

# 1986 EDITION

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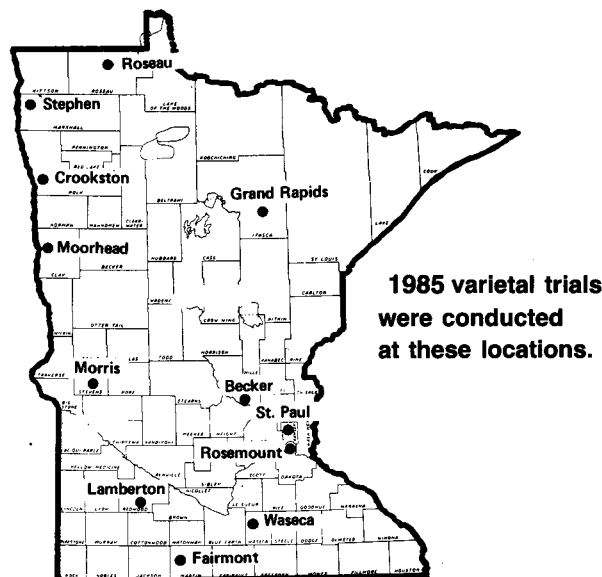
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# VARIETAL TRIALS OF FARM CROPS

AGRICULTURAL EXPERIMENT STATION—UNIVERSITY OF MINNESOTA

ITEM NO. AD-118-1985 (FORMERLY MINNESOTA REPORT 24)

## 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 1986 Planting. This annual publication can be obtained without charge from the Minnesota Crop Improvement As-

sociation, 1900 Hendon Avenue, St. Paul, MN 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-tangierpea, flax, grain sorghum, lentil, millet, mustard-canola-oil-seed rape, sunflower, and rye); D.K. Barnes and N.P. Martin (alfalfa, birdsfoot trefoil, brome grass, orchardgrass, red clover, reed canarygrass, tall fescue, and timothy); D.C. Rasmusson (barley); J.L. Gadelmann and R.H. Peterson (corn); 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 and assistant extension specialist P.R. Montgomery are other members of the committee for 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 and W. Stienstra (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.

Data from this report may be quoted or published in either complete or modified form provided that the data are not chosen to distort conclusions.

The University of Minnesota, including the Agricultural Experiment Station, is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, religion, color, sex, national origin, handicap, age or veteran status.

# 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 1986, are listed in this report.

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

The varieties listed in tables 1 and 2 are ranked according to 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. *Moderately winterhardy varieties* usually reach 1/10 bloom several days earlier than more winterhardy varieties. They are also characterized by rapid recovery after harvest.

*Nonwinterhardy varieties* should not be grown in Minnesota except for plowdown in the seedling year. Varieties in this group are not listed in the tables but include Amador, Ardiente, AS-13R, AS-49R, Caliente, Caliverde 65, CUF 101, Florida 77, Granada,

Table 1. Average yields of alfalfa varieties expressed as percentage of Vernal for all tests in Minnesota, 1959-85

Variety	Test Location <sup>1</sup>						Number tests	Yield (percent of Vernal)					
								Year after seeding				Average over years	
								1st	2nd	3rd	4th	1-2	3-4
<b>VERY WINTERHARDY</b>													
Rambler	†		†	†			4	85	86	83	85	86	84
Prowler	†	†	†	†	†	†	6	98	93	96	90	95	92
Ladak	†						3	87	88	78	89	88	82
Spredor II	†	†		†		†	4	95	89	91	82	93	87
Teton	†		†	†			7	89	93	86	93	91	90
Travois	†	†	†	†			5	88	88	88	87	88	88
Maverick	†	†	†	†	*	†	6	96	101	92	—	98	92
<b>WINTERHARDY</b>													
Wrangler	*	†				†	4	99	108	130	—	101	130
Victoria	†						2	99	100	100	95	100	98
Vernal, tons/acre, 15% M	†	†	†	*	†	†	80	4.8	4.6	4.5	4.4	4.7	4.2
Baker	*	†	*	*	†	†	15	97	98	105	106	97	105
Dawson	†	†	†	†			8	100	104	104	100	102	101
526	*	*	*	*	*	*	6	107	109	113	—	108	113
Vancor	†	†	†	†	†	†	6	103	100	102	88	102	95
G2818	†	†		†		†	5	102	104	97	95	103	96
Agate	†	†	†	†	†	†	29	98	99	101	98	99	100
Iroquois	†	†	†	†	†	*	15	106	104	104	109	105	106
Ladak 65	†			†	†		5	100	101	99	97	101	98
524	*	†	†	*	†	†	9	106	101	105	104	104	104
Blazer	*	*	†	†	†	†	10	105	104	111	110	104	110
545	†	*	†	†	†	†	8	100	102	104	105	101	104
Thunder	†	†	†	†	†	†	7	103	100	104	104	103	104
Phytor	†	*	†	†	*	†	8	102	104	107	108	103	108
Valor	†	*	†	*	†	†	9	100	103	103	105	101	104
120	*	*	†	*	*	*	11	107	110	114	113	108	114
A-54	†	†	*	*		†	6	102	108	111	102	105	106
Ranger	†	†	†	†	†	†	26	97	98	97	99	97	97
532	†	*	*	†	†	*	7	110	103	104	108	107	105
Polar II	†	†	†	†	†	†	7	99	99	98	79	99	95

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.

The asterisks under "test location" in table 1 indicate that the variety yielded in the top 20 percent of entries for one or more tests.

**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 seed-

ing. 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 resis-

Table 1 (continued). Average yields of alfalfa varieties expressed as percentage of Vernal for all tests in Minnesota, 1959-85

Variety	Test Location <sup>1</sup>						Number tests	Yield (percent of Vernal)					
	R	W	L	M	C	G		Year after seeding				Average over years	
								1st	2nd	3rd	4th	1-2	3-4
<b>MODERATELY WINTERHARDY</b>													
Marathon	†	†	†	†		†	6	104	104	100	92	104	98
Oneida	†	*	†		†	*	8	104	105	105	105	104	105
Apollo	†	*	†	†		*	11	101	100	103	107	101	105
Vernema	*	†	*	†		†	5	108	104	102	—	106	102
Expo	†	†	†	*	*	†	6	99	105	103	102	103	103
G7730	†	†	†		*	†	6	100	103	107	112	101	109
Magnum	*	†	*	†	†	†	7	105	101	109	113	103	111
Perry	†	†	*		†		5	102	104	108	108	103	108
Advantage	†	*	†	†	*	†	7	104	103	101	104	104	102
Answer	†	*	†	*		†	7	105	102	105	102	103	104
Endure	*	†				†	4	105	108	113	—	106	113
Honeoye	†	†	†		*	†	6	103	103	103	102	103	103
Primal	†	†	*	*		*	8	107	106	101	100	106	100
Saranac AR	*	†	†	†	†	†	19	103	101	99	98	102	99
Apollo II	†	†	†	*	†	†	8	101	103	97	88	102	94
Duke	†	†	†	*	†	†	7	102	104	102	100	103	101
DK 135	*	†	*	†	†	†	6	102	105	104	—	104	104
Peak	*	*	†	*		†	9	106	106	112	112	106	112
Preserve	*	†				†	4	103	104	93	—	104	93
Saranac	†	†	†	†	†	†	39	104	103	101	102	103	100
Thor	†	†	†		†	*	10	103	103	100	102	103	102
Trident	†	†	†	†	†	†	8	103	104	103	108	103	105
Spectrum	†	*	†	*	†	†	7	105	104	96	—	105	96
Drummor	*	†				†	4	100	104	90	—	101	90
G-2815	†	†	†	†	†	†	7	99	98	103	102	99	103
A-57	†	†	*	†		†	7	99	99	93	98	99	95
Trumpetor	†	*	*	†	†	*	8	104	105	99	84	104	97
Aquarius	†	†		†			5	97	103	99	94	100	97
Decathlon	†	†		†		†	5	100	97	85	—	99	—
Sparta	*						2	108	108	—	—	108	—
Target	†						1	103	—	—	—	103	—
Armor	†	*	*	†	*	*	8	105	105	107	101	105	104
A-24	†						1	109	101	—	—	105	—
Hi-Phy	†	*	†	†	†	†	7	102	107	111	118	105	115
Epic	*	†	*	*		†	9	101	108	110	116	104	113
Cimarron	†	*		†		†	3	105	86	84	94	98	90
Shenandoah	†	*				*	3	109	95	95	—	106	93
Maxim	†	†				†	3	103	—	—	—	103	—
Challenger	†	†				†	4	101	96	82	—	100	82

<sup>1</sup>Test locations: R - Rosemount, W - Waseca, L - Lamberton, M - Morris, C - Crookston, G - Grand Rapids; † = tested at location, \* = tested at location and yielded in top 20 percent of entries for one or more tests.

tance 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, Sparta, 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)	
----- highest value best -----						
<b>VERY WINTERHARDY</b>						
Rambler	Agr. Canada <sup>u</sup>	8.0	16	3	—	S
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>z</sup>	7.3	42	17	36	S
<b>WINTERHARDY</b>						
Wrangler	USDA & Nebraska Agr. Exp. Sta. <sup>w</sup>	7.0	36	47	42	LR
Victoria	Arkansas Agr. Exp. Sta. <sup>p*</sup>	6.9	5	12	48	S
Vernal	Wisconsin Agr. Exp. Sta. & USDA <sup>afhijop*qtuw</sup>	6.5	42	5	32	S
Baker	USDA & Nebraska Agr. Exp. Sta. <sup>aj</sup>	6.5	49	2	36	LR
Dawson	USDA & Nebraska Agr. Exp. Sta. <sup>aj</sup>	6.5	15	1	35	S
526	Pioneer Hi-Bred International Inc. <sup>pp*</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>afhijop*qtuw</sup>	6.0	65	43	54	MR
Iroquois	Cornell University <sup>iop*qtw</sup>	6.0	61	1	22	S
Ladak 65	Montana Agr. Exp. Sta. <sup>p*</sup>	6.0	36	2	15	S
524	Pioneer Hi-Bred International Inc. <sup>p</sup>	5.9	24	8	44	LR
Blazer	Land O'Lakes <sup>i</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>i</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>t</sup>	5.4	26	11	25	—
Ranger	USDA & Nebraska Agr. Exp. Sta. <sup>aho</sup>	5.4	18	4	25	S
532	Pioneer Hi-Bred International Inc. <sup>p</sup>	5.4	63	7	37	MR
Polar II	Pride Seed Co. <sup>r</sup>	5.3	57	60	34	S
<b>MODERATELY WINTERHARDY</b>						
Marathon	Cargill Inc. <sup>b</sup>	5.2	36	2	13	S
Oneida	Cornell University <sup>wp*t</sup>	5.1	62	52	62	S
Apollo	AgriPro <sup>xz</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>oo</sup>	4.7	55	62	62	LR
Magnum	Dairyland Seed Co. Inc. <sup>d</sup>	4.7	51	5	32	MR
Perry	USDA & Nebraska Agr. Exp. Sta.	4.7	30	10	38	S
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
Honeye	Cornell University <sup>p*</sup>	4.6	16	1	19	S
Primal	Pride Seed Co. <sup>r</sup>	4.6	62	9	33	S
Saranac AR	Cornell University <sup>ip*</sup>	4.6	35	14	44	HR
Apollo II	AgriPro <sup>fxz</sup>	4.5	43	54	47	MR

Table 2 (continued). 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>MODERATELY WINTERHARDY</b>						
----- highest value best -----						
Duke	AgriPro <sup>k</sup>	4.5	43	55	43	MR
DK 135	DeKalb-Pfizer Genetics <sup>o</sup>	4.5	26	20	46	MR
Peak	Research Seeds, Inc. <sup>p*o</sup>	4.5	52	16	28	LR
Preserve	Pride Seed Co. <sup>r</sup>	4.5	40	19	35	LR
Saranac	Cornell University <sup>iqp*</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
Drummor	Northrup King Co. <sup>l</sup>	4.4	38	29	17	MR
G 2815	Funk Seed Int. <sup>g</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>l</sup>	4.3	75	2	47	HR
Decathlon	Cargill, Inc. <sup>bn</sup>	4.3	66	21	43	MR
Sparta	Land O'Lakes <sup>i</sup>	4.3	48	20	22	S
Target	Ziller Seed Farm, Inc. <sup>*</sup>	4.3	66	44	48	MR
Armor	AgriPro <sup>fxz</sup>	4.2	39	43	44	MR
A-24	Embro Seed Co., Inc. <sup>t</sup>	4.2	5	2	13	S
Hi-Phy	Farmers Forage Res. Coop. <sup>c</sup>	4.1	64	27	57	—
Epic	Larry Peterson, Ltd. <sup>p**sv</sup>	3.9	58	34	45	S
Cimarron	Great Plains Research <sup>y</sup>	3.6	44	15	52	HR
Shenandoah	Great Plains Research <sup>y</sup>	3.6	56	12	36	—
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>1986 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 seeding, respectively. The relative 3-year yield of varieties sold in Minnesota (percent of Em-

pire) and 1986 sources of seed<sup>1</sup> are: Leo-112<sup>oqw</sup>, Carroll-109<sup>pq</sup>, Dawn-108<sup>f</sup>, Norcen-105<sup>ipp\*qw</sup>, Viking-103<sup>qu</sup>, and Empire-100<sup>hijoqtu</sup>. Norcen was released in 1983 by the agricultural experiment stations of Minnesota and six other states. It has performed exceptionally well in grazing trials.

<sup>1</sup>1986 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. 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 for Fox bromegrass were about 4.7 tons/acre at Grand Rapids and 3.6 tons/acre at the other locations. The relative yield of varieties sold in Minnesota (percent of Fox) and 1986 sources of seed<sup>1</sup> are: Barton-105<sup>i</sup>, Rebound-102<sup>aj</sup>, Baylor-101<sup>fm</sup>, and Lincoln-95<sup>afghjoquw</sup>.

<sup>1</sup>1986 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 (percent of Hallmark) and 1986 sources of seed<sup>1</sup> are: Dart-102<sup>i</sup>, Hallmark-100<sup>c</sup>, Sterling-100<sup>ijw</sup>, Napier-100<sup>m</sup>, Comet-98<sup>l</sup>, Hawk-91<sup>f</sup>, Potomac-87<sup>hjqquw</sup>, and Crown (no information available)<sup>f</sup>.

<sup>1</sup>1986 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 rel-

ative 2-year yield of varieties sold in Minnesota (percent of Lakeland) and 1986 sources of seed<sup>1</sup> are: Florex-116<sup>l</sup>, Arlington-113<sup>ijop\*quw</sup>, Prosper I-111<sup>t</sup>, Lakeland-100<sup>ihjop\*quw</sup>, and Redman-99<sup>c</sup>. No data are available on: Atlas<sup>l</sup>, E688<sup>l</sup>, G-2284<sup>s</sup>, Mammoth<sup>th</sup>, Reddy<sup>c</sup>, Redfield<sup>m</sup>, Redland 11<sup>2fx</sup>, and Ruby<sup>2d</sup>.

<sup>1</sup>1986 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. Prior to 1985 common reed canarygrass had been described as being less palatable than most species seeded for hay and pasture, but cattle produced well on the grass if it was used before it became mature. 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. Satisfactory pasture utilization oc-

curs 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.

Seeds of two low alkaloid varieties: Palaton<sup>i</sup> and Venture<sup>pp\*q</sup>, and three common reed canarygrass varieties: Flare<sup>i</sup>, Rise<sup>h</sup>, and Vantage<sup>e\*pp\*q</sup> are available<sup>l</sup>.

<sup>1</sup>1986 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 (percent of Kentucky-31) and 1986 sources of seed<sup>1</sup> are: Kenhy-102<sup>w</sup>, Kentucky-31<sup>lejqquw</sup>, Forager-92<sup>c</sup>, and Fawn-78<sup>ij</sup>. No data are available for: Falcon<sup>u</sup>, Rebel<sup>l</sup>, and Mustang<sup>q</sup>.

<sup>1</sup>1986 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 (percent of Itasca) and 1986 sources of seed<sup>1</sup> are: Timfor-100<sup>r</sup> and Climax-95<sup>afghijoktuw</sup>. No data are available for: Basho<sup>w</sup>, Mohawk<sup>c</sup>, and Mor-tim<sup>m</sup>.

<sup>1</sup>1986 seed sources are listed at the end of the forage crops section.

1986 forage seed sources are: a. Discount Farm Center, P.O. Box 84, Watertown, SD 57201; b. Cargill Seed Division, P.O. Box 5645, Minneapolis, MN 55440; c. Cenex Seed Department, Seed Dept., Station 570, P.O. Box 64089, St. Paul, MN 55164-0089; 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 9480, 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., Dept. of Alfalfa Breeding, 7305 N.W. 62nd Ave., P.O. Box 287, Johnston, IA 50131; p\*. Peterson Seed Co., 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. Developed 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	Crookston 1979-85	Stephen 1979-84	Rosemount 1979-84	Becker <sup>1</sup> 1982-84	Average 22 trials
Alden	1516	1162	1081	910	1218
Elias	1810	1554	1224	918	1459
Keet	1660	1318	1142	925	1325
Checks <sup>2</sup>	1454	1026	919	736	1093
LSD 5%	128	127	99	80	25

<sup>1</sup>Irrigated. <sup>2</sup>1984-85 data of progeny of seedlots 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)	Height (inches)	Seeds/ pound (number)	Test weight/ bushel (pounds)
Alden	66	107	3.9	36	60,500	48
Elias	64	106	2.6	36	58,200	51
Keet	63	104	2.8	35	61,300	49
Checks <sup>2</sup>	64	107	3.9	34	56,000	49

<sup>1</sup>1 = erect, 9 = flat. <sup>2</sup>1984-85 data of progeny of seedlots and varieties imported 10 to 30 years ago.





Annual canarygrass resembles wheat, more than its botanical relative, reed canarygrass, in growth habit and culture.



Agronomist S. R. Simmons and a field day visitor admire Robust, Minnesota's newest and highest yield malting barley variety. Robust was planted on 76 percent of Minnesota and 42 percent of North Dakota barley land in 1985.

## BARLEY

### RECOMMENDED VARIETIES

**Morex**—Medium yield. Early. Medium lodging resistance. Kernel plumpness intermediate. 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**—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. Seed sale regulated by U.S. Variety Protection Act.

### VARIETIES NOT ADEQUATELY TESTED

**Hazen**—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**—High yield. Medium maturity. Six-row, semi-smooth awn, long rachilla hairs, blue aleurone. Classified as a malting vari-

ety by AMBA. Resistant to stem rust and spot blotch. Yielded similar to Robust in Minnesota trials. Not recommended because of limited demand for a blue aleurone malting variety and associated marketing problem. Developed by North Dakota, Agricultural Experiment Station from a cross involving Bonanza, Nordic, and ND B130. 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. Susceptible to spot blotch. Developed by Agriculture Canada, Brandon, from a cross involving Vantage, Jet, Vantmore, Parkland, and Conquest. Licensed in 1970.

**Bumper**—Medium yield. Later maturing than Morex, Medium lodging resistance. Six-row, rough-awn, long rachilla hairs, colorless aleurone. Not classified as a malting variety by AMBA. 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.

**Glenn**—Medium yield. Early. Good lodging resistance. Six-row, rough-awn, long rachilla hairs, colorless aleurone. Classified as a malting variety by AMBA. Resistant to stem rust and spot blotch. Developed by North Dakota Agricultural Experiment Station from crosses involving Br5755-3, ND B138, and Trophy. Released in 1977.

**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

Table 5. Yields of barley varieties in bushels per acre, 1982-85

Variety	Location						
	Crookston 4 <sup>1</sup>	Morris 4	Stephen 1	St. Paul 2	Lamberton 1	Roseau 1	Average 14
Morex	84	86	60	78	78	45	79
Robust	89	88	65	82	88	62	84
Glenn	85	81	50	82	60	53	77
Hazen	87	90	63	91	82	53	84
Larker	81	78	60	68	67	—	73 <sup>2</sup>
LSD 5%	4	6	16	10	10	7	3

<sup>1</sup>Number of trials. <sup>2</sup>Adjusted.

spot blotch. Yield loss from spot blotch may reach 25 bushels per acre. Developed by North Dakota Agricultural Experiment Station from a cross of Traill and a selection from UM 570. Released in 1961.

**Manker**—Medium 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.



Thousands of 10-foot rows are planted annually in the barley breeding nursery at Crookston.

Table 6. Characteristics of barley varieties, 1982-85

Variety	Heading day (June)	Height (inches)	Lodging (percent)	Plump kernels (percent)	Seeds/pound (number)	Reaction to disease		
						Stem <sup>1</sup> rust	Spot <sup>1</sup> blotch	Net blotch (1-5) <sup>2</sup>
Morex	22	35	33	84	13,200	R	MR	3.3
Robust	25	33	26	88	12,600	R	R	1.5
Glenn	21	32	25	87	12,700	R	R	2.7
Hazen	25	33	21	93	11,900	R	R	1.8
Larker	23	33	46	87	12,700	R	S	4.1

<sup>1</sup>R = resistant, S = susceptible, MR = moderately resistant. <sup>2</sup>1 = most resistant.

## 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

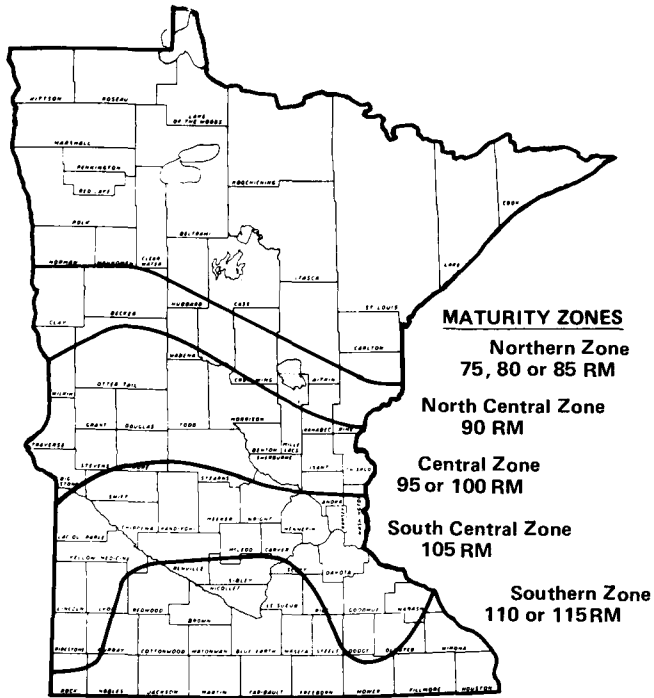
Variety	Morris 1983-85	Crookston 1983-85	Grand Rapids 1982-85	Waseca 1983-85	Lamberton 1982-84	Becker 1982-84	Rosemount 1982,84	Average 7 locations
Mancan	1511	809	418	1046	964	680	1442	981
Manor	1832	765	393	952	1210	643	1569	1052
Winsor Royal	1716	859	389	1096	1262	744	1662	1104
LSD 5%	286	226	46	280	335	146	242	91

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	4.7	40	2.9	15,640	44
Manor	32	4.5	40	2.8	16,200	44
Winsor Royal	32	4.2	40	3.0	15,120	44

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

## CORN



Many corn hybrids are produced by private companies. A total of 1,459 hybrids were registered for sale in Minnesota in 1985. 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. Information on the performance of these inbreds is available from the Corn Breeding Project, 411 Agronomy, University of Minnesota, 1991 Buford Circle, 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.

Table 9. Description of some recent Minhybrids

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

Table 11. 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.

## 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.

**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.

Table 12. Yields of millet varieties in pounds per acre, 1983-85

Type and variety	Grain <sup>1</sup>			Forage <sup>2</sup>		
	Rosemount	Becker	Average	Rosemount	Becker	Average
<b>Foxtail</b>						
Empire	1950	570	1260	8837	6048	7443
<b>Proso</b>						
Dawn	3432	1588	2510	7022	3601	5312
Minco	3978	1537	2758	9937	3924	6931
Minsum	3602	1679	2641	8130	4140	6135
Rise	3936	1491	2714	8654	3676	6165
Cerise	3657	2005	2831	8740	4782	6761
LSD 5%	372	303	240	590	464	375

<sup>1</sup>100 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 (thousands)	Test weight/ bushel (pounds)
	heading (days)	maturity (days)				
<b>Foxtail</b>						
Empire	59	99	2.8	47	239	47
<b>Proso</b>						
Dawn	39	74	3.3	31	68	51
Minco	42	83	3.6	40	71	53
Minsum	39	78	4.8	38	66	51
Rise	42	81	3.2	35	73	51
Cerise	38	73	2.9	40	81	56

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

**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.

## OAT



Agronomist D. D. Stuthman and the new, high-protein oat variety, Proat.

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, medium 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, high yield, tall, fair lodging resistance, medium test weight, high 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 65B 1286, a crown rust resistant selection. Released in 1979.

**Ogle**—Medium maturity, high yield, medium height, good lodging resistance, medium test weight, high groat percent, low

protein percent, yellow seed. Susceptible to crown rust and smut, tolerant to red leaf. Selected at Illinois Agricultural Experiment Station from a cross of Brave, Tyler and Egdolon. Released in 1981.

**Preston**—Early, medium yield and height, fair 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.

**Proat**—Late, high yield, medium height, good lodging resistance, high test weight and groat percent, high protein percent, ivory seed. Resistant to crown rust and smut. Selected at the Minnesota Agricultural Experiment Station from a cross between Dal and Lyon. Released in 1985.

**Steele**—Late, 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. Released in 1984.

### VARIETIES NOT ADEQUATELY TESTED

**Don**—Early, very high yield, poor lodging resistance, very high test weight, high groat percent, low protein percent, white seed, resistant to crown rust and smut, tolerant to red leaf. Selected at the Illinois Agricultural Experiment Station. Released in 1985.

**Hazel**—Medium maturity, high yield, good lodging resistance, high test weight, and very high groat percent, medium protein percent, Ivory seed. Resistant to crown rust, susceptible to smut, tolerant to red leaf. Selected at the Illinois Agricultural Experiment Station from a cross involving Clintford and Portal. Released in 1985.

**Webster**—Early, medium yield and height, good lodging resistance, high test weight and groat percent, medium 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. Released in 1984.

### OTHER VARIETIES

**Benson**—Medium maturity, yield and height, poor lodging resistance, medium test weight, medium groat and protein percent, ivory 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.

**Centennial**—Late, medium 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 Froke. Released in 1983. 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, medium yield and 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.

**Pierce**—Late, 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.

**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. Yield of oat varieties in bushels per acre, 1983-85

Variety	Rosemount	Waseca	Lamberton	Morris	Crookston	Grand Rapids	Average 6 locations	Roseau
Webster <sup>1</sup>	92	90	94	101	116	65	93	92 <sup>2</sup>
Don <sup>2</sup>	102	100	158	147	127	96	122	—
Preston	86	74	93	93	107	69	88	82
Ogle	97	99	89	102	129	90	101	97
Hazel <sup>2</sup>	96	81	125	145	128	72	108	—
Lyon	80	92	80	102	114	70	90	98
Centennial	88	72	83	117	130	80	95	94
Steele	96	103	89	125	134	89	106	113 <sup>1</sup>
Moore	93	101	99	112	135	75	103	100
Proat	91	83	81	116	118	80	95	99 <sup>2</sup>
Pierce	90	99	82	128	131	81	101	106
LSD 5%	8	7	11	8	11	7	3	—

<sup>1</sup>1984-85. <sup>2</sup>1985.

Table 15. Characteristics of oat varieties, 1983-85<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 (pounds) <sup>3</sup>	Reactions to disease <sup>4,5</sup>	
							groat	seed		crown rust	smut
Webster <sup>6</sup>	6-20	38	2.1	14224	41	76	—	—	—	MS	R
Don <sup>5</sup>	23	38	2.5	13271	44	76	—	—	—	HR	HR
Preston	23	39	2.3	16245	41	75	19.4	14.5	373	MR	R
Ogle	26	39	2.0	15738	39	76	14.9	11.2	364	S	S
Hazel <sup>5</sup>	27	38	2.2	14011	43	78	—	—	—	HR	S
Lyon	27	45	2.6	14670	39	75	17.5	13.2	372	MS	HR
Centennial	28	41	2.4	15080	40	76	16.1	12.2	367	HR	MS
Steele	29	45	2.1	14561	41	76	16.7	12.4	430	HR	MR
Moore	29	44	2.3	16920	40	76	15.9	12.0	394	R	MS
Proat	30	42	2.2	15738	42	75	18.6	13.8	403	MR	HR
Pierce	7-1	42	2.4	14960	41	75	17.0	12.7	406	R	MR

<sup>1</sup>Does not include Roseau. <sup>2</sup>1 = erect, 5 = flat. <sup>3</sup>1983-84, 11 percent moisture. <sup>4</sup>HR = highly resistant, R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible. <sup>5</sup>1985. <sup>6</sup>1984-85.

## 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.

**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.

**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.

### VARIETIES NOT ADEQUATELY TESTED

**Monroe**—Awned, early, medium height and fair lodging resistance. Resistant to stem rust and moderately susceptible to leaf rust.

High yield and medium test weight with high seed weight. Superior quality for export market. Released by North Dakota Agricultural Experiment Station in 1985.

### OTHER VARIETIES

**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.

**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.

**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.

Table 16. Characteristics of durum wheat varieties, 1983-85

Variety	Heading (days after May 31)	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 <sup>3</sup>	Average
Cando	35	29	1.5	S	R	12,300	60.1	52	50	52	51
Lloyd	34	29	1.5	MS	R	12,200	59.1	52	54	59	55
Rugby	33	37	1.7	MS	R	11,300	60.3	61	45	51	53
Vic	33	37	1.8	MS	R	11,100	60.8	58	52	52	54
Crosby	31	37	2.1	MS	R	11,000	60.5	59	50	48	52
Mindum	36	46	3.8	S	S	11,300	62.2	57	43	41	47
Monroe	31	37	2.0	MS	R	11,000	59.6	62	49	—	—
Ward	32	38	2.3	MS	R	11,300	60.5	59	46	48	51
LSD 5%								7	7	7	3

<sup>1</sup> 1 = erect, 9 = flat.  
tiple. <sup>3</sup> 1983-84.

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

## 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

**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.

**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. High yield and test weight. Medium protein percent. Satisfactory milling and baking. Disadvantages—Moderately susceptible to shattering.

**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. Seed sale regulated by U. S. Variety Protection Act. 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.

**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. Medium protein percent. Satisfactory milling and baking. Disadvantages—Higher potential for lodging.

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

#### OTHER 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. Medium yield and high test weight. 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.

**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.

#### PRIVATELY DEVELOPED VARIETIES

**Apex 83**—First marketed by SeedTec in 1983. Seed sale regulated by U.S. Variety Protection Act. Awned, early, semidwarf. Resistant to stem and leaf rust. Tolerant of loose smut. High yield and medium test weight. Low to medium protein percent. Disadvantages—Low bake absorption and loaf volume.

**A99AR**—Released by Weather Master in 1982. Seed sale regulated by U.S. Variety Protection Act. Awnless, 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**—First marketed by Arrowhead 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. Low to medium protein percent. Satisfactory milling and baking. Disadvantages—Moderately susceptible to leaf rust.

**Challenger**—Released by Western Plant Breeders in 1983. Seed sale regulated by U.S. Variety Protection Act. Awned, early, semidwarf. Resistant to stem and leaf rust. Tolerant of loose smut. Medium yield and test weight. Low to medium protein percent. Disadvantages—Low bake absorption and loaf volume.

**Erik**—First marketed by Agripro 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. Very high yield. Low to medium protein percent. Disadvantages—Moderately susceptible to loose smut and mildew. Low test weight.

**Leif**—First marketed by Rohm and Haas in 1984. Seed sale regulated by U.S. Variety Protection Act. Awned, midseason, semidwarf. Resistant to stem and leaf rust. Medium lodging resistance. Medium yield and test weight. Disadvantages—Low protein percent and bake absorption.

**Norseman**—First marketed by Agripro in 1984. Seed sale regulated by U.S. Variety Protection Act. Awned, midseason, semi-

Table 17. Yields of hard red spring wheat varieties in bushels per acre, 1983-85

Variety	Crookston	Stephen <sup>1</sup>	Roseau	Northern average	St. Paul	Morris	Lamberton <sup>2</sup>	Waseca	Southern average	State average
<b>Publicly developed varieties</b>										
Era	59	51	43	51	53	54	57	57	55	53
Guard	56	51	45	51	56	56	56	59	57	54
Len	52	46	41	46	51	52	51	56	53	50
Marshall	59	54	44	52	54	55	56	61	57	55
Stoa	61	53	42	52	51	61	55	62 <sup>2</sup>	57 <sup>2</sup>	55
Wheaton	63	56	47	55	56	62	60	62	60	58
Butte	51	44	46	47	51	52	46	51	51	49
Chris	44	38	41	41	43	46	43	45	43	42
Olaf	52	46	42	47	49	53	52	53	53	50
<b>Privately developed varieties</b>										
Apex 83	59 <sup>2</sup>	48 <sup>3</sup>	48 <sup>2</sup>	52 <sup>2</sup>	55 <sup>2</sup>	48 <sup>2</sup>	51	55 <sup>2</sup>	52 <sup>2</sup>	52 <sup>2</sup>
A99AR	56	49	60	55	50	61	54	62	57	56
Buckshot	55	53	43	50	59	51	55	60	56	53
Challenger	55 <sup>2</sup>	45 <sup>3</sup>	46 <sup>2</sup>	49 <sup>2</sup>	54 <sup>2</sup>	47 <sup>2</sup>	49	53 <sup>2</sup>	51 <sup>2</sup>	50 <sup>2</sup>
Erik	61	54	43	53	44	55	61	68	58	55
Leif	50 <sup>2</sup>	53 <sup>3</sup>	42 <sup>2</sup>	48 <sup>2</sup>	51 <sup>2</sup>	47 <sup>2</sup>	49	60 <sup>2</sup>	52 <sup>2</sup>	50 <sup>2</sup>
Norseman	63 <sup>2</sup>	51 <sup>3</sup>	45 <sup>2</sup>	52 <sup>2</sup>	49 <sup>2</sup>	51 <sup>2</sup>	54	62 <sup>2</sup>	54 <sup>2</sup>	54 <sup>2</sup>
Oslo	56	50	45	50	56	55	49	56	54	52
PR2360	55	49	43	49	50	54	50	57	53	52
Solar	61	51	42	51	51	52	57	59	55	53
Success	56 <sup>2</sup>	56 <sup>3</sup>	48	53 <sup>2</sup>	52 <sup>2</sup>	60 <sup>2</sup>	57	60 <sup>2</sup>	57 <sup>2</sup>	55 <sup>2</sup>
Walera	60	50	43	51	52	52	57	58	55	53
2369	60	51	48	53	56	57	56	61	58	56
LSD 5%	7	8	6	5	5	6	10	8	5	3

<sup>1</sup> 1983-84. <sup>2</sup> 1984-85. <sup>3</sup> 1984. Data adjusted to 3-year average.





Agronomist R. H. Busch talks "wheat" at the Crookston field day in July. Seventy percent of Minnesota and 30 percent of North Dakota wheatland was occupied by the Marshall variety in 1985. Wheaton occupied 10 percent of Minnesota and 5 percent of North Dakota wheatland.

dwarf. Resistant to stem and leaf rust. Good lodging resistance. Very high yield and medium test weight. Low to medium protein percent. Disadvantages—Low bake absorption.

**Oslo**—First marketed by Agripro in 1981. Seed sale regulated by U.S. Variety Protection Act. Awne, 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. Awne, 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**—First marketed by Agsco in 1977. Seed sale regulated by U.S. Variety Protection Act. Awne, 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. Disadvan-

tages—Low protein percent and bake absorption. Because of later maturity, less suitable for late seeding in southern Minnesota.

**Success**—First marketed by Cenex in 1984. Seed sale regulated by U.S. Variety Protection Act. Awne, late, semidwarf. Resistant to stem and leaf rust. Very high yield and medium test weight. Disadvantages—Low protein percent. Moderately susceptible to lodging.

**Walera**—First marketed by Agsco in 1980. Seed sale regulated by U.S. Variety Protection Act. Awne, late to midseason, semidwarf. Resistant to stem rust and moderately resistant to leaf rust. Moderately tolerant 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. Awne, 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.

Table 18. Characteristics of hard red spring wheat varieties, 1983-85

Variety	Heading (days after May 31)	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				
Publicly developed varieties									
Era	30	30	3.4	MR	R	14,300	60.5	12.0	low-med.
Guard	25	30	2.4	MR	MR	12,500	61.3	12.9	med.
Len	28	31	2.4	MR	R	12,700	60.3	13.9	high-med.
Marshall	29	30	1.7	MR	R	13,200	61.2	12.4	med.-low
Stoa	27	36	2.4	R	R	13,000	60.1	13.1	med.-high

Table 18 (continued). Characteristics of hard red spring wheat varieties, 1983-85

Variety	Heading (days after May 31)	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				
Wheaton	27	30	2.7	R	R	11,400	59.7	12.3	low-med.
Butte	24	35	4.4	S	R	13,000	61.6	12.7	med.-high
Chris	29	38	5.3	MR	MR	14,300	60.2	14.4	v. high
Olaf	29	31	2.4	MS	R	11,500	60.3	13.8	med.-low
Privately developed varieties									
Apex 83	24	30	1.7	R	R	10,800	60.7	12.6	low-med.
A99AR	30	40	3.7	S	MR-MS	9,800	60.1	12.6	low
Buckshot	28	31	2.4	S	R	12,000	60.3	12.8	med.-high
Challenger	24	30	1.8	R	R	11,100	60.7	12.4	low-med.
Erik	31	32	2.6	R	R	12,600	59.5	12.2	med.-low
Leif	28	33	2.5	R	R	11,100	60.7	12.0	low
Norseman	29	29	1.5	R	R	12,500	60.0	12.6	med.-low
Oslo	25	29	2.3	MS	R	11,600	59.3	12.2	low
PR 2360	28	31	2.4	MR	R	13,400	60.3	12.3	low-med.
Solar	31	30	2.8	MR	R	12,700	60.5	11.8	low-med.
Success	32	33	3.4	R	R	11,500	60.7	11.9	low-med.
Walera	31	30	2.6	MR	R	12,100	60.5	11.7	low
2369	28	30	2.6	MS	R	11,400	61.3	12.6	low-med.

<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

Table 19. Characteristics of winter wheat varieties, 1983-85

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)				
					leaf	stem		Rosemount <sup>3</sup>	Morris	Crookston <sup>4</sup>	Roseau <sup>5</sup>	Average
Rose	11	37	83	1.5	S	R	61.9	39	53	53	31	45
Roughrider	12	41	93	2.7	S	R	61.8	40	53	52	37	46
Agassiz	15	46	88	3.0	S	R	60.6	37	51 <sup>5</sup>	—	38 <sup>6</sup>	44
Brule	10	37	71	1.8	S	R	59.5	41	59	58	45	51
Minter	16	44	94	4.4	S	R	61.4	35	50	47	40	43
Norstar	16	46	89	2.3	S	S	60.0	37	52	47	39	43
LSD 5%										5	7	4

<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>1984-85. <sup>4</sup>1983. <sup>5</sup>1983-84. <sup>6</sup>1984. Data adjusted to be comparable.

Cultural practices have a major 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**—Awed, early, semidwarf with good lodging resistance. Winterhardness 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.

**Minter**—Awed, tall, winterhardy, late, and poor lodging re-

sistance. 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.

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

## WILD RICE



A wild rice research paddy at Rosemount and plot coordinator D. O. Sandstrom. All research paddies are covered with plastic netting of 1-inch mesh to exclude birds.

Cultivated wild rice is grown on 23,000 acres in Minnesota. Most wild rice is produced from varieties with nonshattering tendency, but some fields are still planted to 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

**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.

**Meter**—Short height, very early maturity and reduced foliage in the canopy compared to other varieties. Large seed size and low to medium yield. Developed by Minnesota Agricultural Experiment Station and released in 1985.

**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

Variety	Yield/acre (pounds) <sup>1</sup>		1981-1985		Seeds per pound <sup>3</sup>
	1985 <sup>2</sup>	1981-83	Harvest (August)	Height (inches)	
K2	1530	1521	21	72	7300
M3	—	1607	25	73	—
Meter	960	1110	1	50	—
Netum	1434	1497	17	69	8300
Voyager	1379	1523	16	65	8600
LSD 5%	149	138	—	4	—

<sup>1</sup>Adjusted green weight of grain at 40% moisture. based on wet, stored seed.

<sup>2</sup>1985 data from spring plantings at Grand Rapids and Excelsior.

<sup>3</sup>Seeds per pound

## WINTER RYE

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

### 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

**Dankowskie Nowe (Danko)**—Medium yield, poor winter hardiness, late, medium height, and good lodging resistance. Very large seed of predominantly green color and high test weight. Developed by Dankow-Laski and Choryn experiment stations and is reported to be the leading variety in Poland. Seed distributed by Northern Farm and Garden Inc. at Bemidji, MN 56601 and at Roseau, MN 56751.

### OTHER VARIETIES

**Aroostook**—Low yield, good winterhardiness, 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



Rymin winter rye, Roughrider winter wheat, and 239 winter triticale are compared by agronomist D. L. Rabas at Grand Rapids. Rye is the hardest winter-annual, grain crop.

selection in a composite cross of European and Canadian varieties. Licensed in 1967.

**Frederick**—Medium yield, good 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.

**Puma**—Medium yield, good winterhardiness, medium late, medium height. Poor lodging resistance. Small seed of predominantly green color and medium test weight. Winterhardy selection from Dominant by University of Manitoba. Licensed in 1972.

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

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

Variety	Rosemount 1981-85	Becker 1982-85	Morris 1982-85	Crookston 1982-85	Grand Rapids 1982-85	Average 5 locations
Hancock	59	46	58	53	49	53
Musketeer	58	47	61	65	48	56
Rymin	58	50	61	61	51	56
Dankowskie Nowe <sup>1</sup>	61	47	56	42	36	48
Frederick	51 <sup>2</sup>	42	54 <sup>3</sup>	53	49 <sup>3</sup>	50
LSD 5%	2	4	3	5	4	2

<sup>1</sup>1985. <sup>2</sup>1982-85. <sup>3</sup>1982-83, 85.

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	8	31	20	2.7	54	15,600	55
Musketeer	3	30	20	3.1	53	16,200	56
Rymin	5	30	20	2.9	52	16,200	56
Dankowskie Nowe	25	31	22	2.6	49	14,600	56
Frederick	3	30	20	3.7	53	16,800	56

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

# Oilseed Crops

## FLAX



A new flax variety developed by agronomist V. E. Comstock is being increased for potential release in 1987.

### RECOMMENDED VARIETIES

**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.

**Rahab**—High yield. Medium maturity, good lodging resistance, brown seed, blue flowers. High oil percent. Resistant to rust, moderately susceptible to wilt and pasmo. Released in 1985 by South Dakota Agricultural Experiment Station.

### VARIETIES NOT ADEQUATELY TESTED

**Linton**—Medium yield. Medium maturity, medium lodging resistance, brown seed, blue flowers. Medium oil percent. Resistant to rust and wilt, moderately susceptible to pasmo. Released by North Dakota Agricultural Experiment Station in 1985.

### OTHER VARIETIES

**Clark**—Medium yield. Early, brown seed, blue flowers. Medium oil percent. Resistant to rust, moderately resistant to wilt and pasmo. Released in 1983 by South Dakota Agricultural Experiment Station.

**Culbert and Culbert 79**—Medium yield. Early maturity, good lodging resistance, brown seed, blue flowers. High oil percent. Resistant to rust, moderately resistant to wilt, moderately susceptible to pasmo. Culbert released in 1975 by Minnesota Agricultural Experiment Station. Culbert 79 selected from Culbert and released in 1979 by South Dakota Agricultural Experiment Station. The two varieties do not differ significantly.

**Flor**—Medium yield. Medium maturity, brown seed, blue flowers. High oil percent. Resistant to rust, susceptible to wilt,

Table 23. Yields of flax varieties in bushels per acre

Variety	Lamberton 1981-85	Crookston 1981-85	Stephen 1981-85	Roseau 1984-85	Grand Rapids 1984-85	St. Paul 1981-84	Morris 1982-83	Average 25 trials
Dufferin	25	16	15	15	31	19	34	20.7
Rahab	26	17	14	18	31	18	34	20.7
Clark	23	15	13	16	27	17	33	18.9
Culbert	24	14	13	17	26	18	33	19.1
Culbert 79	24 <sup>1</sup>	13 <sup>1</sup>	12 <sup>1</sup>	19 <sup>3</sup>	22 <sup>1</sup>	16 <sup>4</sup>	30	18.1
Flor	24	16	14	13	29	17	33	19.5
Linton	24 <sup>1</sup>	15 <sup>1</sup>	14 <sup>1</sup>	13	24 <sup>1</sup>	20 <sup>4</sup>	33	19.3
McGregor	28 <sup>1</sup>	16 <sup>1</sup>	14 <sup>1</sup>	17 <sup>3</sup>	26 <sup>1</sup>	17 <sup>4</sup>	34	20.2
NorLin	24 <sup>1</sup>	19 <sup>1</sup>	16 <sup>1</sup>	18 <sup>3</sup>	28 <sup>1</sup>	17 <sup>4</sup>	34	20.9
NorMan	24 <sup>2</sup>	17 <sup>2</sup>	15 <sup>2</sup>	21	31 <sup>2</sup>	19 <sup>5</sup>	34	21.0
LSD 5%	2	2	2	4	4	2	2	0.4

<sup>1</sup>1981-82, 85. <sup>2</sup>1982-85. <sup>3</sup>1985. <sup>4</sup>1981-82. <sup>5</sup>1982-84.

moderately susceptible to pasmo. Released in 1981 by North Dakota Agricultural Experiment Station.

**Linott**—Medium yield. Early maturity, brown seed, blue flowers. High oil percent. Resistant to rust (has a trace of susceptible plants), moderately susceptible to wilt and pasmo. Licensed in 1967 by Agriculture Canada, Ottawa.

**McGregor**—High yield when sown early. Very late, brown seed, blue flowers. Very resistant to lodging. Medium oil percent. Resistant to rust, moderately resistant to wilt, and susceptible to pasmo. Licensed in 1981 by Agriculture Canada, Ottawa. Production of certified seed limited to Canada.

Table 24. Characteristics of flax varieties

Variety	Oil (percent) <sup>1</sup>	Test weight/ bushel (pounds)	Seeds/ pound (number)	Planting to bloom		Lodging (score) <sup>2</sup>	Height (inches)	Disease reaction		
				first (days)	full (days)			Wilt (score) <sup>3</sup>	Pasmo (score) <sup>3</sup>	Rust (rating) <sup>4</sup>
Dufferin	42	53	82,470	56	61	2.7	24	2.0	5.2	R
Rahab	41	53	78,210	54	58	2.9	23	3.7	3.0	R
Clark	40	54	79,580	51	56	3.6	22	3.3	3.4	R
Culbert	41	54	76,880	50	56	2.6	21	2.6	3.1	R
Culbert 79	41	54	76,880	51	57	2.5	21	2.5	3.1	R
Flor	41	53	82,470	54	58	3.7	22	4.7	3.3	R
Linton	40	54	81,000	54	59	3.3	22	1.4	3.6	R
McGregor	40	54	87,230	56	62	1.8	24	3.2	4.2	R
NorLin	40	54	78,210	53	59	3.2	22	3.7	3.4	R
NorMan	41	53	79,580	55	60	4.0	22	3.8	4.0	R

<sup>1</sup>Oven-dry. <sup>2</sup>1 = erect, 9 = flat. <sup>3</sup>1 = best, 9 = poorest. <sup>4</sup>R = resistant.

## 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 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 0.1 percent of glucosinolate sulfur compounds compared with about 1 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. Distributed by Minn-Dak Growers Association, Grand Forks, ND.

**NorLin**—High yield. Medium maturity, brown seed, blue flowers. Medium oil percent. Resistant to rust, moderately susceptible to wilt and pasmo. Licensed in 1982 by Agriculture Canada, Ottawa. Production of certified seed limited to Canada.

**NorMan**—High yield. Late maturity, brown seed, blue flowers. High oil percent. Resistant to rust, moderately susceptible to wilt and pasmo. Licensed in 1984 by Agriculture Canada, Morden. Production of certified seed limited to Canada.

**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 oilseed rape. Originated by University of Alberta. Licensed in 1978.

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

**Global**—Canola oilseed rape. Developed by Svalöf A.B., Plant Breeding Station, Sweden. Distributed by Bonis and Company Ltd., Lindsay, Ontario, Canada.

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

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

**Topas**—Canola oilseed rape. Reported to have moderate resistance to Sclerotinia. Developed by Svalöf A.B., Plant Breeding Station, Sweden. Distributed by Bonis and Company Ltd., Lindsay, Ontario, Canada.

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

**Tribute**—Canola oilseed rape. Tolerant of triazine herbicides (Sencor, Lexone, atrazine, etc.). Better oil quality than OAC Triton but much lower seed yield than Westar. Originated by Agriculture Canada, Saskatoon, and University of Guelph, Ontario. Licensed in 1985.

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

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

**Tobin**—Canola turnip rape. 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 0.1 percent glucosinolate in meal. Originated by University of Manitoba. Licensed in 1982.

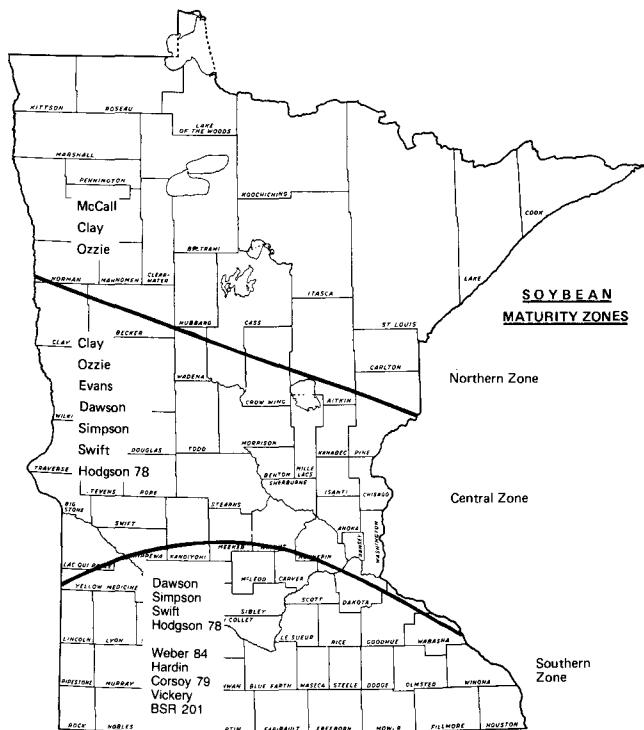
**R-500**—Turnip rape. Over 50 percent erucic acid in oil and very high glucosinolate in meal. Originated by Agriculture Canada, Saskatoon. Licensed in 1975.

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

Crop and variety	Seed yield/acre (pounds)			Oil (percent) <sup>1</sup>	Test weight/ bushel (pounds)	Seeds/ pound (thousands)	Planting to		Lodging (score) <sup>2</sup>	Height (inches)
	Roseau 1981-82,84-85	Crookston 1980-81,85	Rosemount 1979-83				bloom (days)	maturity (days)		
<b>Yellow mustard (<i>Brassica hirta</i>)</b>										
Kirby	1524	868	1144	25	55	89	43	94	3	41
Ochre	1494	927	1166	25	55	91	41	92	4	39
Tilney <sup>3</sup>	1880	1011	1041	25	54	94	45	98	2	39
<b>Oriental mustard (<i>Brassica juncea</i>)</b>										
Domo	1437	1204	1626	35	52	168	45	94	4	45
<b>Brown mustard (<i>Brassica juncea</i>)</b>										
Blaze	1585	973	1466	33	53	189	47	94	4	45
<b>Canola oilseed rape (<i>Brassica napus</i>)</b>										
Andor <sup>4</sup>	1768	1045	1435	43	50	137	51	103	5	36
Global <sup>5</sup>	2524	589	—	43	51	133	56	102	4	47
OAC Triton <sup>6</sup>	1393	492	—	41	51	116	55	100	5	35
Topas <sup>5</sup>	1670	596	—	42	51	156	56	101	4	43
Westar <sup>7</sup>	2337	915	1652	43	51	123	52	103	3	34
<b>Canola turnip rape (<i>Brassica campestris</i>)</b>										
Tobin <sup>8</sup>	1140	414	1379	38	52	197	43	90	3	30
<b>Oilseed rape (<i>Brassica napus</i>)</b>										
Reston <sup>8</sup>	1511	1138	1254	43	50	146	52	107	4	38
<b>Turnip rape (<i>Brassica campestris</i>)</b>										
R-500	—	—	1139	39	49	93	50	104	1	29
LSD 5%	275	225	117							

<sup>1</sup>Oven-dry basis. <sup>2</sup>1 = erect, 9 = flat. <sup>3</sup>1985. (1977-78 Rosemount). <sup>4</sup>1982-85. <sup>5</sup>1985. <sup>6</sup>1984-85. <sup>7</sup>1983-85. <sup>8</sup>1982-85.

## 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



Agronomist J. H. Orf, microbiologist P. H. Graham, and student S. L. Neuhausen cooperate in research on soybean nodulation and nitrogen fixation.

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. *The reactions are to phytophthora races 1 and 3.*

**POWDERY MILDEW**—In 1985 conditions were favorable for the development of powdery mildew. The reactions to powdery mildew reported in the tables were determined on field grown plants under natural infestations by members of the Department of Plant Pathology.

**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 iron 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, high yield. 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 phytoph-



thora. 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 84**—Southern zone. Good tolerance to high lime soils. Similar to Weber. Similar to Corsoy 79 in lodging. Resistant to races 1 and 2 of phytophthora. Developed by Iowa Agricultural Experiment Station. Released in 1984.

#### VARIETIES NOT ADEQUATELY TESTED

**Bicentennial**—Matures about 6 days later than McCall. Medium yield potential. Resistant to races 1 and 2 of phytophthora. Developed by University of Guelph. Licensed in 1985. Production of certified seed limited to Canada.

**BSR 101**—Similar in maturity to Corsoy 79. High yield potential and moderate resistance to brown stem rot. Resistant to races 1 and 2 of phytophthora. Developed by Iowa Agricultural Experiment Station. Released in 1985.

**Hack**—Matures several days later than Corsoy 79. High yield potential but not tolerant to iron chlorosis on high lime soils. Good lodging resistance. Resistant to races 1 and 2 of phytophthora. Developed by Illinois Agricultural Experiment Station. Released in 1984.

**Maple Isle**—Matures about 2 days earlier than McCall. Yields less than McCall. Susceptible to phytophthora. Developed by Agriculture Canada, Ottawa. Licensed in 1984.

**Maple Ridge**—Matures about 7 days earlier than McCall. Yield similar to Maple Amber. Susceptible to phytophthora. Developed by Agriculture Canada, Ottawa. Licensed in 1985. Production of certified seed limited to Canada.

#### 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.

**Elgin**—Similar in maturity to Corsoy 79. Not tolerant to iron chlorosis on high lime soils. Susceptible to phytophthora. High yield potential and lodging resistance. Developed by Iowa Agricultural Experiment Station. Released in 1983.

**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 iron 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, 2, 3 and 4 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. Licensed in 1979. Production of certified seed limited to Canada.

**Weber**—Southern Zone. Good tolerance to high lime soils. Susceptible to phytophthora. Developed by Iowa Agricultural Experiment Station. Released in 1979. Seed sale regulated by U.S. Variety Protection Act.

**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 1985 Minnesota tests and the brand names were: AgriPro, Route 2, Hwy 30 East, Ames, IA 50010 (AgriPro); Arrowhead, Inc., P.O. Box 667, Watertown, SD 57201 (Arrowhead); Asgrow Seed Company, 7000 Portage Road, Kalamazoo, MI 49001 (Asgrow); Cenex, Box 64089, St. Paul, MN 55164-0089 (Cenex); Challenger Seed Ltd., P.O. Box 747, Cedar Falls, IA 50613 (Challenger); Country Brand Seeds, Inc., 4735 Sergeant Road, Waterloo, IA 50613 (CBS); Dairyland Seed Company, Inc., P.O. Box 958, West Bend, WI 53095 (Dairyland); DeKalb-Pfizer Genetics, 3100 Sycamore Road, DeKalb, IL 60115 (DeKalb); Diamond Brand Seeds, 1127 Plaza Drive, Carroll, IA (Diamond); Domestic Seed and Supply, Inc. Box 466, Madison, SD 57042 (Mustang); Ehrich Seed Farm, Route 1, Elmore, MN 56027 (Ehrich Seed Farm); 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 Farms); Funk Seeds International, 1300 West Washington, Bloomington, IL 61701 (Funks); Hoffman Seed Farms, Inc., Route 1, Box 148, Iowa Falls, IA 50126 (Hoffman); Hy-Vigor Seeds, Inc., Route 1, Paullina, IA 51046 (Hy-Vigor Seeds); Interstate Seed Company, Box 470, Fargo, ND 58107 (Interstate); Jacques Seed Company, 720 St. Croix St., Prescott, WI 54021 (Jacques); Kaltenberg Seed Farms, Inc., 5506 Hwy 19, Box 278, Route 2, Waunakee, WI 53597 (Kaltenberg); King Grain Ltd., P.O. Box 1088, Chatham, Ontario, N7M 5L6 Canada (King Grain); Kruger Seed Company, Hwy 57 East, P.O. Box A., Dike, IA 50624 (Kruger DeSoy, Kruger); Land O'Lakes, Inc., 800 53rd Avenue North East, Minneapolis, MN 55440 (Land O'Lakes); Latham Brothers Farms, Alexander, IA 50420 (Latham); Latham Seed Company, Alexander, IA 50420 (Latham); Lynks Seeds, Box 637, Marshalltown, IA 50158 (Lynks Seeds); Lynnville Seed Company, P.O. Box 8, Lynnville, IA 50153 (Riverside); Midwest Oilseeds, Route 3, Box 204, Adel, IA 50003 (Midwest Oilseeds); Northrup King Company, 1500 Jackson St. N.E., Minneapolis, MN 55440 (Northrup King); Payco Seeds, Inc., P.O. Box 70, Dassel, MN 55325 (Payco Seeds); Pride Company, Inc., RFD Box 58, Glen Haven, WI 53810 (Pride); ProfiSeed, Inc., Route 2, Hampton, IA 50441 (ProfiSeed); J.C. Robinson Seed Co., Waterloo, NE 68069 (Golden Harvest); Roebke Seed, E. Hwy 212, Hector, MN 55342 (Roebke); Rossbach Lakeside Seeds, Route 1, Hanska, MN 56041 (Lakeside); Sand Seed Service, Inc., P.O. Box 648, Marcus, IA 51035 (Sands); Schechinger Seed Company, Route 1, Harlan, IA 51537 (S-Brand); Bruellman Select Seeds, Route 1 Box 27, Whittemore, IA 50598 (Select Seeds); The Sexauer Company, P.O. Box 58, 100 Main St., Brookings, SD 57006 (Sexauer); Sigco Research, Inc., Box 289, Breckenridge, MN 56520 (Sigco); 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 (Willette Seed Farm); Wilson Hybrids, Inc., P.O. Box 391, Harlan, IA 51537 (Wilson Blend<sup>R</sup>); Ziller Seed Company, Route 1, Box 122, Bird Island, MN 55310 (Ziller).

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

Variety	Crookston 1982-85	Grand Rapids 1982-85	Moorhead 1982-85	Morris 1983-85	Roseau 1982-85
Maple Presto	24	22	—	—	20
Maple Amber	27	25	28	32	23
Portage	—	27	—	—	25
McCall	33	32	30	38	30
Chico	25	27 <sup>2</sup>	33	36	—
Clay	32	26	35	37	26
Maple Arrow	29	27	28	34	24
Ozzie	30 <sup>1</sup>	—	36	43	—
Evans	28 <sup>1</sup>	—	35	43	—
Simpson	—	—	35	42	—
Dawson	—	—	33	45	—
LSD 5%	3	3	2	2	4

<sup>1</sup>1983-85. <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	Morris 1985			Rosemount and Morris 1983-85		Rosemount 1983-85	Morris 1983-85	Becker 1983-85	Average 1983-85
	mid-May planting 30-inch	late-May planting 30-inch	mid-June planting 30-inch	10-inch	30-inch	30-inch	30-inch	30-inch	30-inch
	McCall	37	35	25	—	—	—	—	—
Clay	—	—	—	39	36	36	35	—	36
Ozzie	42	43	21	44	40	40	39	45	41
Evans	46	42	19	44	41	40	42	45	42
Simpson	51	43	13	45	42	41	42	49	44
Dawson	50	46	15	44	43	41	45	46	44
Swift	—	—	—	43	41	39	43	44	42
Hodgson 78	54	41	8	47	43	43	42	48	44
LSD 5%	9	10	3	3	2	3	4	3	2

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

Variety	Waseca and Lamberton				Fairmont	Waseca	Lamberton	Average
	late-April planting 1982-85	mid-May planting 1982-85	mid-May planting 1982-85	mid-June planting 1983-85	mid-May planting 1982-85	mid-May planting 1982-85	mid-May planting 1982-85	mid-May planting 1982-85
	30-inch	10-inch	30-inch	30-inch	30-inch	30-inch	30-inch	30-inch
McCall	—	—	—	27	—	—	—	—
Clay	—	—	—	25	—	—	—	—
Ozzie	—	—	38	31	42	35	41	39
Evans	—	—	39	31	43	37	41	40
Simpson	—	—	41	31	46	38	44	43
Dawson	—	—	41	32	44	38	44	42
Swift	—	—	41	—	45	36	45	42
Hodgson 78	39	44	42	32	51	39	45	45
Lakota	—	42	40	—	46	39	42	42
Weber	—	—	—	—	50	40	44	45
Weber 84	41	46	42	31	50	40	44	45
Hardin	43	50	46	32	53	44	48	48
Vickery	—	46	44	—	50	41	46	46
Corsoy 79	42	47	43	27	51	39	47	46
Elgin	45 <sup>1</sup>	46	43	—	50	42	44	45
BSR 101	50 <sup>2</sup>	49 <sup>2</sup>	50 <sup>2</sup>	—	53 <sup>2</sup>	52 <sup>2</sup>	47 <sup>2</sup>	51 <sup>2</sup>
BSR 201	45 <sup>1</sup>	41	42	—	51	40	44	45
Hack	48 <sup>2</sup>	52 <sup>2</sup>	48 <sup>2</sup>	—	50 <sup>1</sup>	51 <sup>2</sup>	54 <sup>2</sup>	52 <sup>2</sup>
LSD 5%	2	2	3	2	3	3	3	2

<sup>1</sup>1984-85. <sup>2</sup>1985.

Table 29. Field characteristics of publicly developed soybean varieties, 1985

Variety	Mature		Lodging (score) <sup>3</sup>	Height (inches)	Phytophthora (reaction) <sup>4</sup>	Powdery Mildew (reaction) <sup>6</sup>	Chlorosis (score) <sup>3</sup>
	mid-May planting (days after August 31)	mid-June planting					
<b>Northern Zone (Crookston and Moorhead)</b>							
Maple Presto	3	—	1.0	22	R	S	4.0
Maple Ridge	8	—	1.2	26	S	S	3.5
Maple Amber	11	—	1.1	28	R <sup>5</sup>	S	5.0
Portage	12	—	1.2	26	S	S	3.2
Maple Isle	13	—	1.0	27	S	S	3.5
McCall	14	—	1.3	30	S	S	4.0
Maple Arrow	20 <sup>2</sup>	—	1.1	28	R	S	5.0
Bicentennial	20 <sup>2</sup>	—	1.3	35	R	S	4.8
Chico	22 <sup>2</sup>	—	1.9	34	R	R	3.8
Clay	22 <sup>2</sup>	—	1.3	30	S	S	3.5
Ozzie	25 <sup>2</sup>	—	1.1	35	R	S	3.0
Evans	28 <sup>2</sup>	—	1.9	38	R	R	2.8
Dawson <sup>1</sup>	33 <sup>2</sup>	—	1.7	30	R	S	2.6
Simpson <sup>1</sup>	35 <sup>2</sup>	—	1.3	32	R	S	3.2
<b>Central Zone (Morris and Rosemount)</b>							
Chico	14	—	1.4	29	R	S	3.8
Clay	14	—	1.3	27	S	S	3.5
Ozzie	16	—	1.1	30	R	S	3.0
Evans	22	—	1.8	37	R	R	2.8
Dawson	20	—	1.7	33	R	S	2.6
Simpson	23	—	1.7	34	R	S	3.2
Swift	23	—	2.9	40	S	R	2.0
Hodgson 78	29	—	2.0	36	R	S	2.8
Lakota	31 <sup>2</sup>	—	—	—	R	R	2.5
Weber	35 <sup>2</sup>	—	—	—	S	R	2.0
Weber 84	35 <sup>2</sup>	—	—	—	R	R	2.0
Hardin	36 <sup>2</sup>	—	—	—	R	S	4.5
Vickery	40 <sup>2</sup>	—	—	—	R <sup>5</sup>	S	5.0
Corsoy 79	40 <sup>2</sup>	—	—	—	R <sup>5</sup>	S	4.5
<b>Southern Zone (Lamberton and Waseca)</b>							
McCall	—	18	—	—	S	S	4.0
Clay	—	19	—	—	S	S	3.5
Ozzie	11	24	1.0	28	R	S	3.0
Evans	14	27	1.5	34	R	R	2.8
Dawson	15	28	1.8	32	R	S	2.2
Simpson	16	30	1.3	33	R	S	3.2
Swift	17	30	1.3	35	S	R	2.0
Hodgson 78	20	31	1.6	34	R	S	2.8
Lakota	22	33 <sup>2</sup>	3.0	40	R	R	2.5
Weber	25	34 <sup>2</sup>	2.2	37	S	R	2.0
Weber 84	25	34 <sup>2</sup>	2.2	37	R	R	2.0
Hardin	26	37 <sup>2</sup>	2.0	37	R	S	4.5
Vickery	27	39 <sup>2</sup>	1.9	37	R	S	5.0
Corsoy 79	28	39 <sup>2</sup>	1.9	40	R	S	4.5
Elgin	29	40 <sup>2</sup>	1.8	33	S	R	3.8
BSR 101	32	46 <sup>2</sup>	1.6	37	R	R	4.0
BSR 201	34	48 <sup>2</sup>	2.3	35	R	R	5.0
Hack	37	51 <sup>2</sup>	1.1	36	R	S	4.5

<sup>1</sup>Not grown at Crookston. <sup>2</sup>Not mature at killing frost. <sup>3</sup>1 = excellent 5 = very poor. <sup>4</sup>R = resistant, S = susceptible to races 1 and 2. <sup>5</sup>Also resistant to race 3. <sup>6</sup>R = resistant, S = susceptible.

Table 30. Plant characteristics of publicly developed soybean varieties, 1985

Variety	Color			Seeds/ pound (number)	Seed Quality (score) <sup>5</sup>	Protein (percent) <sup>6</sup>	Oil (percent) <sup>6</sup>
	flower <sup>2</sup>	pubescence <sup>3</sup>	hilum <sup>4</sup>				
<u>Northern Zone (Crookston, Moorhead and Morris)</u>							
Maple Presto	P	T	G	2670	3.0	42.1 <sup>7</sup>	17.2 <sup>7</sup>
Maple Ridge	P	T	Y	2700	2.3	41.7 <sup>7</sup>	16.0 <sup>7</sup>
Maple Amber	P	T	Br	2655	1.6	43.3 <sup>7</sup>	17.1 <sup>7</sup>
Portage	P	G	Y	2320	2.0	41.8 <sup>7</sup>	17.2 <sup>7</sup>
Maple Isle	P	T	Br	2340	2.4	43.5 <sup>7</sup>	16.5 <sup>7</sup>
McCall	P	G	Y	3025	1.8	40.1 <sup>7</sup>	17.5 <sup>7</sup>
Maple Arrow	P	T	Br	2480	1.5	42.1 <sup>7</sup>	17.0 <sup>7</sup>
Bicentennial	P	T	Br	2270	1.8	43.4 <sup>7</sup>	17.0 <sup>7</sup>
Chico	W	G	Bf	3910	2.2	43.3 <sup>7</sup>	17.1 <sup>7</sup>
Clay	P	G	Y	2655	1.8	43.1 <sup>7</sup>	17.0 <sup>7</sup>
Ozzie	P	G	Y	2670	1.8	43.4 <sup>7</sup>	17.9 <sup>7</sup>
Evans	W	G	Y	3000	1.7	41.4 <sup>7</sup>	17.0 <sup>7</sup>
Simpson <sup>1</sup>	P	G	Bf	2340	2.7	43.0 <sup>7</sup>	16.9 <sup>7</sup>
Dawson <sup>1</sup>	P	G	Y	2580	1.8	41.3 <sup>7</sup>	17.1 <sup>7</sup>
<u>Central Zone (Morris and Rosemount)</u>							
Chico	W	G	Bf	3910	2.2	39.5	19.7
Clay	P	G	Y	2810	2.5	39.3	19.6
Ozzie	P	G	Y	2820	1.8	40.2	19.2
Evans	W	G	Y	2920	1.8	38.6	20.2
Dawson	P	G	Y	3160	1.8	39.3	18.3
Simpson	P	G	Bf	3000	2.2	39.0	19.1
Swift	W	T	Bl	2950	1.8	38.6	18.7
Hodgson 78	P	G	Bf	2800	2.0	39.9	19.4
Lakota	P	T	Bl	2865	1.5	40.5	19.3
Weber	W	T	Bl	3065	1.7	40.2	19.0
Weber 84	W	T	Bl	3065	1.7	40.2	19.0
Hardin	P	G	Y	3055	1.8	38.6	19.9
Vickery	P	G	Y	2890	2.0	40.2	19.0
Corsoy 79	P	G	Y	2985	2.2	40.4	19.2
<u>Southern Zone (Lamberton and Waseca)</u>							
McCall	P	G	Y	3000	2.0	40.5	18.8
Clay	P	G	Y	2955	1.7	40.9	19.7
Ozzie	P	G	Y	2700	1.8	40.4	19.7
Evans	W	G	Y	2640	1.8	38.7	20.6
Dawson	P	G	Y	2880	1.7	38.9	20.2
Simpson	P	G	Bf	2960	1.5	39.7	19.7
Swift	W	T	Bl	2710	2.0	37.6	19.8
Hodgson 78	P	G	Bf	2630	1.5	39.6	20.4
Lakota	P	T	Bl	2865	1.5	40.5	19.3
Weber	W	T	Bl	3065	1.7	40.2	19.0
Weber 84	W	T	Bl	3065	1.7	40.2	19.0
Hardin	P	G	Y	3055	1.8	38.6	19.9
Vickery	P	G	Y	2890	2.0	40.2	19.0
Corsoy 79	P	G	Y	2985	2.2	40.4	19.2
Elgin	P	T	Bl	2480	1.7	39.2	19.7
BSR 101	P	G	lb	2625	2.2	40.0	18.6
BSR 201	W	G	Bf	2820	2.0	40.7	19.6
Hack	W	G	Bf	2500	1.5	40.4	20.0

<sup>1</sup>Moorhead only. <sup>2</sup>P = purple, W = white. <sup>3</sup>T = tawny, G = gray. <sup>4</sup>Y = yellow, G = gray, Br = brown, Bl = black, Bf = buff, lb = imperfect black. <sup>5</sup>1 = excellent, 5 = very poor. <sup>6</sup>Oven-dry. <sup>7</sup>1984.

Table 31. Yields and characteristics of public and private soybean varieties, northern zone, 1985 (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>	Powdery Mildew (reaction) <sup>5</sup>	Chlorosis (score) <sup>2</sup>
			1985	1984-85	1983-85					
Agric. Canada	Maple Presto	1	25	20	—	1.0	22	R	S	4.0
Agric. Canada	Maple Ridge	4	37	—	—	1.2	26	S	S	3.5
Sigco	KG20	6	38	—	—	1.6	27	S	S	2.5
King Grain	KG20	6	35	—	—	1.4	26	S	S	2.5
Agric. Canada	Maple Amber	9	35	29	29	1.1	28	R <sup>4</sup>	S	5.0
Minn. AES	McCall	11	39	37	35	1.3	30	S	S	3.2
Agric. Canada	Maple Isle	11	34	—	—	1.0	27	M	S	3.5
King Grain	KG2119	15	39	—	—	1.3	34	S	S	2.5
King Grain	KG30	17	38	—	—	1.5	35	S	S	2.2
Agric. Canada	Maple Arrow	17	31	30	31	1.1	28	R	S	5.0
Univ. of Guelph	Bicentennial	18	33	—	—	1.3	35	R	S	4.8
Minn. AES	Clay	19	33	35	35	1.3	30	S	S	3.5
Jacques	E8570	19	32	—	—	1.7	32	S	S	2.2
Minn. AES	Chico	19	29	33	33	1.9	34	R	R	3.8
Sigco	Ex 40	20	34	—	—	1.7	32	S	S	5.0
Arrowhead	AH9010	22	36	—	—	1.8	35	S	S	2.5
Minn. AES	Ozzie	23	37	38	—	1.1	35	R	S	2.5
ProfiSeed	811	25 <sup>1</sup>	38	—	—	1.9	35	R	S	2.7
Stine	0510	25 <sup>1</sup>	32	36	—	1.9	33	S	R	2.7
Jacques	E8571	25 <sup>1</sup>	30	—	—	1.9	39	R	R	2.0
Minn. AES	Evans	27 <sup>1</sup>	29	35	—	1.9	38	R	R	2.8
Midwest Oilseeds	0750	29 <sup>1</sup>	30	—	—	1.9	36	M	S	4.0
Northrup King	SO512	30 <sup>1</sup>	28	32	—	2.3	38	S	R	3.0
Land O'Lakes	HC-800	32 <sup>1</sup>	28	—	—	2.3	40	S	R	3.0
Interstate	IS 535	34 <sup>1</sup>	18	—	—	2.1	37	S	S	5.0
Interstate	IS 545	35 <sup>1</sup>	30	34	35	2.3	37	S	S	2.2
Asgrow	XP 0949	37 <sup>1</sup>	30	—	—	1.9	40	R <sup>4</sup>	R	3.5
Hy-Vigor Seeds	Hardy	37 <sup>1</sup>	22	—	—	1.6	34	M	S	2.2
Arrowhead	AH8450	38 <sup>1</sup>	25	—	—	2.2	37	S	S	2.2
Interstate	IS 546	40 <sup>1</sup>	24	—	—	2.0	37	R	S	2.5
Land O'Lakes	LL0007	40 <sup>1</sup>	24	—	—	2.6	38	R	S	2.5
	LSD 5%		3	4	2					

<sup>1</sup>Not mature at killing frost. <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>Also resistant to race 3. <sup>5</sup>R = resistant, S = susceptible.

Table 32. Yields and characteristics of public and private soybean varieties, central zone, 1985 (Becker, Morris, Rosemount)

Brand or Originator	Variety	Mature (days after August 31)	Yield/acre (bushels)			Lodging (score) <sup>3</sup>	Height (inches)	Phytophthora (reaction) <sup>4</sup>	Powdery Mildew (reaction) <sup>6</sup>	Chlorosis (score) <sup>3</sup>
			1985	1984-85	1983-85					
Minn. AES	Ozzie	16	36	38	38	1.1	30	R	S	2.5
Minn. AES	Dawson	20	35	—	—	1.7	33	R	S	3.0
Jacques	J-82	22	38	42	42	2.2	40	S	S	2.2
King Grain	KG60	22	37	—	—	1.2	29	S	S	4.0
Minn. AES	Evans	22	35	39	39	1.8	37	R	R	2.8
Dairyland	DSR-120	23	38	42	43	1.8	34	S	S	3.2
Minn. AES	Swift	23	36	—	—	2.9	40	S	R	2.5
AgriPro	AP 120	23	36	41	41	1.7	36	S	S	3.2
Minn. AES	Simpson	23	36	40	41	1.7	34	R	S	3.2
Northrup King	SO9-90	24	35	42	43	1.8	37	R	S	3.2
Roebke	R-180	25	36	43	—	1.9	36	R	S	2.5
Ziller	BT 1330	26	38	—	—	2.1	35	M	S	2.5
Kaltenberg	EXP 015	26	35	—	—	2.3	38	R	S	2.5
ProfiSeed	922	27	35	—	—	2.0	37	R	S	2.2
Interstate	546	27	35	—	—	2.0	38	R	S	2.5

Table 32 (continued). Yields and characteristics of public and private soybean varieties, central zone, 1985 (Becker, Morris, Rosemount)

Brand or Originator	Variety	Mature (days after August 31)	Yield/acre (bushels)			Lodging (score) <sup>3</sup>	Height (inches)	Phytophthora (reaction) <sup>4</sup>	Powdery Mildew (reaction) <sup>6</sup>	Chlorosis (score) <sup>3</sup>
			1985	1984-85	1983-85					
Pride	B095	27	34	—	—	2.0	40	S	S	2.5
Sigco	80	27	33	—	—	2.1	37	R	S	2.2
DeKalb	CX282	27	32	38	38	2.4	37	S	R	2.2
Dairyland	DST 1102	28	38	—	—	2.3	34	S	R	2.5
Sands	SOI EXP 059A	28	37	—	—	1.9	36	R	S	2.8
Asgrow	A1214	28	37	—	—	2.1	40	S	S	3.5
Midwest Oilseeds	0450	28	33	42	40	2.2	36	R	S	2.0
Sands	SOI EXP 059B	28	28	—	—	2.6	37	R	S	4.5
Sands	SOI 142	29	38	43	—	2.2	33	R	S	4.5
Minn. AES	Hodgson 78	29	37	42	42	2.0	36	R	S	2.8
Golden Harvest	X135	29	36	—	—	2.1	36	R	S	3.5
Ziller	Exp 22	29	36	40	—	2.7	38	S	S	2.2
Cenex	8300	29	32	—	—	2.1	39	R	S	3.2
Sigco	90	30	40	—	—	2.0	35	R	S	5.0
Dairyland	DST 1101	30	38	—	—	1.7	35	R <sup>5</sup>	S	4.5
Northrup King	S14-60	30	38	42	43	2.2	36	S	S	4.0
Land O'Lakes	G0-45 <sup>1</sup>	30	34	—	—	2.3	33	R	S	3.2
Land O'Lakes	LL0012	31	40	—	—	2.1	35	R	S	5.0
Thompson	T-9	31	36	—	—	1.8	39	S	S	3.0
Kaltenberg	KB115	32	38	41	—	1.8	32	S	S	2.5
Golden Harvest	X183	33	37	—	—	1.7	33	S	S	2.5
Cenex	8410	33	35	40	—	1.7	32	S	S	4.5
Stine	1350A	34	41	—	—	2.4	36	S	S	4.0
Farmacy	Independence	34	36	40	—	1.8	33	S	S	3.5
Funks	12231	35	40	44	44	2.4	34	S	R	2.5
NAPB	EX 31101	35	38	—	—	1.8	36	R	R	2.0
Interstate	555	35	37	—	—	3.3	38	R	R	3.5
DeKalb	CX134	35	34	41	—	2.4	38	S	S	2.8
Funks	12283	36	41	—	—	2.6	36	S	R	5.0
Hi-Vigor Seeds	Rocker 9 <sup>1</sup>	36	39	—	—	2.3	41	R	S	2.2
Arrowhead	AH8155	36	38	—	—	2.7	38	S	R	2.2
Midwest Oilseeds	1520	36	37	—	—	2.6	36	R	R	2.8
Mustang	EXP-9	36	37	—	—	2.6	36	S	S	2.8
Asgrow	A1525	36	35	—	—	1.8	38	R	S	5.0
Stine	1350	36	34	41	42	1.9	34	S	S	4.0
AgriPro	AP 10	36	34	39	40	2.9	38	R	S	4.5
Pride	B152	37 <sup>2</sup>	38	43	44	1.9	34	R	S	2.8
Kruger	K1012	37 <sup>2</sup>	37	—	—	2.6	36	S	S	2.8
Thompson	Exp 198	37 <sup>2</sup>	37	—	—	2.6	41	S	R	2.7
Arrowhead	AH2188	37 <sup>2</sup>	36	—	—	2.9	38	S	R	3.0
Mustang	1120A	38 <sup>2</sup>	36	—	—	3.1	39	R	R	3.5
Payco Seeds	PS0019	38 <sup>2</sup>	35	—	—	2.8	37	S	R	4.0
ProfiSeed	1018	40 <sup>2</sup>	31	—	—	2.6	37	R	R	4.0
Challenger	CSV10	43 <sup>2</sup>	34	—	—	3.2	42	R	R	2.8
Kruger	K1010	43 <sup>2</sup>	33	40	—	2.8	42	R	R	2.2
Riverside	1405	43 <sup>2</sup>	33	—	—	3.2	42	R	R	2.5
Arrowhead	AH8650	44 <sup>2</sup>	34	—	—	2.9	40	S	R	2.8
Payco Seeds	PS0015	44 <sup>2</sup>	34	—	—	2.7	41	S	S	3.5
LSD 5%			3	3	2					

<sup>1</sup>Blend (information supplied by originator). <sup>2</sup>Not mature at killing frost. <sup>3</sup>1 = excellent, 5 = very poor. <sup>4</sup>R = resistant, S = susceptible, M = mixture of R and S to races 1 and 2. <sup>5</sup>Also resistant to race 3. <sup>6</sup>R = resistant, S = susceptible.

Table 33. Yields and characteristics of public and private soybean varieties, southern zone, 1985 (Fairmont, Lambertton, Waseca)

Brand or Originator	Variety	Mature (days after August 31)	Yield/acre (bushels)			Lodging (score) <sup>2</sup>	Height (inches)	Phytophthora (reaction) <sup>3</sup>	Powdery Mildew (reaction) <sup>6</sup>	Chlorosis (score) <sup>2</sup>
			1985	1984-85	1983-85					
Roebke	R-180	18	40	—	—	1.3	33	R	S	2.2
Minn. AES	Hodgson 78	20	40	42	42	1.6	34	R	S	2.8
Ziller	Exp 21	20	39	41	—	1.8	32	S	S	2.2
Northrup King	S14-60	21	43	46	46	1.6	35	S	S	4.0
Funks	12231	21	42	—	—	2.0	33	S	R	2.5
AgriPro	AP 10	22	39	41	40	2.0	35	R	S	4.0
Dairyland	DSR-151	22	37	—	—	1.3	35	R	S	3.5
Wilson BlendR	1650	22	33	—	—	1.3	38	R	S	2.8
Iowa AES	Hardin	23	43	46	—	2.0	37	R	S	4.5
AgriPro	AP200	23	42	42	43	1.6	38	R	R	3.4
Thompson	T-12	23	41	44	—	1.6	35	R	S	4.5
Northrup King	S15-50	23	39	—	—	1.4	37	R <sup>4</sup>	S	3.5
Jacques	E8590	23	38	—	—	1.6	36	R	S	3.2
Lakeside	104 <sup>1</sup>	24	45	—	—	2.1	37	M	S	3.2
Cenex	8017	24	42	44	44	1.6	38	R	R	3.5
Mustang	Exp-9	24	42	—	—	1.2	33	S	S	2.8
Payco Seeds	PS0019	24	41	—	—	1.8	35	S	R	4.0
Ziller	BT 2300 <sup>1</sup>	24	41	44	—	1.6	35	M	R	2.5
Asgrow	A1937	24	40	44	45	1.6	33	M	R	4.0
Diamond	D-140B <sup>1</sup>	24	40	—	—	2.0	36	M	S	2.8
Asgrow	A1525	24	38	—	—	1.1	34	R	S	5.0
Iowa AES	Weber 84	25	44	45	44	2.2	37	R	R	2.0
Golden Harvest	X198 <sup>1</sup>	25	43	—	—	1.7	36	S	S	2.2
Pride	B203	25	41	43	45	1.7	36	R <sup>4</sup>	S	5.0
Farmacy	Enterprise II	25	41	43	—	1.8	37	S	S	3.5
Kruger DeSoy	302B <sup>1</sup>	25	41	44	45	1.8	36	R <sup>5</sup>	S	3.5
Iowa AES	Vickery	25	40	—	—	1.9	37	R <sup>4</sup>	S	5.0
Asgrow	A2187	25	39	—	—	1.3	38	R	S	2.8
Land O'Lakes	L1808	26	45	45	—	2.1	32	R	R	3.0
Funks	G3145 <sup>1</sup>	26	42	44	44	1.8	35	R	S	4.0
Northrup King	S23-03	26	41	44	—	1.9	36	S	S	3.2
Cenex	8212	26	39	41	42	1.7	36	M	R	2.8
DeKalb	CB151P <sup>1</sup>	26	39	—	—	1.6	37	S	S	2.5
Lakeside	105 <sup>1</sup>	26	38	—	—	2.1	39	M <sup>5</sup>	S	2.5
AgriPro	HP20-20	26	38	41	—	1.6	36	S	S	4.5
Jacques	E8597	26	37	—	—	1.3	35	R	S	2.5
DeKalb	CX155	26	37	42	44	2.0	37	S	S	2.5
Latham	650	27	44	47	48	2.0	35	S	S	3.2
Sands	SOI 226	27	43	48	48	1.6	34	S	S	2.2
Midwest Oilseeds	1480	27	43	45	45	1.1	31	S	S	2.8
Hy-Vigor Seeds	Derby 9	27	42	—	—	2.3	38	S	S	3.5
ProfiSeed	Trisoy 84 <sup>1</sup>	27	41	—	—	2.1	37	S	S	2.8
Arrowhead	AH2244	27	41	—	—	1.6	36	S	S	2.5
Kruger Desoy	414 <sup>1</sup>	27	40	—	—	1.6	34	S	S	2.2
S-Brand	Ex 40A	27	40	—	—	1.9	38	R	R	2.2
Hy-Vigor Seeds	Row-T-9 <sup>1</sup>	27	38	—	—	1.8	35	M	S	2.5
ProfiSeed	1138	27	38	42	43	2.0	38	S	S	4.5
Lynks Seeds	8190	27	34	—	—	1.4	38	S	S	3.2
Thompson	T-30P <sup>1</sup>	28	45	—	—	1.6	34	S	S	2.5
Latham	551	28	44	46	—	1.9	38	M	S	2.0
CBS	Exp-1301	28	43	—	—	1.2	36	R <sup>4</sup>	R	3.0
Latham	500	28	43	43	44	1.6	35	R	S	2.8
Dairyland	DSR-171	28	40	41	41	1.8	40	S	R	5.0
Hoffman	8300	28	39	—	—	1.8	35	S	S	2.8

Table 33 (continued). Yields and characteristics of public and private soybean varieties, southern zone, 1985 (Fairmont, Lamberton, Waseca)

Brand or Originator	Variety	Mature (days after August 31)	Yield/acre (bushels)			Lodging (score) <sup>2</sup>	Height (inches)	Phytophthora (reaction) <sup>3</sup>	Powdery Mildew (reaction) <sup>6</sup>	Chlorosis (score) <sup>2</sup>
			1985	1984-85	1983-85					
Illinois AES	Corsoy 79	28	39	45	45	1.9	40	R <sup>4</sup>	S	4.5
Funks	G3213 <sup>1</sup>	28	38	—	—	2.0	40	M <sup>5</sup>	S	3.5
Sexauer	SX29	28	38	—	—	1.6	34	R	S	3.0
Willette Seed Farm	Wilsoy 84	28	38	41	—	1.4	35	R	S	2.8
Iowa AES	Elgin	29	44	44	—	1.8	33	S	R	3.8
Mustang	1225	29	44	—	—	1.7	36	S	S	2.2
Select Seeds	288	29	43	—	—	2.1	35	S	S	2.2
Hoffman	850 <sup>1</sup>	29	43	—	—	2.3	36	M	S	2.8
Golden Harvest	H-1233	29	42	—	—	1.6	34	M	S	2.2
Ehrich Seed Farm	E-85	29	41	—	—	1.4	39	R	S	4.0
Hoffman	Dawn	29	40	—	—	1.8	39	S	R	4.5
ProfiSeed	1152	29	39	45	45	1.7	35	S	S	2.5
Riverside	404P	29	39	42	—	1.7	36	M	S	2.5
CBS	Stetson	29	39	42	—	1.4	34	R	S	2.8
Midwest Oilseeds	2610	29	38	—	—	1.2	35	R	R	3.0
Lakeside	107 <sup>1</sup>	29	37	—	—	1.7	38	M <sup>5</sup>	S	2.5
Challenger	CSV 15	29	29	—	—	1.2	31	R	R	4.0
Pride	225 Brand <sup>1</sup>	30	42	—	—	2.0	38	M <sup>5</sup>	S	4.5
Pride	B216	30	41	43	45	1.6	36	S	S	5.0
Sands	SOI Exp 255	30	40	—	—	2.0	35	R	R	4.5
Hy-Vigor Seeds	901 <sup>1</sup>	30	38	43	42	1.8	37	R <sup>4</sup>	S	5.0
Kaltenberg	KB 231	31	44	46	47	2.2	34	S	S	2.8
Field Seed Farms	FSF-150	31	43	—	—	2.3	42	R	R	2.5
Kruger	KB220 <sup>1</sup>	31	41	—	—	1.4	36	M	S	3.5
Arrowhead	AH8650	31	41	—	—	2.2	39	S	R	2.8
Sands	SOI 254	31	40	—	—	1.2	38	R	R	4.5
Select Seeds	286	31	39	—	—	1.2	37	M	S	3.5
CBS	Wrangler	31	38	41	—	1.4	34	S	R	3.5
Dairyland	DSR-205	31	35	—	—	1.8	38	S	S	5.0
Iowa AES	BSR 101	32	45	—	—	1.6	37	R	R	4.0
Latham	851	32	45	—	—	2.0	33	M	S	2.5
Golden Harvest	X190	32	43	—	—	1.9	41	R	R	2.2
Land O'Lakes	G0-44 <sup>1</sup>	32	43	—	—	2.0	38	R <sup>5</sup>	R	2.8
Select Seeds	189	32	42	—	—	2.0	42	R	R	2.5
Thompson	T-15	32	42	43	—	2.1	40	R	R	2.5
Kaltenberg	KB 125	32	42	—	—	1.9	39	R	R	3.0
Latham	330	32	41	—	—	1.8	40	R	R	2.8
Wilson Blend <sup>R</sup>	2010 <sup>1</sup>	32	40	—	—	1.6	36	M	R	3.5
Hoffman	Ex 6116 <sup>1</sup>	32	37	—	—	1.6	37	R <sup>4</sup>	R	5.0
Riverside	4042 <sup>1</sup>	32	37	40	41	1.7	39	R	S	3.5
S-Brand	Ex 41b <sup>1</sup>	32	37	—	—	1.6	39	R	R	3.0
Jacques	J-231	33	45	45	—	1.9	36	R	R	2.8
Thompson	T-25	33	45	—	—	2.3	40	S	R	2.0
Payco Seeds	PS0021	33	44	—	—	1.8	36	R <sup>4</sup>	R	4.0
Latham	301 <sup>1</sup>	33	44	42	44	2.2	39	S	R	3.0
Ziller	Exp 20	33	44	—	—	2.1	40	R	S	3.0
Field Seed Farms	Exp 1770 <sup>1</sup>	33	44	—	—	1.7	37	S	S	4.0
Stine	2220 <sup>1</sup>	33	43	46	45	1.9	35	M	S	2.2
Land O'Lakes	LL0023	33	42	—	—	2.3	35	R <sup>4</sup>	R	2.5
Cenex	8422	33	42	—	—	1.4	36	R	R	2.8
Riverside	303C	33	42	—	—	1.3	35	R	S	4.5
Ehrich Seed Farm	E-84	33	42	—	—	1.9	37	R	S	2.2
FFR	12003	33	41	—	—	1.6	39	S	R	5.0
AgriPro	AP 2190	33	40	43	—	2.0	39	R	R	4.5



Table 33 (continued). Yields and characteristics of public and private soybean varieties, southern zone, 1985 (Fairmont, Lamberton, Waseca)

Brand or Originator	Variety	Mature (days after August 31)	Yield/acre (bushels)			Lodging (score) <sup>2</sup>	Height (inches)	Phytophthora (reaction) <sup>3</sup>	Powdery Mildew (reaction) <sup>6</sup>	Chlorosis (score) <sup>2</sup>
			1985	1984-85	1983-85					
Farmacy	Eve	33	39	40	42	1.7	41	R	S	3.0
DeKalb	CX174	33	38	42	—	1.3	37	S	S	2.5
Wilson Blend <sup>a</sup>	2101 <sup>1</sup>	33	38	—	—	1.8	36	M	S	2.2
FFR	10248	33	33	—	—	1.2	36	S	R	2.5
Iowa AES	BSR 201	34	42	44	—	2.3	35	R	R	5.0
Riverside	1405	34	40	—	—	2.0	41	R	R	2.5
Asgrow	A2522	34	39	43	—	2.2	39	S	S	4.5
FFR	13004	34	31	36	—	2.0	42	S	R	2.2
Diamond	D-201	35	44	—	—	1.7	41	R	R	3.5
Pride	PEX 110	35	43	—	—	1.7	36	S	R	5.0
Mustang	1220A	35	40	—	—	1.9	37	R	R	2.8
Dairyland	DSR-207	35	36	40	41	1.8	39	S	R	5.0
S-Brand	S-41	35	36	—	—	1.4	37	R	R	4.5
Challenger	CSV 20	36	44	43	—	1.9	40	R	S	4.5
Lynks Seeds	8202	36	42	—	—	2.2	36	R	R	3.5
Stine	2720	36	41	—	—	1.8	38	S	R	5.0
Select Seeds	213	36	29	—	—	3.1	31	S	R	4.0
Illinois AES	Hack	37	45	—	—	1.1	36	R	S	4.5
LSD 5%			3	2	2					

<sup>1</sup>Blend (information supplied by originator). <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>Also resistant to race 3. <sup>5</sup>Also mixture of R and S to race 3. <sup>6</sup>R = resistant, S = susceptible.

## 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.

Table 34. Yields of sunflower varieties in pounds per acre

Variety and company	Crookston	Morris	Lamberton	Rosemount	Average <sup>1</sup>	Crookston	Morris	Lamberton	Rosemount	Average
	1985	1985	1985	1985	1985	1981,83-85	1981,83-85	1981-85	1981-85	4 locations
<b>Oilseed varieties</b>										
894, USDA	2215	2266	2277	2530	2253	1464	1879	1817	2209	1842
Arrowhead 747, Arrowhead Inc.	1995	2061	2410	—	2155	1885	1769	1765	2101	1880 <sup>2</sup>
Arrowhead 757, Arrowhead Inc.	1874	2284	2039	—	2066	1452	2187	1512	2267	1855 <sup>3</sup>
206, Cargill	1972	2229	2583	—	2261	1621	1835	1977	2502	1984
207, Cargill	2506	1902	2181	—	2196	2092	2229	2017	2886	2306 <sup>2</sup>
208, Cargill	1767	2143	1995	—	1968	1447	1604	1542	1750	1586 <sup>3</sup>
DO 705, Dahlgren	1802	1503	2514	—	1940	1478	1555	2064	2558	1914
DO 730, Dahlgren	2127	2260	2260	—	2216	1871	1592	1616	3209	2072 <sup>3</sup>
DO 855, Dahlgren	1499	1817	2248	—	1855	1440	2142	1899	2507	1997 <sup>4</sup>
Cenex 8101, Interstate	2114	2402	2478	—	2331	1788	2182	1839	2738	2137 <sup>3</sup>
IS 3001, Interstate	2153	2231	2490	—	2291	1690	1823	1994	2323	1958 <sup>2</sup>
IS 3003, Interstate	1772	1978	2286	2043	2012	—	—	—	—	—

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

Variety and company	Crookston 1985	Morris 1985	Lamberton 1985	Rosemount 1985	Average <sup>1</sup> 1985	Crookston 1981,83-85	Morris 1981,83-85	Lamberton 1981-85	Rosemount 1981-85	Average 4 locations
IS 3214, Interstate	1956	2352	1644	1824	1984	—	—	—	—	—
IS 3312, Interstate	1631	1838	2568	2651	2012	—	—	—	—	—
IS 7111, Interstate	2061	1957	2682	—	2233	1434	1769	1974	2302	1870 <sup>2</sup>
Challenger, Jacques	1726	1925	2236	—	1962	1434	1520	1836	2483	1818 <sup>3</sup>
Columbia II, Jacques	1872	1935	2350	2609	2052	—	—	—	—	—
Discovery, Jacques	1791	2319	2096	—	2069	1603	1758	1779	2593	1933 <sup>3</sup>
KO-66, Keltgen	1962	1787	2143	—	1964	1719	1767	1826	2539	1963 <sup>2</sup>
Sunbred 262, Northrup King	2246	2008	2299	—	2184	1753	1841	1897	2392	1971 <sup>3</sup>
Sunbred 285, Northrup King	2387	2559	2622	—	2523	1917	2211	1934	2657	2180 <sup>3</sup>
PAG SF 100, PAG Seeds	1826	2528	2448	—	2267	1444	1783	1866	1740	1708 <sup>3</sup>
PAG SF 102, PAG Seeds	2257	2037	2606	—	2300	1758	1592	2012	2177	1885 <sup>5</sup>
PAG SF 103, PAG Seeds	2554	2084	2590	—	2409	2136	2283	2159	2997	2394 <sup>3</sup>
Sun M20, Sask. Wheat Pool	1069	804	1975	—	1283	672	1227	1664	2366	1482 <sup>3</sup>
Sun M21, Sask. Wheat Pool	1100	1175	2123	2000	1466	—	—	—	—	—
SeedTec 315, SeedTec Int'l	2318	2249	2266	—	2278	1804	2017	1958	2244	2006 <sup>6</sup>
SeedTec 316, SeedTec Int'l	2053	2218	2347	—	2206	1826	2238	1960	2302	2082 <sup>2</sup>
SeedTec 317, SeedTec Int'l	1362	1761	1660	—	1594	1698	2212	1677	2105	1923 <sup>4</sup>
SeedTec 318, SeedTec Int'l	2000	2837	2184	1949	2340	—	—	—	—	—
X30084, SeedTec Int'l	1928	1826	2029	2405	1928	—	—	—	—	—
SeedTec XR38, SeedTec Int'l	1398	2274	1882	1413	1851	—	—	—	—	—
SeedTec SS300, SeedTec Int'l	2470	1815	2404	—	2230	—	—	—	—	—
SeedTec 634 Brand, SeedTec Int.	2080	2533	2358	—	2324	1828	2229	1718	2056	1958 <sup>7</sup>
SIGCO 455, Sigco Research	2121	1561	1913	—	1865	1707	2103	1836	2140	1947 <sup>4</sup>
SIGCO 456, Sigco Research	1984	2339	2289	—	2204	1908	2228	1796	3032	2241 <sup>3</sup>
SIGCO 465, Sigco Research	2214	1609	2399	1702	2074	—	—	—	—	—
SIGCO 468, Sigco Research	1833	2016	2330	—	2060	1544	1860	1737	1357	1625 <sup>3</sup>
SIGCO 475, Sigco Research	2262	2289	2105	2174	2219	—	—	—	—	—
Sokota 2057, Sokota Hybrid	1938	1730	2567	—	2078	1332	1842	2050	2530	1939 <sup>2</sup>
Sokota 2200, Sokota Hybrid	1743	1686	2712	2241	2047	—	—	—	—	—
Sokota 5000, Sokota Hybrid	1914	2265	2306	—	2162	1392	1959	1716	1988	1764 <sup>8</sup>
S-1300, Stauffer Seeds	1712	2149	2694	—	2185	1373	1476	2168	2099	1779 <sup>4</sup>
S-1888, Stauffer Seeds	1944	2222	2423	—	2196	1500	1983	1825	2353	1915 <sup>2</sup>
EX 1296, Stauffer Seeds	1918	2527	2637	2607	2361	—	—	—	—	—
EX 1424, Stauffer Seeds	1896	1894	2651	2013	2147	—	—	—	—	—
Sputnik, USSR	—	—	—	1762	—	—	—	—	2359	—
LSD 5%	314	716	450	726	289	198	276	185	255	116
<b>Nonoilseed varieties</b>										
924, USDA	1554	1585	1858	2039	1666	1250	1833	1600	2398	1770
Royal Hybrid 2141, Agway	2489	2285	2268	—	2347	1900	2317	2185	2900	2326
D131, Dahlgren	2027	2557	2260	—	2281	1909	2547	1872	2565	2223
D141, Dahlgren	2029	1494	2598	2349	2040	—	—	—	—	—
SIGCO 954, Sigco Research	2181	2275	2361	—	2272	1650	2442	1876	2751	2180
SIGCO 964, Sigco Research	2214	1599	2387	—	2067	1777	2121	1977	2442	2079 <sup>2</sup>
SeedTec 043, SeedTec Int'l	2093	1948	2391	2154	2144	1594	2102	2069	2418	2046 <sup>9</sup>
LSD 5%	315	452	404	726	249	202	275	225	256	121

<sup>1</sup>Crookston, Morris, Lamberton. <sup>2</sup>1982-85. <sup>3</sup>1984-85. <sup>4</sup>1983-85. <sup>5</sup>1981-82, 84-85. <sup>6</sup>1981-82, 85. <sup>7</sup>1982, 84-85. <sup>8</sup>1981-83, 85. <sup>9</sup>1982-83, 85.

Yield and oil percentage data of all varieties are based on seed of 10 percent moisture. All hybrids offered for testing were included in 1985 trials. Data for other hybrids tested in previous years may be found in the 1985 and earlier editions of this publication.

Companies with hybrids in these trials are: Agway Inc., Box 169, 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; Interstate Seed and Grain Company, Box 470, Fargo, ND

58102; Jacques Seed Co., Prescott, WI 54021; Keltgen Seed Company, Box A, 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 5692, 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.

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

Variety and company	Oil (percent) <sup>1</sup>	Seeds/ pounds (number) <sup>2</sup>	Planting to		Lodging (percent) <sup>5</sup>	Height (inches) <sup>6</sup>	Head moisture (percent) <sup>7</sup>	Midge damage (percent) <sup>8</sup>	Artifact autogamy (percent) <sup>9</sup>
			bloom (days) <sup>3</sup>	maturity (days) <sup>4</sup>					
894, USDA	42	11,060	75	122	11	66	51	76	100
Arrowhead 747, Arrowhead Inc.	46	10,550	76	123	16	68	54	69	100
Arrowhead 757, Arrowhead Inc.	44	9,860	76	125	11	70	56	—	80
206, Cargill	44	9,450	74	122	12	68	46	58	89
207, Cargill	40	8,560	73	121	16	71	43	35	100
208, Cargill	40	10,800	75	122	8	55	53	—	90
DO 705, Dahlgren	43	8,720	71	120	16	67	49	54	90
DO 730, Dahlgren	46	9,070	74	124	15	69	51	—	39
DO 855, Dahlgren	43	8,250	71	121	14	65	50	—	89
Cenex 8101, Interstate	45	8,100	74	124	12	66	49	—	97
IS 3001, Interstate	45	9,260	74	123	6	64	48	33	73
IS 3003, Interstate	47	8,720	74	123	14	68	45	—	100
IS 3214, Interstate	41	9,860	79	125	12	77	62	—	100
IS 3312, Interstate	45	6,570	71	123	20	70	59	—	95
IS 7111, Interstate	45	8,400	71	122	9	65	47	58	65
Challenger, Jacques	43	10,310	70	122	9	63	49	—	89
Columbia II, Jacques	44	10,550	71	124	10	64	49	—	77
Discovery, Jacques	43	10,310	73	121	10	63	49	—	72
KO-66, Keltgen	41	8,560	72	123	16	68	59	72	85
Sunbred 262, Northrup King	44	9,860	75	122	15	67	49	—	100
Sunbred 285, Northrup King	43	8,890	76	124	18	68	54	—	85
PAG SF 100, PAG Seeds	40	10,310	75	123	9	58	48	—	100
PAG SF 102, PAG Seeds	43	10,080	75	124	13	68	46	68	100
PAG SF 103, PAG Seeds	40	9,260	73	119	12	70	45	—	100
Sun M20, Saskatchewan Wheat Pool	42	8,400	68	117	9	65	36	—	73
Sun M21, Saskatchewan Wheat Pool	44	8,890	68	114	10	59	41	—	93
SeedTec 315, SeedTec Int'l.	39	8,890	76	—	5	75	62	32	100
SeedTec 316, SeedTec Int'l.	43	8,560	75	123	14	68	52	12	100
SeedTec 317, SeedTec Int'l.	44	8,400	75	125	13	69	61	—	88
SeedTec 318, SeedTec Int'l.	41	9,450	75	126	14	68	61	—	100
X30084, SeedTec Int'l.	43	10,080	72	124	11	65	56	—	100
SeedTec XR38, SeedTec Int'l.	42	8,400	77	127	15	65	61	—	100
SeedTec SS300, SeedTec Int'l.	41	9,860	76	123	11	67	50	—	100
SeedTec 634 Brand, SeedTec Int'l.	43	9,450	75	125	9	67	54	74	99
SIGCO 455, Sigco Research	40	8,890	75	124	16	71	61	—	100
SIGCO 456, Sigco Research	40	8,890	76	125	17	77	58	—	94
SIGCO 465, Sigco Research	42	10,550	75	125	9	70	62	—	100
SIGCO 468, Sigco Research	46	9,860	76	125	9	69	55	—	99
SIGCO 475, Sigco Research	42	9,450	77	124	14	71	65	—	85
Sokota 2057, Sokota Hybrid	41	9,450	71	120	9	67	45	77	76
Sokota 2200, Sokota Hybrid	37	9,260	70	121	10	65	51	—	100
Sokota 5000, Sokota Hybrid	42	10,800	74	122	12	67	50	63	82
S-1300, Stauffer Seeds	41	11,060	72	119	9	59	36	—	95
S-1888, Stauffer Seeds	42	10,550	73	122	11	67	49	67	68
EX 1296, Stauffer Seeds	43	8,560	69	123	14	64	57	—	92
EX 1424, Stauffer Seeds	45	8,890	72	123	10	68	55	—	100
Sputnik, USSR	44	6,770	74	125	21	76	58	—	25
LSD 5%							3	17	14

<sup>1</sup>10 percent moisture basis. Crookston and Morris 1981, 83-85; Lamberton and Rosemount 1981-85. <sup>2</sup>Rosemount 1981-84; Crookston 1985. <sup>3</sup>Crookston and Morris 1983-85; Lamberton 1982-85; Rosemount 1982. <sup>4</sup>Crookston and Rosemount 1983-84. <sup>5</sup>Down or broken stalks. Crookston 1983-84; Morris 1983-85; Lamberton 1982, 84-85; Rosemount 1983-84. <sup>6</sup>Crookston 1981, 83; Morris 1981, 83-85; Lamberton 1982-84; Rosemount 1982-85. <sup>7</sup>Crookston 1981, 83-85; Morris 1985; Lamberton 1982, 85; Rosemount 1981-85. <sup>8</sup>Damaged ray flowers and cupped heads. Crookston 1981-82; Morris 1981. <sup>9</sup>100 times yield of self-pollinated plants (covered with bags) divided by yield of cross-pollinated plants (no bags). Rosemount 1981-85.

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>	mature (days) <sup>4</sup>						
924, USDA	69	25	3630	73	124	19	66	59	27	79	96
Royal Hybrid 2141, Agway	33	28	3980	72	124	4	68	62	22	83	69
D 131, Dahlgren	29	27	4090	73	123	8	64	62	22	57	82
D 141, Dahlgren	28	26	4450	74	123	7	62	59	—	—	100
SIGCO 954, Sigco Research	46	25	3340	71	123	9	64	60	24	68	71
SIGCO 964, Sigco Research	36	26	3880	70	121	6	62	48	18	52	62
SeedTec 043, SeedTec Int'l.	26	26	4490	73	122	1	63	59	19	68	89
LSD5%								3	10	12	13

<sup>1</sup>Held on a 20/64 round-hole sieve. Crookston and Morris 1981, 83-85; Lamberton and Rosemount 1981-85. <sup>2</sup>Crookston and Morris 1981, 83-85; Lamberton and Rosemount 1981-85. <sup>3</sup>Crookston 1983, 85; Morris 1983-85; Lamberton 1982-85; Rosemount 1982. <sup>4</sup>Crookston and Rosemount 1983-84. <sup>5</sup>Down or broken stalks. Crookston 1981, 83, 84; Morris 1981, 83-85; Lamberton 1982, 84-85; Rosemount 1983-84. <sup>6</sup>Crookston 1981, 1983; Morris 1981, 83-85; Lamberton 1982-84; Rosemount 1982-85. <sup>7</sup>Crookston 1981, 83-85; Morris 1985; Lamberton 1982, 85; Rosemount 1981-85. <sup>8</sup>Lamberton 1981, 83. <sup>9</sup>Damaged ray flowers and cupped heads. Crookston 1981-82; 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 1981-85.

# 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.

Adzuki is adapted in parts of central and southern Minnesota. It dies before maturity when planted in the silt loam soils of pH 8 at Crookston in the Red River Valley.

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 or 1985, 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 4,000 pounds and averaged about 1,400 pounds per acre. The plants mature in about 112 days and are about 22 inches tall.

**Minoka**—Medium yield. Medium-late maturity. Medium height. Large, red seed. Selected by 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 Red River Edible Bean Growers Association in 1977-78.



Poor emergence and growth of adzuki varieties in the foreground contrast with the healthy fieldbean varieties behind agronomist J. V. Wiersma. Adzuki is not adapted to the soil at Crookston. At other locations bacterial stem rot disease is the major hazard.

## FIELDBEAN

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 nine have been grown commercially in Minnesota, Minnesota's 1984 production amounted to 59 percent navy, 29 percent pinto, 11 percent red kidney, and 1 percent other classes. Varietal recommendations are confined to varieties within the navy, small white, pinto, dark red kidney, light 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**—Medium yield. Late. Erect vine. Medium size, navy seed. Released by Colombian Agriculture Institute. Rereleased by Michigan Agricultural Experiment Station in 1983.

**C-20 navy**—High yield. Late. Erect vine. Medium size, navy 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 maturity. Large, prostrate vine. Very 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 83303 in 1981. Seed sale regulated by U.S. Variety Protection Act.

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

**Gala pinto**—High yield. Medium maturity. Large, prostrate vine. Large pinto seed. Released by Idaho Seed Bean Co., Twin Falls, ID 83303 in 1981. Variety protection pending.

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

**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.

**Linden light red kidney**—Medium yield. *Very late*. Large, erect bush. Very large, light red seed. Released by California Agricultural Experiment Station in 1981.

**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, navy 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.

**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.

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

**Snow-Bunting navy**—Medium yield. Early. Medium size bush. Medium size, navy seed. Released by Clarence Muehlfeld, Bridgeport, MI 48722 in 1974. Distributed by Agri Sales, Inc., Olivia, MN 56277.

**Snow-Flake navy**—Medium yield. Early. Erect bush. Medium size, navy seed. Released by Clarence Muehlfeld, Bridgeport, MI 48722 in 1974. Distributed by Agri Sales, Inc., 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.*

**UI-158 small white**—High yield. Late. Erect, short vine. Large seed for small white class. May sometimes be classed as navy. Released by Idaho Agricultural Experiment Station in 1985.

**UI-425 great northern**—High yield. Late. Short vine. Medium size, great northern seed. Released by Idaho Agricultural Experiment Station in 1985.

**Up-Land navy**—Medium yield. Medium maturity. Medium size bush. Medium size, navy seed. Released by Clarence Muehlfeld, Bridgeport, MI 48722 in 1974. Distributed by Agri Sales, Inc., Olivia, MN 56277.

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

**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

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

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

**Hyden navy**—High yield. Late. Vine. Medium size, navy seed. Resistant to all strains of BCMV and has field resistance to Fusarium root rot. Has a barely noticeable tan spot near the hilum opposite the micropyle. Released by Washington Agricultural Experiment Station and USDA in 1985.

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

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

**UI-126 pinto**—High yield. Late. Large, prostrate vine. Large, pinto seed. Released by Idaho Agricultural Experiment Station in 1983.

**UI 129 pinto**—High yield. Late. Large, prostrate vine. Medium size, pinto seed. Released by Idaho Agricultural Experiment Station in 1983.

**Wesland navy**—Medium yield. Late. Bush. Medium size, navy 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 83303 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 83303 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.

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

**ISB-1 navy**—Medium yield. Early. Erect bush. Medium size, navy seed. Released by Idaho Seed Bean Company, Twin Falls, ID 83303. Variety protection pending.

**ISB-456 navy**—Medium yield. Late. Erect bush. Very small, navy seed. Released by Idaho Seed Bean Company, Twin Falls, ID 83303. Variety protection pending.

**ISB-730 navy**—Medium to low yield. Late. Erect bush. Medium size, navy seed. Released by Idaho Seed Bean Company, Twin Falls, ID 83303. Variety protection pending.

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

**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.

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

**Northland navy**—Low yield. Very early. Small 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.

**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**—High yield. Late. Large, prostrate vine. Small, pinto seed. Released by Washington Agricultural Experiment Station and USDA in 1980.

**NW 590 pinto**—Medium yield. Very late. Large, prostrate vine. Small, pinto seed. Released by Washington Agricultural Experiment Station and USDA in 1979.

**Olathe pinto**—Medium yield. Late. Small, pinto seed. Large, prostrate vine. Tolerant of rust. Released by Colorado Agricultural Experiment Station in 1979. Seed sale regulated by U.S. Variety Protection Act.

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

**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.

**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-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

Class and variety	Seed yield/acre (pounds)				Average - 4 locations			
	Crookston 1982-85	Morris 1982-85	Lamberton 1982-85	Becker <sup>1</sup> 1982-84	Yield/acre (pounds)	Seeds/ pound (number)	Planting to maturity (days)	Growth habit <sup>2</sup>
<b>Pinto</b>								
Fiesta	2259	1824	1434	2484	2000	1080	97	V
Gala	2267	2007	1351	2595	2055	1160	99	V
Nodak	2356	2084	1321	2554	2079	1280	96	V
Pindak	1996	1833	1498	2286	1903	1440	99	V
UI-126 <sup>3</sup>	1872	2190	2003	—	—	1190	101	V
UI-129 <sup>3</sup>	2029	2114	2063	—	—	1220	101	V
Wyo 167	2083 <sup>4</sup>	2061 <sup>5</sup>	1563 <sup>5</sup>	2697 <sup>6</sup>	2101	1170	104	V
<b>Navy</b>								
Bunsi <sup>5</sup>	1877	1871	1215	2144	1777	2450	104	ESV
C-20	1653	2279	1422	2150	1876	2390	108	ESV
Fleetwood	1770	1913	1503	2423	1902	2470	104	B
Harofleet	1859	1835	1402	2481	1894	2520	105	B
OAC Seaforth	1198	1606	1290	1742	1459	2430	96	B
Seafarer	1508	1602	1290	1546	1487	2400	95	B
Snow-Bunting	1710	1968	1265	1820	1691	2310	96	B
Snow-Flake	1455 <sup>5</sup>	1630 <sup>4</sup>	1319 <sup>4</sup>	1830 <sup>7</sup>	1556	2310	95	B
Up-Land	1544	1935	1409	2057	1736	2430	98	B
Crestwood <sup>5</sup>	1665	2076	1362	2298	1850	2110	106	B
Ex Rico 23	1369	2092	1370	2225	1764	2170	103	ESV
Hyden	2133 <sup>8</sup>	2073	947 <sup>8</sup>	—	—	2440	101	V
ISB-1 <sup>5</sup>	1279	1439	970	1733	1355	2410	96	B
ISB-456	1280 <sup>3</sup>	1631 <sup>4</sup>	1085 <sup>3</sup>	—	—	2870	105	B
ISB-730	1535 <sup>3</sup>	1395 <sup>5</sup>	1072 <sup>3</sup>	—	—	2340	103	B
Laker <sup>5</sup>	1123	1637	1397	2069	1557	2520	108	B
Midland <sup>5</sup>	1739	1629	1260	1419	1512	3000	98	B
Northland <sup>5</sup>	1159	1455	1109	1555	1320	2650	93	B

Table 37 (continued). Characteristics of fieldbean varieties

Class and variety	Seed yield/acre (pounds)				Average - 4 locations			
	Crookston	Morris	Lamberton	Becker <sup>1</sup>	Yield/acre (pounds)	Seeds/ pound (number)	Planting to maturity (days)	Growth habit <sup>2</sup>
	1982-85	1982-85	1982-85	1982-84				
Pulsar <sup>5</sup>	1940	1884	1079	1332	1559	2850	100	SV
Sunrise <sup>5</sup>	1942	2014	1288	2530	1944	2210	106	B
Wesland <sup>5</sup>	1928	1819	1300	1799	1712	2390	102	B
<b>Small White</b>								
Aurora	2046	2027	1396	2246	1929	3020	107	ESV
UI-158 <sup>8</sup>	2105	1869	1301	—	—	2670	106	ESV
<b>Great Northern</b>								
Emerson	2340	2063	1581	2614	2150	990	100	V
UI-425	2139	2278	1741	2647	2201	1250	103	SV
Spinel <sup>5</sup>	1493	2383	1796	1862	1884	1260	104	B
<b>Small Red</b>								
UI-37	1658	1376	957	1678	1417	1440	91	ESV
<b>Pink</b>								
Viva	1888	2011	1601	2036	1884	1710	103	V
Harold	2095 <sup>4</sup>	2032 <sup>5</sup>	1543 <sup>5</sup>	1786 <sup>6</sup>	1864	1440	103	V
Victor	1989 <sup>4</sup>	1872 <sup>5</sup>	1570 <sup>5</sup>	2233 <sup>6</sup>	1916	1410	100	V
<b>Dark Red Kidney</b>								
Montcalm	1566	1494	1022	2318	1600	1000	104	B
<b>Light Red Kidney</b>								
Linden	1455 <sup>5</sup>	1643 <sup>5</sup>	1088 <sup>4</sup>	2747 <sup>6</sup>	1733	960	109	B
Red Kloud	1241	1344	792	2207	1396	1000	96	B
Isabella <sup>4</sup>	1172	1259	858	1743	1258	1090	96	B
Ruddy	1332	1205	848	1706	1273	1180	95	B
<b>Black Turtle Soup</b>								
Black Magic	1765	2007	1486	2374	1908	2300	104	ESV
Domino	1906	2083	1425	2423	1959	2330	104	ESV
Ebony	2067	2077	1447	2407	2000	2280	102	ESV
Midnight	1663	2005	1403	1931	1751	2400	104	ESV
T-39	1852	2086	1530	2208	1919	2220	102	ESV
LSD 5%	265	214	206	246	117			

<sup>1</sup>Irrigated. <sup>2</sup>V = vine, SV = short vine, ESV = erect short vine, B = bush. <sup>3</sup>1985. <sup>4</sup>1983-85. <sup>5</sup>1984-85. <sup>6</sup>1984. <sup>7</sup>1983-84. <sup>8</sup>1982,85.

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 <sup>3</sup>		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	T	S	T	T	T	—	S	S	—
Gala	S	S	T	T	T	B	S	S	S
Nodak	T	S	S	T	T	—	T	—	—
<b>Pindak</b>									
Pindak	T	S	T	T	T	S	T	S	S
Holberg	S	S	T	T	T	S	T	S	—
NW 410	S	S	T	T	T	—	T	S	S
<b>NW 590</b>									
NW 590	S	S	T	T	T	—	T	S	S
Olathe	T	S	T	T	T	BG	S	S	S
UI-111	S	S	T	T	S	S	S	S	S
<b>UI-114</b>									
UI-114	S	S	T	T	T	S	T	S	S
<b>UI-126</b>									
UI-126	S	S	T	T	T	—	T	S	S
<b>UI-129</b>									
UI-129	S	S	T	T	T	—	T	S	S
<b>Wyo 166</b>									
Wyo 166	S	S	T	T	S	—	S	S	S
<b>Wyo 167</b>									
Wyo 167	S	S	T	T	S	—	S	S	S

Table 38 (cont.). 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 <sup>3</sup>		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>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	T	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
Hyden	—	—	—	T	T	—	T	—	—
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	T	S	T	T	T	S	S	S	S
NW 395	T	S	T	T	T	—	S	T	S
Pulsar	T	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	T	S	T	T	T	S	S	S	S
<b>Small White</b>									
Aurora	T	S	T	T	T	BG	T	T	T
UI-158	T	—	—	T	T	—	T	T	T
<b>Great Northern</b>									
Emerson <sup>4</sup>	S	T	T	T	T	—	S	S	S
UI-425	T	—	T	T	T	—	—	S	T
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>									
Harold	S	S	T	T	T	—	T	S	S
Victor	S	S	T	T	T	—	T	S	—
Viva	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>									
Linden	T	S	S	T	T	—	S	S	T
Red Kloud	T	S	T	T	T	G	S	S	T
Isabella	T	S	T	T	T	S	S	S	T
Ruddy	—	S	S	T	T	S	S	S	T
<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
Midnight <sup>5</sup>	T	S	T	T	T	BGD	T	T	T
T 39	T	S	T	T	T	G	T	T	T

<sup>1</sup>Many of these reactions are adapted from North Central Regional 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.



## 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.

Century, Lenca, Miranda, Paloma, and Trapper produce seed of satisfactory cooking quality. Procon seed has not been tested for culinary quality, but it may be used as a protein concentrate feed for livestock. Century, Lenca, Trapper, and Procon are also useful as forage crops and may be 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. Lupine has performed better in the Staples-Perham area than it has at the trial locations reported in table 39. 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."

Tangierpea (*Lathyrus tingitanus*) is being promoted as a green manure, soil cover, or forage crop to replace fallow in wheat-fallow crop sequences. The pods tend to open as they mature so seed shattering losses are high. The seed is not edible so is used only for planting.

### 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.

**Procon**—Very high yield. Very early. Short vined but not dwarf. Large, cream-colored seed for protein concentrate in livestock rations. Released by Minnesota Agricultural Experiment Station in 1986.

**Trapper**—Low yield. Late maturity. Long vined. 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.

**Tipu**—High yield. Medium maturity. Long vined. Medium size, cream-colored seed. Semi-leafless plant type with normal stipules and leaflets reduced to tendrils. Released by Agriculture Canada, Morden. Licensed in 1985. Production of certified seed limited to Canada.

**Victoria**—High yield. Early. Medium vine length. Small, cream-colored seed. Developed by Svalöf A. B. Plant Breeding Station, Sweden. Seed distributed by Bonis and Company, Ltd., Lindsay, Ontario. Variety protection pending.

### 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, lupine, and tangierpea

Variety	Seed yield/acre (pounds)					Seeds/ pound (number)	Seed protein <sup>2</sup> (percent)	Planting to		Plant length (inches)
	Becker <sup>1</sup> 1981-85	Grand Rapids 1981-85	Crookston 1981,85	Roseau 1985	Average 13 trials			bloom (days)	maturity (days)	
Century	1770	1925	2505	1995	1960	2140	26	64	104	57
Lenca	2235	2231	2965	2084	2334	2480	25	63	102	50
Miranda	3467	2543	3388	2280	3008	1440	23	57	97	21
Paloma	3211	2432	3029	1862	2780	1630	25	59	99	21
Procon	3076	2725	3190	2964	2950	1840	25	58	97	27
Trapper	1823	1759	2190	344	1741	3660	27	64	106	55
Belinda <sup>3</sup>	3652	1894	3184	2474	2813	1600	25	58	99	20
Tipu <sup>4</sup>	2104	2944	2636	2561	2544	2260	24	63	105	54
Victoria	2230 <sup>5</sup>	2363 <sup>4</sup>	2984 <sup>4</sup>	1853	2368	2620	25	59	100	46
LSD 5%	189	234	419	765	91					
Fababean, lupine, and tangierpea grown in or beside the fieldpea trials <sup>6</sup>										
Fababean	3215	2224	2415	2326	2642	1180	28	61	116	42
Lupine	1978	983 <sup>7</sup>	77	103	1159	1690	28	59	123	31
Tangierpea <sup>4</sup>	1231	1347	1507	0	1223	4490	37	65	121	52

<sup>1</sup>Irrigated. <sup>2</sup>10 percent moisture basis. <sup>3</sup>1984-85. <sup>4</sup>1985. <sup>5</sup>1982. <sup>6</sup>Minnesota fababean 1981, Outlook fababean 1982-85, Gela lupine 1981-82, Ultra lupine 1983-85, Tinga tangierpea. <sup>7</sup>1981, 1983-85 (Kiev 1985).

## 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.

**Brewer**—High yield. Early maturity. Medium height. Medium size seed. Released by Washington Agricultural Experiment Station and USDA in 1982.

**Chilean 78**—Medium yield. Early maturity. Medium 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.

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

**Jasper**—Medium yield. Late maturity. Short. Very small, dark mottled seed. Wilbur-Ellis Company, Spokane, WA 99206. Variety protection pending.

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

**Primera**—Medium yield. Late maturity. Medium height. Large seed. Wilbur-Ellis Company, Spokane, WA 99206.

**Red Chief**—Medium yield. Early maturity. Medium 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	
	Grand Rapids 1982-85	Crookston 1981,85	Becker <sup>1</sup> 1982-84					bloom (days)	maturity (days)
Brewer <sup>4</sup>	943	2031	1357	8,890	27.4	18	4.9	60	111
Chilean 78 <sup>5</sup>	750	—	1226	9,650	26.5	19	4.8	61	110
Eston	1029	1733	1650	15,120	25.1	17	3.4	63	113
Jasper <sup>6</sup>	1043	1525	—	15,120	26.5	17	3.8	63	116
Laird <sup>7</sup>	343	1344	820	7,440	24.2	21	3.5	67	115
Primera <sup>6</sup>	554	1895	—	5,670	28.3	18	4.9	64	119
Red Chief <sup>4</sup>	757	1673	1574	9,070	26.7	18	5.6	60	111
LSD 5%	132	512	164						

<sup>1</sup>Irrigated. <sup>2</sup>Oven-dry. <sup>3</sup>1 = erect, 9 = flat. <sup>4</sup>1982-85. <sup>5</sup>1982-84. <sup>6</sup>1985. <sup>7</sup>1981-84.



Agronomist C. C. Sheaffer found that winterhard alfalfa varieties are needed to survive several years of fall cutting. The variety at the right did not survive and only weeds remain.



**Agronomist D. C. Rasmusson and an interesting comparison of lodging resistance between Kindred, the leading barley variety from 1945 through 1958, and Robust, today's leading variety.**



**Rye in the sky. Crops are also useful art objects.**

## 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... 6- to 14-inch rows... .....	40	44,000	10	25/foot of row	May 20 to June 10
.....			20	20/square foot	
Sweetclover.....	60	240,000	10	55/square foot	Early spring
Tangierpea.....	60	4,500	85	9/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.