2.6	37	S	3.0
Minn. AES	Simpson	18	45	44	44	1.9	32	R	2.8
Dairyland	DSR-120	19	46	46	45	2.1	34	S	4.6
ProfiSeed	921ex	19	46	—	—	2.3	36	R	—
DeKalb	CX282	19	43	41	39	2.7	36	S	1.6
Hy-Vigor Seeds	Hardy	19	42	43	—	2.3	32	R	3.8
Northrup King	SO9-90	19	50	48	45	2.7	37	R	3.2
Ziller	Exp. 28	19	46	—	—	2.4	35	R	—
Midwest Oilseeds	0450	20	46	44	—	2.4	36	R	2.2
Land O'Lakes	L4503	20	46	—	—	3.1	33	M	—
Ziller	Exp. 22	20	44	—	—	3.1	36	S	—
Land O'Lakes	L4504	20	47	—	—	2.3	33	R	—
Stine	0560	20	45	—	—	2.9	37	R	—
Cenex	1018	20	40	—	—	2.9	34	R	—
Sands	SOI EXP 142	20	48	—	—	2.6	32	R	—
Roebke	R180	21	50	—	—	3.0	36	S	—
Funk	12231	21	48	46	—	2.8	34	R	4.0
Payco Select	PS0011	21	43	42	—	2.6	34	R	—
North Country Seed	NCS 220	21	42	—	—	2.8	34	R	—
CMC	78H2	21	46	—	—	2.8	38	R	—
North Country Seed	NCS 350	21	44	—	—	3.2	36	R	—
Thompson	Exp 166	21	47	—	—	2.4	36	R	—
CMC	78HI	21	47	—	—	2.6	37	R	—

Table 32 (continued). Yields and characteristics of public and private soybean varieties, central zone, 1982-84 (Morris, Becker, Rosemount)

Brand or originator	Variety	Mature (days after August 31)	Yield/acre (bushels)			Lodging (score) <sup>1</sup>	Height (inches)	Phytophthora (reaction) <sup>2</sup>	Chlorosis (score) <sup>1,3</sup>
			1984	1983-84	1982-84				
Pride	PEX96	22	48	46	—	3.0	40	M	2.8
Minn. AES	Hodgson 78	23	46	44	45	2.6	38	R	2.7
AgriPro	AP 10	23	45	43	42	3.3	38	R	2.0
Midwest Oilseeds	1520	23	47	—	—	2.8	36	M	—
Pride	B152	24	49	47	46	2.6	35	R	3.8
Northrup King	S14-60	24	46	46	—	2.7	34	S	2.2
DeKalb	CX134	24	49	—	—	2.9	38	S	—
Stine	1350	24	48	46	—	2.3	34	S	4.4
Kaltenberg	KB 115	25	45	—	—	2.7	34	R	—
Riverside	505	25	42	—	—	2.8	37	R	—
Thompson	T-14	25	44	—	—	2.7	34	S	—
Golden Harvest	X183	25	47	—	—	2.7	33	S	—
Cenex	8410	25	46	—	—	2.2	32	S	—
Farmacy	Independence	25	44	—	—	2.8	32	S	—
Hofler	Opal	26	45	—	—	2.6	33	S	—
Sands	SOI 133	26	45	—	—	2.8	32	S	—
Kruger	K1010	27	46	—	—	3.4	43	R	—
Golden Harvest	X190	28	43	—	—	3.7	43	R	—
LSD (5%)			4	3	2				

<sup>1</sup>1 = excellent, 5 = very poor. <sup>2</sup>R = resistant, S = susceptible, M = mixture of R and S to races 1 and 2. <sup>3</sup>1983.

Table 33. Yields and characteristics of public and private soybean varieties, southern zone, 1982-84 (Lamberton, Waseca, Fairmont)

Brand or originator	Variety	Mature (days after August 31)	Yield/acre (bushels)			Lodging (score) <sup>2</sup>	Height (inches)	Phytophthora (reaction) <sup>3</sup>	Chlorosis (score) <sup>2,4</sup>
			1984	1983-84	1982-84				
Mustang Brand	M-1101	8	36	—	—	1.4	30	R	—
Ziller	Exp. 21	13	43	—	—	1.8	35	S	—
Minn. AES	Hodgson 78	14	44	43	44	1.8	35	R	2.7
Diamond Brand	TC137	15	43	44	45	1.9	36	R	3.6
Mustang Brand	M-1120A	15	41	—	—	2.3	36	R	—
Iowa AES	Hardin	15	48	—	—	2.4	37	R	3.8
Northrup King	S14-60	15	49	50	—	1.8	34	S	2.2
Interstate	575	15	46	—	—	1.8	35	S	—
Hy-Vigor Seeds	Ex 98 <sup>1</sup>	15	45	—	—	2.1	37	R	—
North Country Seed	NCS 440	16	40	—	—	2.4	39	R	—
Payco Select	PS0019 <sup>1</sup>	16	43	42	—	2.3	36	R	—
Asgrow	A1937	16	48	48	49	2.3	38	R	3.8
Land O'Lakes	L1771	16	42	—	—	2.2	36	R	—
AgriPro	HP 20-20	16	45	—	—	2.6	39	S	—
SRF	76-24486	16	43	43	—	2.2	37	R	4.6
AgriPro	AP200	16	41	44	46	2.0	37	R	3.6
AgriPro	AP 10	16	42	40	43	2.8	38	R	—
Funk	G3145 Brand <sup>1</sup>	16	47	46	—	2.1	37	R	3.6
Farmacy	Enterprise II	16	47	—	—	2.4	36	S	4.0
Land O'Lakes	L1808	16	46	—	—	2.4	35	R	—
Ziller	BT2300 <sup>1</sup>	17	47	—	—	2.6	36	M	—
Thompson	T-12	17	46	—	—	2.6	39	R	—
CMC	HD7	17	49	—	—	2.4	38	R	—
CMC	HD1	17	47	—	—	2.7	39	R	—
S-Brand	S-38	17	44	—	—	2.8	40	R	—
ProfiSeed	1138	17	45	44	46	2.7	38	R	4.2
Cenex	8017	17	45	45	—	2.3	37	R	4.2

Table 33 (continued). Yields and characteristics of public and private soybean varieties, southern zone, 1982-84 (Lamberton, Waseca, Fairmont)

Brand or originator	Variety	Mature (days after August 31)	Yield/acre (bushels)			Lodging (score) <sup>2</sup>	Height (inches)	Phytophthora (reaction) <sup>3</sup>	Chlorosis (score) <sup>2,4</sup>
			1984	1983-84	1982-84				
Dairyland	DSR-171	17	41	42	43	2.6	40	S	4.4
DeKalb	CX155	17	47	47	47	2.9	37	S	2.0
Funk	G3115	18	43	44	44	1.9	33	R	4.0
DeSoy	302B <sup>1</sup>	18	47	46	—	2.6	36	R	4.2
Latham	301 <sup>1</sup>	18	40	44	—	2.9	39	S	2.6
Farmacy	Eve	18	41	43	45	2.3	39	R	4.4
Midwest Oilseeds	1480	18	47	46	—	2.0	36	S	3.0
GFS	213	18	44	44	—	2.2	37	R	2.2
Challenger	CSV 10	18	42	—	—	3.0	39	R	—
Golden Harvest	H-1210 <sup>1</sup>	18	46	—	—	2.3	38	M	—
Kaltenberg	KB231	18	48	48	49	2.3	37	R	2.8
Iowa AES	Weber	18	46	44	46	2.7	40	S	1.6
Genex	8212	18	44	44	—	2.6	35	S	1.6
Jacques	E84100	19	46	—	—	2.6	38	R	—
Kruger	K2000	19	44	45	—	2.6	42	R	3.0
Jacques	J-103	19	48	46	48	2.7	37	S	3.0
Golden Harvest	X190	19	45	—	—	2.8	40	R	—
ProfiSeed	1152	19	50	48	—	2.4	36	R	2.2
Ill. AES	Corsoy 79	19	48	46	47	2.6	42	R	4.0
Hy-Vigor Seeds	901 <sup>1</sup>	19	47	44	—	2.9	42	R	4.0
Thompson	T-15	19	44	—	—	3.0	41	R	—
Payco Select	PS0021 <sup>1</sup>	19	47	46	—	2.7	43	R	—
Field Seed Farm	210	19	44	—	—	2.8	39	R	—
Field Seed Farm	Exp 1150	19	44	—	—	2.8	40	R	—
Latham	650	19	50	50	—	2.7	36	S	3.4
S-Brand	S-40	19	45	—	—	2.7	38	R	—
Challenger	CSV 20	19	42	—	—	2.6	41	R	—
Sands	SOI 222	19	41	—	—	2.4	41	R	—
Roebke	R200	19	41	—	—	2.9	41	S	—
Hoffman	8001A <sup>1</sup>	19	47	45	—	2.8	41	R	4.0
Sands	SOI 226	20	52	50	—	2.6	37	S	2.2
Stine	1570	20	46	—	—	3.1	40	R	—
Diamond Brand	D195B <sup>1</sup>	20	46	47	—	2.4	37	R	3.0
North Country Seed	NCS 550	20	44	—	—	2.8	41	R	—
Willette Seed Farm	Wilsoy 84	20	44	—	—	2.9	39	R	—
Midwest Oilseeds	2510	20	47	—	—	2.8	36	R	—
DeKalb	CX174	20	46	—	—	1.9	38	M	—
Interstate	595	20	43	—	—	2.8	41	R	—
Latham	500	20	46	46	46	2.9	41	R	2.6
Iowa AES	Elgin	20	44	—	—	2.8	35	S	3.5
Kaltenberg	KB 225	20	43	—	—	2.6	37	R	—
Lynks Seeds	8202	20	50	—	—	2.6	37	M	—
Roebke	Exp 202 <sup>1</sup>	20	42	—	—	2.7	39	M	—
Latham	551 <sup>1</sup>	21	48	—	—	3.0	37	M	—
AgriPro	Ex 034	21	46	—	—	3.1	41	R	—
Hoffman	8450 <sup>1</sup>	21	44	—	—	2.7	41	R	—
Hofler	Jewell	21	42	—	—	2.8	41	R	—
Pride	B203	21	45	47	47	2.8	39	R	4.8
GFS	423	21	43	45	—	2.7	40	R	2.0
Riverside	4042 <sup>1</sup>	21	44	42	44	2.6	42	R	4.0
Riverside	404P <sup>1</sup>	21	45	—	—	2.9	40	M	—
FFR	13004	21	40	—	—	2.6	42	R	—
Northrup King	S23-03	21	46	—	—	2.9	38	M	—
Country Brand	Stetson	21	45	—	—	3.1	42	R	—



Table 33 (continued). Yields and characteristics of public and private soybean varieties, southern zone, 1982-84 (Lamberton, Waseca, Fairmont)

Brand or originator	Variety	Mature (days after August 31)	Yield/acre (bushels)			Lodging (score) <sup>2</sup>	Height (inches)	Phytophthora (reaction) <sup>3</sup>	Chlorosis (score) <sup>2,4</sup>
			1984	1983-84	1982-84				
Stine	2220 <sup>1</sup>	22	48	46	48	2.6	39	M	2.2
Asgrow	A2522	22	46	—	—	3.0	42	S	—
Hofler	Onyx	22	43	—	—	3.1	45	R	—
FFR	10297	22	39	—	—	3.2	43	R	—
Dairyland	DSR-207	22	43	44	44	2.8	41	S	3.6
Pride	B216	23	46	45	45	3.3	39	S	5.0
Iowa AES	BSR201	23	46	—	—	3.2	37	R	4.8
SRF	76-29329	23	43	—	—	2.2	39	R	—
Country Brand	Wrangler	23	44	—	—	2.3	37	S	—
LSD (5%)			3	3	2				

<sup>1</sup>Blend. <sup>2</sup>1 = excellent, 5 = very poor. <sup>3</sup>R = resistant, S = susceptible, M = mixture of R and S to races 1 and 2. <sup>4</sup>1983.

## SUNFLOWER

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

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

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

A major advantage of some hybrids over the old varieties is their ability to produce a normal yield despite a shortage of insect pollinators. However, this is artifact, not true, autogamy because the hybrids increase seed size and weight to compensate for fewer seeds per head. Hybrids of 70 percent artifact autogamy suffered a 30 percent yield reduction when bees were excluded by bags; no yield reduction occurred with hybrids of 100 percent artifact autogamy (tables 35 and 36, last column). The larger seeds

resulting from a shortage of bees are usually lower in oil percentage than normal-size seeds.

Companies enter hybrids in these trials voluntarily, and hybrids are usually tested for 3 years. Data reported for hybrids not included in all trials are adjusted to be comparable with average data of all hybrids tested.

Companies with hybrids in these trials are: Agway Inc., Grandin, ND 58038; Arrowhead Inc., Watertown, SD 57201; Cargill Seed Division, Box 5645, Minneapolis, MN 55440; Dahlgren and Company, Inc., 1220 Sunflower St., Crookston, MN 56716; DeKalb-Pfizer Genetics, Box 8AA, Glyndon, MN 56547; Interstate Seed Company, Box 470, Fargo, ND 58107; Jacques Seed Co., Prescott, WI 54021; Keltgen Seed Company, Box 143, Olivia, MN 56277; Northrup King Co., 1500 NE Jackson St., Minneapolis, MN 55413; PAG Seeds, Box 9480, Minneapolis, MN 55440; Saskatchewan Wheat Pool, 2625 Victoria Ave., Regina, Sask. S4T 7T9; SeedTec International Inc., Box 5522, Fargo, ND 58105; Sigco Research, Inc., Box 289, Breckenridge, MN 56520; Sokota Hybrid Producers, Brookings, SD 57006; Stauffer Seeds, Inc., 1323 23 St. S., Fargo, ND 58103; TNT/SUN-FLO, Box 5637, Fargo, ND 58105.



Most sunflower hybrids are semidwarf compared with the giant varieties sometimes grown in Minnesota gardens. New semidwarf hybrids considerably shorter than the commonly grown hybrids are now available. Commercial agronomist G. E. Auwarter.

Table 34. Yields of sunflower varieties in pounds per acre

Variety and company	Crookston 1984	Morris 1984	Lamberton 1984	Rosemount 1984	Average 1984	Crookston 1980-84	Morris 1978-81, 83-84	Lamberton 1980-84	Rosemount 1979, 81-84	Average 4 locations
<b>Oilseed varieties</b>										
894, USDA	1942	1876	1301	1759	1720	1139	1984	1864	2062	1762
Arrowhead 747, Arrowhead Inc.	2955	1225	1299	1883	1841	1559	1801	1798	2067	1806 <sup>1</sup>
Arrowhead 757, Arrowhead Inc.	1813	2202	976	1867	1715	—	—	—	—	—
204, Cargill	—	—	—	—	—	1042	2065	1762	2317	1797 <sup>2</sup>
205, Cargill	—	—	—	—	—	1258	2057	1863	2289	1867 <sup>2</sup>
206, Cargill	1822	1447	1652	2371	1823	1404	2015	1944	2476	1960 <sup>3</sup>
207, Cargill	2572	3033	1799	2722	2532	1598	2570	2210	2852	2308 <sup>4</sup>
208, Cargill	1909	1178	1079	1350	1379	—	—	—	—	—
DO 704XL, Dahlgren	—	—	—	—	—	1186	1999	1931	2624	1935 <sup>5</sup>
DO 705, Dahlgren	1723	1554	1365	2759	1850	1291	1806	2103	2532	1933 <sup>6</sup>
DO 725, Dahlgren	1732	3018	1311	2485	2137	—	—	—	—	—
DO 730, Dahlgren	2397	1037	962	2809	1801	—	—	—	—	—
DO 855, Dahlgren	1853	2686	1179	2195	1978	1334	2482	2066	2381	2066 <sup>7</sup>
DKS-37, DeKalb	—	—	—	—	—	1131	2118	1878	1920	1762 <sup>8</sup>
DKS-42, DeKalb	2205	2022	1249	1976	1863	—	—	—	—	—
DKS-X3362, DeKalb	2180	1160	1044	2061	1611	—	—	—	—	—
Cenex 7101, Interstate	—	—	—	—	—	1049	1833	1696	2285	1716 <sup>9</sup>
Cenex 8101, Interstate	2245	2074	1191	2338	1962	—	—	—	—	—
IS 3001, Interstate	2144	1440	1311	2114	1752	1296	1797	2076	2289	1865 <sup>1</sup>
IS 3170, Interstate	2175	1814	1262	2354	1901	—	—	—	—	—
IS 7111, Interstate	1550	1645	1412	2100	1677	1066	1853	1986	2268	1793 <sup>1</sup>
IS 7120, Interstate	—	—	—	—	—	868	2404	1991	2239	1876 <sup>10</sup>
IS 7775 Select, Interstate	—	—	—	—	—	1192	2129	1777	2413	1878 <sup>2</sup>
J-311, Jacques	1939	1718	1494	2132	1821	1202	2133	2049	2175	1890 <sup>1</sup>
J-503, Jacques	—	—	—	—	—	1148	2313	1934	2524	1980 <sup>8</sup>
J-4402, Jacques	1924	1228	1427	2083	1666	—	—	—	—	—
J-4501, Jacques	2198	1310	1453	2193	1789	—	—	—	—	—
KO-66, Keltgen	2090	1763	718	2541	1778	1388	1935	1968	2505	1949 <sup>1</sup>
Sunbred 254, Northrup King	—	—	—	—	—	1189	2153	1713	2191	1812 <sup>2</sup>
Sunbred 262, Northrup King	2042	1787	1485	1992	1827	—	—	—	—	—
Sunbred 265, Northrup King	—	—	—	—	—	1045	2289	1665	2067	1767 <sup>2</sup>
Sunbred 285, Northrup King	2229	1976	1237	2257	1925	—	—	—	—	—
PAG SF 100, PAG Seeds	1844	1150	1275	1340	1402	—	—	—	—	—
PAG SF 101, PAG Seeds	—	—	—	—	—	1233	2120	1786	1926	1766 <sup>11</sup>
PAG SF 102, PAG Seeds	2108	1081	1697	1584	1618	1441	1689	1960	2159	1812 <sup>12</sup>
PAG SF 103, PAG Seeds	2501	2595	1718	2597	2353	—	—	—	—	—
Sun M20, Sask. Wheat Pool	1058	1763	1343	1966	1533	—	—	—	—	—
SeedTec 307, SeedTec Int'l.	—	—	—	—	—	1034	2076	1842	1946	1725 <sup>13</sup>
SeedTec 315, SeedTec Int'l.	—	—	—	—	—	1374	2407	1753	2318	1963 <sup>14</sup>
SeedTec 316, SeedTec Int'l.	2338	2439	1441	2057	2069	1509	2426	2078	2267	2070 <sup>1</sup>
SeedTec 317, SeedTec Int'l.	2656	2543	1451	1619	2067	1789	2615	2027	1979	2103 <sup>7</sup>
SeedTec 327, SeedTec Int'l.	—	—	—	—	—	913	2036	1804	2273	1757 <sup>10</sup>
Dakota Gold, SeedTec-TNT	2076	1881	1103	1336	1599	1342	2008	1771	1934	1764 <sup>15</sup>
SIGCO 448, Sigco Research	—	—	—	—	—	978	2022	1849	2438	1822 <sup>2</sup>
SIGCO 449, Sigco Research	—	—	—	—	—	1095	1938	1907	2320	1815 <sup>2</sup>
SIGCO 450, Sigco Research	—	—	—	—	—	1119	2092	1374	2222	1702 <sup>16</sup>
SIGCO 454, Sigco Research	—	—	—	—	—	1050	1887	1980	2576	1873 <sup>9</sup>
SIGCO 455, Sigco Research	2201	2644	1528	1693	2017	1422	2551	2140	2014	2032 <sup>7</sup>
SIGCO 456, Sigco Research	2614	2230	1293	2632	2192	—	—	—	—	—
SIGCO 468, Sigco Research	2037	1816	1135	957	1486	—	—	—	—	—
SIGCO 472, Sigco Research	—	—	—	—	—	1041	2047	1955	2089	1783 <sup>18</sup>
Sokota 2057, Sokota Hybrid	1460	1971	1490	2626	1887	1005	2075	2126	2495	1925 <sup>1</sup>
Sokota 4000, Sokota Hybrid	—	—	—	—	—	1242	2031	1780	2302	1839 <sup>14</sup>
Sokota 5000, Sokota Hybrid	—	—	—	—	—	1161	2169	1695	2021	1762 <sup>8</sup>

Table 34 (continued). Yields of sunflower varieties in pounds per acre

Variety and company	Crookston	Morris	Lamberton	Rosemount	Average	Crookston	Morris	Lamberton	Rosemount	Average
	1984	1984	1984	1984	1984	1980-84	1978-81, 83-84	1980-84	1979, 81-84	4 locations
Sokota 6000, Sokota Hybrid	—	—	—	—	—	1104	1985	1867	2172	1782 <sup>8</sup>
S-1300, Stauffer Seeds	1555	960	1829	1750	1524	1126	1317	2247	1973	1666 <sup>7</sup>
S-1830, Stauffer Seeds	—	—	—	—	—	1092	1716	2192	2016	1754 <sup>10</sup>
S-1888, Stauffer Seeds	1755	1986	1395	2184	1830	1178	2042	1873	2319	1853 <sup>1</sup>
3101, Stauffer Seeds	1563	1916	1660	2117	1814	1139	1972	2105	2005	1805 <sup>6</sup>
GH 10, TNT/SUN-FLO	—	—	—	—	—	1192	2051	1638	2111	1748 <sup>2</sup>
GH 20, TNT/SUN-FLO	—	—	—	—	—	1221	1933	1406	2359	1730 <sup>17</sup>
L12, TNT/SUN-FLO	2183	1475	1439	1906	1751	—	—	—	—	—
SS 300, TNT/ SUN-FLO	1967	1711	1257	1854	1697	—	—	—	—	—
XR 28, TNT/SUN-FLO	—	—	—	—	—	1149	2209	1908	1944	1803 <sup>18</sup>
134 Brand, TNT/SUN-FLO	2242	1754	1269	2222	1872	—	—	—	—	—
634 Brand, TNT/SUN-FLO	2359	2038	1209	1858	1866	1473	2146	1721	2030	1843 <sup>19</sup>
Peredovik, USSR	—	—	—	1698	—	—	—	—	1986	—
Sputnik, USSR	—	—	—	2009	—	—	—	—	2298	—
LSD 5%	416	593	461	652	270	182	280	461	232	154
Nonoilseed varieties										
924, USDA	1453	2446	784	2645	1832	1123	2040	1712	2559	1859
Royal Hybrid 621, Agway	2213	2611	692	2423	1985	1452	2425	1906	2608	2098 <sup>1</sup>
Royal Hybrid 2121, Agway	—	—	—	—	—	1094	1933	1924	2597	1887 <sup>14</sup>
Royal Hybrid 2141, Agway	2447	2712	1475	2951	2396	1518	2313	2317	2930	2270 <sup>6</sup>
D131, Dahlgren	2490	2869	808	1990	2039	1643	2529	1928	2595	2174 <sup>6</sup>
SIGCO 934, Sigco Research	—	—	—	—	—	1246	2047	1740	2056	1772 <sup>8</sup>
SIGCO 944, Sigco Research	—	—	—	—	—	1114	—	1800	2614	1905 <sup>20</sup>
SIGCO 954, Sigco Research	1637	2845	942	3021	2111	1354	2483	1907	2781	2131 <sup>6</sup>
SIGCO 964, Sigco Research	1877	2889	1110	2202	2020	1448	2385	1961	2650	2111 <sup>1</sup>
LSD 5%	466	726	441	677	295	182	334	441	239	157

<sup>1</sup>1982-84. <sup>2</sup>1978-82. <sup>3</sup>1980-84. <sup>4</sup>1982-84. <sup>5</sup>1978-83. <sup>6</sup>1981-84. <sup>7</sup>1983-84. <sup>8</sup>1981-83. <sup>9</sup>1979-82. <sup>10</sup>1983. <sup>11</sup>1979-83.  
<sup>12</sup>1980-82, 84. <sup>13</sup>1982-83. <sup>14</sup>1980-82. <sup>15</sup>1981,83,84. <sup>16</sup>1979-80. <sup>17</sup>1978-80. <sup>18</sup>1980,83. <sup>19</sup>1982,84. <sup>20</sup>1982.

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

Variety and company	Oil (percent) <sup>1</sup>	Seeds/pound (number) <sup>2</sup>	Planting to			Height (inches) <sup>6</sup>	Head moisture (percent) <sup>7</sup>	Seed moisture (percent) <sup>8</sup>	Midge damage (percent) <sup>9</sup>	Artifact autogamy (percent) <sup>10</sup>
			bloom (days) <sup>3</sup>	maturity (days) <sup>4</sup>	Lodging (percent) <sup>5</sup>					
894, USDA	46	11,100	74	122	14	66	50	14	75	100
Arrowhead 747, Arrowhead Inc.	50	10,500	75	123	21	67	54	14	69	100
Arrowhead 757, Arrowhead Inc.	48	8,900	75	125	12	71	59	—	—	83
204, Cargill	46	—	74	—	16	65	41	13	70	100
205, Cargill	49	9,300	72	—	25	63	38	17	76	96
206, Cargill	47	9,500	73	122	17	67	44	16	58	89
207, Cargill	44	8,900	73	121	20	70	37	16	35	100
208, Cargill	44	11,100	74	122	9	55	54	—	—	93
DO 704XL, Dahlgren	45	8,400	72	121	24	67	49	16	70	74
DO 705, Dahlgren	46	8,700	70	120	21	67	45	17	54	89
DO 725, Dahlgren	46	9,700	69	122	11	64	43	—	—	89
DO 730, Dahlgren	50	8,200	73	124	20	67	49	—	—	42
DO 855, Dahlgren	47	8,600	70	121	18	64	43	14	—	90
DKS-37, DeKalb	47	10,300	75	123	20	66	55	21	16	84
DKS-42, DeKalb	44	10,500	73	124	13	60	61	—	—	98
DKS-X3362, DeKalb	50	9,900	74	125	12	63	56	—	—	100
Cenex 7101, Interstate	45	10,100	72	—	36	69	43	10	79	61
Cenex 8101, Interstate	50	8,600	73	124	17	65	44	—	—	100
IS 3001, Interstate	49	9,100	73	123	9	63	45	13	33	72
IS 3170, Interstate	48	8,900	75	124	40	72	50	—	—	100
IS 7111, Interstate	49	8,600	70	122	12	65	43	14	58	64
IS 7120, Interstate	47	8,400	74	124	31	74	57	31	—	100
IS 7775 Select, Interstate	45	9,900	74	—	20	71	54	18	76	100
J-311, Jacques	46	10,100	73	123	12	67	52	16	76	99

Table 35 (continued). Characteristics of oilseed sunflower varieties, four location average

Variety and company	Oil (percent) <sup>1</sup>	Seeds/ pound <sup>2</sup>	Planting to			Height (inches) <sup>6</sup>	Head moisture (percent) <sup>7</sup>	Seed moisture (percent) <sup>8</sup>	Midge damage (percent) <sup>9</sup>	Artifact autogamy (percent) <sup>10</sup>
			bloom (days) <sup>3</sup>	maturity (days) <sup>4</sup>	Lodging (percent) <sup>5</sup>					
J-503, Jacques	44	9,700	74	123	18	70	56	16	70	92
J-4402, Jacques	48	11,100	70	122	9	62	44	—	—	92
J-4501, Jacques	48	11,100	71	121	14	61	38	—	—	75
KO-66, Keltgen	45	8,400	72	123	20	67	56	16	72	84
Sunbred 254, Northrup King	46	11,300	75	—	13	68	51	24	62	100
Sunbred 262, Northrup King	48	10,500	74	122	21	66	43	—	—	100
Sunbred 265, Northrup King	47	8,700	72	—	28	60	43	18	70	98
Sunbred 285, Northrup King	48	8,600	75	124	23	67	48	—	—	88
PAG SF 100, PAG Seeds	43	10,100	73	123	9	57	36	—	—	100
PAG SF 101, PAG Seeds	47	10,500	73	122	14	62	44	14	67	100
PAG SF 102, PAG Seeds	47	9,500	74	124	20	67	42	19	68	97
PAG SF 103, PAG Seeds	44	10,500	73	119	14	71	32	—	—	100
Sun M20, Sask. Wheat Pool	47	8,900	67	117	12	65	18	—	—	76
SeedTec 307, SeedTec Int'l.	46	10,100	74	123	17	68	53	18	66	100
SeedTec 315, SeedTec Int'l.	44	8,200	76	—	16	73	58	20	32	100
SeedTec 316, SeedTec Int'l	47	8,200	73	123	19	68	51	15	12	100
SeedTec 317, SeedTec Int'l	49	8,400	74	125	18	69	59	16	—	89
SeedTec 327, SeedTec Int'l	45	10,100	74	—	15	70	51	16	77	88
Dakota Gold, SeedTec—TNT	50	9,500	73	123	23	64	38	13	—	52
SIGCO 448, Sigco Research	51	9,900	74	—	30	66	49	21	69	75
SIGCO 449, Sigco Research	44	9,900	72	—	16	71	43	15	81	87
SIGCO 450, Sigco Research	49	—	74	—	32	67	—	—	—	60
SIGCO 454, Sigco Research	44	9,300	74	—	21	70	54	17	70	89
SIGCO 455, Sigco Research	44	8,900	74	124	22	70	60	16	—	100
SIGCO 456, Sigco Research	43	8,400	74	125	25	76	52	—	—	97
SIGCO 468, Sigco Research	50	9,500	76	125	13	69	55	—	—	100
SIGCO 472, Sigco Research	45	10,800	74	—	15	70	53	15	78	100
Sokota 2057, Sokota Hybrid	45	9,700	70	120	13	66	38	15	77	75
Sokota 4000, Sokota Hybrid	46	11,300	74	—	13	66	43	18	63	94
Sokota 5000, Sokota Hybrid	45	10,500	74	122	16	67	47	13	63	80
Sokota 6000, Sokota Hybrid	47	8,700	74	125	17	69	60	24	77	74
S-1300, Stauffer Seeds	45	11,300	72	119	13	58	28	15	—	96
S-1830, Stauffer Seeds	48	8,600	71	119	25	65	42	14	—	100
S-1888, Stauffer Seeds	46	10,300	73	122	15	66	47	14	67	67
3101, Stauffer Seeds	39	13,000	70	119	10	60	31	13	70	100
GH10, TNT/SUN-FLO	46	10,300	74	—	17	66	46	13	61	90
GH20, TNT/SUN-FLO	46	—	73	—	15	67	—	17	—	100
L12, TNT/SUN-FLO	46	8,200	75	125	23	71	53	—	—	100
SS 300, TNT/SUN-FLO	46	11,100	75	123	16	64	42	—	—	100
XR28, TNT/SUN-FLO	48	7,400	76	126	23	74	68	17	—	100
134 Brand, TNT/SUN-FLO	46	11,300	74	123	16	66	45	—	—	89
634 Brand, TNT/SUN-FLO	47	9,500	74	125	12	66	50	—	74	98
Peredovik, USSR	45	6,800	75	128	26	74	64	—	—	25
Sputnik, USSR	49	6,800	73	125	27	76	58	—	—	24
LSD 5%							4	5		12

<sup>1</sup>Oven-dry. Crookston and Morris 1980-81, 83, 84; Lamberton 1980-84; Rosemount 1981-84. <sup>2</sup>Rosemount 1981-84. <sup>3</sup>Crookston 1980, 83, 84; Morris 1980-81, 83, 84; Lamberton 1980, 82-84; Rosemount 1982. <sup>4</sup>Crookston and Rosemount 1983-84. <sup>5</sup>Down or broken stalks. Crookston and Morris, 1981, 83, 84; Lamberton 1982, 84; Rosemount 1980, 83, 84. <sup>6</sup>Crookston and Morris 1980-81, 83, 84; Lamberton 1982, 84; Rosemount 1982-84. <sup>7</sup>Crookston 1981, 83, 84; Rosemount 1981-84. <sup>8</sup>Lamberton 1980-81, 83. <sup>9</sup>Damaged ray flowers and cupped heads. Crookston 1980-81; Morris 1981. <sup>10</sup>100 times yield of self-pollinated plants (covered with bags) divided by yield of cross-pollinated plants (no bags). Rosemount 1978-84.

Table 36. Characteristics of nonoilseed sunflower varieties, four location average

Variety and company	Large seed (percent) <sup>1</sup>	Test weight/ bushel (pounds) <sup>2</sup>	Seeds/ pound (number) <sup>2</sup>	Planting to		Lodging (percent) <sup>5</sup>	Height (inches) <sup>6</sup>	Head moisture (percent) <sup>7</sup>	Seed moisture (percent) <sup>8</sup>	Midge damage (percent) <sup>9</sup>	Artifact autogamy (percent) <sup>10</sup>
				bloom (days) <sup>3</sup>	maturity (days) <sup>4</sup>						
924, USDA	67	25	3660	73	124	25	65	56	23	79	96
Royal Hybrid 621, Agway	27	28	4160	72	125	16	65	57	22	78	84
Royal Hybrid 2121, Agway	34	27	3980	71	—	27	65	60	18	80	81
Royal Hybrid 2141, Agway	30	28	4090	72	124	9	67	60	18	83	68
D131, Dahlgren	28	27	4120	72	123	13	63	60	17	57	82
SIGCO 934, Sigco Research	35	26	3940	72	122	16	65	57	27	80	86
SIGCO 944, Sigco Research	16	26	4240	71	—	19	62	52	—	70	64
SIGCO 954, Sigco Research	43	25	3390	71	123	14	63	58	20	68	71
SIGCO 964, Sigco Research	38	26	3910	70	121	10	61	42	18	53	61
LSD 5%								4	7		12

<sup>1</sup>Held on a 20/64 round-hole sieve. Crookston and Morris 1981, 83, 84; Lamberton and Rosemount 1981-84. <sup>2</sup>Crookston and Morris 1981, 83, 84; Lamberton and Rosemount 1981-84. <sup>3</sup>Crookston 1980, 83, 84; Morris 1980, 81, 83, 84; Lamberton 1980, 82-84; Rosemount 1982. <sup>4</sup>Crookston and Rosemount 1983-84. <sup>5</sup>Down or broken stalks. Crookston and Morris 1981, 83, 84; Lamberton 1982, 84; Rosemount 1980, 83, 84. <sup>6</sup>Crookston and Morris 1980-81, 83, 84; Lamberton 1982, 84; Rosemount 1982-84; Rosemount 1982-84. <sup>7</sup>Crookston 1981, 83, 84; Rosemount 1981-84. <sup>8</sup>Lamberton 1980-81, 83. <sup>9</sup>Damaged ray flowers and cupped heads. Crookston 1980-81; Morris 1981. <sup>10</sup>100 times yield of self-pollinated plants (covered with bags) divided by yield of cross-pollinated plants (no bags). Rosemount 1978-84.

# Pulse Crops

## ADZUKI

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

All varieties in trials from 1980-83 were severely damaged by bacterial stem rot disease for which no control has been developed. The disease did not develop in 1984, and adzuki yields were high in both research plots and farm fields. The uncertainty of where or when severe losses will occur has delayed rapid expansion of adzuki production.

Research plot yields of Takara and Minoka varieties have

ranged from 0 to 3,000 pounds and averaged about 1,000 pounds per acre. The plants mature in about 110 days and are about 22 inches tall.

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

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

## FIELD BEAN

Fieldbean is combine-harvested as mature, dry seed. 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 1983 production amounted to 60 percent navy, 22 percent pinto, 15 percent red kidney, and 3 percent other classes. Varietal recommendations are confined to varieties within the navy, small white, pinto, dark red kidney, pink, black turtle soup, great northern, and small red classes. Other classes are grown successfully, but important differences among varieties within their classes have not yet been identified in our trials.

### RECOMMENDED VARIETIES

**Aurora small white**—High yield. Late. Erect vine. Very small, white seed. Released by New York Agricultural Experiment Station in 1973.

**Black Magic black turtle soup**—High yield. Late. Erect vine. Small, black seed. Released by Michigan Agricultural Experiment Station in 1981.

**Bunsi navy**—High yield. Late. Erect vine. Small, white seed. Released by Colombian Agriculture Institute. Rereleased by Michigan Agricultural Experiment Station in 1983.

**C-20 navy**—High yield. Late. Erect vine. Small, white seed. Developed by Campbell Soup Co. Released by Michigan Agricultural Experiment Station in 1982. Variety protection pending.

**Domino black turtle soup**—High yield. Late. Erect vine. Small, black seed. Released by Michigan Agricultural Experiment Station in 1981.

**Ebony black turtle soup**—High yield. Medium late. Erect vine. Small, black seed. Wilbur-Ellis Co., Spokane, WA 99206. Seed sale regulated by U.S. Variety Protection Act.

**Emerson great northern**—High yield. Medium late. Large, prostrate vine. Large, white seed. Released by Nebraska Agricultural Experiment Station in 1971.

**Fiesta pinto**—High yield. Early. Large, prostrate vine. Large, pinto seed. Released by Idaho Seed Bean Co., Twin Falls, ID 83301 in 1981. Seed sale regulated by U.S. Variety Protection Act.

**Fleetwood navy**—High yield. Late. Medium-size bush. Small, white seed. Released by Agriculture Canada, Harrow. Licensed in 1977.

**Gala pinto**—High yield. Medium maturity. Large, prostrate vine. Tan and brown mottled seed. Released by Idaho Seed Bean Co., Twin Falls, ID 83301 in 1981. Variety protection pending.

**Harofleet navy**—High yield. Late. Medium size bush. Small, white seed. Developed by Agriculture Canada, Harrow and University of Guelph. Licensed in 1983.

**Midnight black turtle soup**—Medium yield. Late. Erect vine of excellent type for combine-harvest. Small, black seed. Released by Cornell University Agricultural Experiment Station in 1980. Seed sale regulated by U.S. Variety Protection Act.

**Montcalm dark red kidney**—Medium yield. Late. Large, erect bush. Very large, dark red seed. Released by Michigan Agricultural Experiment Station in 1974.

**Nodak pinto**—High yield. Early. Large, prostrate vine. Medium size, pinto seed. Released by USDA and North Dakota, Washington, and Idaho Agricultural Experiment Stations in 1984.

**OAC Seaforth navy**—Medium yield. Early. Erect bush. Small, white seed. Developed by Agriculture Canada, Harrow and University of Guelph. Licensed in 1983.

**Pindak pinto**—High yield. Medium maturity. Large, prostrate vine. Small, pinto seed. Released by USDA and North Dakota Agricultural Experiment Station in 1981.

**Seafarer navy**—Medium yield. Early. Erect bush. Small white seed. Released by Michigan Agricultural Experiment Station in 1967.

**Snow-Bunting navy**—Medium yield. Early. Medium-size bush. Small, white seed. Released by Clarence Muehlfeld, Bridgeport, MI 48722 in 1974. Distributed by Lakeland Bean Company, Olivia, MN 56277.

**Snow-Flake navy**—Medium yield. Early. Erect bush. Small, white seed. Released by Clarence Muehlfeld, Bridgeport, MI 48722 in 1974. Distributed by Lakeland Bean Company, Olivia, MN 56277.

**T39 black turtle soup**—High yield. Medium late. Erect vine. Small, black seed. Released by California Agricultural Experiment Station.

**UI-37 small red**—Low yield. Very early. Short, usually erect vine. Large, dark red seed. Released by Idaho Agricultural Experiment Station in 1964. *Recommended only as a very early maturing fieldbean; other small red varieties yield more in a normal growing season.*

**Up-Land navy**—Medium yield. Medium maturity. Medium size bush. Small, white seed. Released by Clarence Muehlfeld, Bridgeport, MI 48722 in 1974.

**Viva pink**—High yield. Late. Large, prostrate vine. Pink seed resistant to splitting. Released by Washington Agricultural Experiment Station and USDA in 1974.

#### VARIETIES NOT ADEQUATELY TESTED

**Chico light red kidney**—High yield. Very late. Large, erect bush. Very large light red seed. Released by California Agricultural Experiment Station in 1983.

**Crestwood navy**—High yield. Late. Medium size bush. Large, navy seed. Developed by Gen-Tec Seeds Ltd., Box 98, Woodslee, Ontario NOR 1V0. Variety protection pending.

**Ex Rico 23 navy**—High yield. Late. Erect vine. Small, white seed. Released by University of Guelph, Ontario, Canada. Licensed in 1980.

**Harold pink**—High yield. Late. Large, prostrate vine. Larger seed than Viva. Released by Washington, Idaho, and Oregon Agricultural Experiment Stations and USDA in 1984.

**Isabella light red kidney**—Low yield. Early. Large, erect bush. Very large, light red seed. Released by Michigan Agricultural Experiment Station in 1983.

**Laker navy**—Medium yield. Late. Medium size bush. Resistant to lodging. Small, white seed. Released by Michigan Agricultural Experiment Station and USDA in 1984.

**Linden light red kidney**—High yield. Very late. Large, erect bush. Very large, light red seed. Released by California Agricul-

tural Experiment Station in 1981.

**Midland navy**—Medium yield. Medium maturity. Bush. Small navy seed. Developed by W. T. Thompson and Sons, Blenheim, Ontario. Distributed by Asgrow Seed Co., Twin Falls, ID 83301. Variety protection pending.

**Northland navy**—Low yield. Very early. Small bush. Small, white seed. Developed by W. T. Thompson and Sons, Blenheim, Ontario. Distributed by Asgrow Seed Co., Twin Falls, ID 83301. Variety protection pending.

**Pulsar navy**—Medium yield. Medium maturity. Short vine. Very small, navy seed. Wilbur-Ellis Co., Spokane, WA 99206.

**Red Kloud light red kidney**—Low yield. Early. Large, erect bush. Very large, light red seed. Released by Cornell University Agricultural Experiment Station in 1973.

**Ruddy light red kidney**—Low yield. Very early. Large, erect bush. Very large, light red seed. Released by Cornell University Agricultural Experiment Station in 1982.

**Spinel great northern**—High yield. Late. Bush. Medium large, white seed. Released by Rogers Brothers Seed Co., Twin Falls, ID 83301. Seed sale regulated by U. S. Variety Protection Act.

**Victor pink**—High yield. Very late. Large, prostrate vine. Larger seed than Viva. Released by Washington, Idaho, and Oregon Agricultural Experiment Stations and USDA in 1983.

**Wesland navy**—Medium yield. Late. Bush. Small, white seed. Developed by W. T. Thompson and Sons, Blenheim, Ontario. Distributed by Asgrow Seed Co., Twin Falls, ID 83301. Variety protection pending.

**Wyo 167 pinto**—High yield. Late. Large, prostrate vine. Large pinto seed. Released by Wyoming Agricultural Experiment Station in 1983.

#### OTHER VARIETIES

**Admiral navy**—Medium yield. Late. Bush. Released by Idaho Seed Bean Co., Twin Falls, ID 83301 in 1981. Variety protection pending.

**Agate pinto**—Medium yield. Early. Bush. Released by Rogers Brothers Seed Co., Idaho Falls, ID 83401 in 1982. Seed sale regulated by U.S. Variety Protection Act.

**Amber pinto**—Medium yield. Medium maturity. Bush. Released by Rogers Brothers Seed Co., Idaho Falls, ID 83401 in 1982. Seed sale regulated by U.S. Variety Protection Act.

**Bos'n navy**—Medium yield. Late. Bush. Released by Idaho Seed Bean Co., Twin Falls, ID 83301 in 1981. Variety protection pending.

**Captain navy**—Low yield. Late. Bush. Released by Idaho Seed Bean Co., Twin Falls, ID 83301 in 1981. Variety protection pending.

**Harris great northern**—High yield. Very late. Large, prostrate vine. Seed quality frequently poor. Released by Nebraska Agricultural Experiment Station in 1980. Seed sale regulated by U.S. Variety Protection Act.

**Holberg pinto**—High yield. Very late. Large, prostrate vine. Small, pinto seed. Released by North Dakota Agricultural Experiment Station and USDA in 1983.

**Neptune navy**—High yield. Very late. Erect vine. Small, white seed. Released by Michigan Agricultural Experiment Station in 1981.

**NW 395 navy**—Medium yield. Medium maturity. Short vine. Large, navy seed. Released by Washington Agricultural Experiment Station and USDA in 1979.

**NW 410 pinto**—Lower yield than UI-114. Late. Large, prostrate vine. Small, pinto seed. Released by USDA and Washington Agricultural Experiment Station in 1980.

**Olathe pinto**—Medium yield. Late. Small, pinto seed. Large, prostrate vine. Lower yield than UI-114 but is tolerant of rust. Released by Colorado Agricultural Experiment Station in 1979. Seed sale regulated by U.S. Variety Protection Act.

**Sanilac navy**—Medium yield. Medium late. Bush. Released by Michigan Agricultural Experiment Station in 1956.

**Swan Valley navy**—High yield. Very late. Erect vine. Small, white seed. Released by Michigan Agricultural Experiment Station in 1981.

**UI-36 small red**—Medium yield. Medium maturity. Large, prostrate vine. Seed quality frequently poor. Released by Idaho Agricultural Experiment Station in 1964.

**UI-111 pinto**—Medium yield. Late. Large, prostrate vine. Released by Idaho Agricultural Experiment Station in 1945.

**UI-114 pinto**—High yield. Late. Large, prostrate vine. Released by Idaho Agricultural Experiment Station in 1965.

**Wyo 166 pinto**—High yield. Late. Large, prostrate vine. Released by Wyoming Agricultural Experiment Station in 1965.

Table 37. Characteristics of fieldbean varieties, 1982-84

Class and variety	Seed yield/acre (pounds)				Yield/acre (pounds)	Average—4 locations		
	Becker <sup>1</sup>	Lamberton	Morris	Crookston		Seeds/pound (number)	Planting to maturity (days)	Growth (habit) <sup>2</sup>
<b>Pinto</b>								
Fiesta	2484	1132	1838	2267	1930	1130	96	V
Gala	2595	1022	2042	2285	1986	1200	97	V
Nodak	2554 <sup>3</sup>	948	2004	2228	1934	1340	94	V
Pindak	2286	1106	1671	1849	1728	1500	97	V
UI-114	2160	1163	1891	2027	1810	1270	102	V
Wyo 167	2697 <sup>4</sup>	1101 <sup>4</sup>	1905 <sup>4</sup>	1819 <sup>3</sup>	1881	1210	102	V
<b>Navy</b>								
Bunsi <sup>4</sup>	2144	828	1612	1872	1614	2470	102	ESV
C-20	2150	1099	2061	1594	1726	2450	106	ESV
Fleetwood	2423	1198	1812	1725	1790	2490	103	B
Harofleet	2481	1091	1664	1827	1766	2560	104	B
OAC Seaforth	1742	1012	1460	921	1284	2530	94	B
Seafarer	1546	959	1499	1424 <sup>5</sup>	1357	2510	93	B
Snow Bunting	1820	902	2007	1556	1571	2370	94	B
Snow-Flake	1830 <sup>3</sup>	1062 <sup>3</sup>	1600 <sup>3</sup>	1105 <sup>4</sup>	1399	2310	94	B
Up-Land	2057	1092	1962	1324	1609	2450	96	B
Crestwood <sup>4</sup>	2298	956	1753	1821	1707	2160	104	B
Ex Rico 23	2225	1020	1938	1241	1606	2220	101	ESV
Laker	2069 <sup>4</sup>	1113 <sup>4</sup>	1559 <sup>3</sup>	1584 <sup>4</sup>	1581	2510	106	B
Midland <sup>4</sup>	1419	825	1746	1371	1340	3000	97	B
Neptune	2326	1321	2101	1325 <sup>6</sup>	1768	2650	107	ESV
Northland <sup>4</sup>	1555	731	1584	807	1169	2530	92	B
Pulsar <sup>4</sup>	1332	878	1736	2107	1513	2840	98	SV
Swan Valley	2419	1251	1807	1587	1766	2680	107	ESV
Wesland <sup>4</sup>	1799	827	1783	1859	1567	2480	100	B
<b>Small White</b>								
Aurora	2246	1174	1991	1974	1846	3060	105	ESV
<b>Great Northern</b>								
Emerson	2614	1267	1948	2219	2012	1010	99	V
Spinel <sup>4</sup>	1862	1517	2222	1611	1803	1330	102	B
<b>Small Red</b>								
UI-37	1678	690	1238	1413	1255	1520	88	ESV
<b>Pink</b>								
Viva	2036	1296	1894	1656	1721	1780	102	V
Harold	1786 <sup>4</sup>	1155 <sup>4</sup>	1906 <sup>4</sup>	1883 <sup>3</sup>	1683	1550	100	V
Victor	2233 <sup>4</sup>	1151 <sup>4</sup>	1716 <sup>4</sup>	1812 <sup>3</sup>	1728	1490	97	V
<b>Dark Red Kidney</b>								
Montcalm	2318	750	1453	1482	1501	1030	103	B
<b>Light Red Kidney</b>								
Chico	2894 <sup>4</sup>	802 <sup>3</sup>	1839 <sup>4</sup>	1299 <sup>4</sup>	1709	950	106	B
Isabella	1743 <sup>3</sup>	636 <sup>3</sup>	1296 <sup>3</sup>	1043 <sup>3</sup>	1180	1130	94	B
Linden	2747 <sup>4</sup>	917 <sup>3</sup>	1699 <sup>4</sup>	1650 <sup>4</sup>	1753	970	108	B
Red Kloud	2207	538	1356	1077	1295	1030	94	B
Ruddy	1706	507	1159	1195	1142	1260	92	B
<b>Black Turtle Soup</b>								
Black Magic	2374	1275	2016	1684	1837	2340	102	ESV
Domino	2423	1063	2093	1825	1851	2360	102	ESV
Ebony	2407	1126	2069	1968	1893	2330	100	ESV
Midnight	1931	1125	1915	1590	1640	2470	101	ESV
T 39	2208	1199	2050	1741	1800	2270	100	ESV
LSD 5%	246	235	223	323	130			

<sup>1</sup>Irrigated. <sup>2</sup>V = vine, SV = short vine, ESV = erect short vine, B = bush. <sup>3</sup>1983-84. <sup>4</sup>1984. <sup>5</sup>1982-83. <sup>6</sup>1982, 84.



Table 38. Reaction of fieldbean varieties to some important pathogens and air pollution<sup>1</sup>

Class and variety	Rust <sup>2</sup>	Blight <sup>2</sup>		Mosaic		Anthracnose <sup>3</sup>	Fusarium root rot <sup>2</sup>	White mold <sup>2</sup>	Air pollution <sup>2</sup>
		Common	Halo	V1	V15				
<b>Pinto</b>									
Fiesta	S	S	T	T	T	—	S	S	—
Gala	S	S	T	T	T	B	S	S	S
Nodak	T	S	S	T	T	—	T	—	—
Pindak	T	S	T	T	T	S	T	S	S
Holberg	S	S	T	T	T	S	T	S	—
Olathe	T	S	T	T	T	BG	S	S	S
UI-111	S	S	T	T	S	S	S	S	S
UI-114	S	S	T	T	T	S	T	S	S
Wyo 166	S	S	T	T	S	—	S	S	S
Wyo 167	S	S	T	T	S	—	S	S	S
<b>Navy</b>									
Bunsi	T	S	T	T	T	G	S	T	T
C-20	T	S	T	T	T	BGD	T	T	T
Fleetwood	T	S	T	T	T	ABG	S	S	T
Harofleet	T	S	T	T	T	ABGD	S	S	T
OAC Seaforth	S	S	T	T	T	ABGD	S	S	S
Seafarer	S	S	T	T	T	ABG	S	S	S
Snow-Bunting	S	S	T	T	S	AB	S	S	S
Snow-Flake	S	S	T	S	S	A	S	S	S
Up-Land	S	S	T	T	S	A	S	S	S
Admiral	T	S	T	T	T	S	S	S	S
Bos'n	T	S	T	T	T	S	S	S	S
Crestwood	S	S	T	T	T	ABGD	S	T	T
Ex Rico 23	T	S	T	T	T	G	S	T	S
Laker	T	S	T	T	T	AG	S	S	T
Midland	S	S	T	T	T	S	S	S	S
Neptune	T	S	T	T	T	S	T	T	T
Northland	S	S	T	T	T	S	S	S	S
NW 395	—	S	T	T	T	—	S	T	S
Pulsar	—	S	T	T	T	—	T	S	S
Sanilac	S	S	T	T	S	ABG	S	S	S
Swan Valley	T	S	T	T	T	BGD	T	T	T
Wesland	S	S	T	T	T	S	S	S	S
<b>Small White</b>									
Aurora	T	S	T	T	T	BG	T	T	T
<b>Great Northern</b>									
Emerson <sup>4</sup>	S	T	T	T	T	—	—	S	S
Harris	S	T	T	T	T	—	—	S	S
Spinel	T	S	T	T	T	—	—	S	S
<b>Small Red</b>									
UI-37	S	S	S	T	T	—	S	S	S
<b>Pink</b>									
Viva	S	S	T	T	T	—	T	S	S
Harold	S	S	T	T	T	—	T	S	—
Victor	S	S	T	T	T	—	T	S	—
<b>Dark Red Kidney</b>									
Montcalm	T	S	T	T	T	A	S	S	T
<b>Light Red Kidney</b>									
Chico	—	S	—	—	—	—	—	—	—
Isabella	T	S	T	T	T	S	S	S	T
Linden	T	S	S	R	R	—	S	S	T
Red Kloud	T	S	T	T	T	G	S	S	T
Ruddy	—	S	S	T	T	S	S	S	T

Table 38 (continued). Reaction of fieldbean varieties to some important pathogens and air pollution<sup>1</sup>

Class and variety	Rust <sup>2</sup>	Blight <sup>2</sup>		Mosaic		Anthracnose <sup>3</sup>	Fusarium root rot <sup>2</sup>	White mold <sup>2</sup>	Air pollution <sup>2</sup>
		Common	Halo	V1	V15				
<b>Black Turtle Soup</b>									
Black Magic	T	S	T	T	T	G	T	T	T
Domino	T	S	T	T	T	BGD	T	T	T
Ebony	T	S	T	T	T	—	T	S	T
<b>Midnight<sup>5</sup></b>									
T 39	T	S	T	T	T	BGD	T	T	T
	T	S	T	T	T	G	T	T	T

<sup>1</sup>Many of these reactions are adapted from North Central Regional Extension Publication 198 and other sources. <sup>2</sup>T=tolerant or resistant, S=susceptible. <sup>3</sup>Resistant to A=alpha, B=beta, G=gamma, and D=delta races of anthracnose. <sup>4</sup>Resistant to bacterial wilt. <sup>5</sup>Resistant to pythium root rot.



The viny fieldbean variety (right) contrasts with the bush variety (left). Former student J. McCullough at Becker.

## FIELDPEA, FABABEAN, AND LUPINE

Fieldpea is usually combine-harvested as mature, dry seed. The seed is sold 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, fieldpea 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.

All five recommended varieties produce seed of satisfactory cooking quality. Century, Lenca, and Trapper are also useful as forage crops and are grown alone or in mixture with small grains for silage or feed grain.

Fababean and lupine, like fieldpea, are planted in April with a grain drill, and the seed is used for livestock feed. More information on these crops is available in Minnesota Agricultural Experiment Station AD-MR-2339: "Crop sequence effects of pulse crops and agronomic research on lupine."

### RECOMMENDED VARIETIES

**Century**—Medium yield and maturity. Long vined. Large, cream-colored seed. Released by Agriculture Canada, Ottawa. Licensed in 1960.

**Lenca**—High yield. Medium maturity. Medium vine length. Medium size, cream-colored seed. Susceptible to powdery mildew. Released by Agriculture Canada, Morden, in 1979. Production of certified seed limited to Canada.

**Miranda**—Very high yield. Very early. Very short. Very large, cream-colored seed. Released by Cebeco-Handelsraad of The Netherlands. Seed distributed by Wilbur-Ellis Co., Spokane, WA 99206. Seed sale regulated by U.S. Variety Protection Act.

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

**Trapper**—Medium yield, maturity, and vine length. Small, cream-colored seed. Suitable for birdfeed markets that require small, "yellow" seed. Released by Agriculture Canada, Morden. Licensed in 1970.

### VARIETIES NOT ADEQUATELY TESTED

**Belinda**—Very high yield. Early. Very short. Large, cream-colored seed. Developed by Cebeco-Handelsraad of The Netherlands. Seed obtained from International Seeds Inc., Halsey, OR 97348.

### OTHER VARIETIES

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

**Tara**—High yield. Medium maturity. Long-vined. Medium size, cream-colored seed. Satisfactory cooking quality, but irregular seed shape undesirable. Resistant to powdery mildew. Released by Agriculture Canada, Morden. Licensed in 1978. Production of certified seed limited to Canada.

Table 39. Characteristics of fieldpea varieties, fababean, and lupine

Variety	Seed yield/acre (pounds)			Seeds/ pound (number)	Seed protein <sup>2</sup> (percent)	Planting to		Plant length (inches)
	Becker <sup>1</sup> 1981-84	Grand Rapids 1981-84	Crookston 1981			bloom (days)	maturity (days)	
Century	1492	1924	2580	2220	26.5	63	101	61
Lenca	2109	2298	2988	2520	25.3	62	98	53
Miranda	3384	2709	3630	1430	23.4	57	95	22
Paloma	3103	2485	2990	1640	25.3	58	96	21
Belinda <sup>3</sup>	3458	2444	—	1660	24.4	58	96	18
LSD 5%	194	241	694					
		Fababean and lupine grown beside the fieldpea trials <sup>4</sup>						
Fababean	3091	1992	3286	1150	29.5	59	111	44
Lupine	1340	633	0	1720	—	57	117	29

<sup>1</sup>Irrigated. <sup>2</sup>Oven-dry. <sup>3</sup>1984. <sup>4</sup>Minnesota fababean 1981, Outlook fababean 1982-84, Gela lupine 1981-82, Ultra lupine 1983-84.

## LENTIL

Lentil is a pulse crop, and the seed is used in soup. The crop is sown with a grain drill and harvested with a windrower and combine.

**Eston**—High yield. Medium maturity. Short. Very small seed. Released by University of Saskatchewan. Licensed in 1981. Production of certified seed limited to Canada.

**Laird**—Low yield. Late maturity. Medium height. Large seed. Released by University of Saskatchewan. Licensed in 1978. Production of certified seed limited to Canada.

**Brewer**—Medium yield, maturity, and height. Medium size

seed. Released by Washington Agricultural Experiment Station and USDA in 1982.

**Chilean 78**—Medium yield, maturity, and height. Medium size seed. Chilean, introduced to the U.S. about 1920, is the principal variety grown. Chilean 78 was distributed to growers in 1981.

**Red Chief**—Medium yield, maturity, and height. Medium size seed. Cotyledon color in the seed is brick red in contrast to the yellow of other varieties. Released by Washington Agricultural Experiment Station and USDA in 1980.

Table 40. Characteristics of lentil varieties

Variety	Seed yield/acre (pounds)			Seeds/ pound (number)	Seed protein (percent) <sup>2</sup>	Height (inches)	Lodging (score) <sup>3</sup>	Planting to	
	Becker <sup>1</sup> 1982-84	Grand Rapids 1982-84	Crookston 1981					bloom (days)	maturity (days)
Eston	1650	1111	1631	15,400	26.4	16	3.3	60	103
Laird	820	397	1242	7,800	25.6	21	3.4	64	106
Brewer	1357	965	—	9,200	26.8	18	4.4	57	100
Chilean 78	1226	804	—	9,800	26.6	19	4.8	58	100
Red Chief	1574	817	—	9,400	27.2	17	4.7	57	100
LSD 5%	164	165	694						

<sup>1</sup>Irrigated. <sup>2</sup>Oven-dry. <sup>3</sup>1 = erect, 9 = flat.

## PLANTING RATE AND DATE

Rates are based on normal seedbeds and on 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) <sup>1</sup>	Seeds/pound (number)	Rate/acre (pounds)	Rate (seeds)	Date
Barley	48	14,300	85	28/square foot	Early spring
Corn	56	1,400	17	24,000/acre	Late April or early May
Fieldbean Black turtle soup	60	2,300	35	78,000/acre	May 20 to June 15
Great northern		1,000	75	78,000/acre	
Kidney		900	90	80,000/acre	
Navy		2,500	30	78,000/acre	
Navy 6- to 14-inch rows			60	155,000/acre	
Pink		1,700	45	78,000/acre	
Pinto		1,300	60	78,000/acre	
Small Red		1,400	55	78,000/acre	
Small White		3,000	25	78,000/acre	
Flax	56	88,000	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	136,000	16	50/square foot	Early spring or summer
in mixtures			10	31/square foot	
Orchardgrass in mixtures	14	653,000	2	30/square foot	Early spring or summer
Reed canarygrass alone	46	526,000	7	85/square foot	Early spring or summer
in mixtures			5	60/square foot	
Tall fescue in mixtures	25	229,000	4	21/square foot	Early spring or summer
Timothy in mixtures	45	1,234,000	3	85/square foot	Early spring or summer
Forage Legumes (perennial)					
Alfalfa alone	60	199,000	11	50/square foot	Early spring to August 10
with grass			7	32/square foot	
Alsike clover in mixtures	60	653,000	2	30/square foot	Early spring to August 10
Birdsfoot trefoil alone	60	372,000	7	60/square foot	Early spring or summer
with grass			4	34/square foot	
Ladino clover in mixtures	60	784,000	1	18/square foot	Early spring to August 10
Red clover alone	60	252,000	9	50/square foot	Early spring to August 10
with grass			5	30/square foot	
Oat	32	15,200	80	28/square foot	Early spring
Rye	56	18,200	60	25/square foot	September
Sorghum 18- to 40-inch rows	56	15,000	10	150,000/acre	May 20 to June 5 for grain
6- to 14-inch rows			15	5/square foot	
Soybean 6- to 8-inch rows	60	2,800	80	3/foot of row	May 5 to May 25
20-inch rows			65	7/foot of row	
30-inch rows			55	9/foot of row	
40-inch rows			50	11/foot of row	
Sunflower Nonoilseed	24	4,300	4	17,000/acre	May 1 to June 15
Oilseed	27	7,700	3	23,000/acre	
Wheat Durum	60	12,100	90	25/square foot	Early spring
Hard red spring		15,200	80	28/square foot	Early spring
Winter		14,500	75	25/square foot	August 20 to September 20
Other Crops					
Adzuki	60	3,500	25	78,000/acre	May 20 to June 10
Annual canarygrass	50	58,000	30	40/square foot	Early spring
Buckwheat	48	14,900	50	17/square foot	June 15 to July 20
Canola <i>B. napus</i>	50	140,000	8	25/square foot	May
Canola <i>B. campestris</i>	50	210,000	5	25/square foot	May
Fieldpea	60	2,300	180	9/square foot	Early spring
With 1½ to 2 bushels of oat			70	4/square foot	
Fababean-medium size	60	1,300	180	5/square foot	Early spring
With 2 bushels of oat			60	2/square foot	
Lentil-small	60	15,600	55	20/square foot	Early spring
Lupine 6- to 8-inch rows	60	1,500	170	6/square foot	Early spring
30-inch rows			70	6/foot of row	
Millet Foxtail	48	218,000	15	75/square foot	June 15 to July 15
Proso	56	65,000	20	30/square foot	June 15 to July 15
Mustard Yellow	56	90,000	12	25/square foot	May
Oriental, Brown	50	180,000	6	25/square foot	May
Rape Forage	50	145,000	6	20/square foot	Early spring with oat
Oilseed	50	136,000	8	25/square foot	May
Sudangrass 18- to 40-inch rows	40	44,000	10	25/foot of row	May 20 to June 10
6- to 14-inch rows			20	20/square foot	
Sweetclover	60	240,000	10	55/square foot	Early spring
Wild rice (wet)	25	7,900	33	6/square foot	Late fall

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